
Packages and Features

Release 10.3

The Sage Development Team

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STANDARD PACKAGES

The Sage distribution includes most programs and libraries on which Sage depends. It installs them automatically if it does not find equivalent system packages.

- *_prereq*: Represents system packages required for installing SageMath from source
- *alabaster*: Default theme for the Sphinx documentation system
- *anyio*: High level compatibility layer for multiple asynchronous event loop implementations
- *appdirs*: A small Python module for determining appropriate platform-specific dirs, e.g. a “user data dir”.
- *appnope*: Disable App Nap on macOS ≥ 10.9
- *argon2_cffi*: The secure Argon2 password hashing algorithm
- *argon2_cffi_bindings*: Low-level CFFI bindings for Argon2
- *arrow*: Better dates & times for Python
- *asttokens*: Annotate AST trees with source code positions
- *async_lru*: Simple LRU cache for asyncio
- *attrs*: Decorator for Python classes with attributes
- *babel*: Internationalization utilities
- *beautifulsoup4*: Screen-scraping library
- *beniget*: Extract semantic information about static Python code
- *bleach*: An HTML-sanitizing tool
- *boost_cropped*: Portable C++ libraries (subset needed for Sage)
- *brial*: Boolean Ring Algebra implementation using binary decision diagrams
- *bzip2*: High-quality data compressor
- *cachetools*: Extensible memoizing collections and decorators
- *calver*: Setuptools extension for CalVer package versions
- *cddlib*: Double description method for polyhedral representation conversion
- *certifi*: Python package for providing Mozilla’s CA Bundle
- *cffi*: Foreign Function Interface for Python calling C code
- *chardet*: Universal encoding detector for Python 3
- *charset_normalizer*: The Real First Universal Charset Detector. Open, modern and actively maintained alternative to Chardet.

- *cliquer*: Routines for clique searching
- *cmake*: A cross-platform build system generator
- *colorama*: Cross-platform colored terminal text.
- *combinatorial_designs*: Data from the Handbook of Combinatorial Designs
- *comm*: Jupyter Python Comm implementation, for usage in ipykernel, xeus-python etc.
- *contourpy*: Python library for calculating contours of 2D quadrilateral grids
- *conway_polynomials*: Python interface to Frank Lübeck's Conway polynomial database
- *cppy*: C++ headers for C extension development
- *curl*: Multiprotocol data transfer library and utility
- *cvxopt*: Python software for convex optimization
- *cycler*: Composable cycles
- *cypari2*: Python interface to the number theory library libpari
- *cysignals*: Interrupt and signal handling for Cython
- *cython*: C-Extensions for Python, an optimizing static compiler
- *dateutil*: Extensions to the standard Python module datetime
- *debugpy*: An implementation of the Debug Adapter Protocol for Python
- *decorator*: Python library providing decorators
- *defusedxml*: Addresses vulnerabilities of XML parsers and XML libraries
- *distlib*: Distribution utilities
- *docutils*: Processing plaintext documentation into useful formats, such as HTML or LaTeX
- *ecl*: An implementation of the Common Lisp language
- *eclib*: Enumerating and computing with elliptic curves defined over the rational numbers
- *ecm*: Elliptic curve method for integer factorization
- *editables*: Editable installations
- *elliptic_curves*: Databases of elliptic curves
- *entrypoints*: Discover and load entry points from installed Python packages
- *exceptiongroup*: Backport of PEP 654 (exception groups)
- *executing*: Get the currently executing AST node of a frame, and other information
- *fastjsonschema*: Fastest Python implementation of JSON schema
- *fflas_ffpack*: Dense linear algebra over word-size finite fields
- *filelock*: A platform independent file lock
- *flint*: Fast Library for Number Theory
- *flit_core*: Distribution-building parts of Flit. See flit package for more information
- *fonttools*: Tools to manipulate font files
- *fplll*: Lattice algorithms, including LLL with floating-point orthogonalization
- *fpLLL*: Python interface for FPLLL

- *fqdn*: Validates fully-qualified domain names against RFC 1123, so that they are acceptable to modern browsers
- *freetype*: A free, high-quality, and portable font engine
- *furo*: A clean customizable Sphinx documentation theme
- *gap*: Groups, Algorithms, Programming - a system for computational discrete algebra
- *gast*: Python AST that abstracts the underlying Python version
- *gc*: The Boehm-Demers-Weiser conservative garbage collector
- *gcc*: The GNU Compiler Collection or other suitable C and C++ compilers
- *gengetopt*: getopt_long parser generator
- *gf2x*: Fast arithmetic in $GF(2)[x]$ and searching for irreducible/primitive trinomials
- *gfan*: Groebner fans and tropical varieties
- *gfortran*: Fortran compiler from the GNU Compiler Collection
- *giac*: A general purpose computer algebra system
- *givaro*: C++ library for arithmetic and algebraic computations
- *glpk*: GNU Linear Programming Kit
- *gmp*: Library for arbitrary precision arithmetic
- *gmpy2*: Python interface to GMP/MPFR, MPFR, and MPC
- *gnulib*: Modules imported from Gnulib
- *gnumake_tokenpool*: Jobclient and jobserver for the GNU make tokenpool protocol
- *graphs*: A database of combinatorial graphs
- *gsl*: The GNU Scientific Library
- *h11*: A pure-Python, bring-your-own-I/O implementation of HTTP/1.1
- *hatch_fancy_pypi_readme*: Fancy PyPI READMEs with Hatch
- *hatch_vcs*: Hatch plugin for versioning with your preferred VCS
- *hatchling*: Modern, extensible Python build backend
- *httpcore*: A minimal low-level HTTP client.
- *httpx*: The next generation HTTP client.
- *iconv*: Library for language/country-dependent character encodings
- *idna*: Internationalized Domain Names in Applications (IDNA)
- *imagesize*: Getting image size from png/jpeg/jpeg2000/gif file
- *iml*: Integer Matrix Library
- *importlib_metadata*: Library to access the metadata for a Python package
- *importlib_resources*: Read resources from Python packages
- *info*: stand-alone Info documentation reader
- *ipykernel*: IPython Kernel for Jupyter
- *ipympl*: Matplotlib Jupyter Extension
- *ipython*: Interactive computing environment with an enhanced interactive Python shell

- *ipython_genutils*: Vestigial utilities from IPython
- *ipywidgets*: Interactive HTML widgets for Jupyter notebooks and the IPython kernel
- *isoduration*: Operations with ISO 8601 durations
- *jedi*: Static analysis tool providing IDE support for Python
- *jinja2*: General purpose template engine for Python
- *jmol*: Java viewer for chemical structures in 3D
- *json5*: A Python implementation of the JSON5 data format.
- *jsonpointer*: Identify specific nodes in a JSON document (RFC 6901)
- *jsonschema*: Python implementation of JSON Schema
- *jsonschema_specifications*: The JSON Schema meta-schemas and vocabularies, exposed as a Registry
- *jupyter_client*: Jupyter protocol implementation and client libraries
- *jupyter_core*: Jupyter core package
- *jupyter_events*: Jupyter Event System library
- *jupyter_ismol*: JSmol viewer widget for Jupyter
- *jupyter_lsp*: Multi-Language Server WebSocket proxy for Jupyter Notebook/Lab server
- *jupyter_server*: The backend (core services, APIs, REST endpoints) to Jupyter web applications
- *jupyter_server_terminals*: A Jupyter Server Extension Providing Terminals
- *jupyter_sphinx*: Jupyter Sphinx Extension
- *jupyterlab*: JupyterLab computational environment
- *jupyterlab_mathjax2*: A MathJax Typesetting provider for JupyterLab 4 and above
- *jupyterlab_pygments*: Pygments theme using JupyterLab CSS variables
- *jupyterlab_server*: A set of server components for JupyterLab and JupyterLab like applications.
- *jupyterlab_widgets*: Jupyter interactive widgets for JupyterLab
- *kiwisolver*: An implementation of the Cassowary constraint solving algorithm
- *lcalc*: L-function calculator
- *libatomic_ops*: Access hardware-provided atomic memory update operations
- *libbraiding*: Computing with braids
- *libffi*: A portable foreign-function interface library
- *libgd*: Dynamic graphics generation tool
- *libhomfly*: Compute the homfly polynomial of knots and links
- *liblzma*: General-purpose data compression software
- *libpng*: Bitmap image support
- *linbox*: Linear algebra with dense, sparse, structured matrices over the integers and finite fields
- *lrcalc*: Littlewood-Richardson calculator
- *lrcalc_python*: Littlewood-Richardson calculator
- *m4ri*: fast arithmetic with dense matrices over GF(2)

- *m4rie*: Arithmetic with dense matrices over $GF(2^e)$
- *markupsafe*: Safely add untrusted strings to HTML/XML markup
- *mathjax*: A JavaScript library for displaying mathematical formulas
- *matplotlib*: Python 2D plotting library
- *matplotlib_inline*: Inline Matplotlib backend for Jupyter
- *maxima*: System for manipulating symbolic and numerical expressions
- *memory_allocator*: An extension class to allocate memory easily with Cython
- *meson*: A high performance build system
- *meson_python*: Meson Python build backend (PEP 517)
- *mistune*: A markdown parser in pure Python
- *mpc*: Arithmetic of complex numbers with arbitrarily high precision and correct rounding
- *mpfi*: Multiple precision interval arithmetic library based on MPFR
- *mpfr*: Multiple-precision floating-point computations with correct rounding
- *mpmath*: Pure Python library for multiprecision floating-point arithmetic
- *nauty*: Find automorphism groups of graphs, generate non-isomorphic graphs
- *nbclient*: A client library for executing notebooks. Formerly nbconvert's *ExecutePreprocessor*.
- *nbconvert*: Converting Jupyter Notebooks
- *nbformat*: The Jupyter Notebook format
- *ncurses*: Classic terminal output library
- *nest_asyncio*: Patch asyncio to allow nested event loops
- *networkx*: Python package for complex networks
- *ninja_build*: A build system with a focus on speed
- *notebook*: Jupyter notebook, a web-based notebook environment for interactive computing
- *notebook_shim*: A shim layer for notebook traits and config
- *ntl*: A library for doing number theory
- *numpy*: Package for scientific computing with Python
- *openblas*: An optimized implementation of BLAS (Basic Linear Algebra Subprograms)
- *openssl*: Implementation of the SSL and TLS protocols
- *overrides*: A decorator to automatically detect mismatch when overriding a method.
- *packaging*: Core utilities for Python packages
- *palp*: A package for Analyzing Lattice Polytopes
- *pandocfilters*: A Python module for writing pandoc filters
- *pari*: Computer algebra system for fast computations in number theory
- *pari_galdata*: PARI data package needed to compute Galois groups in degrees 8 through 11
- *pari_seadata_small*: PARI data package needed by ellap for large primes (small version)
- *parso*: A Python parser

- *patch*: Applies diffs and patches to files
- *patchelf*: A small utility to modify the dynamic linker and RPATH of ELF executables
- *pathspec*: Utility library for gitignore style pattern matching of file paths.
- *pexpect*: Python module for controlling and automating other programs
- *pickleshare*: A 'shelve' like datastore with concurrency support
- *pillow*: Python Imaging Library
- *pip*: Tool for installing and managing Python packages
- *pkgconf*: An implementation of the pkg-config spec
- *pkgconfig*: Python interface to pkg-config
- *planarity*: Planarity-related graph algorithms
- *platformdirs*: A small Python module for determining appropriate platform-specific dirs, e.g. a "user data dir".
- *pluggy*: plugin and hook calling mechanisms for python
- *ply*: Python Lex & Yacc
- *polytopes_db*: Databases of 2- and 3-dimensional reflexive polytopes
- *ppl*: Parma Polyhedra Library
- *pplpy*: Python interface to the Parma Polyhedra Library
- *pplpy_doc*: Python interface to the Parma Polyhedra Library (documentation)
- *primecount*: Algorithms for counting primes
- *primecountpy*: Cython interface for C++ primecount library
- *primesieve*: CLI program and C/C++ library for generating primes
- *prometheus_client*: Python client for the systems monitoring and alerting toolkit Prometheus
- *prompt_toolkit*: Interactive command lines for Python
- *psutil*: Cross-platform lib for process and system monitoring in Python.
- *ptyprocess*: Python interaction with subprocesses in a pseudoterminal
- *pure_eval*: Safely evaluate AST nodes without side effects
- *py*: library with cross-python path, ini-parsing, io, code, log facilities
- *pybind11*: Create Python bindings to C++ code
- *pycparser*: Parser of the C language in Python
- *pygments*: Generic syntax highlighter
- *pyparsing*: A Python parsing module
- *pyproject_api*: API to interact with the python pyproject.toml based projects
- *pyproject_metadata*: PEP 621 metadata parsing
- *pyrsistent*: Persistent data structures in Python
- *python3*: The Python programming language
- *python_json_logger*: A python library adding a json log formatter
- *pythran*: Ahead of Time compiler for numeric kernels

- *pytz*: Timezone definitions for Python
- *pytz_deprecation_shim*: Shims to make deprecation of pytz easier
- *pyyaml*: YAML parser and emitter for Python
- *pyzmq*: Python bindings for the zeromq networking library
- *qhull*: Compute convex hulls, Delaunay triangulations, Voronoi diagrams
- *readline*: Command line editing library
- *referencing*: JSON Referencing + Python
- *requests*: An HTTP library for Python
- *rfc3339_validator*: A pure python RFC3339 validator
- *rfc3986_validator*: Pure python rfc3986 validator
- *rpy2*: Python interface to R
- *rw*: Compute rank-width and rank-decompositions
- *sage_conf*: Configuration module for the SageMath library (distributable version)
- *sage_docbuild*: Build system of the Sage documentation
- *sage-setup*: Build system of the SageMath library
- *sagenb_export*: Convert legacy SageNB notebooks to Jupyter notebooks and other formats
- *sagetex*: Embed code, results of computations, and plots from Sage into LaTeX documents
- *scipy*: Scientific tools for Python
- *send2trash*: Send file to trash natively under Mac OS X, Windows and Linux
- *setuptools*: Build system for Python packages
- *setuptools_scm*: Python build system extension to obtain package version from version control
- *singular*: Computer algebra system for polynomial computations, algebraic geometry, singularity theory
- *six*: Python 2 and 3 compatibility utilities
- *sniffio*: Sniff out which async library your code is running under
- *snowballstemmer*: Stemmer algorithms for natural language processing in Python
- *soupsieve*: A modern CSS selector implementation for BeautifulSoup.
- *sphinx*: Python documentation generator
- *sphinx_basic_ng*: A modern skeleton for Sphinx themes.
- *sphinx_copybutton*: Add a copy button to each of your code cells.
- *sphinx_inline_tabs*: Add inline tabbed content to your Sphinx documentation.
- *sphinxcontrib_applehelp*: Sphinx extension which outputs Apple help book
- *sphinxcontrib_devhelp*: Sphinx extension which outputs Devhelp documents
- *sphinxcontrib_htmlhelp*: Sphinx extension which outputs HTML help book
- *sphinxcontrib_jsmath*: Sphinx extension which renders display math in HTML via JavaScript
- *sphinxcontrib_qthelp*: Sphinx extension which outputs QtHelp documents
- *sphinxcontrib_serializinghtml*: Sphinx extension which outputs serialized HTML files

- *sphinxcontrib_websupport*: Sphinx API for Web apps
- *sqlite*: An SQL database engine
- *stack_data*: Extract data from python stack frames and tracebacks for informative displays
- *suitesparse*: A suite of sparse matrix software
- *symmetrica*: Library for representation theory
- *sympow*: Computes special values of symmetric power elliptic curve L-functions
- *sympy*: Python library for symbolic mathematics
- *tachyon*: A ray tracing system
- *terminado*: Tornado websocket backend for the term.js Javascript terminal emulator library
- *threejs*: JavaScript library to display 3D graphics in the browser
- *tinycss2*: A tiny CSS parser
- *tomli*: A lil' TOML parser
- *tornado*: Python web framework and asynchronous networking library
- *tox*: tox is a generic virtualenv management and test command line tool
- *traitlets*: Traitlets Python configuration system
- *trove_classifiers*: Canonical source for classifiers on PyPI (pypi.org).
- *types_python_dateutil*: Typing stubs for python-dateutil
- *typing_extensions*: Backported and Experimental Type Hints for Python 3.8+
- *tzdata*: Provider of IANA time zone data
- *tzlocal*: Python timezone information for the local timezone
- *uri_template*: RFC 6570 URI Template Processor
- *urllib3*: HTTP library with thread-safe connection pooling, file post, and more.
- *virtualenv*: Virtual Python Environment builder
- *wcwidth*: Measures the displayed width of unicode strings in a terminal
- *webcolors*: A library for working with the color formats defined by HTML and CSS.
- *webencodings*: Character encoding aliases for legacy web content
- *websocket_client*: WebSocket client for Python with low level API options
- *wheel*: A built-package format for Python
- *widgetsnbextension*: Jupyter interactive widgets for Jupyter Notebook
- *xz*: General-purpose data compression software
- *zeromq*: A modern networking library
- *zip*: A pathlib-compatible zipfile object wrapper
- *zlib*: Data compression library

OPTIONAL PACKAGES

For additional functionality, you can install some of the following optional packages.

- *4ti2*: Algebraic, geometric and combinatorial problems on linear spaces
- *_bootstrap*: Represents system packages required for running the top-level bootstrap script
- *_develop*: Represents system packages recommended for development
- *_recommended*: Represents system packages recommended for additional functionality
- *_sagemath*: Downstream package of Sage in distributions
- *admcycles*: Computation in the tautological ring of the moduli space of curves
- *auditwheel_or_delocate*: Repair wheels on Linux or macOS
- *benzene*: Generate fusenes and benzenoids with a given number of faces
- *biopython*: Tools for computational molecular biology
- *bliss*: Computing automorphism groups and canonical forms of graphs
- *buckygen*: Efficient generation of nonisomorphic fullerenes
- *cbc*: COIN-OR branch and cut solver for mixed-integer programs
- *ccache*: A compiler cache
- *clarabel*: Clarabel Conic Interior Point Solver for Rust / Python
- *coxeter3*: Library for Coxeter groups, Bruhat ordering, Kazhdan-Lusztig polynomials
- *cryptominisat*: A SAT solver
- *csdp*: Solver for semidefinite programs
- *cunningham_tables*: List of the prime numbers occuring in the Cunningham table
- *cvxpy*: A domain-specific language for modeling convex optimization problems in Python.
- *cylp*: A Python interface for CLP, CBC, and CGL
- *d3js*: JavaScript library for manipulating documents based on data
- *database_crema_ellcurve*: Database of elliptic curves
- *database_cubic_hecke*: Ivan Marin's representations of the cubic Hecke algebra
- *database_jones_numfield*: Table of number fields
- *database_knotinfo*: Content of the KnotInfo and LinkInfo databases as lists of dictionaries
- *database_kohel*: Database of modular and Hilbert polynomials

- *database_mutation_class*: Database of exceptional mutation classes of quivers
- *database_odlyzko_zeta*: Table of zeros of the Riemann zeta function
- *database_stein_watkins*: Database of elliptic curves (full version)
- *database_stein_watkins_mini*: Database of elliptic curves (small version)
- *database_symbolic_data*: Database from the SymbolicData project
- *dot2tex*: Create PGF/TikZ commands from Graphviz output
- *dsdp*: Semidefinite programming solver
- *e_antic*: Real embedded number fields
- *ecos_python*: Embedded Cone Solver (Python wrapper)
- *ffmpeg*: ffmpeg video converter
- *free_fonts*: a free family of scalable outline fonts
- *fricas*: A general purpose computer algebra system
- *frobby*: Computations on monomial ideals
- *gap_jupyter*: Jupyter kernel for GAP
- *gap_packages*: A collection of GAP packages
- *git*: Version control system
- *github_cli*: Command-line interface for GitHub
- *gitpython*: GitPython is a python library used to interact with Git repositories
- *glucose*: A SAT solver
- *gp2c*: A compiler for translating GP routines to C
- *graphviz*: Graph visualization software
- *hypothesis*: A library for property-based testing
- *igraph*: A library for creating and manipulating graphs
- *ImageMagick*: A collection of tools and libraries for many image file formats
- *isl*: Sets and relations of integer points bounded by affine constraints
- *jupymake*: A Python wrapper for the polymake shell
- *kenzo*: Construct topological spaces and compute homology groups
- *kissat*: SAT solver
- *latte_int*: Count lattice points, compute volumes, and integrate over convex polytopes
- *libgraphviz*: Graph visualization software (callable library)
- *libjpeg*: JPEG image support
- *libnauty*: Find automorphism groups of graphs, generate non-isomorphic graphs (callable library)
- *libogg*: Library for the Ogg multimedia container format
- *libsemigroups*: Library for semigroups and monoids
- *libxml2*: XML parser and toolkit
- *lidia*: A library for computational number theory

- *llvm*: The LLVM Compiler Infrastructure, including the Clang C/C++/Objective-C compiler
- *lrslib*: Reverse search algorithm for vertex enumeration and convex hull problems
- *mathics*: A general-purpose computer algebra system
- *mathics_scanner*: Character Tables and Tokenizer for Mathics and the Wolfram Language.
- *matroid_database*: Python interface to matroid database
- *mcqd*: An exact algorithm for finding a maximum clique in an undirected graph
- *meataxe*: Library for computing with modular representations
- *p_group_cohomology*: Modular cohomology rings of finite groups
- *mpfrcx*: Arithmetic of univariate polynomials over arbitrary precision real or complex numbers
- *msolve*: Multivariate polynomial system solver
- *nibabel*: Access a multitude of neuroimaging data formats
- *normaliz*: Computations in affine monoids, vector configurations, lattice polytopes, and rational cones
- *notedown*: Create IPython notebooks from markdown
- *onetbb*: oneAPI Threading Building Blocks
- *ore_algebra*: Ore algebra
- *osqp_python*: The Operator Splitting QP Solver (Python wrapper)
- *p_group_cohomology*: Modular cohomology rings of finite groups
- *palettable*: Color palettes for Python
- *pandoc*: A document converter
- *pandoc_attributes*: A parser and generator for pandoc block attributes
- *papilo*: Parallel presolve for integer and linear optimization
- *pari_elldata*: PARI data package for elliptic curves
- *pari_galpol*: PARI data package for polynomials defining Galois extensions of the rationals
- *pari_jupyter*: A Jupyter kernel for PARI/GP
- *pari_nftables*: PARI data package for number fields
- *pari_seadata*: PARI data package needed by ellap for large primes (full version)
- *pdf2svg* - PDF to SVG convertor
- *perl_cpan_polymake_prereq*: Represents all Perl packages that are prerequisites for polymake
- *perl_mongodb*: A prerequisite for polymake's PolyDB feature
- *perl_term_readline_gnu*: Perl extension for the GNU Readline/History libraries
- *phitigra*: A graph editor for SageMath/Jupyter
- *pint*: Physical quantities module
- *plantri*: Generate non-isomorphic sphere-embedded graphs
- *polymake*: Computations with polyhedra, fans, simplicial complexes, matroids, graphs, tropical hypersurfaces
- *polytopes_db_4d*: Database of 4-dimensional reflexive polytopes
- *pybtex*: A BibTeX-compatible bibliography processor in Python

- *pycosat*: SAT solver picosat with Python bindings
- *pycryptosat*: Python module of cryptominisat
- *pygraphviz*: Python interface to Graphviz
- *pynormaliz*: Python bindings for the normaliz library
- *pyppeteer*: Headless chrome/chromium automation library
- *pyscipopt*: Python interface and modeling environment for SCIP
- *pysingular*: A basic Python interface to Singular
- *pytest*: Simple powerful testing with Python
- *pytest_mock*: Thin-wrapper around the mock package for easier use with pytest
- *pytest_xdist*: pytest xdist plugin for distributed testing and loop-on-failing modes
- *python_build*: A simple, correct PEP517 package builder
- *python_igraph*: Python bindings for igraph
- *pyx*: Generate PostScript, PDF, and SVG files in Python
- *qlddl_python*: QDLDL, a free LDL factorization routine (Python wrapper)
- *qepcad*: Quantifier elimination by partial cylindrical algebraic decomposition
- *r*: A free software environment for statistical computing and graphics
- *rst2ipynb*: Convert reStructuredText files to Jupyter notebooks
- *rubiks*: Programs for Rubik's cube
- *saclib*: Computations with real algebraic numbers
- *sage_flatsurf*: computation with flat surfaces
- *sage_numerical_backends_coin*: COIN-OR backend for Sage MixedIntegerLinearProgram
- *sage_numerical_backends_cplex*: Cplex backend for Sage MixedIntegerLinearProgram
- *sage_numerical_backends_gurobi*: Gurobi backend for Sage MixedIntegerLinearProgram
- *sage_sws2rst*: Translate legacy Sage worksheet files (.sws) to reStructuredText (.rst) files
- *scip*: Mixed integer programming solver
- *scip_sdp*: Mixed integer semidefinite programming plugin for SCIP
- *scs*: Splitting conic solver
- *singular_jupyter*: Jupyter kernel for Singular
- *sirocco*: Compute topologically certified root continuation of bivariate polynomials
- *slabbe*: Sébastien Labbé's Research code
- *snappy*: Topology and geometry of 3-manifolds, with a focus on hyperbolic structures
- *soplex*: Linear optimization solver using the revised simplex method
- *sqlalchemy*: A database abstraction library
- *surface_dynamics*: dynamics on surfaces (measured foliations, interval exchange transformation, Teichmüller flow, etc)
- *symengine*: A C++ symbolic manipulation library

- *symengine_py*: Python wrappers for SymEngine
- *tdlib*: Algorithms for computing tree decompositions
- *texlive*: A comprehensive TeX system
- *texlive luatex*: LuaTeX packages
- *texttable*: Python module for creating simple ASCII tables
- *tides*: Integration of ODEs
- *topcom*: Compute triangulations of point configurations and oriented matroids
- *xindy*: a general-purpose index processor

FEATURES

3.1 Testing for features of the environment at runtime

A computation can require a certain package to be installed in the runtime environment. Abstractly such a package describes a *Feature* which can be tested for at runtime. It can be of various kinds, most prominently an *Executable* in the PATH, a *PythonModule*, or an additional package for some installed system such as a *GapPackage*.

AUTHORS:

- Julian Rüth (2016-04-07): Initial version
- Jeroen Demeyer (2018-02-12): Refactoring and clean up

EXAMPLES:

Some generic features are available for common cases. For example, to test for the existence of a binary, one can use an *Executable* feature:

```
sage: from sage.features import Executable
sage: Executable(name="sh", executable="sh").is_present()
FeatureTestResult('sh', True)
```

Here we test whether the grape GAP package is available:

```
sage: from sage.features.gap import GapPackage
sage: GapPackage("grape", spkg="gap_packages").is_present() # optional - gap_packages
FeatureTestResult('gap_package_grape', True)
```

Note that a *FeatureTestResult* acts like a bool in most contexts:

```
sage: if Executable(name="sh", executable="sh").is_present(): "present."
'present.'
```

When one wants to raise an error if the feature is not available, one can use the `require` method:

```
sage: Executable(name="sh", executable="sh").require()

sage: Executable(name="random", executable="randomOochoz6x", spkg="random", url=
↳ "http://rand.om").require() # optional - sage_spkg
Traceback (most recent call last):
...
FeatureNotPresentError: random is not available.
Executable 'randomOochoz6x' not found on PATH.
...try to run...sage -i random...
Further installation instructions might be available at http://rand.om.
```

As can be seen above, features try to produce helpful error messages.

class sage.features.CythonFeature (*args, **kws)

Bases: *Feature*

A *Feature* which describes the ability to compile and import a particular piece of Cython code.

To test the presence of name, the cython compiler is run on test_code and the resulting module is imported.

EXAMPLES:

```
sage: from sage.features import CythonFeature
sage: fabs_test_code = '''
....: cdef extern from "<math.h>":
....:     double fabs(double x)
....:
....:     assert fabs(-1) == 1
....: '''
sage: fabs = CythonFeature("fabs", test_code=fabs_test_code, #_
↳needs sage.misc.cython
....:                        spkg="gcc", url="https://gnu.org",
....:                        type="standard")
sage: fabs.is_present() #_
↳needs sage.misc.cython
FeatureTestResult('fabs', True)
```

Test various failures:

```
sage: broken_code = '''this is not a valid Cython program!'''
sage: broken = CythonFeature("broken", test_code=broken_code)
sage: broken.is_present()
FeatureTestResult('broken', False)
```

```
sage: broken_code = '''cdef extern from "no_such_header_file": pass'''
sage: broken = CythonFeature("broken", test_code=broken_code)
sage: broken.is_present()
FeatureTestResult('broken', False)
```

```
sage: broken_code = '''import no_such_python_module'''
sage: broken = CythonFeature("broken", test_code=broken_code)
sage: broken.is_present()
FeatureTestResult('broken', False)
```

```
sage: broken_code = '''raise AssertionError("sorry!")'''
sage: broken = CythonFeature("broken", test_code=broken_code)
sage: broken.is_present()
FeatureTestResult('broken', False)
```

class sage.features.Executable (*args, **kws)

Bases: *FileFeature*

A feature describing an executable in the PATH.

In an installation of Sage with SAGE_LOCAL different from SAGE_VENV, the executable is searched first in SAGE_VENV/bin, then in SAGE_LOCAL/bin, then in PATH.

Note: Overwrite *is_functional()* if you also want to check whether the executable shows proper behaviour.

Calls to `is_present()` are cached. You might want to cache the *Executable* object to prevent unnecessary calls to the executable.

EXAMPLES:

```
sage: from sage.features import Executable
sage: Executable(name="sh", executable="sh").is_present()
FeatureTestResult('sh', True)
sage: Executable(name="does-not-exist", executable="does-not-exist-xxxxxyxyxy").
↳ is_present()
FeatureTestResult('does-not-exist', False)
```

`absolute_filename()`

The absolute path of the executable as a string.

EXAMPLES:

```
sage: from sage.features import Executable
sage: Executable(name="sh", executable="sh").absolute_filename()
'../../bin/sh'
```

A *FeatureNotPresentError* is raised if the file cannot be found:

```
sage: Executable(name="does-not-exist", executable="does-not-exist-xxxxxyxyxy")
↳ ).absolute_path()
Traceback (most recent call last):
...
sage.features.FeatureNotPresentError: does-not-exist is not available.
Executable 'does-not-exist-xxxxxyxyxy' not found on PATH.
```

`is_functional()`

Return whether an executable in the path is functional.

This method is used internally and can be overridden in subclasses in order to implement a feature test. It should not be called directly. Use *Feature.is_present()* instead.

EXAMPLES:

The function returns `True` unless explicitly overwritten:

```
sage: from sage.features import Executable
sage: Executable(name="sh", executable="sh").is_functional()
FeatureTestResult('sh', True)
```

class `sage.features.Feature(*args, **kws)`

Bases: *TrivialUniqueRepresentation*

A feature of the runtime environment

INPUT:

- `name` – (string) name of the feature; this should be suitable as an optional tag for the Sage doctester, i.e., lowercase alphanumeric with underscores (`_`) allowed; features that correspond to Python modules/packages may use periods (`.`)
- `spkg` – (string) name of the SPKG providing the feature
- `description` – (string) optional; plain English description of the feature
- `url` – a URL for the upstream package providing the feature

- `type` – (string) one of 'standard', 'optional' (default), 'experimental'

Overwrite `_is_present()` to add feature checks.

EXAMPLES:

```
sage: from sage.features.gap import GapPackage
sage: GapPackage("grape", spkg="gap_packages") # indirect doctest
Feature('gap_package_grape')
```

For efficiency, features are unique:

```
sage: GapPackage("grape") is GapPackage("grape")
True
```

hide()

Hide this feature. For example this is used when the doctest option `--hide` is set. Setting an installed feature as hidden pretends that it is not available. To revert this use `unhide()`.

EXAMPLES:

Benzene is an optional SPKG. The following test fails if it is hidden or not installed. Thus, in the second invocation the optional tag is needed:

```
sage: from sage.features.graph_generators import Benzene
sage: Benzene().hide()
sage: len(list(graphs.fusenenes(2))) #_
↳ needs sage.graphs
Traceback (most recent call last):
...
FeatureNotPresentError: benzene is not available.
Feature `benzene` is hidden.
Use method `unhide` to make it available again.

sage: Benzene().unhide()
sage: len(list(graphs.fusenenes(2))) # optional - benzene, needs sage.graphs
1
```

is_optional()

Return whether this feature corresponds to an optional SPKG.

EXAMPLES:

```
sage: from sage.features.databases import DatabaseCremona
sage: DatabaseCremona().is_optional()
True
```

is_present()

Return whether the feature is present.

OUTPUT:

A `FeatureTestResult` which can be used as a boolean and contains additional information about the feature test.

EXAMPLES:

```
sage: from sage.features.gap import GapPackage
sage: GapPackage("grape", spkg="gap_packages").is_present() # optional - gap_
```

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```
↪ packages
FeatureTestResult('gap_package_grape', True)
sage: GapPackage("NOT_A_PACKAGE", spkg="gap_packages").is_present()
FeatureTestResult('gap_package_NOT_A_PACKAGE', False)
```

The result is cached:

```
sage: from sage.features import Feature
sage: class TestFeature(Feature):
....:     def _is_present(self):
....:         print("checking presence")
....:         return True
sage: TestFeature("test").is_present()
checking presence
FeatureTestResult('test', True)
sage: TestFeature("test").is_present()
FeatureTestResult('test', True)
sage: TestFeature("other").is_present()
checking presence
FeatureTestResult('other', True)
sage: TestFeature("other").is_present()
FeatureTestResult('other', True)
```

`is_standard()`

Return whether this feature corresponds to a standard SPKG.

EXAMPLES:

```
sage: from sage.features.databases import DatabaseCremona
sage: DatabaseCremona().is_standard()
False
```

`joined_features()`

Return a list of features that `self` is the join of.

OUTPUT:

A (possibly empty) list of instances of *Feature*.

EXAMPLES:

```
sage: from sage.features.graphviz import Graphviz
sage: Graphviz().joined_features()
[Feature('dot'), Feature('neato'), Feature('twopi')]
sage: from sage.features.sagemath import sage__rings__function_field
sage: sage__rings__function_field().joined_features()
[Feature('sage.rings.function_field.function_field_polymod'),
Feature('sage.libs.singular'),
Feature('sage.libs.singular.singular'),
Feature('sage.interfaces.singular')]
sage: from sage.features.interfaces import Mathematica
sage: Mathematica().joined_features()
[]
```

`require()`

Raise a *FeatureNotPresentError* if the feature is not present.

EXAMPLES:

```
sage: from sage.features.gap import GapPackage
sage: GapPackage("ve1EeThu").require() #_
↳needs sage.libs.gap
Traceback (most recent call last):
...
FeatureNotPresentError: gap_package_ve1EeThu is not available.
`LoadPackage("ve1EeThu")` evaluated to `fail` in GAP.
```

resolution()

Return a suggestion on how to make `is_present()` pass if it did not pass.

OUTPUT:

A string.

EXAMPLES:

```
sage: from sage.features import Executable
sage: Executable(name="CSDP", spkg="csdp", executable="theta", url="https://
↳github.com/dimpase/csdp").resolution() # optional - sage_spkg
'...To install CSDP...you can try to run...sage -i csdp...Further_
↳installation instructions might be available at https://github.com/dimpase/
↳csdp.'
```

unhide()

Revert what `hide()` does.

EXAMPLES:

PolyCyclic is an optional GAP package. The following test fails if it is hidden, regardless of whether it is installed or not:

```
sage: from sage.features.gap import GapPackage
sage: Polycyclic = GapPackage("polycyclic", spkg="gap_packages")
sage: Polycyclic.hide()
sage: libgap(AbelianGroup(3, [0,3,4], names="abc")) #_
↳needs sage.libs.gap # optional - gap_packages_polycyclic
Traceback (most recent call last):
...
FeatureNotPresentError: gap_package_polycyclic is not available.
Feature `gap_package_polycyclic` is hidden.
Use method `unhide` to make it available again.
```

After un hiding the feature, the test should pass again if PolyCyclic is installed and loaded:

```
sage: Polycyclic.unhide()
sage: libgap(AbelianGroup(3, [0,3,4], names="abc")) #_
↳needs sage.libs.gap # optional - gap_packages_polycyclic
Pcp-group with orders [ 0, 3, 4 ]
```

exception `sage.features.FeatureNotPresentError` (*feature, reason=None, resolution=None*)

Bases: `RuntimeError`

A missing feature error.

EXAMPLES:


```
sage: from sage.features import Feature, FeatureTestResult
sage: class Missing(Feature):
....:     def _is_present(self):
....:         return False

sage: Missing(name="missing").require()
Traceback (most recent call last):
...
FeatureNotPresentError: missing is not available.
```

property resolution

Initialize self. See `help(type(self))` for accurate signature.

class `sage.features.FeatureTestResult` (*feature, is_present, reason=None, resolution=None*)

Bases: `object`

The result of a `Feature.is_present()` call.

Behaves like a boolean with some extra data which may explain why a feature is not present and how this may be resolved.

EXAMPLES:

```
sage: from sage.features.gap import GapPackage
sage: presence = GapPackage("NOT_A_PACKAGE").is_present(); presence # indirect_
↳doctest
FeatureTestResult('gap_package_NOT_A_PACKAGE', False)
sage: bool(presence)
False
```

Explanatory messages might be available as `reason` and `resolution`:

```
sage: presence.reason
↳needs sage.libs.gap #_
'LoadPackage("NOT_A_PACKAGE")` evaluated to `fail` in GAP.'
sage: bool(presence.resolution)
False
```

If a feature is not present, `resolution` defaults to `feature.resolution()` if this is defined. If you do not want to use this default you need explicitly set `resolution` to a string:

```
sage: from sage.features import FeatureTestResult
sage: package = GapPackage("NOT_A_PACKAGE", spkg="no_package")
sage: str(FeatureTestResult(package, True).resolution) # optional - sage_spkg
'...To install gap_package_NOT_A_PACKAGE...you can try to run...sage -i no_
↳package...'
sage: str(FeatureTestResult(package, False).resolution) # optional - sage_spkg
'...To install gap_package_NOT_A_PACKAGE...you can try to run...sage -i no_
↳package...'
sage: FeatureTestResult(package, False, resolution="rtm").resolution
'rtm'
```

property resolution

Initialize self. See `help(type(self))` for accurate signature.

class `sage.features.FileFeature` (**args, **kws*)

Bases: `Feature`

Base class for features that describe a file or directory in the file system.

A subclass should implement a method `absolute_filename()`.

EXAMPLES:

Two direct concrete subclasses of `FileFeature` are defined:

```
sage: from sage.features import StaticFile, Executable, FileFeature
sage: issubclass(StaticFile, FileFeature)
True
sage: issubclass(Executable, FileFeature)
True
```

To work with the file described by the feature, use the method `absolute_filename()`. A `FeatureNotPresentError` is raised if the file cannot be found:

```
sage: Executable(name="does-not-exist", executable="does-not-exist-xxxxxyxyxy").
↳ absolute_path()
Traceback (most recent call last):
...
sage.features.FeatureNotPresentError: does-not-exist is not available.
Executable 'does-not-exist-xxxxxyxyxy' not found on PATH.
```

A `FileFeature` also provides the `is_present()` method to test for the presence of the file at run time. This is inherited from the base class `Feature`:

```
sage: Executable(name="sh", executable="sh").is_present()
FeatureTestResult('sh', True)
```

`absolute_filename()`

The absolute path of the file as a string.

Concrete subclasses must override this abstract method.

`absolute_path()`

Deprecated alias for `absolute_filename()`.

Deprecated to make way for a method of this name returning a `Path`.

EXAMPLES:

```
sage: from sage.features import Executable
sage: Executable(name="sh", executable="sh").absolute_path()
doctest:warning...
DeprecationWarning: method absolute_path has been replaced by absolute_
↳ filename
See https://github.com/sagemath/sage/issues/31292 for details.
'../../bin/sh'
```

`class sage.features.PythonModule(*args, **kwargs)`

Bases: `Feature`

A `Feature` which describes whether a python module can be imported.

EXAMPLES:

Not all builds of python include the `ssl` module, so you could check whether it is available:

```
sage: from sage.features import PythonModule
sage: PythonModule("ssl").require() # not tested - output depends on the python_
↳ build
```

```
class sage.features.StaticFile(*args,**kws)
```

Bases: *FileFeature*

A *Feature* which describes the presence of a certain file such as a database.

EXAMPLES:

```
sage: from sage.features import StaticFile
sage: StaticFile(name="no_such_file", filename="KaTlaihu", #
↳ optional - sage_spkg
....:         search_path="/", spkg="some_spkg",
....:         url="http://rand.om").require()
Traceback (most recent call last):
...
FeatureNotPresentError: no_such_file is not available.
'KaTlaihu' not found in any of ['/']...
To install no_such_file...you can try to run...sage -i some_spkg...
Further installation instructions might be available at http://rand.om.
```

```
absolute_filename()
```

The absolute path of the file as a string.

EXAMPLES:

```
sage: from sage.features import StaticFile
sage: from sage.misc.temporary_file import tmp_dir
sage: dir_with_file = tmp_dir()
sage: file_path = os.path.join(dir_with_file, "file.txt")
sage: open(file_path, 'a').close() # make sure the file exists
sage: search_path = ( '/foo/bar', dir_with_file ) # file is somewhere in the
↳ search path
sage: feature = StaticFile(name="file", filename="file.txt", search_
↳ path=search_path)
sage: feature.absolute_filename() == file_path
True
```

A *FeatureNotPresentError* is raised if the file cannot be found:

```
sage: from sage.features import StaticFile
sage: StaticFile(name="no_such_file", filename="KaTlaihu", \
        search_path=(), spkg="some_spkg", \
        url="http://rand.om").absolute_filename() # optional - sage_
↳ spkg
Traceback (most recent call last):
...
FeatureNotPresentError: no_such_file is not available.
'KaTlaihu' not found in any of [].
To install no_such_file...you can try to run...sage -i some_spkg...
Further installation instructions might be available at http://rand.om.
```

```
class sage.features.TrivialClasscallMetaClass
```

Bases: *type*

A trivial version of `sage.misc.classcall_metaclass.ClasscallMetaclass` without Cython dependencies.

```
class sage.features.TrivialUniqueRepresentation(*args,**kws)
```

Bases: *object*

A trivial version of *UniqueRepresentation* without Cython dependencies.

`sage.features.package_systems()`

Return a list of *PackageSystem* objects representing the available package systems.

The list is ordered by decreasing preference.

EXAMPLES:

```
sage: from sage.features import package_systems
sage: package_systems() # random
[Feature('homebrew'), Feature('sage_spkg'), Feature('pip')]
```

3.2 Join features

class `sage.features.join_feature.JoinFeature(*args, **kws)`

Bases: *Feature*

Join of several *Feature* instances.

This creates a new feature as the union of the given features. Typically these are executables of an SPKG. For an example, see *Rubiks*.

Furthermore, this can be the union of a single feature. This is used to map the given feature to a more convenient name to be used in optional tags of doctests. Thus you can equip a feature such as a *PythonModule* with a tag name that differs from the systematic tag name. As an example for this use case, see *Meataxe*.

EXAMPLES:

```
sage: from sage.features import Executable
sage: from sage.features.join_feature import JoinFeature
sage: F = JoinFeature("shell-boolean",
.....:                 (Executable('shell-true', 'true'),
.....:                 Executable('shell-false', 'false')))
sage: F.is_present()
FeatureTestResult('shell-boolean', True)
sage: F = JoinFeature("asdfghjkl",
.....:                 (Executable('shell-true', 'true'),
.....:                 Executable('xyyyyy', 'xyyyyy-does-not-exist')))
sage: F.is_present()
FeatureTestResult('xyyyyy', False)
```

hide()

Hide this feature and all its joined features.

EXAMPLES:

```
sage: from sage.features.sagemath import sage__groups
sage: f = sage__groups()
sage: f.hide()
sage: f._features[0].is_present()
FeatureTestResult('sage.groups.perm_gps.permgroup', False)

sage: f.require()
Traceback (most recent call last):
...
FeatureNotPresentError: sage.groups is not available.
Feature `sage.groups` is hidden.
Use method `unhide` to make it available again.
```

`is_functional()`

Test whether the join feature is functional.

This method is deprecated. Use `Feature.is_present()` instead.

EXAMPLES:

```
sage: from sage.features.latte import Latte
sage: Latte().is_functional() # optional - latte_int
doctest:warning...
DeprecationWarning: method JoinFeature.is_functional; use is_present instead
See https://github.com/sagemath/sage/issues/33114 for details.
FeatureTestResult('latte_int', True)
```

`unhide()`

Revert what `hide()` does.

EXAMPLES:

```
sage: from sage.features.sagemath import sage__groups
sage: f = sage__groups()
sage: f.hide()
sage: f.is_present()
FeatureTestResult('sage.groups', False)
sage: f._features[0].is_present()
FeatureTestResult('sage.groups.perm_gps.permgroup', False)

sage: f.unhide()
sage: f.is_present() # optional sage.groups
FeatureTestResult('sage.groups', True)
sage: f._features[0].is_present() # optional sage.groups
FeatureTestResult('sage.groups.perm_gps.permgroup', True)
```

3.3 Enumeration of all defined features

`sage.features.all.all_features()`

Return an iterable of all features.

EXAMPLES:

```
sage: from sage.features.all import all_features
sage: sorted(all_features(), key=lambda f: f.name) # random
[...Feature('sage.combinat')...]
```

`sage.features.all.module_feature(module_name)`

Find a top-level Feature that provides the Python module of the given `module_name`.

Only features known to `all_features()` are considered.

INPUT:

- `module_name` – string

OUTPUT: a Feature or None.

EXAMPLES:

```
sage: from sage.features.all import module_feature
sage: module_feature('sage.combinat.tableau') #_
↪needs sage.combinat
Feature('sage.combinat')
sage: module_feature('sage.combinat.posets.poset') #_
↪needs sage.graphs
Feature('sage.graphs')
sage: module_feature('sage.schemes.toric.variety') #_
↪needs sage.geometry.polyhedron
Feature('sage.geometry.polyhedron')
sage: module_feature('scipy') #_
↪needs scipy
Feature('scipy')
sage: print(module_feature('sage.structure.element'))
None
sage: print(module_feature('sage.does_not_exist'))
None
```

`sage.features.all.name_feature(name, toplevel=None)`

Find a top-level Feature that provides the top-level name.

Only features known to `all_features()` are considered.

INPUT:

- name – string
- toplevel – a module or other namespace

OUTPUT: a Feature or None.

EXAMPLES:

```
sage: from sage.features.all import name_feature
sage: name_feature('QuadraticField') #_
↪needs sage.rings.number_field
Feature('sage.rings.number_field')
sage: name_feature('line') #_
↪needs sage.plot
Feature('sage.plot')
sage: print(name_feature('ZZ'))
None
sage: print(name_feature('does_not_exist'))
None
```

3.4 Features for testing the presence of Python modules in the Sage library

All of these features are present in a monolithic installation of the Sage library, such as the one made by the SageMath distribution.

The features are defined for the purpose of separately testing modularized distributions such as *sagemath-categories* and *sagemath-repl*.

Often, doctests in a module of the Sage library illustrate the interplay with a range of different objects; this is a form of integration testing. These objects may come from modules shipped in other distributions. For example, `sage.structure.element` (shipped by *sagemath-objects*, one of the most fundamental distributions) contains the doctest:

```

sage: G = SymmetricGroup(4)                                     #_
↪needs sage.groups
sage: g = G([2, 3, 4, 1])                                     #_
↪needs sage.groups
sage: g.powers(4)                                              #_
↪needs sage.groups
[(), (1,2,3,4), (1,3)(2,4), (1,4,3,2)]
    
```

This test cannot pass when the distribution *sagemath-objects* is tested separately (in a virtual environment): In this situation, `SymmetricGroup` is not defined anywhere (and thus not present in the top-level namespace). Hence, we conditionalize this doctest on the presence of the feature `sage.groups`.

```
sage.features.sagemath.all_features()
```

Return features corresponding to parts of the Sage library.

These features are named after Python packages/modules (e.g., `sage.symbolic`), not distribution packages (**sagemath-symbolics**).

This design is motivated by a separation of concerns: The author of a module that depends on some functionality provided by a Python module usually already knows the name of the Python module, so we do not want to force the author to also know about the distribution package that provides the Python module.

Instead, we associate distribution packages to Python modules in `sage.features.sagemath` via the `spkg` parameter of *Feature*.

EXAMPLES:

```

sage: from sage.features.sagemath import all_features
sage: list(all_features())
[...Feature('sage.combinat'), ...]
    
```

```
class sage.features.sagemath.sage__combinat(*args, **kws)
```

Bases: *JoinFeature*

A *Feature* describing the presence of `sage.combinat`.

EXAMPLES:

Python modules that provide elementary combinatorial objects such as `sage.combinat.subset`, `sage.combinat.composition`, `sage.combinat.permutation` are always available; there is no need for an `# optional/needs` tag:

```

sage: Permutation([1,2,3]).is_even()
True
sage: Permutation([6,1,4,5,2,3]).bruhat_inversions()
[[0, 1], [0, 2], [0, 3], [2, 4], [2, 5], [3, 4], [3, 5]]
    
```

Use `# needs sage.combinat` for doctests that use any other Python modules from `sage.combinat`, for example `sage.combinat.tableau_tuple`:

```

sage: TableauTuple([[7,8,9]], [], [[1,2,3], [4,5], [6]]).shape() #_
↪needs sage.combinat
([3], [], [3, 2, 1])
    
```

Doctests that use Python modules from `sage.combinat` that involve trees, graphs, hypergraphs, posets, quivers, combinatorial designs, finite state machines etc. should be marked `# needs sage.combinat sage.graphs`:

```
sage: L = Poset({0: [1], 1: [2], 2:[3], 3:[4]}) #_
↪needs sage.combinat sage.graphs
sage: L.is_chain() #_
↪needs sage.combinat sage.graphs
True
```

Doctests that use combinatorial modules/algebras, or root systems should use the tag `# needs sage.combinat sage.modules`:

```
sage: # needs sage.combinat sage.modules
sage: A = SchurAlgebra(QQ, 2, 3)
sage: a = A.an_element(); a
2*S((1, 1, 1), (1, 1, 1)) + 2*S((1, 1, 1), (1, 1, 2))
+ 3*S((1, 1, 1), (1, 2, 2))
sage: L = RootSystem(['A', 3, 1]).root_lattice()
sage: PIR = L.positive_imaginary_roots(); PIR
Positive imaginary roots of type ['A', 3, 1]
```

Doctests that use lattices, semilattices, or Dynkin diagrams should use the tag `# needs sage.combinat sage.graphs sage.modules`:

```
sage: L = LatticePoset({0: [1,2], 1: [3], 2: [3,4], 3: [5], 4: [5]}) #_
↪needs sage.combinat sage.graphs sage.modules
sage: L.meet_irreducibles() #_
↪needs sage.combinat sage.graphs sage.modules
[1, 3, 4]
```

class `sage.features.sagemath.sage__geometry__polyhedron(*args, **kwargs)`

Bases: `JoinFeature`

A `Feature` describing the presence of `sage.geometry.polyhedron`.

EXAMPLES:

Doctests that use polyhedra, cones, geometric complexes, triangulations, etc. should use the tag `# needs sage.geometry.polyhedron`:

```
sage: co = polytopes.truncated_tetrahedron() #_
↪needs sage.geometry.polyhedron
sage: co.volume() #_
↪needs sage.geometry.polyhedron
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```

Some constructions of polyhedra require additional tags:

```
sage: # needs sage.combinat sage.geometry.polyhedron sage.rings.number_field
sage: perm_a3_reg_nf = polytopes.generalized_permutahedron(
....:     ['A', 3], regular=True, backend='number_field'); perm_a3_reg_nf
A 3-dimensional polyhedron in AA^3 defined as the convex hull of 24 vertices
```

class `sage.features.sagemath.sage__graphs(*args, **kwargs)`

Bases: `JoinFeature`

A `Feature` describing the presence of `sage.graphs`.

EXAMPLES:

Doctests that use anything from `sage.graphs` (`Graph`, `DiGraph`, ...) should be marked `# needs sage.graphs`. The same applies to any doctest that uses a `Poset`, cluster algebra quiver, finite state machines, abelian

sandpiles, or Dynkin diagrams:

```
sage: g = graphs.PetersenGraph() #_
↪needs sage.graphs
sage: r, s = g.is_weakly_chordal(certificate=True); r #_
↪needs sage.graphs
False
```

Also any use of tree classes defined in `sage.combinat` (`BinaryTree`, `RootedTree`, ...) in doctests should be marked the same.

By way of generalization, any use of `SimplicialComplex` or other abstract complexes from `sage.topology`, hypergraphs, and combinatorial designs, should be marked `# needs sage.graphs` as well:

```
sage: X = SimplicialComplex([[0,1,2], [1,2,3]]) #_
↪needs sage.graphs
sage: X.link(Simplex([0])) #_
↪needs sage.graphs
Simplicial complex with vertex set (1, 2) and facets {(1, 2)}

sage: IncidenceStructure([[1,2,3],[1,4]]).degrees(2) #_
↪needs sage.graphs
{(1, 2): 1, (1, 3): 1, (1, 4): 1, (2, 3): 1, (2, 4): 0, (3, 4): 0}
```

On the other hand, matroids are not implemented as posets in Sage but are instead closely tied to linear algebra over fields; hence use `# needs sage.modules` instead:

```
sage: # needs sage.modules
sage: M = Matroid(Matrix(QQ, [[1, 0, 0, 0, 1, 1, 1],
.....:                      [0, 1, 0, 1, 0, 1, 1],
.....:                      [0, 0, 1, 1, 1, 0, 1]]))
sage: N = (M / [2]).delete([3, 4])
sage: sorted(N.groundset())
[0, 1, 5, 6]
```

However, many constructions (and some methods) of matroids do involve graphs:

```
sage: # needs sage.modules
sage: W = matroids.Wheel(3) # despite the name, not created via graphs
sage: W.is_isomorphic(N) # goes through a graph isomorphism test #_
↪needs sage.graphs
False
sage: K4 = matroids.CompleteGraphic(4) # this one is created via graphs #_
↪needs sage.graphs
sage: K4.is_isomorphic(W) #_
↪needs sage.graphs
True
```

```
class sage.features.sagemath.sage__groups(*args, **kwargs)
```

Bases: `JoinFeature`

A `Feature` describing the presence of `sage.groups`.

EXAMPLES:

Permutations and sets of permutations are always available, but permutation groups are implemented in Sage using the `GAP` system and require the tag `# needs sage.groups`:

```
sage: p = Permutation([2,1,4,3])
sage: p.to_permutation_group_element()
↪needs sage.groups
(1,2) (3,4)
```

class sage.features.sagemath.sage__libs__braiding(*args, **kws)

Bases: *PythonModule*

A *Feature* describing the presence of sage.libs.braiding.

EXAMPLES:

```
sage: from sage.features.sagemath import sage__libs__braiding
sage: sage__libs__braiding().is_present()
↪ # needs sage.libs.braiding
FeatureTestResult('sage.libs.braiding', True)
```

class sage.features.sagemath.sage__libs__ecl(*args, **kws)

Bases: *PythonModule*

A *Feature* describing the presence of sage.libs.ecl.

EXAMPLES:

```
sage: from sage.features.sagemath import sage__libs__ecl
sage: sage__libs__ecl().is_present()
↪libs.ecl
FeatureTestResult('sage.libs.ecl', True) # optional - sage.
```

class sage.features.sagemath.sage__libs__flint(*args, **kws)

Bases: *JoinFeature*

A *sage.features.Feature* describing the presence of sage.libs.flint and other modules depending on FLINT and arb.

In addition to the modularization purposes that this tag serves, it also provides attribution to the upstream project.

class sage.features.sagemath.sage__libs__gap(*args, **kws)

Bases: *JoinFeature*

A *sage.features.Feature* describing the presence of sage.libs.gap (the library interface to *GAP*) and *sage.interfaces.gap* (the pexpect interface to *GAP*). By design, we do not distinguish between these two, in order to facilitate the conversion of code from the pexpect interface to the library interface.

See also:

Features for GAP packages

class sage.features.sagemath.sage__libs__linbox(*args, **kws)

Bases: *JoinFeature*

A *sage.features.Feature* describing the presence of sage.libs.linbox and other modules depending on Givaro, FFLAS-FFPACK, LinBox.

In addition to the modularization purposes that this tag serves, it also provides attribution to the upstream project.

class sage.features.sagemath.sage__libs__m4ri(*args, **kws)

Bases: *JoinFeature*

A *sage.features.Feature* describing the presence of Cython modules depending on the M4RI and/or M4RIe libraries.

In addition to the modularization purposes that this tag serves, it also provides attribution to the upstream project.

```
class sage.features.sagemath.sage__libs__ntl(*args, **kws)
```

Bases: *JoinFeature*

A *sage.features.Feature* describing the presence of `sage.libs.ntl` and other modules depending on NTL.

In addition to the modularization purposes that this tag serves, it also provides attribution to the upstream project.

```
class sage.features.sagemath.sage__libs__pari(*args, **kws)
```

Bases: *JoinFeature*

A *Feature* describing the presence of `sage.libs.pari`.

SageMath uses the *PARI* library (via *cypari2*) for numerous purposes. Doctests that involves such features should be marked `# needs sage.libs.pari`.

In addition to the modularization purposes that this tag serves, it also provides attribution to the upstream project.

EXAMPLES:

```
sage: R.<a> = QQ[]
sage: S.<x> = R[]
sage: f = x^2 + a; g = x^3 + a
sage: r = f.resultant(g); r
↪needs sage.libs.pari
a^3 + a^2
```

```
class sage.features.sagemath.sage__libs__singular(*args, **kws)
```

Bases: *JoinFeature*

A *sage.features.Feature* describing the presence of `sage.libs.singular` (the library interface to Singular) and `sage.interfaces.singular` (the pexpect interface to Singular). By design, we do not distinguish between these two, in order to facilitate the conversion of code from the pexpect interface to the library interface.

See also:

Feature singular

```
class sage.features.sagemath.sage__modular(*args, **kws)
```

Bases: *JoinFeature*

A *Feature* describing the presence of `sage.modular`.

```
class sage.features.sagemath.sage__modules(*args, **kws)
```

Bases: *JoinFeature*

A *Feature* describing the presence of `sage.modules`.

EXAMPLES:

All uses of implementations of vector spaces / free modules in SageMath, whether `sage.modules.free_module.FreeModule`, `sage.combinat.free_module.CombinatorialFreeModule`, `sage.tensor.modules.finite_rank_free_module.FiniteRankFreeModule`, or additive abelian groups, should be marked `# needs sage.modules`.

The same holds for matrices, tensors, algebras, quadratic forms, point lattices, root systems, matrix/affine/Weyl/Coxeter groups, matroids, and ring derivations.

Likewise, all uses of `sage.coding`, `sage.crypto`, and `sage.homology` in doctests should be marked `# needs sage.modules`.

class sage.features.sagemath.sage__numerical__mip(*args, **kws)

Bases: *PythonModule*

A *Feature* describing the presence of `sage.numerical.mip`.

class sage.features.sagemath.sage__plot(*args, **kws)

Bases: *JoinFeature*

A *Feature* describing the presence of `sage.plot`.

class sage.features.sagemath.sage__rings__complex_double(*args, **kws)

Bases: *PythonModule*

A *Feature* describing the presence of `sage.rings.complex_double`.

class sage.features.sagemath.sage__rings__finite_rings(*args, **kws)

Bases: *JoinFeature*

A *Feature* describing the presence of `sage.rings.finite_rings`; specifically, the element implementations using the *PARI* library.

class sage.features.sagemath.sage__rings__function_field(*args, **kws)

Bases: *JoinFeature*

A *Feature* describing the presence of `sage.rings.function_field`.

EXAMPLES:

Rational function fields are always available:

```
sage: K.<x> = FunctionField(QQ)
sage: K.maximal_order()
Maximal order of Rational function field in x over Rational Field
```

Use the tag `# needs sage.rings.function_field` whenever extensions of function fields (by adjoining a root of a univariate polynomial) come into play:

```
sage: R.<y> = K[]
sage: L.<y> = K.extension(y^5 - (x^3 + 2*x*y + 1/x)); L
↪needs sage.rings.function_field
Function field in y defined by y^5 - 2*x*y + (-x^4 - 1)/x
```

Such extensions of function fields are implemented using Gröbner bases of polynomial rings; Sage makes essential use of the *Singular* system for this. (It is not necessary to use the tag `# needs sage.libs.singular`; it is implied by `# needs sage.rings.function_field`.)

class sage.features.sagemath.sage__rings__number_field(*args, **kws)

Bases: *JoinFeature*

A *Feature* describing the presence of `sage.rings.number_field`.

Number fields are implemented in Sage using a complicated mixture of various libraries, including *FLINT*, *GAP*, *MPFI*, *NTL*, and *PARI*.

EXAMPLES:

Rational numbers are, of course, always available:

```
sage: QQ in NumberFields()
True
```

Doctests that construct algebraic number fields should be marked `# needs sage.rings.number_field`:

```
sage: # needs sage.rings.number_field
sage: K.<cuberoot2> = NumberField(x^3 - 2)
sage: L.<cuberoot3> = K.extension(x^3 - 3)
sage: S.<sqrt2> = L.extension(x^2 - 2); S
Number Field in sqrt2 with defining polynomial x^2 - 2 over its base field

sage: # needs sage.rings.number_field
sage: K.<zeta> = CyclotomicField(15)
sage: CC(zeta)
0.913545457642601 + 0.406736643075800*I
```

Doctests that make use of the algebraic field `QQbar` or the algebraic real field `AA` should be marked likewise:

```
sage: # needs sage.rings.number_field
sage: AA(-1)^(1/3)
-1
sage: QQbar(-1)^(1/3)
0.5000000000000000? + 0.866025403784439?*I
```

Use of the universal cyclotomic field should be marked `# needs sage.libs.gap sage.rings.number_field`.

```
sage: # needs sage.libs.gap sage.rings.number_field sage: UCF = UniversalCyclotomicField(); UCF
Universal Cyclotomic Field sage: E = UCF.gen sage: f = E(2) + E(3); f 2*E(3) + E(3)^2 sage: f.galois_conjugates() [2*E(3) + E(3)^2, E(3) + 2*E(3)^2]
```

```
class sage.features.sagemath.sage__rings__padics(*args, **kws)
```

Bases: `JoinFeature`

A `Feature` describing the presence of `sage.rings.padics`.

```
class sage.features.sagemath.sage__rings__polynomial__pbori(*args, **kws)
```

Bases: `JoinFeature`

A `sage.features.Feature` describing the presence of `sage.rings.polynomial.pbori`.

```
class sage.features.sagemath.sage__rings__real_double(*args, **kws)
```

Bases: `PythonModule`

A `Feature` describing the presence of `sage.rings.real_double`.

EXAMPLES:

The Real Double Field is basically always available, and no `# optional/needs` tag is needed:

```
sage: RDF.characteristic()
0
```

The feature exists for use in doctests of Python modules that are shipped by the most fundamental distributions.

```
class sage.features.sagemath.sage__rings__real_mpfr(*args, **kws)
```

Bases: `JoinFeature`

A `Feature` describing the presence of `sage.rings.real_mpfr`.

```
class sage.features.sagemath.sage__sat(*args, **kws)
```

Bases: `JoinFeature`

A `Feature` describing the presence of `sage.sat`.

```
class sage.features.sagemath.sage__schemes (*args, **kws)
```

Bases: *JoinFeature*

A *Feature* describing the presence of `sage.schemes`.

```
class sage.features.sagemath.sage__symbolic (*args, **kws)
```

Bases: *JoinFeature*

A *Feature* describing the presence of `sage.symbolic`.

EXAMPLES:

The symbolics subsystem of Sage will be provided by the distribution `sagemath-symbolics`, in preparation at [github issue #35095](#). If it is not installed, Sage will be able to provide installation advice:

```
sage: from sage.features.sagemath import sage__symbolic
sage: print(sage__symbolic().resolution())
↳ optional - sage_spkg, not tested
...To install sagemath-symbolics...you can try to run...
pip install sagemath-symbolics
...
```

```
class sage.features.sagemath.sagemath_doc_html (*args, **kws)
```

Bases: *StaticFile*

A *Feature* which describes the presence of the documentation of the Sage library in HTML format.

Developers often use `make build` instead of `make` to avoid the long time it takes to compile the documentation. Although commands such as `make ptest` build the documentation before testing, other test commands such as `make ptestlong-nodoc` or `./sage -t --all` do not.

All doctests that refer to the built documentation need to be marked `# needs sagemath_doc_html`.

3.5 Features for testing the presence of package systems `sage_spkg`, `conda`, `pip`, `debian`, `fedora` etc.

```
class sage.features.pkg_systems.PackageSystem (*args, **kws)
```

Bases: *Feature*

A *Feature* describing a system package manager.

EXAMPLES:

```
sage: from sage.features.pkg_systems import PackageSystem
sage: PackageSystem('conda')
Feature('conda')
```

```
spkg_installation_hint (spkgs, prompt, feature)
```

Return a string that explains how to install *feature*.

EXAMPLES:

```
sage: from sage.features.pkg_systems import PackageSystem
sage: homebrew = PackageSystem('homebrew')
sage: homebrew.spkg_installation_hint('openblas') # optional - SAGE_ROOT
'To install openblas using the homebrew package manager, you can try to run:\n↳ !brew install openblas'
```

```
class sage.features.pkg_systems.PipPackageSystem(*args, **kws)
```

Bases: *PackageSystem*

A *Feature* describing the Pip package manager.

EXAMPLES:

```
sage: from sage.features.pkg_systems import PipPackageSystem
sage: PipPackageSystem()
Feature('pip')
```

```
class sage.features.pkg_systems.SagePackageSystem(*args, **kws)
```

Bases: *PackageSystem*

A *Feature* describing the package manager of the SageMath distribution.

EXAMPLES:

```
sage: from sage.features.pkg_systems import SagePackageSystem
sage: SagePackageSystem()
Feature('sage_spkg')
```

3.6 Features for testing the presence of bliss

```
class sage.features.bliss.Bliss(*args, **kws)
```

Bases: *JoinFeature*

A *Feature* which describes whether the `sage.graphs.bliss` module is available in this installation of Sage.

EXAMPLES:

```
sage: from sage.features.bliss import Bliss
sage: Bliss().require() # optional - bliss
```

```
class sage.features.bliss.BlissLibrary(*args, **kws)
```

Bases: *CythonFeature*

A *Feature* which describes whether the *Bliss library* is present and functional.

EXAMPLES:

```
sage: from sage.features.bliss import BlissLibrary
sage: BlissLibrary().require() # optional - libbliss
```

```
sage.features.bliss.all_features()
```

3.7 Feature for testing the presence of csdp

class sage.features.csdp.CSDP (*args, **kws)

Bases: *Executable*

A *Feature* which checks for the theta binary of *CSDP*.

EXAMPLES:

```
sage: from sage.features.csdp import CSDP
sage: CSDP().is_present() # optional - csdp
FeatureTestResult('csdp', True)
```

is_functional()

Check whether theta works on a trivial example.

EXAMPLES:

```
sage: from sage.features.csdp import CSDP
sage: CSDP().is_functional() # optional - csdp
FeatureTestResult('csdp', True)
```

sage.features.csdp.all_features()

3.8 Features for testing the presence of various databases

class sage.features.databases.DatabaseCremona (*args, **kws)

Bases: *StaticFile*

A *Feature* which describes the presence of *John Cremona's database of elliptic curves*.

INPUT:

- name – either 'cremona' (the default) for the full large database or 'cremona_mini' for the small database.

EXAMPLES:

```
sage: from sage.features.databases import DatabaseCremona
sage: DatabaseCremona('cremona_mini').is_present()
FeatureTestResult('database_cremona_mini_ellcurve', True)
sage: DatabaseCremona().is_present() #
↳ optional - database_cremona_ellcurve
FeatureTestResult('database_cremona_ellcurve', True)
```

class sage.features.databases.DatabaseCubicHecke (*args, **kws)

Bases: *PythonModule*

A *Feature* which describes the presence of the *Cubic Hecke algebra database package*.

The home of this database is the web-page [Cubic Hecke algebra on 4 strands](#) of Ivan Marin.

EXAMPLES:

```
sage: from sage.features.databases import DatabaseCubicHecke
sage: DatabaseCubicHecke().is_present() # optional - database_cubic_hecke
FeatureTestResult('database_cubic_hecke', True)
```



```
class sage.features.databases.DatabaseEllcurves (*args, **kwargs)
```

Bases: *StaticFile*

A *Feature* which describes the presence of William Stein's database of interesting curves.

EXAMPLES:

```
sage: from sage.features.databases import DatabaseEllcurves
sage: bool(DatabaseEllcurves().is_present()) # optional - database_ellcurves
True
```

```
class sage.features.databases.DatabaseGraphs (*args, **kwargs)
```

Bases: *StaticFile*

A *Feature* which describes the presence of the graphs database.

EXAMPLES:

```
sage: from sage.features.databases import DatabaseGraphs
sage: bool(DatabaseGraphs().is_present()) # optional - database_graphs
True
```

```
class sage.features.databases.DatabaseJones (*args, **kwargs)
```

Bases: *StaticFile*

A *Feature* which describes the presence of *John Jones's tables of number fields*.

EXAMPLES:

```
sage: from sage.features.databases import DatabaseJones
sage: bool(DatabaseJones().is_present()) # optional - database_jones_numfield
True
```

```
class sage.features.databases.DatabaseKnotInfo (*args, **kwargs)
```

Bases: *PythonModule*

A *Feature* which describes the presence of the *package providing the KnotInfo and LinkInfo databases*.

The homes of these databases are the web-pages [KnotInfo](#) and [LinkInfo](#).

EXAMPLES:

```
sage: from sage.features.databases import DatabaseKnotInfo
sage: DatabaseKnotInfo().is_present() # optional - database_knotinfo
FeatureTestResult('database_knotinfo', True)
```

```
class sage.features.databases.DatabaseMatroids (*args, **kwargs)
```

Bases: *PythonModule*

A *Feature* which describes the presence of *Yoshitake Matsumoto's Database of Matroids*.

EXAMPLES:

```
sage: from sage.features.databases import DatabaseMatroids
sage: DatabaseMatroids().is_present() # optional - matroid_database
↪optional - matroid_database
FeatureTestResult('matroid_database', True)
```

REFERENCES:

[Mat2012]

```
class sage.features.databases.DatabaseReflexivePolytopes(*args, **kws)
```

Bases: *StaticFile*

A *Feature* which describes the presence of the *PALP* databases of reflexive three-dimensional and four-dimensional lattice polytopes.

EXAMPLES:

```
sage: from sage.features.databases import DatabaseReflexivePolytopes
sage: bool(DatabaseReflexivePolytopes().is_present()) #_
↳ optional - polytopes_db
True
sage: bool(DatabaseReflexivePolytopes('polytopes_db_4d').is_present()) #_
↳ optional - polytopes_db_4d
True
```

```
sage.features.databases.all_features()
```

```
sage.features.databases.sage_data_path(data_name)
```

Search path for database *data_name*.

EXAMPLES:

```
sage: from sage.features.databases import sage_data_path
sage: sage_data_path("cremona")
['../cremona']
```

3.9 Feature for testing the presence of dvipng

```
sage.features.dvipng.all_features()
```

```
class sage.features.dvipng.dvipng(*args, **kws)
```

Bases: *Executable*

A *Feature* describing the presence of dvipng

EXAMPLES:

```
sage: from sage.features.dvipng import dvipng
sage: dvipng().is_present() # optional - dvipng
FeatureTestResult('dvipng', True)
```

3.10 Feature for testing the presence of ffmpeg

```
class sage.features.ffmpeg.FFmpeg(*args, **kws)
```

Bases: *Executable*

A *Feature* describing the presence of *ffmpeg*.

EXAMPLES:

```
sage: from sage.features.ffmpeg import FFmpeg
sage: FFmpeg().is_present() # optional - ffmpeg
FeatureTestResult('ffmpeg', True)
```

is_functional()

Return whether command `ffmpeg` in the path is functional.

EXAMPLES:

```
sage: from sage.features.ffmpeg import FFmpeg
sage: FFmpeg().is_functional() # optional - ffmpeg
FeatureTestResult('ffmpeg', True)
```

`sage.features.ffmpeg.all_features()`

3.11 Features for testing the presence of 4ti2

class `sage.features.four_ti_2.FourTi2(*args, **kws)`

Bases: *JoinFeature*

A *Feature* describing the presence of all *4ti2* executables.

EXAMPLES:

```
sage: from sage.features.four_ti_2 import FourTi2
sage: FourTi2().is_present() # optional - 4ti2
FeatureTestResult('4ti2', True)
```

class `sage.features.four_ti_2.FourTi2Executable(*args, **kws)`

Bases: *Executable*

A *Feature* for the *4ti2* executables.

`sage.features.four_ti_2.all_features()`

3.12 Features for testing the presence of the SageMath interfaces to gap and of GAP packages

class `sage.features.gap.GapPackage(*args, **kws)`

Bases: *Feature*

A *Feature* describing the presence of a GAP package.

A GAP package is “present” if it *can be* loaded, not if it *has been* loaded.

See also:

Feature `sage.libs.gap`

EXAMPLES:

```
sage: from sage.features.gap import GapPackage
sage: GapPackage("grape", spkg="gap_packages")
Feature('gap_package_grape')
```

`sage.features.gap.all_features()`

3.13 Features for testing the presence of graph generator programs benzene, buckygen, plantri

class sage.features.graph_generators.**Benzene** (*args, **kws)

Bases: *Executable*

A *Feature* which checks for the *benzene* binary.

EXAMPLES:

```
sage: from sage.features.graph_generators import Benzene
sage: Benzene().is_present() # optional - benzene
FeatureTestResult('benzene', True)
```

is_functional()

Check whether benzene works on trivial input.

EXAMPLES:

```
sage: from sage.features.graph_generators import Benzene
sage: Benzene().is_functional() # optional - benzene
FeatureTestResult('benzene', True)
```

class sage.features.graph_generators.**Buckygen** (*args, **kws)

Bases: *Executable*

A *Feature* which checks for the *buckygen* binary.

EXAMPLES:

```
sage: from sage.features.graph_generators import Buckygen
sage: Buckygen().is_present() # optional - buckygen
FeatureTestResult('buckygen', True)
```

is_functional()

Check whether buckygen works on trivial input.

EXAMPLES:

```
sage: from sage.features.graph_generators import Buckygen
sage: Buckygen().is_functional() # optional - buckygen
FeatureTestResult('buckygen', True)
```

class sage.features.graph_generators.**Plantri** (*args, **kws)

Bases: *Executable*

A *Feature* which checks for the *plantri* binary.

EXAMPLES:

```
sage: from sage.features.graph_generators import Plantri
sage: Plantri().is_present() # optional - plantri
FeatureTestResult('plantri', True)
```

is_functional()

Check whether plantri works on trivial input.

EXAMPLES:

```
sage: from sage.features.graph_generators import Plantri
sage: Plantri().is_functional() # optional - plantri
FeatureTestResult('plantri', True)
```

sage.features.graph_generators.all_features()

3.14 Features for testing the presence of graphviz

class sage.features.graphviz.Graphviz(*args, **kws)

Bases: *JoinFeature*

A *Feature* describing the presence of the *dot*, *neato*, and *twopi* executables from the *graphviz* package.

EXAMPLES:

```
sage: from sage.features.graphviz import Graphviz
sage: Graphviz().is_present() # optional - graphviz
FeatureTestResult('graphviz', True)
```

sage.features.graphviz.all_features()

class sage.features.graphviz.dot(*args, **kws)

Bases: *Executable*

A *Feature* describing the presence of dot.

class sage.features.graphviz.neato(*args, **kws)

Bases: *Executable*

A *Feature* describing the presence of neato.

class sage.features.graphviz.twopi(*args, **kws)

Bases: *Executable*

A *Feature* describing the presence of twopi.

3.15 Feature for testing the presence of imagemagick

Currently we only check for the presence of convert. When needed, other commands like magick, magick-script, convert, mogrify, identify, composite, montage, compare, etc. could be also checked in this module.

class sage.features.imagemagick.Convert(*args, **kws)

Bases: *Executable*

A *Feature* describing the presence of convert.

EXAMPLES:

```
sage: from sage.features.imagemagick import Convert
sage: Convert().is_present() # optional - imagemagick
FeatureTestResult('convert', True)
```

is_functional()

Return whether command `convert` in the path is functional.

EXAMPLES:

```
sage: from sage.features.imagemagick import Convert
sage: Convert().is_functional() # optional - imagemagick
FeatureTestResult('convert', True)
```

class `sage.features.imagemagick.ImageMagick(*args, **kws)`

Bases: *JoinFeature*

A *Feature* describing the presence of *ImageMagick*

Currently, only the availability of the `convert` program is checked.

EXAMPLES:

```
sage: from sage.features.imagemagick import ImageMagick
sage: ImageMagick().is_present() # optional - imagemagick
FeatureTestResult('imagemagick', True)
```

`sage.features.imagemagick.all_features()`

3.16 Features for testing whether interpreter interfaces to magma, maple, mathematica etc. are functional

class `sage.features.interfaces.InterfaceFeature(*args, **kws)`

Bases: *Feature*

A *Feature* describing whether an *Interface* is present and functional.

class `sage.features.interfaces.Macaulay2(*args, **kws)`

Bases: *InterfaceFeature*

A *Feature* describing whether `sage.interfaces.macaulay2.Macaulay2` is present and functional.

EXAMPLES:

```
sage: from sage.features.interfaces import Macaulay2
sage: Macaulay2().is_present() # random
FeatureTestResult('macaulay2', False)
```

class `sage.features.interfaces.Magma(*args, **kws)`

Bases: *InterfaceFeature*

A *Feature* describing whether `sage.interfaces.magma.Magma` is present and functional.

EXAMPLES:

```
sage: from sage.features.interfaces import Magma
sage: Magma().is_present() # random
FeatureTestResult('magma', False)
```

```
class sage.features.interfaces.Maple(*args, **kws)
```

Bases: *InterfaceFeature*

A *Feature* describing whether `sage.interfaces.maple.Maple` is present and functional.

EXAMPLES:

```
sage: from sage.features.interfaces import Maple
sage: Maple().is_present() # random
FeatureTestResult('maple', False)
```

```
class sage.features.interfaces.Mathematica(*args, **kws)
```

Bases: *InterfaceFeature*

A *Feature* describing whether `sage.interfaces.mathematica.Mathematica` is present and functional.

EXAMPLES:

```
sage: from sage.features.interfaces import Mathematica
sage: Mathematica().is_present() # not tested
FeatureTestResult('mathematica', False)
```

```
class sage.features.interfaces.Matlab(*args, **kws)
```

Bases: *InterfaceFeature*

A *Feature* describing whether `sage.interfaces.matlab.Matlab` is present and functional.

EXAMPLES:

```
sage: from sage.features.interfaces import Matlab
sage: Matlab().is_present() # random
FeatureTestResult('matlab', False)
```

```
class sage.features.interfaces.Octave(*args, **kws)
```

Bases: *InterfaceFeature*

A *Feature* describing whether `sage.interfaces.octave.Octave` is present and functional.

EXAMPLES:

```
sage: from sage.features.interfaces import Octave
sage: Octave().is_present() # random
FeatureTestResult('octave', False)
```

```
class sage.features.interfaces.Scilab(*args, **kws)
```

Bases: *InterfaceFeature*

A *Feature* describing whether `sage.interfaces.scilab.Scilab` is present and functional.

EXAMPLES:

```
sage: from sage.features.interfaces import Scilab
sage: Scilab().is_present() # random
FeatureTestResult('scilab', False)
```

```
sage.features.interfaces.all_features()
```

Return features corresponding to interpreter interfaces.

EXAMPLES:

```
sage: from sage.features.interfaces import all_features
sage: list(all_features())
[Feature('magma'),
 Feature('matlab'),
 Feature('mathematica'),
 Feature('maple'),
 Feature('macaulay2'),
 Feature('octave'),
 Feature('scilab')]
```

3.17 Feature for testing if the Internet is available

class sage.features.internet.**Internet** (*args, **kws)

Bases: *Feature*

A *Feature* describing if Internet is available.

Failure of connecting to the site “<https://www.sagemath.org>” within a second is regarded as internet being not available.

EXAMPLES:

```
sage: from sage.features.internet import Internet
sage: Internet()
Feature('internet')
```

sage.features.internet.all_features()

3.18 Feature for testing the presence of kenzo

class sage.features.kenzo.**Kenzo** (*args, **kws)

Bases: *Feature*

A *Feature* describing the presence of *Kenzo*.

EXAMPLES:

```
sage: from sage.features.kenzo import Kenzo
sage: Kenzo().is_present() # optional - kenzo
FeatureTestResult('kenzo', True)
```

sage.features.kenzo.all_features()

3.19 Features for testing the presence of latex and equivalent programs

class sage.features.latex.LaTeX(*args, **kws)

Bases: *Executable*

A *Feature* describing the presence of latex

EXAMPLES:

```
sage: from sage.features.latex import latex
sage: latex().is_present()           # optional - latex
FeatureTestResult('latex', True)
```

is_functional()

Return whether latex in the path is functional.

EXAMPLES:

```
sage: from sage.features.latex import latex
sage: latex().is_functional()       # optional - latex
FeatureTestResult('latex', True)
```

When the feature is not functional, more information on the reason can be obtained as follows:

```
sage: result = latex().is_functional()   # not tested
sage: print(result.reason)               # not tested
Running latex on a sample file
(with command='latex -interaction=nonstopmode tmp_wmpos8ak.tex')
returned non-zero exit status='1' with stderr='
and stdout='This is pdfTeX,
...
Runaway argument?
{document
! File ended while scanning use of \end.
...
No pages of output.
Transcript written on tmp_wmpos8ak.log.'
```

class sage.features.latex.LaTeXPackage(*args, **kws)

Bases: *TeXFile*

A *sage.features.Feature* describing the presence of a LaTeX package (.sty file).

EXAMPLES:

```
sage: from sage.features.latex import LaTeXPackage
sage: LaTeXPackage('graphics').is_present() # optional - latex
FeatureTestResult('latex_package_graphics', True)
```

class sage.features.latex.TeXFile(*args, **kws)

Bases: *StaticFile*

A *sage.features.Feature* describing the presence of a TeX file

EXAMPLES:

```
sage: from sage.features.latex import TeXFile
sage: TeXFile('x', 'x.tex').is_present() # optional - latex
FeatureTestResult('x', True)
```

absolute_filename()

The absolute path of the file.

EXAMPLES:

```
sage: from sage.features.latex import TeXFile
sage: feature = TeXFile('latex_class_article', 'article.cls')
sage: feature.absolute_filename() # optional - latex
'.../latex/base/article.cls'
```

`sage.features.latex.all_features()`

class `sage.features.latex.dvips(*args, **kws)`

Bases: *Executable*

A *Feature* describing the presence of dvips

EXAMPLES:

```
sage: from sage.features.latex import dvips
sage: dvips().is_present() # optional - dvips
FeatureTestResult('dvips', True)
```

class `sage.features.latex.latex(*args, **kws)`

Bases: *LaTeX*

A *Feature* describing the presence of latex

EXAMPLES:

```
sage: from sage.features.latex import latex
sage: latex().is_present() # optional - latex
FeatureTestResult('latex', True)
```

class `sage.features.latex.lualatex(*args, **kws)`

Bases: *LaTeX*

A *Feature* describing the presence of lualatex

EXAMPLES:

```
sage: from sage.features.latex import lualatex
sage: lualatex().is_present() # optional - lualatex
FeatureTestResult('lualatex', True)
```

class `sage.features.latex.pdflatex(*args, **kws)`

Bases: *LaTeX*

A *Feature* describing the presence of pdflatex

EXAMPLES:

```
sage: from sage.features.latex import pdflatex
sage: pdflatex().is_present() # optional - pdflatex
FeatureTestResult('pdflatex', True)
```

```
class sage.features.latex.xelatex(*args, **kws)
```

Bases: *LaTeX*

A *Feature* describing the presence of xelatex

EXAMPLES:

```
sage: from sage.features.latex import xelatex
sage: xelatex().is_present()           # optional - xelatex
FeatureTestResult('xelatex', True)
```

3.20 Features for testing the presence of latte_int

```
class sage.features.latte.Latte(*args, **kws)
```

Bases: *JoinFeature*

A *Feature* describing the presence of executables from *LattE integrale*.

EXAMPLES:

```
sage: from sage.features.latte import Latte
sage: Latte().is_present()             # optional - latte_int
FeatureTestResult('latte_int', True)
```

```
class sage.features.latte.Latte_count(*args, **kws)
```

Bases: *Executable*

Feature for the executable count from *LattE integrale*.

```
class sage.features.latte.Latte_integrate(*args, **kws)
```

Bases: *Executable*

Feature for the executable integrate from *LattE integrale*.

```
sage.features.latte.all_features()
```

3.21 Feature for testing the presence of lrslib

```
class sage.features.lrs.Lrs(*args, **kws)
```

Bases: *Executable*

A *Feature* describing the presence of the lrs binary which comes as a part of lrslib.

EXAMPLES:

```
sage: from sage.features.lrs import Lrs
sage: Lrs().is_present()               # optional - lrslib
FeatureTestResult('lrs', True)
```

```
is_functional()
```

Test whether lrs works on a trivial input.

EXAMPLES:

```
sage: from sage.features.lrs import Lrs
sage: Lrs().is_functional() # optional - lrslib
FeatureTestResult('lrs', True)
```

class sage.features.lrs.LrsNash(*args, **kws)

Bases: *Executable*

A *Feature* describing the presence of the lrsnash binary which comes as a part of lrslib.

EXAMPLES:

```
sage: from sage.features.lrs import LrsNash
sage: LrsNash().is_present() # optional - lrslib
FeatureTestResult('lrsnash', True)
```

is_functional()

Test whether lrsnash works on a trivial input.

EXAMPLES:

```
sage: from sage.features.lrs import LrsNash
sage: LrsNash().is_functional() # optional - lrslib
FeatureTestResult('lrsnash', True)
```

class sage.features.lrs.Lrslib(*args, **kws)

Bases: *JoinFeature*

A *Feature* describing the presence of the executables *lrs* and *lrsnash* provided by the *lrslib* package.

EXAMPLES:

```
sage: from sage.features.lrs import Lrslib
sage: Lrslib().is_present() # optional - lrslib
FeatureTestResult('lrslib', True)
```

sage.features.lrs.all_features()

3.22 Features for testing the presence of mcqd

class sage.features.mcqd.Mcqd(*args, **kws)

Bases: *JoinFeature*

A *Feature* describing the presence of the mcqd module, which is the SageMath interface to the *mcqd* library

EXAMPLES:

```
sage: from sage.features.mcqd import Mcqd
sage: Mcqd().is_present() # optional - mcqd
FeatureTestResult('mcqd', True)
```

sage.features.mcqd.all_features()

3.23 Feature for testing the presence of meataxe

```
class sage.features.meataxe.Meataxe (*args, **kws)
```

Bases: *JoinFeature*

A *Feature* describing the presence of the Sage modules that depend on the *meataxe* library.

EXAMPLES:

```
sage: from sage.features.meataxe import Meataxe
sage: Meataxe().is_present() # optional - meataxe
FeatureTestResult('meataxe', True)
```

```
sage.features.meataxe.all_features()
```

3.24 Features for testing the presence of MixedIntegerLinearProgram backends

```
class sage.features.mip_backends.COIN (*args, **kws)
```

Bases: *JoinFeature*

A *Feature* describing whether the *MixedIntegerLinearProgram* backend COIN is available.

```
class sage.features.mip_backends.Cplex (*args, **kws)
```

Bases: *MIPBackend*

A *Feature* describing whether the *MixedIntegerLinearProgram* backend CPLEX is available.

```
class sage.features.mip_backends.CVXOPT (*args, **kws)
```

Bases: *JoinFeature*

A *Feature* describing whether the *MixedIntegerLinearProgram* backend CVXOPT is available.

```
class sage.features.mip_backends.Gurobi (*args, **kws)
```

Bases: *MIPBackend*

A *Feature* describing whether the *MixedIntegerLinearProgram* backend Gurobi is available.

```
class sage.features.mip_backends.MIPBackend (*args, **kws)
```

Bases: *Feature*

A *Feature* describing whether a *MixedIntegerLinearProgram* backend is available.

```
sage.features.mip_backends.all_features()
```

3.25 Feature for testing the presence of pynormaliz

```
class sage.features.normaliz.PyNormaliz (*args, **kws)
```

Bases: *JoinFeature*

A *Feature* describing the presence of the Python package *PyNormaliz*.

EXAMPLES:

```
sage: from sage.features.normaliz import PyNormaliz
sage: PyNormaliz().is_present() # optional - pynormaliz
FeatureTestResult('pynormaliz', True)
```

```
sage.features.normaliz.all_features()
```

3.26 Feature for testing the presence of pandoc

```
class sage.features.pandoc.Pandoc(*args, **kws)
```

Bases: *Executable*

A *Feature* describing the presence of *pandoc*.

EXAMPLES:

```
sage: from sage.features.pandoc import Pandoc
sage: Pandoc().is_present() # optional - pandoc
FeatureTestResult('pandoc', True)
```

```
sage.features.pandoc.all_features()
```

3.27 Feature for testing the presence of pdf2svg

```
sage.features.pdf2svg.all_features()
```

```
class sage.features.pdf2svg.pdf2svg(*args, **kws)
```

Bases: *Executable*

A *Feature* describing the presence of *pdf2svg*.

EXAMPLES:

```
sage: from sage.features.pdf2svg import pdf2svg
sage: pdf2svg().is_present() # optional - pdf2svg
FeatureTestResult('pdf2svg', True)
```

3.28 Feature for testing the presence of jupymake, the Python interface to polymake

```
class sage.features.polymake.JuPyMake(*args, **kws)
```

Bases: *JoinFeature*

A *Feature* describing the presence of the *JuPyMake* module, a Python interface to the *polymake* library.

EXAMPLES:

```
sage: from sage.features.polymake import JuPyMake
sage: JuPyMake().is_present() # optional - jupymake
FeatureTestResult('jupymake', True)
```

```
sage.features.polymake.all_features()
```

3.29 Features for testing the presence of rubiks

class sage.features.rubiks.**Rubiks**(*args, **kws)

Bases: *JoinFeature*

A *Feature* describing the presence of the *cu2*, *cubex*, *dikcube*, *mcube*, *optimal*, and *size222* programs from the *rubiks* package.

EXAMPLES:

```
sage: from sage.features.rubiks import Rubiks
sage: Rubiks().is_present() # optional - rubiks
FeatureTestResult('rubiks', True)
```

sage.features.rubiks.all_features()

class sage.features.rubiks.**cu2**(*args, **kws)

Bases: *Executable*

A *Feature* describing the presence of *cu2*.

EXAMPLES:

```
sage: from sage.features.rubiks import cu2
sage: cu2().is_present() # optional - rubiks
FeatureTestResult('cu2', True)
```

class sage.features.rubiks.**cubex**(*args, **kws)

Bases: *Executable*

A *Feature* describing the presence of *cubex*.

EXAMPLES:

```
sage: from sage.features.rubiks import cubex
sage: cubex().is_present() # optional - rubiks
FeatureTestResult('cubex', True)
```

class sage.features.rubiks.**dikcube**(*args, **kws)

Bases: *Executable*

A *Feature* describing the presence of *dikcube*.

EXAMPLES:

```
sage: from sage.features.rubiks import dikcube
sage: dikcube().is_present() # optional - rubiks
FeatureTestResult('dikcube', True)
```

class sage.features.rubiks.**mcube**(*args, **kws)

Bases: *Executable*

A *Feature* describing the presence of *mcube*.

EXAMPLES:

```
sage: from sage.features.rubiks import mcube
sage: mcube().is_present() # optional - rubiks
FeatureTestResult('mcube', True)
```

class sage.features.rubiks.optimal(*args, **kws)

Bases: *Executable*

A *Feature* describing the presence of optimal.

EXAMPLES:

```
sage: from sage.features.rubiks import optimal
sage: optimal().is_present() # optional - rubiks
FeatureTestResult('optimal', True)
```

class sage.features.rubiks.size222(*args, **kws)

Bases: *Executable*

A *Feature* describing the presence of size222.

EXAMPLES:

```
sage: from sage.features.rubiks import size222
sage: size222().is_present() # optional - rubiks
FeatureTestResult('size222', True)
```

3.30 Features for testing the presence of tdlb

class sage.features.tdlb.Tdlb(*args, **kws)

Bases: *JoinFeature*

A *Feature* describing the presence of the SageMath interface to the *tdlib* library.

sage.features.tdlb.all_features()

DISTRIBUTION PACKAGES OF THE SAGE LIBRARY

- *sagemath_bliss*: Graph (iso/auto)morphisms with bliss
- *sagemath_categories*: Sage categories and basic rings
- *sagemath_coxeter3*: Coxeter groups, Bruhat ordering, Kazhdan-Lusztig polynomials with coxeter3
- *sagemath_doc_html*: SageMath documentation in HTML format
- *sagemath_doc_pdf*: SageMath documentation in PDF format
- *sagemath_environment*: System and software environment
- *sagemath_mcqd*: Finding maximum cliques with mcqd
- *sagemath_meataxe*: Matrices over small finite fields with meataxe
- *sagemath_objects*: Sage objects, elements, parents, categories, coercion, metaclasses
- *sagemath_repl*: IPython kernel, Sage preparser, doctester
- *sagemath_sirocco*: Certified root continuation with sirocco
- *sagemath_tdlb*: Tree decompositions with tdlb

EXPERIMENTAL PACKAGES

Some packages that provide additional functionality are marked as “experimental”. Developers are needed in order to improve the integration of these packages into the Sage distribution.

- *awali*: Computation of/with finite state machines
- *barvinok*: Projections of integer point sets of parametric polytopes
- *cocoalib*: Computations in commutative algebra
- *deformation*: Count points on hypersurfaces using the deformation method
- *gambit*: Computations on finite, noncooperative games
- *gap3*: A minimal distribution of GAP 3 containing packages that have no equivalent in GAP 4
- *gdb*: The GNU Project debugger
- *libtheora*: Library for the Theora video codec
- *lie*: Library for the representation theory of complex semisimple Lie groups and algebras
- *modular_decomposition*: A modular decomposition algorithm
- *polylib*: Operations on unions of polyhedra
- *r_jupyter*: Jupyter kernel for R
- *surf*: Visualization of algebraic curves, algebraic surfaces and hyperplane sections of surfaces
- *valgrind*: Memory error detector, call graph generator, runtime profiler

ALL EXTERNAL PACKAGES

6.1 Details of external packages

Packages are in alphabetical order.

6.1.1 4ti2: Algebraic, geometric and combinatorial problems on linear spaces

Description

A software package for algebraic, geometric and combinatorial problems on linear spaces. Available at <https://4ti2.github.io/>.

License

4ti2 is released under a GPL v2 license.

Upstream Contact

- <https://4ti2.github.io/>
- Raymond Hemmecke, TU Munich, Germany
- Matthias Köppe, UC Davis, CA, USA

Type

optional

Dependencies

- \$(MP_LIBRARY)
- *glpk*: GNU Linear Programming Kit
- *zlib*: Data compression library

Version Information

package-version.txt:

```
1.6.10
```

Equivalent System Packages

```
$ sudo pacman -S 4ti2
```

```
$ conda install 4ti2
```

```
$ apt-cyg install lib4ti2_0 lib4ti2-devel
```

```
$ sudo apt-get install 4ti2
```

```
$ sudo yum install 4ti2
```

```
$ sudo pkg install math/4ti2
```

```
$ sudo emerge sci-mathematics/4ti2
```

```
$ sudo zypper install 4ti2 4ti2-devel
```

See <https://repology.org/project/4ti2/versions>

If the system package is installed, `./configure` will check if it can be used.

6.1.2 `_bootstrap`: Represents system packages required for running the top-level bootstrap script

Description

This optional script package represents the requirements (system packages) that are needed in addition to those represented by the `_prereq` package in order to run the top-level bootstrap script.

Type

optional

Dependencies

Version Information

Equivalent System Packages

```
$ apk add bash gettext-dev autoconf automake libtool pkgconf
```

```
$ sudo pacman -S autoconf automake libtool pkgconf
```

```
$ conda install autoconf automake libtool pkg-config
```

```
$ apt-cyg install autoconf automake libtool
```

```
$ sudo apt-get install autoconf automake libtool pkg-config
```

```
$ sudo yum install autoconf automake libtool pkg-config
```

```
$ sudo pkg install autoconf automake libtool pkg-config
```

```
$ sudo emerge dev-build/autoconf dev-build/automake dev-build/libtool
```

```
$ brew install autoconf automake libtool pkg-config
```

```
$ sudo port install gettext autoconf automake libtool pkgconfig
```

```
$ nix-env --install autoconf automake libtool pkg-config
```

```
$ sudo zypper install autoconf automake libtool pkgconfig
```

```
$ sudo slackpkg install autoconf automake libtool pkg-config
```

```
$ sudo xbps-install autoconf automake libtool xtools mk-configure \
    pkg-config
```

6.1.3 `_develop`: Represents system packages recommended for development

Description

Script package representing a list of system packages recommended for developers.

Type

optional

Dependencies

- *_bootstrap*: Represents system packages required for running the top-level bootstrap script
- *git*: Version control system
- *github_cli*: Command-line interface for GitHub
- *pytest*: Simple powerful testing with Python
- *pytest_xdist*: pytest xdist plugin for distributed testing and loop-on-failing modes

Version Information

Equivalent System Packages

```
$ apk add gnupg-gpgconf openssh-client
```

```
$ sudo pacman -S gnupg openssh
```

```
$ conda install openssh pycodestyle esbonio
```

```
$ apt-cyg install gnupg2
```

```
$ sudo apt-get install gpgconf openssh-client
```

```
$ sudo yum install gnupg2 openssh
```

```
$ sudo pkg install security/gnupg security/openssh-portable
```

```
$ sudo emerge app-crypt/gnupg net-misc/openssh
```

```
$ brew install gnupg
```

```
$ sudo port install gnupg2
```

```
$ nix-env --install gnupg openssh
```

```
$ sudo zypper install gpg2 openssh
```

```
$ sudo slackpkg install gnupg2 openssh
```

```
$ sudo xbps-install gnupg2 openssh
```

See <https://repology.org/project/gnupg/versions>, <https://repology.org/project/openssh/versions>

If the system package is installed, `./configure` will check if it can be used.

6.1.4 `_prereq`: Represents system packages required for installing SageMath from source

Description

This dummy package represents the minimal requirements (system packages) for installing SageMath from source.

In addition to standard [POSIX](#) utilities and the [bash](#) shell, the following standard command-line development tools must be installed on your computer:

- **make**: GNU make, version 3.80 or later. Version 3.82 or later is recommended.
- **m4**: GNU m4 1.4.2 or later (non-GNU or older versions might also work).
- **perl**: version 5.8.0 or later.
- **ar** and **ranlib**: can be obtained as part of GNU binutils.
- **tar**: GNU tar version 1.17 or later, or BSD tar (as provided on macOS).
- **python**: Python 3.4 or later, or Python 2.7. (This range of versions is a minimal requirement for internal purposes of the SageMath build system, which is referred to as `sage-bootstrap-python`.)

Other versions of these may work, but they are untested.

On macOS, suitable versions of all of these tools are provided by the Xcode Command Line Tools. To install them, open a terminal window and run `xcode-select --install`; then click “Install” in the pop-up window. If the Xcode Command Line Tools are already installed, you may want to check if they need to be updated by typing `softwareupdate -l`.

On Linux, `ar` and `ranlib` are in the [binutils](#) package. The other programs are usually located in packages with their respective names.

On Redhat-derived systems not all `perl` components are installed by default and you might have to install the `perl-ExtUtils-MakeMaker` package.

To check if you have the above prerequisites installed, for example `perl`, type:

```
$ command -v perl
```

or:

```
$ which perl
```

on the command line. If it gives an error (or returns nothing), then either `perl` is not installed, or it is installed but not in your [PATH](#).

Type

standard

Dependencies

Version Information

Equivalent System Packages

```
$ apk add binutils make m4 perl python3 tar bc gcc g++ ca-certificates \
    coreutils
```

```
$ sudo pacman -S binutils make m4 perl python tar bc gcc which
```

```
$ conda install compilers<=1.6.0 make m4 perl python tar bc
```

```
$ apt-cyg install binutils make m4 python39-urllib3 python39 perl \
    perl-ExtUtils-MakeMaker tar gcc-core gcc-g++ findutils which \
    libcrypt-devel libiconv-devel
```

```
$ sudo apt-get install binutils make m4 perl python3 tar bc gcc g++ \
    ca-certificates
```

```
$ sudo yum install binutils make m4 python3 perl \
    perl-ExtUtils-MakeMaker tar gcc gcc-c++ findutils which diffutils \
    perl-IPC-Cmd
```

```
$ sudo pkg install gmake automake bash dash python
```

```
$ sudo emerge sys-devel/binutils sys-libs/binutils-libs dev-build/make \
    dev-scheme/guile dev-libs/libffi app-arch/tar sys-devel/gcc \
    dev-libs/mpc sys-libs/glibc sys-kernel/linux-headers \
    dev-lang/perl sys-devel/m4 sys-devel/bc dev-lang/python \
    sys-devel/flex app-misc/ca-certificates dev-libs/libxml2 \
    sys-apps/findutils sys-apps/which sys-apps/diffutils
```

No package needed.

No package needed.

```
$ nix-env --install binutils gnumake gnum4 perl python3 gnutar bc gcc \
    bash
```

```
$ sudo zypper install binutils make m4 gawk perl python3 tar bc which \
    glibc-locale-base gcc gcc-c++ ca-certificates gzip findutils \
    diffutils
```

```
$ sudo slackpkg install binutils make guile gc libffi gcc-[0-9] \
    gcc-11 gcc-g++ gcc-g++-11 libmpc glibc kernel-headers perl m4 bc \
    python-2.7 python3 flex ca-certificates libxml2 cyrus-sasl
```

```
$ sudo xbps-install bc binutils gcc libgomp-devel m4 make perl python3 \
    tar bash which diffutils gzip python3-devel bzip2-devel xz \
    liblzma-devel libffi-devel zlib-devel libxcrypt-devel
```

If the system package is installed, `./configure` will check if it can be used.

6.1.5 `_recommended`: Represents system packages recommended for additional functionality

Description

Script package representing a list of system packages recommended to be installed for additional functionality.

Type

optional

Dependencies

- *ffmpeg*: *ffmpeg video converter*
- *free_fonts*: *a free family of scalable outline fonts*
- *git*: *Version control system*
- *ImageMagick*: *A collection of tools and libraries for many image file formats*
- *libjpeg*: *JPEG image support*
- *pandoc*: *A document converter*
- *texlive*: *A comprehensive TeX system*
- *texlive luatex*: *LuaTeX packages*
- *xindy*: *a general-purpose index processor*

Version Information

Equivalent System Packages

```
$ sudo apt-get install default-jdk libavdevice-dev
```

```
$ brew install texinfo
```

```
$ sudo port install texinfo
```

If the system package is installed, `./configure` will check if it can be used.

6.1.6 `_sagemath`: Downstream package of Sage in distributions

SageMath is available from various distributions and can be installed by package managers.

This dummy package records the names of the system packages that should be installed to provide a standard installation of SageMath, including documentation and Jupyter.

Downstream Contact

See [wiki page Distribution](#)

Type

optional

Dependencies

Version Information

Equivalent System Packages

```
$ sudo pacman -S sagemath sagemath-doc
```

```
$ conda install sage
```

```
$ sudo apt-get install sagemath sagemath-doc sagemath-jupyter
```

```
$ sudo yum install sagemath
```

```
$ sudo pkg install math/sage
```

```
$ brew install sage
```

```
$ nix-env --install sage
```

```
$ sudo xbps-install sagemath
```

See <https://repology.org/project/sagemath/versions>

6.1.7 admcycles: Computation in the tautological ring of the moduli space of curves

Description

The SageMath package `admcycles` offers the possibility to compute in the tautological ring of the Deligne-Mumford compactification of the moduli space of curves. Construction for standard generators are provided (`psi`, `kappa` and `lambda` classes) as well as more advanced algebraic construction (double ramification cycle, strata of differentials).

License

GPLv2+

Upstream Contact

<https://pypi.org/project/admcycles/>

Type

optional

Dependencies

- \$(PYTHON)
- \$(PYTHON_TOOLCHAIN)

Version Information

requirements.txt:

```
admcycles
```

Equivalent System Packages

(none known)

6.1.8 alabaster: Default theme for the Sphinx documentation system

Description

Alabaster is a visually (c)lean, responsive, configurable theme for the Sphinx documentation system. It is Python 2+3 compatible.

It began as a third-party theme, and is still maintained separately, but as of Sphinx 1.3, Alabaster is an install-time dependency of Sphinx and is selected as the default theme.

Live examples of this theme can be seen on paramiko.org, fabfile.org and pyinvoke.org.

Upstream Contact

<https://alabaster.readthedocs.io/en/latest/>

Type

standard

Dependencies

- \$(PYTHON)
- \$(PYTHON_TOOLCHAIN)

Version Information

package-version.txt:

```
0.7.16
```

install-requires.txt:

```
alabaster >=0.7.12
```

Equivalent System Packages

```
$ conda install alabaster
```

```
$ sudo emerge dev-python/alabaster
```

```
$ sudo zypper install python3${PYTHON_MINOR}-alabaster
```

```
$ sudo xbps-install python3-alabaster
```

See <https://repology.org/project/alabaster/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

6.1.9 anyio: High level compatibility layer for multiple asynchronous event loop implementations

Description

High level compatibility layer for multiple asynchronous event loop implementations

License

MIT

Upstream Contact

<https://pypi.org/project/anyio/>

Type

standard

Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *idna: Internationalized Domain Names in Applications (IDNA)*
- *sniffio: Sniff out which async library your code is running under*

Version Information

package-version.txt:

4.0.0

install-requires.txt:

anyio

Equivalent System Packages

(none known)

6.1.10 appdirs: A small Python module for determining appropriate platform-specific dirs, e.g. a “user data dir”.

Description

A small Python module for determining appropriate platform-specific dirs, e.g. a “user data dir”.

License

MIT

Upstream Contact

<https://pypi.org/project/appdirs/>

Type

standard

Dependencies

- \$(PYTHON)
- \$(PYTHON_TOOLCHAIN)

Version Information

package-version.txt:

```
1.4.4
```

install-requires.txt:

```
appdirs
```

Equivalent System Packages

```
$ conda install appdirs
```

```
$ sudo xbps-install python3-appdirs
```

If the system package is installed, `./configure` will check if it can be used.

6.1.11 appnope: Disable App Nap on macOS >= 10.9

Description

Disable App Nap on macOS >= 10.9

License

BSD

Upstream Contact

<https://pypi.org/project/appnope/>

Type

standard

Dependencies

- \$(PYTHON)
- \$(PYTHON_TOOLCHAIN)

Version Information

package-version.txt:

```
0.1.3
```

install-requires.txt:

```
appnope >=0.1.0
```

Equivalent System Packages

```
$ conda install appnope
```

```
$ sudo port install py-appnope
```

See <https://repology.org/project/python:appnope/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

6.1.12 argon2_cffi: The secure Argon2 password hashing algorithm

Description

The secure Argon2 password hashing algorithm.

License

MIT

Upstream Contact

<https://pypi.org/project/argon2-cffi/>

Type

standard

Dependencies

- \$(PYTHON)
- \$(PYTHON_TOOLCHAIN)
- *argon2_cffi_bindings*: Low-level CFFI bindings for Argon2
- *flit_core*: Distribution-building parts of Flit. See *flit* package for more information

Version Information

package-version.txt:

```
21.3.0
```

install-requires.txt:

```
argon2-cffi
```

Equivalent System Packages

```
$ conda install argon2-cffi
```

```
$ sudo emerge dev-python/argon2-cffi
```

```
$ sudo port install py-argon2-cffi
```

```
$ sudo xbps-install python3-argon2
```

See <https://repology.org/project/argon2-cffi/versions>, <https://repology.org/project/python:argon2-cffi/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

6.1.13 argon2_cffi_bindings: Low-level CFFI bindings for Argon2

Description

Low-level CFFI bindings for Argon2

License

MIT

Upstream Contact

<https://pypi.org/project/argon2-cffi-bindings/>

Type

standard

Dependencies

- \$(PYTHON)
- \$(PYTHON_TOOLCHAIN)
- *cffi: Foreign Function Interface for Python calling C code*
- *setuptools_scm: Python build system extension to obtain package version from version control*

Version Information

package-version.txt:

```
21.2.0
```

install-requires.txt:

```
argon2-cffi-bindings
```

Equivalent System Packages

```
$ apk add py3-argon2-cffi-bindings
```

```
$ sudo pacman -S python-argon2-cffi-bindings
```

```
$ sudo yum install python-argon2-cffi-bindings
```

```
$ sudo pkg install security/py-argon2-cffi-bindings
```

```
$ sudo emerge dev-python/argon2-cffi-bindings
```

```
$ sudo port install py-argon2-cffi-bindings
```

```
$ sudo zypper install python-argon2-cffi-bindings
```

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

6.1.14 arrow: Better dates & times for Python

Description

Better dates & times for Python

License

Apache 2.0

Upstream Contact

<https://pypi.org/project/arrow/>

Type

standard

Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *dateutil: Extensions to the standard Python module datetime*
- *types_python_dateutil: Typing stubs for python-dateutil*

Version Information

package-version.txt:

```
1.3.0
```

install-requires.txt:

```
arrow
```

Equivalent System Packages

(none known)

6.1.15 asttokens: Annotate AST trees with source code positions

Description

Annotate AST trees with source code positions

License

Apache 2.0

Upstream Contact

<https://pypi.org/project/asttokens/>

Type

standard

Dependencies

- \$(PYTHON)
- \$(PYTHON_TOOLCHAIN)

Version Information

package-version.txt:

```
2.4.1
```

install-requires.txt:

```
asttokens
```

Equivalent System Packages

```
$ conda install asttokens
```

```
$ sudo emerge dev-python/asttokens
```

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

6.1.16 `async_lru`: Simple LRU cache for `asyncio`

Description

Simple LRU cache for `asyncio`

License

MIT License

Upstream Contact

<https://pypi.org/project/async-lru/>

Type

standard

Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`

Version Information

package-version.txt:

```
2.0.4
```

install-requires.txt:

```
async-lru
```

Equivalent System Packages

(none known)

6.1.17 `attrs`: Decorator for Python classes with attributes

Description

`attrs` is the Python package that will bring back the joy of writing classes by relieving you from the drudgery of implementing object protocols (aka dunder methods).

License

MIT License

Upstream Contact

Home page: <https://www.attrs.org>

Type

standard

Dependencies

- \$(PYTHON)
- \$(PYTHON_TOOLCHAIN)

Version Information

package-version.txt:

```
23.1.0
```

install-requires.txt:

```
attrs >=19.3.0
```

Equivalent System Packages

```
$ conda install attrs
```

```
$ sudo emerge dev-python/attrs
```

```
$ sudo port install py-attrs
```

```
$ sudo xbps-install python3-attrs
```

See <https://repology.org/project/python:attrs/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

6.1.18 auditwheel_or_delocate: Repair wheels on Linux or macOS

Description

This package represents `auditwheel` on Linux and `delocate` on macOS.

(Actually, we install `delocate` also on Linux because our script `make -j list-broken-packages` uses a small subroutine of `delocate` even on Linux.)

License

MIT

BSD 2-clause

Upstream Contact

<https://pypi.org/project/auditwheel/>

<https://pypi.org/project/delocate/>

Type

optional

Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`

Version Information

requirements.txt:

```
delocate
auditwheel; sys_platform != 'darwin'
```

Equivalent System Packages

(none known)

6.1.19 awali: Computation of/with finite state machines

Description

Awali is a software platform dedicated to the computation of, and with, finite state machines. Here finite state machines is to be understood in the broadest possible sense: finite automata with output — often called transducers then — or even more generally finite automata with multiplicity, that is, automata that not only accept, or recognize, sequences of symbols but compute for every such sequence a ‘value’ that is associated with it and which can be taken in any semiring. Hence the variety of situations that can thus be modellized.

License

- GPL 3.0

Upstream Contact

- Website: <http://vaucanson-project.org/Awali/index.html>
- Releases: <http://files.vaucanson-project.org/tarballs/>

Dependencies

- graphviz must be installed from your distro, and available in the path.

Type

experimental

Dependencies

- \$(PYTHON)
- *cmake: A cross-platform build system generator*
- *cython: C-Extensions for Python, an optimizing static compiler*
- *nbconvert: Converting Jupyter Notebooks*
- *ncurses: Classic terminal output library*

Version Information

package-version.txt:

```
1.0.2-190218
```

Equivalent System Packages

See <https://repology.org/project/awali/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

6.1.20 babel: Internationalization utilities

Description

Internationalization utilities

License

BSD-3-Clause

Upstream Contact

<https://pypi.org/project/Babel/>

Type

standard

Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *pytz: Timezone definitions for Python*

Version Information

package-version.txt:

```
2.14.0
```

install-requires.txt:

```
babel >=2.11.0
```

Equivalent System Packages

```
$ sudo pacman -S python-babel
```

```
$ conda install babel
```

```
$ sudo apt-get install python3-babel
```

```
$ sudo yum install babel
```

```
$ sudo emerge dev-python/Babel
```

```
$ sudo port install py-babel
```

```
$ sudo zypper install python3\${PYTHON_MINOR}\-Babel
```

```
$ sudo xbps-install python3-Babel
```

See <https://repology.org/project/python:babel/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

6.1.21 barvinok: Projections of integer point sets of parametric polytopes

Description

barvinok is a library for counting the number of integer points in parametric and non-parametric polytopes as well as projections of such sets.

License

GPL v2

Upstream Contact

- <https://sourceforge.net/projects/barvinok/>
- <https://groups.google.com/group/isl-development>

Type

experimental

Dependencies

- *isl*: Sets and relations of integer points bounded by affine constraints
- *ntl*: A library for doing number theory
- *polylib*: Operations on unions of polyhedra

Version Information

package-version.txt:

```
0.41.7
```

Equivalent System Packages

```
$ sudo pkg install math/barvinok
```

```
$ sudo zypper install barvinok pkgconfig\ (barvinok\)
```

See <https://repology.org/project/barvinok/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

6.1.22 beautifulsoup4: Screen-scraping library

Description

Screen-scraping library

License

MIT

Upstream Contact

<https://pypi.org/project/beautifulsoup4/>

Type

standard

Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *soupsieve: A modern CSS selector implementation for Beautiful Soup.*

Version Information

package-version.txt:

```
4.12.2
```

install-requires.txt:

```
beautifulsoup4
```

Equivalent System Packages

```
$ apk add py3-beautifulsoup4
```

```
$ sudo pacman -S python-beautifulsoup4
```

```
$ conda install beautifulsoup4
```

```
$ sudo apt-get install python3-bs4
```

```
$ sudo yum install python-beautifulsoup4
```

```
$ sudo emerge dev-python/beautifulsoup4
```

```
$ sudo port install py-beautifulsoup4
```

```
$ sudo zypper install python-beautifulsoup4
```

```
$ sudo xbps-install python3-BeautifulSoup4
```

See <https://repology.org/project/python:beautifulsoup4/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

6.1.23 beniget: Extract semantic information about static Python code

Description

Extract semantic information about static Python code

License

BSD 3-Clause

Upstream Contact

<https://pypi.org/project/beniget/>

Type

standard

Dependencies

- \$(PYTHON)
- \$(PYTHON_TOOLCHAIN)
- *gast*: *Python AST that abstracts the underlying Python version*

Version Information

package-version.txt:

```
0.4.1
```

install-requires.txt:

```
beniget
```

Equivalent System Packages

```
$ conda install beniget
```

```
$ sudo emerge dev-python/beniget
```

```
$ sudo xbps-install python3-beniget
```

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

6.1.24 benzene: Generate fusenes and benzenoids with a given number of faces

Description

Benzene is a program for the efficient generation of all nonisomorphic fusenes and benzenoids with a given number of faces. Fusenes are planar polycyclic hydrocarbons with all bounded faces hexagons. Benzenoids are fusenes that are subgraphs of the hexagonal lattice.

License

Benzene is licensed under the GNU General Public License v2 or later (June 2007)

Upstream Contact

Benzene was written by Gunnar Brinkmann and Gilles Caporossi. This version was adapted by Gunnar Brinkmann and Nico Van Cleemput for Grinvin.

<http://www.grinvin.org/>

Type

optional

Dependencies

Version Information

package-version.txt:

```
20130630
```

Equivalent System Packages

```
$ sudo pacman -S benzene
```

```
$ sudo zypper install benzene
```

See <https://repology.org/project/benzene/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

6.1.25 biopython: Tools for computational molecular biology

Description

Freely available tools for computational molecular biology.

License

Upstream Contact

<https://pypi.org/project/biopython/>

<http://biopython.org/>

Type

optional

Dependencies

Version Information

requirements.txt:

```
biopython
```

Equivalent System Packages

```
$ conda install biopython
```

```
$ sudo port install py-biopython
```

See <https://repology.org/project/biopython/versions>, <https://repology.org/project/python:biopython/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

6.1.26 bleach: An HTML-sanitizing tool

Description

An easy safelist-based HTML-sanitizing tool.

License

Apache License v2

Upstream Contact

Home Page: <https://github.com/mozilla/bleach>

Type

standard

Dependencies

- \$(PYTHON)
- \$(PYTHON_TOOLCHAIN)
- *six: Python 2 and 3 compatibility utilities*
- *webencodings: Character encoding aliases for legacy web content*

Version Information

package-version.txt:

```
6.1.0
```

install-requires.txt:

```
bleach >= 5
```

Equivalent System Packages

```
$ sudo pacman -S python-bleach
```

```
$ conda install bleach
```

```
$ sudo apt-get install python3-bleach
```

```
$ sudo yum install python-bleach
```

```
$ sudo emerge dev-python/bleach
```

```
$ sudo port install py-bleach
```

```
$ sudo zypper install python3\${PYTHON_MINOR}-bleach
```

```
$ sudo xbps-install python3-bleach
```

See <https://repology.org/project/python:bleach/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

6.1.27 bliss: Computing automorphism groups and canonical forms of graphs

Description

bliss is an open source tool for computing automorphism groups and canonical forms of graphs.

License

LGPL3

Upstream Contact

Bliss is currently being maintained by Tommi Junttila at

<https://users.aalto.fi/~tjunttil/bliss/index.html>

Bliss used to be maintained by Tommi Junttila and Petteri Kaski up to version 0.73 at

<http://www.tcs.tkk.fi/Software/bliss/index.html>

Type

optional

Dependencies

- *cmake: A cross-platform build system generator*

Version Information

package-version.txt:

```
0.77
```

Equivalent System Packages

```
$ apk add bliss
```

```
$ sudo pacman -S bliss
```

```
$ conda install bliss
```

```
$ sudo yum install bliss bliss-devel
```

```
$ sudo emerge sci-libs/bliss
```

```
$ sudo zypper install bliss bliss-devel
```

See <https://repology.org/project/bliss-graphs/versions>

If the system package is installed, `./configure` will check if it can be used.

6.1.28 boost_cropped: Portable C++ libraries (subset needed for Sage)

Description

Boost provides free peer-reviewed portable C++ source libraries.

We emphasize libraries that work well with the C++ Standard Library. Boost libraries are intended to be widely useful, and usable across a broad spectrum of applications. The Boost license encourages both commercial and non-commercial use.

We aim to establish “existing practice” and provide reference implementations so that Boost libraries are suitable for eventual standardization. Ten Boost libraries are already included in the C++ Standards Committee’s Library Technical Report (TR1) and will be in the new C++0x Standard now being finalized. C++0x will also include several more Boost libraries in addition to those from TR1. More Boost libraries are proposed for TR2.

License

Boost Software License - see <http://www.boost.org/users/license.html>

Upstream Contact

Website: <http://www.boost.org/>

See mailing list page at <http://www.boost.org/community/groups.html>

Type

standard

Dependencies

Version Information

package-version.txt:

```
1.66.0.p0
```

Equivalent System Packages

```
$ sudo pacman -S boost
```

```
$ conda install boost-cpp
```

```
$ apt-cyg install libboost-devel
```

```
$ sudo apt-get install libboost-dev
```

```
$ sudo yum install boost-devel
```

```
$ sudo pkg install devel/boost-libs
```

```
$ brew install boost
```

```
$ sudo port install boost
```

```
$ nix-env --install boost
```

```
$ sudo zypper install boost-devel
```

```
$ sudo slackpkg install boost
```

```
$ sudo xbps-install boost-devel
```

See <https://repology.org/project/boost/versions>

If the system package is installed, `./configure` will check if it can be used.

6.1.29 brial: Boolean Ring Algebra implementation using binary decision diagrams

Description

BRiAl (“Boolean Ring Algebra”) is the successor to PolyBoRi.

The core of PolyBoRi is a C++ library, which provides high-level data types for Boolean polynomials and monomials, exponent vectors, as well as for the underlying polynomial rings and subsets of the powerset of the Boolean variables. As a unique approach, binary decision diagrams are used as internal storage type for polynomial structures. On top of this C++-library we provide a Python interface. This allows parsing of complex polynomial systems, as well as sophisticated and extendable strategies for Gröbner base computation. PolyBoRi features a powerful reference implementation for Gröbner basis computation.

License

GPL version 2 or later

Upstream Contact

<https://github.com/BRiAl/BRiAl>

Type

standard

Dependencies

- *boost_cropped*: Portable C++ libraries (subset needed for Sage)
- *libpng*: Bitmap image support
- *m4ri*: fast arithmetic with dense matrices over GF(2)
- *pkgconf*: An implementation of the pkg-config spec

Version Information

package-version.txt:

```
1.2.8
```

Equivalent System Packages

```
$ sudo pacman -S brial
```

```
$ conda install brial
```

```
$ sudo apt-get install libbrial-dev libbrial-groebner-dev
```

```
$ sudo yum install brial brial-devel
```

```
$ sudo pkg install math/brial
```

```
$ sudo emerge sci-libs/brial
```

```
$ nix-env --install brial
```

```
$ sudo zypper install brial-devel
```

```
$ sudo xbps-install brial-devel
```

See <https://repology.org/project/brial/versions>

If the system package is installed, `./configure` will check if it can be used.

6.1.30 buckygen: Efficient generation of nonisomorphic fullerenes

Description

Buckygen is a program for the efficient generation of all nonisomorphic fullerenes. These are triangulations where all vertices have degree 5 or 6. Or if the dual representation is used: cubic plane graphs where all faces are pentagons or hexagons.

License

Buckygen is licensed under the GNU General Public License v3 (June 2007)

Upstream Contact

Buckygen was mainly written by Jan Goedgebeur, jan.goedgebeur@ugent.be.

<http://caagt.ugent.be/buckygen/>

Type

optional

Dependencies

Version Information

package-version.txt:

```
1.1
```

Equivalent System Packages

```
$ sudo pacman -S buckygen
```

```
$ sudo zypper install buckygen
```

See <https://repology.org/project/buckygen/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

6.1.31 bzip2: High-quality data compressor

Description

bzip2 is a freely available, patent free, high-quality data compressor.

It typically compresses files to within 10% to 15% of the best available techniques (the PPM family of statistical compressors), whilst being around twice as fast at compression and six times faster at decompression.

License

BSD-style

Upstream Contact

- Website <http://bzip.org/>
- Author: Julian Seward <julian@bzip.org>

Special Update/Build Instructions

This package must not be bzip2 compressed, so create it using

```
tar c bzip2-1.0.6 | gzip --best >bzip2-1.0.6.spkg
```

The build system has been autotoolized based on a patch by the Suse folk at http://ftp.uni-kl.de/pub/linux/suse/people/sbrabec/bzip2/for_downstream/bzip2-1.0.6-autoconfiscated.patch

See patches/autotools and spkg-src for details.

Type

standard

Dependencies

- *pkgconf*: An implementation of the pkg-config spec

Version Information

package-version.txt:

```
1.0.6-20150304.p0
```

Equivalent System Packages

```
$ apk add bzip2
```

```
$ conda install bzip2
```

```
$ apt-cyg install bzip2 libbz2-devel
```

```
$ sudo apt-get install libbz2-dev bzip2
```

```
$ sudo yum install bzip2 bzip2-devel
```

```
$ brew install bzip2
```

```
$ sudo zypper install bzip2 pkgconfig\ (bzip2\)
```

```
$ sudo slackpkg install bzip2
```

```
$ sudo xbps-install bzip2-devel
```

See <https://repology.org/project/bzip2/versions>

If the system package is installed, `./configure` will check if it can be used.

6.1.32 cachetools: Extensible memoizing collections and decorators

Description

Extensible memoizing collections and decorators

License

MIT

Upstream Contact

<https://pypi.org/project/cachetools/>

Type

standard

Dependencies

- \$(PYTHON)
- \$(PYTHON_TOOLCHAIN)

Version Information

package-version.txt:

5.3.1

install-requires.txt:

cachetools

Equivalent System Packages

(none known)

6.1.33 calver: Setuptools extension for CalVer package versions

Description

Setuptools extension for CalVer package versions

License

Upstream Contact

<https://pypi.org/project/calver/>

Type

standard

Dependencies

- \$(PYTHON)
- *pip: Tool for installing and managing Python packages*

Version Information

package-version.txt:

```
2022.6.26
```

install-requires.txt:

```
calver
```

Equivalent System Packages

```
$ apk add py3-calver
```

```
$ sudo pacman -S python-calver
```

```
$ sudo pkg install devel/py-calver
```

```
$ sudo emerge calver
```

```
$ sudo port install py-calver
```

```
$ sudo zypper install python-calver
```

```
$ sudo xbps-install python3-calver
```

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

6.1.34 cbc: COIN-OR branch and cut solver for mixed-integer programs

Description

The Computational Infrastructure for Operations Research (COIN-OR**, or simply COIN) project is an initiative to spur the development of open-source software for the operations research community.

The COIN Branch and Cut solver (CBC) is an open-source mixed-integer program (MIP) solver written in C++. CBC is intended to be used primarily as a callable library to create customized branch-and-cut solvers. A basic, stand-alone executable version is also available.

License

Eclipse Public License, Version 1.0 (EPL-1.0) (<http://opensource.org/licenses/eclipse-1.0>)

Upstream Contact

- <https://github.com/coin-or/Cbc>

Type

optional

Dependencies

- $\$(BLAS)$
- *bzip2*: High-quality data compressor
- *readline*: Command line editing library
- *zlib*: Data compression library

Version Information

package-version.txt:

```
2.9.4.p0
```

Equivalent System Packages

```
$ sudo pacman -S coin-or-cbc
```

```
$ conda install coinbc
```

```
$ sudo apt-get install coinor-cbc coinor-libcbc-dev
```

```
$ sudo yum install coin-or-Cbc coin-or-Cbc-devel
```

```
$ sudo pkg install math/cbc
```

```
$ sudo emerge sci-libs/coinor-cbc
```

```
$ brew install cbc
```

```
$ nix-env --install cbc
```

```
$ sudo xbps-install CoinMP-devel
```

See <https://repology.org/project/coin-or-cbc/versions>, <https://repology.org/project/cbc/versions>

If the system package is installed, `./configure` will check if it can be used.

6.1.35 ccache: A compiler cache

Description

ccache is a compiler cache. It speeds up recompilation by caching previous compilations and detecting when the same compilation is being done again. Supported languages are C, C++, Objective-C and Objective-C++.

License

GNU General Public License version 3 or later

Upstream Contact

- Author: Andrew Tridgell
- Website: <http://ccache.samba.org/>

Type

optional

Dependencies

- *zlib*: Data compression library

Version Information

package-version.txt:

```
3.3.4
```

Equivalent System Packages

```
$ conda install ccache
```

```
$ brew install ccache
```

```
$ sudo port install ccache
```

```
$ sudo zypper install ccache
```

```
$ sudo xbps-install ccache
```

See <https://repology.org/project/ccache/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

6.1.36 cddlib: Double description method for polyhedral representation conversion

Description

The C-library cddlib is a C implementation of the Double Description Method of Motzkin et al. for generating all vertices (i.e. extreme points) and extreme rays of a general convex polyhedron in \mathbb{R}^d given by a system of linear inequalities:

$$P = \{ x = (x_1, \dots, x_d)^T : b - A x \geq 0 \}$$

where A is a given $m \times d$ real matrix, b is a given m -vector and 0 is the m -vector of all zeros.

The program can be used for the reverse operation (i.e. convex hull computation). This means that one can move back and forth between an inequality representation and a generator (i.e. vertex and ray) representation of a polyhedron with cdd. Also, cdd can solve a linear programming problem, i.e. a problem of maximizing and minimizing a linear function over P .

License

GPL v2

Upstream Contact

<https://github.com/cddlib/cddlib>

Type

standard

Dependencies

- \$(MP_LIBRARY)

Version Information

package-version.txt:

```
0.94m
```

Equivalent System Packages

```
$ sudo pacman -S cddlib
```

```
$ conda install cddlib
```

```
$ apt-cyg install cddlib-devel cddlib-tools
```

```
$ sudo apt-get install libcdd-dev libcdd-tools
```

```
$ sudo yum install cddlib
```

```
$ sudo pkg install math/cddlib
```

```
$ sudo emerge sci-libs/cddlib
```

```
$ brew install cddlib
```

```
$ sudo port install cddlib
```

```
$ nix-env --install cddlib
```

```
$ sudo zypper install cddlib-tools pkgconfig\cddlib\
```

```
$ sudo xbps-install cddlib-devel
```

See <https://repology.org/project/cddlib/versions>

If the system package is installed, `./configure` will check if it can be used.

6.1.37 certifi: Python package for providing Mozilla’s CA Bundle

Description

Python package for providing Mozilla’s CA Bundle.

License

MPL-2.0

Upstream Contact

<https://pypi.org/project/certifi/>

Type

standard

Dependencies

- \$(PYTHON)
- \$(PYTHON_TOOLCHAIN)

Version Information

package-version.txt:

```
2023.11.17
```

install-requires.txt:

```
certifi >=2020.6.20
```

Equivalent System Packages

```
$ sudo pacman -S python-certifi
```

```
$ conda install certifi
```

```
$ sudo apt-get install python3-certifi
```

```
$ sudo yum install python-certifi
```

```
$ sudo emerge dev-python/certifi
```

```
$ sudo port install py-certifi
```

```
$ sudo zypper install python3\${PYTHON_MINOR}-certifi
```

```
$ sudo xbps-install python3-certifi
```

See <https://repology.org/project/python:certifi/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

6.1.38 cffi: Foreign Function Interface for Python calling C code

Description

development website: <https://foss.heptapod.net/pypy/cffi>

documentation website: <https://cffi.readthedocs.io/en/latest/>

PyPI page: <https://pypi.org/project/cffi/>

License

MIT

Upstream Contact

<https://foss.heptapod.net/pypy/cffi>

Type

standard

Dependencies

- \$(PYTHON)
- \$(PYTHON_TOOLCHAIN)
- *pyparser: Parser of the C language in Python*

Version Information

package-version.txt:

```
1.15.1
```

install-requires.txt:

```
cffi >=1.14.0
```

Equivalent System Packages

```
$ conda install cffi
```

```
$ sudo emerge virtual/python-cffi
```

```
$ sudo port install py-cffi
```

```
$ sudo zypper install python3\${PYTHON_MINOR}\-cffi
```

```
$ sudo xbps-install python3-cffi
```

See <https://repology.org/project/python:cffi/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

6.1.39 chardet: Universal encoding detector for Python 3

Description

Universal encoding detector for Python 3

License

LGPL

Upstream Contact

<https://pypi.org/project/chardet/>

Type

standard

Dependencies

- \$(PYTHON)
- \$(PYTHON_TOOLCHAIN)

Version Information

package-version.txt:

```
5.2.0
```

install-requires.txt:

```
chardet
```

Equivalent System Packages

(none known)

6.1.40 charset_normalizer: The Real First Universal Charset Detector. Open, modern and actively maintained alternative to Chardet.

Description

The Real First Universal Charset Detector. Open, modern and actively maintained alternative to Chardet.

License

MIT

Upstream Contact

<https://pypi.org/project/charset-normalizer/>

Type

standard

Dependencies

- \$(PYTHON)
- \$(PYTHON_TOOLCHAIN)

Version Information

package-version.txt:

```
3.3.2
```

install-requires.txt:

```
charset-normalizer
```

Equivalent System Packages

```
$ conda install charset-normalizer
```

```
$ sudo emerge dev-python/charset_normalizer
```

```
$ sudo xbps-install python3-charset-normalizer
```

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

6.1.41 clarabel: Clarabel Conic Interior Point Solver for Rust / Python

Description

Clarabel Conic Interior Point Solver for Rust / Python

License

Apache-2.0

Upstream Contact

<https://pypi.org/project/clarabel/>

Type

optional

Dependencies

- \$(PYTHON)
- \$(PYTHON_TOOLCHAIN)

Version Information

requirements.txt:

```
clarabel
```

Equivalent System Packages

(none known)

6.1.42 cliquer: Routines for clique searching

Description

Cliquer is a set of C routines for finding cliques in an arbitrary weighted graph. It uses an exact branch-and-bound algorithm developed by Patric Östergård.

License

GNU General Public License v2

Upstream Contact

Cliquer was mainly written by Sampo Niskanen, sampo.niskanen@iki.fi (Q=@).

<https://users.aalto.fi/~pat/cliquer.html>

Patches

- minor config updates (v1.22)
- autotoolized - see <https://github.com/dimpase/autocliquer> (v1.21)

Type

standard

Dependencies

Version Information

package-version.txt:

```
1.22
```

Equivalent System Packages

```
$ conda install cliquer
```

```
$ sudo apt-get install cliquer libcliquer-dev
```

```
$ sudo yum install cliquer cliquer-devel
```

```
$ sudo pkg install math/cliquer
```

```
$ sudo emerge sci-mathematics/cliquer
```

```
$ nix-env --install cliquer
```

```
$ sudo zypper install cliquer cliquer-devel
```

```
$ sudo xbps-install cliquer-devel
```

See <https://repology.org/project/cliquer/versions>

If the system package is installed, `./configure` will check if it can be used.

6.1.43 cmake: A cross-platform build system generator

Description

The “cmake” executable is the CMake command-line interface. It may be used to configure projects in scripts. Project configuration settings may be specified on the command line with the `-D` option. The `-i` option will cause cmake to interactively prompt for such settings.

CMake is a cross-platform build system generator. Projects specify their build process with platform-independent CMake listfiles included in each directory of a source tree with the name `CMakeLists.txt`. Users build a project by using CMake to generate a build system for a native tool on their platform.

License

CMake is distributed under the OSI-approved BSD 3-clause License.

Upstream Contact

- <https://cmake.org/>
- cmake-developers@cmake.org

Type

standard

Dependencies

- *bzip2*: High-quality data compressor
- *curl*: Multiprotocol data transfer library and utility
- *liblzma*: General-purpose data compression software
- *zlib*: Data compression library

Version Information

package-version.txt:

3.27.8

Equivalent System Packages

```
$ apk add cmake
```

```
$ sudo pacman -S cmake
```

```
$ conda install cmake
```

```
$ apt-cyg install cmake
```

```
$ sudo apt-get install cmake
```

```
$ sudo yum install cmake
```

```
$ sudo pkg install devel/cmake
```

```
$ sudo emerge dev-build/cmake
```

```
$ brew install cmake
```

No package needed.

```
$ nix-env --install cmake
```

```
$ sudo zypper install cmake
```

```
$ sudo slackpkg install cmake
```

```
$ sudo xbps-install cmake
```

See <https://repology.org/project/cmake/versions>

If the system package is installed, `./configure` will check if it can be used.

6.1.44 cocoalib: Computations in commutative algebra

Description

CoCoA is a program to compute with numbers and polynomials.

License

- GPL v3

Upstream Contact

- Authors: <http://cocoa.dima.unige.it/research/>
- Email: cocoa@dim.unige.it
- Website: <http://cocoa.dima.unige.it/>
- Releases: <http://cocoa.dima.unige.it/cocoalib/>

Type

experimental

Dependencies

- \$(MP_LIBRARY)

Version Information

package-version.txt:

```
0.99564
```

Equivalent System Packages

```
$ sudo pkg install math/cocoalib
```

See <https://repology.org/project/cocoalib/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

6.1.45 colorama: Cross-platform colored terminal text.

Description

Cross-platform colored terminal text.

License

Upstream Contact

<https://pypi.org/project/colorama/>

Type

standard

Dependencies

- \$(PYTHON)
- \$(PYTHON_TOOLCHAIN)

Version Information

package-version.txt:

```
0.4.6
```

install-requires.txt:

```
colorama
```

Equivalent System Packages

(none known)

6.1.46 combinatorial_designs: Data from the Handbook of Combinatorial Designs

Description

Data for Combinatorial Designs. Current content:

- The table of MOLS (10 000 integers) from the Handbook of Combinatorial Designs, 2ed.

License

Public domain.

Upstream Contact

None

Type

standard

Dependencies

Version Information

package-version.txt:

```
20140630.p0
```

Equivalent System Packages

```
$ sudo pacman -S sage-data-combinatorial_designs
```

```
$ conda install sagemath-db-combinatorial-designs
```

See <https://repology.org/project/sagemath-combinatorial-designs/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

6.1.47 comm: Jupyter Python Comm implementation, for usage in ipykernel, xeus-python etc.

Description

Jupyter Python Comm implementation, for usage in ipykernel, xeus-python etc.

License

BSD 3-Clause License

Upstream Contact

<https://pypi.org/project/comm/>

Type

standard

Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *traitlets: Traitlets Python configuration system*

Version Information

package-version.txt:

```
0.1.4
```

install-requires.txt:

```
comm
```

Equivalent System Packages

(none known)

6.1.48 configure: Files of the Sage distribution that are autogenerated in the bootstrapping phase

Description

This package contains a tar archive of auto-generated files. They are shipped with Sage in case you do not have a sufficiently recent autotools version installed.

License

GPLv3+

Upstream Contact

Automatically generated by Sage, use trac and/or sage-devel for questions.

Special Update/Build Instructions

This tarball is automatically generated by Sage whenever you run the `$SAGE_ROOT/bootstrap -s` or the `$SAGE_ROOT/src/bin/sage-update-version` script.

Type

base

Dependencies

Version Information

package-version.txt:

```
ab1a517b64b02bf15bbcb8d7c2d4d643bd5eff9b
```

Equivalent System Packages

(none known)

6.1.49 contourpy: Python library for calculating contours of 2D quadrilateral grids

Description

Python library for calculating contours of 2D quadrilateral grids

License

BSD-3-Clause

Upstream Contact

<https://pypi.org/project/contourpy/>

Type

standard

Dependencies

- \$(PYTHON)
- \$(PYTHON_TOOLCHAIN)
- *meson_python*: Meson Python build backend (PEP 517)
- *numpy*: Package for scientific computing with Python
- *pybind11*: Create Python bindings to C++ code

Version Information

package-version.txt:

```
1.1.1
```

install-requires.txt:

```
contourpy
```

Equivalent System Packages

```
$ sudo emerge dev-python/contourpy
```

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

6.1.50 `conway_polynomials`: Python interface to Frank Lübeck's Conway polynomial database

Description

This python module evolved from the old SageMath *conway_polynomials* package once hosted at,

http://files.sagemath.org/spkg/upstream/conway_polynomials/

It's still maintained by Sage developers, but having a pip-installable interface to the data will make it easier to install SageMath via pip or another package manager.

License

GPL version 3 or later

Upstream Contact

<https://github.com/sagemath/conway-polynomials>

Type

standard

Dependencies

- \$(PYTHON)
- \$(PYTHON_TOOLCHAIN)

Version Information

package-version.txt:

```
0.8
```

install-requires.txt:

```
conway-polynomials >=0.8
```

Equivalent System Packages

```
$ sudo pacman -S sage-data-conway_polynomials
```

```
$ conda install conway-polynomials
```

```
$ sudo emerge dev-python/conway-polynomials
```

See <https://repology.org/project/sagemath-conway-polynomials/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

6.1.51 coxeter3: Library for Coxeter groups, Bruhat ordering, Kazhdan-Lusztig polynomials

Description

This package wraps Fokko Ducloux's Coxeter 3 C++ library

Features:

- General Coxeter groups, implemented through the combinatorics of reduced words;
- Reduced expression and normal form computations;
- Bruhat ordering;
- Ordinary Kazhdan-Lusztig polynomials;
- Kazhdan-Lusztig polynomials with unequal parameters;
- Inverse Kazhdan-Lusztig polynomials;
- Cells and W-graphs;

http://math.univ-lyon1.fr/~ducloux/coxeter/coxeter3/english/coxeter3_e.html

This is a patched version done by Mike Hansen 2009-2013 and some fixes by Nicolas M. Thiéry and Jean-Pierre Flori.

License

GPL

Upstream Contact

github: <https://github.com/tscrim/coxeter>

Alas, Fokko Ducloux passed away in 2006.

http://math.univ-lyon1.fr/~ducloux/du_Cloux.html

Special Update/Build Instructions

The source package was created by running

```
commit=8ac9c71723c8ca57a836d6381aed125261e44e9e
git clone https://github.com/tscrim/coxeter.git
cd coxeter
git archive $commit | bzip2 --best >coxeter-$commit.tar.bz2
```

Type

optional

Dependencies

Version Information

package-version.txt:

```
8ac9c71723c8ca57a836d6381aed125261e44e9e.p0
```

Equivalent System Packages

```
$ sudo pacman -S coxeter
```

```
$ sudo yum install coxeter coxeter-devel coxeter-tools
```

```
$ sudo zypper install coxeter
```

See <https://repology.org/project/coxeter/versions>

If the system package is installed, `./configure` will check if it can be used.

6.1.52 cppy: C++ headers for C extension development

Description

From: <https://pypi.org/project/cppy/>

A small C++ header library which makes it easier to write Python extension modules. The primary feature is a PyObject smart pointer which automatically handles reference counting and provides convenience methods for performing common object operations.

License

Modified BSD 3-Clause-License

Upstream Contact

<https://github.com/nucleic/cppy>

Type

standard

Dependencies

- \$(PYTHON)
- \$(PYTHON_TOOLCHAIN)

Version Information

package-version.txt:

```
1.2.1
```

install-requires.txt:

```
cpyy >=1.2.0
```

Equivalent System Packages

```
$ conda install cppy
```

```
$ sudo emerge dev-python/cppy
```

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

6.1.53 cryptominisat: A SAT solver

Description

CryptoMiniSat is a SAT solver that aims to become a premiere SAT solver with all the features and speed of successful SAT solvers, such as MiniSat and PrecoSat. The long-term goals of CryptoMiniSat are to be an efficient sequential, parallel and distributed solver. There are solvers that are good at one or the other, e.g. ManySat (parallel) or PSolver (distributed), but we wish to excel at all.

CryptoMiniSat 2.5 won the SAT Race 2010 among 20 solvers submitted by researchers and industry.

License

MIT License

Upstream Contact

- Authors: Mate Soos
- Email: soos.mate@gmail.com
- Website: <http://www.msoos.org/>
- Releases: <https://github.com/msoos/cryptominisat/releases>

Special Update/Build Instructions

CryptoMiniSat's tarball downloaded from github is called VERSION.tar.gz and should be renamed to cryptominisat-VERSION.tar.gz. Its Python module is installed by the pycryptosat spkg.

Type

optional

Dependencies

- \$(PYTHON)
- *boost_cropped*: Portable C++ libraries (subset needed for Sage)
- *cmake*: A cross-platform build system generator
- *libpng*: Bitmap image support
- *m4ri*: fast arithmetic with dense matrices over GF(2)
- *zlib*: Data compression library

Version Information

package-version.txt:

```
5.8.0
```

Equivalent System Packages

```
$ conda install cryptominisat
```

```
$ brew install cryptominisat
```

See <https://repology.org/project/cryptominisat/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

6.1.54 csdp: Solver for semidefinite programs

Description

This is a fast SDP solver written in C, with a callable library namely, an autotool'ed version of CSDP, by Brian Borchers, see <https://projects.coin-or.org/Csdp>

License

Common Public License Version 1.0

Upstream Contact

Dmitrii Pasechnik <dimpase+sage@gmail.com>

Special Update/Build Instructions

`csdp` is an autotool'ed version of CSDP, see <https://projects.coin-or.org/Csdp>, developed in its own repository at <https://github.com/dimpase/csdp>.

To update to a new version, you need to bump the version number in `configure.ac` and rerun autotools (`autoreconf -fiv`). Any changes should be merged to the upstream repo.

The build is done with `NOSHORTS` variable defined; this makes it compatible with packages, where `NOSHORTS` must be defined, e.g. <https://github.com/dimpase/pycsdp>; also the Sage Cython interface needs `NOSHORTS` defined.

Detailed steps to build the `spkg` are as follows. You need

- `git`
- autotools and libtool (the full autohell suite, version at least 2.67)

With these ready:

- `./spkg-src`
- copy the resulting `csdp-<version>.tar.gz` to `SAGE_ROOT/upstream`, or somewhere else appropriate

Type

optional

Dependencies

- \$(BLAS)

Version Information

package-version.txt:

```
6.2.p1
```

Equivalent System Packages

```
$ sudo pacman -S coin-or-csdp
```

See <https://repology.org/project/coin-or-csdp/versions>, <https://repology.org/project/csdp/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

6.1.55 `cunningham_tables`: List of the prime numbers occuring in the Cunningham table

The script `read_cunningham_prime_factors.py` was used to generate the data set from the file <http://cage.ugent.be/~jdemeyer/cunningham/main.gz> We include a local copy, `main.gz` (see comments in the file for details)

Type

optional

Dependencies

Version Information

package-version.txt:

```
1.0
```

Equivalent System Packages

See <https://repology.org/project/cunningham-tables/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

6.1.56 curl: Multiprotocol data transfer library and utility

Description

Multiprotocols data transfer library (and utility).

License

“MIT style license” : see file “COPYING” at the root of the source tarball, explanations at <https://curl.haxx.se/docs/copyright.html>.

Upstream Contact

According to the file README at the root of the tarball, contact is done by mailing <https://curl.haxx.se/mail/>

Type

standard

Dependencies

- *openssl: Implementation of the SSL and TLS protocols*

Version Information

package-version.txt:

```
7.84.0
```

Equivalent System Packages

```
$ apk add curl
```

```
$ conda install curl
```

```
$ apt-cyg install libcurl-devel curl
```

```
$ sudo apt-get install curl libcurl4-openssl-dev
```

```
$ sudo yum install libcurl-devel curl
```

```
$ sudo pkg install ftp/curl
```

```
$ brew install curl
```

No package needed.

```
$ sudo zypper install curl pkgconfig\ (libcurl\)
```

```
$ sudo slackpkg install curl cyrus-sasl openldap-client libssh2
```

```
$ sudo xbps-install curl libcurl-devel
```

See <https://repology.org/project/curl/versions>

If the system package is installed, `./configure` will check if it can be used.

6.1.57 cvxopt: Python software for convex optimization

Description

CVXOPT is a free software package for convex optimization based on the Python programming language. It can be used with the interactive Python interpreter, on the command line by executing Python scripts, or integrated in other software via Python extension modules. Its main purpose is to make the development of software for convex optimization applications straightforward by building on Python's extensive standard library and on the strengths of Python as a high-level programming language.

Upstream Contact

- J. Dahl <dahl.joachim@gmail.com>
- L. Vandenberghe <vandenbe@ee.ucla.edu>

<https://cvxopt.org/>

License

GPLv3 or later. Includes parts under GPLv2, GNU Lesser General Public License, v2.1. See `src/LICENSE` for more details. (Sage-compatible)

Type

standard

Dependencies

- \$(BLAS)
- \$(PYTHON)
- \$(PYTHON_TOOLCHAIN)
- *glpk*: GNU Linear Programming Kit
- *gsl*: The GNU Scientific Library
- *numpy*: Package for scientific computing with Python
- *pkgconfig*: Python interface to pkg-config
- *suitesparse*: A suite of sparse matrix software

Version Information

package-version.txt:

```
1.3.2
```

install-requires.txt:

```
cvxopt >=1.2.5
```

Equivalent System Packages

```
$ sudo pacman -S python-cvxopt
```

```
$ conda install cvxopt
```

```
$ sudo apt-get install python3-cvxopt
```

```
$ sudo yum install python-cvxopt
```

```
$ sudo pkg install math/py-cvxopt
```

```
$ sudo emerge dev-python/cvxopt
```

```
$ sudo port install py-cvxopt
```

```
$ sudo zypper install python3\${PYTHON_MINOR}\-cvxopt
```

See <https://repology.org/project/python:cvxopt/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

6.1.58 cvxpy: A domain-specific language for modeling convex optimization problems in Python.

Description

A domain-specific language for modeling convex optimization problems in Python.

License

Apache License, Version 2.0

Upstream Contact

<https://pypi.org/project/cvxpy/>

Type

optional

Dependencies

- \$(PYTHON)
- \$(PYTHON_TOOLCHAIN)
- *clarabel*: Clarabel Conic Interior Point Solver for Rust / Python
- *cvxopt*: Python software for convex optimization
- *ecos_python*: Embedded Cone Solver (Python wrapper)
- *glpk*: GNU Linear Programming Kit
- *numpy*: Package for scientific computing with Python
- *osqp_python*: The Operator Splitting QP Solver (Python wrapper)
- *scipy*: Scientific tools for Python
- *scs*: Splitting conic solver

Version Information

package-version.txt:

```
1.4.1
```

install-requires.txt:

```
cvxpy
```

Equivalent System Packages

```
$ conda install cvxpy
```

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

6.1.59 cycler: Composable cycles

Description

Cyclor is a small break-off of matplotlib to deal with “composable cycles”. It is a required dependency of matplotlib 1.5.0.

License

BSD

Upstream Contact

cyclor is developed on github: <https://github.com/matplotlib/cyclor>

A more informative webpage about cyclor, its motivation and usage is at <http://tacaswell.github.io/cyclor/>

Type

standard

Dependencies

- \$(PYTHON)
- \$(PYTHON_TOOLCHAIN)

Version Information

package-version.txt:

```
0.11.0
```

install-requires.txt:

```
cyclor >=0.10.0
```

Equivalent System Packages

```
$ sudo pacman -S python-cycler
```

```
$ conda install cycler
```

```
$ sudo apt-get install python3-cycler
```

```
$ sudo yum install python-cycler
```

```
$ sudo pkg install devel/py-cycler
```

```
$ sudo emerge dev-python/cycler
```

```
$ sudo port install py-cycler
```

```
$ sudo zypper install python3\${PYTHON_MINOR}-Cycler
```

```
$ sudo xbps-install python3-cycler
```

See <https://repology.org/project/cycler/versions>, <https://repology.org/project/python:cycler/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

6.1.60 cylv: A Python interface for CLP, CBC, and CGL

Description

A Python interface for CLP, CBC, and CGL

License

Eclipse Public License (EPL) version 2 (without a Secondary Licenses Notice).

Note: This license is incompatible with the GPL according to <https://www.gnu.org/licenses/license-list.html#EPL2>; see also the discussion in [github issue #26511](#).

Upstream Contact

<https://pypi.org/project/cylv/>

Type

optional

Dependencies

- \$(PYTHON)
- \$(PYTHON_TOOLCHAIN)
- *cbc*: COIN-OR branch and cut solver for mixed-integer programs
- *cython*: C-Extensions for Python, an optimizing static compiler
- *numpy*: Package for scientific computing with Python
- *scipy*: Scientific tools for Python

Version Information

package-version.txt:

```
0.92.2
```

install-requires.txt:

```
cylp
```

Equivalent System Packages

(none known)

6.1.61 cypari2: Python interface to the number theory library libpari**Description**

A Python interface to the number theory library libpari.

License

GPL version 2 or later

Upstream Contact

<https://github.com/defeo/cypari2>

Type

standard

Dependencies

- \$(PYTHON)
- \$(PYTHON_TOOLCHAIN)
- *cysignals*: Interrupt and signal handling for Cython
- *cython*: C-Extensions for Python, an optimizing static compiler
- *pari*: Computer algebra system for fast computations in number theory

Version Information

package-version.txt:

```
2.1.4
```

install-requires.txt:

```
cypari2 >=2.1.1
```

Equivalent System Packages

```
$ conda install cypari2
```

```
$ sudo emerge dev-python/cypari2
```

See <https://repology.org/project/python:cypari2/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

6.1.62 cysignals: Interrupt and signal handling for Cython

Description

Interrupt and signal handling for Cython

License

LGPL version 3 or later

Upstream Contact

<https://github.com/sagemath/cysignals>

Type

standard

Dependencies

- \$(PYTHON)
- \$(PYTHON_TOOLCHAIN)
- *cython*: C-Extensions for Python, an optimizing static compiler
- *pari*: Computer algebra system for fast computations in number theory

Version Information

package-version.txt:

```
1.11.4
```

install-requires.txt:

```
cysignals >=1.10.2
```

Equivalent System Packages

```
$ conda install cysignals
```

```
$ sudo emerge dev-python/cysignals
```

See <https://repology.org/project/cysignals/versions>, <https://repology.org/project/python:cysignals/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

6.1.63 cython: C-Extensions for Python, an optimizing static compiler

Description

Cython is a language that makes writing C extensions for the Python language as easy as Python itself. Cython is based on the well-known Pyrex, but supports more cutting edge functionality and optimizations.

The Cython language is very close to the Python language, but Cython additionally supports calling C functions and declaring C types on variables and class attributes. This allows the compiler to generate very efficient C code from Cython code.

This makes Cython the ideal language for wrapping for external C libraries, and for fast C modules that speed up the execution of Python code.

License

Apache License, Version 2.0

Upstream Contact

- <http://www.cython.org/>
- cython-devel@python.org

Type

standard

Dependencies

- \$(PYTHON)
- \$(PYTHON_TOOLCHAIN)
- *pythran: Ahead of Time compiler for numeric kernels*

Version Information

package-version.txt:

```
3.0.7
```

install-requires.txt:

```
cython >=3.0, != 3.0.3, <4.0
# Exclude 3.0.3 because of https://github.com/cython/cython/issues/5748
```

Equivalent System Packages

```
$ sudo pacman -S cython
```

```
$ conda install cython\>=3.0\,\!=3.0.3\,\<4.0
```

```
$ sudo apt-get install cython3
```

```
$ sudo yum install Cython
```

```
$ sudo pkg install lang/cython
```

```
$ sudo emerge dev-python/cython
```

```
$ brew install cython
```

```
$ sudo port install py-cython
```

```
$ sudo zypper install python3\${PYTHON_MINOR}-Cython
```

```
$ sudo xbps-install python3-Cython
```

See <https://repology.org/project/python:cython/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

6.1.64 d3js: JavaScript library for manipulating documents based on data

Description

D3.js is a JavaScript library for manipulating documents based on data. The file `d3.min.js` will be placed into the `${SAGE_SHARE}/d3js/` directory.

License

BSD 3-Clause License

Upstream Contact

- Author: Mike Bostock (<http://bost.ocks.org/mike/>)
- Home page: <http://d3js.org/>

Special Update/Build Instructions

Two kind of archives can be downloaded from d3.js website: one with all source code and tests that weights 2,9M (both in zip and tar.gz formats) and one with the final javascript scripts which weights 121K (zip format only). Since testing requires node.js that is not shipped with Sage, we currentlty ship the final js only. Hence we have to transform it from zip to tar.gz format. Running sage-src should do all the repackaging job.

Type

optional

Dependencies

Version Information

package-version.txt:

3.4.8

Equivalent System Packages

See <https://repology.org/project/node:d3/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

6.1.65 database_cremona_ellcurve: Database of elliptic curves

Description

John Cremona's database of elliptic curves

See <https://github.com/JohnCremona/ecdata>

This is an optional package, not included by default.

License

Public Domain

Upstream Contact

- Author: John Cremona
- Email: john.cremona@gmail.com
- Website: <http://homepages.warwick.ac.uk/staff/J.E.Cremona/>

Update Instructions

Get an up-to-date copy of the git repository ecdata from <https://github.com/JohnCremona/ecdata>.

If the cremona database has already been installed, remove `SAGE_DATA/cremona/cremona.db`. Then run

The build script expects to find the files in subfolders allcurves, allgens, degphi and allbsd of the ecdata folder. It extracts them and builds the new cremona.db file from the contents.

Finally, copy `SAGE_DATA/cremona/cremona.db` to the src directory of the spkg.

Type

optional

Dependencies

Version Information

package-version.txt:

```
20190911
```

Equivalent System Packages

See <https://repology.org/project/sage-data-cremona-ellcurve/versions>, <https://repology.org/project/sagemath-database-cremona-elliptic-curves/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

6.1.66 database_cubic_hecke: Ivan Marin's representations of the cubic Hecke algebra

Description

Ivan Marin's representations of the cubic Hecke algebra on 4 strands as Python dictionaries

License

GPL

Upstream Contact

<https://pypi.org/project/database-cubic-hecke/>

Type

optional

Dependencies

- \$(PYTHON)
- \$(PYTHON_TOOLCHAIN)

Version Information

package-version.txt:

```
2022.3.1
```

install-requires.txt:

```
database-cubic-hecke
```

Equivalent System Packages

(none known)

6.1.67 database_jones_numfield: Table of number fields

Description

This is a table of number fields with bounded ramification and degree at most 6.

License

GPLv2+

Upstream Contact

sage-devel@googlegroups.com

Special Update/Build Instructions

Created by taking the original old-style spkg and removing crud from it.

Type

optional

Dependencies

Version Information

package-version.txt:

4

Equivalent System Packages

See <https://repology.org/project/sage-data-jones-numfield/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

6.1.68 database_knotinfo: Content of the KnotInfo and LinkInfo databases as lists of dictionaries

Description

Content of the KnotInfo and LinkInfo databases as lists of dictionaries

License

GPL

Upstream Contact

<https://pypi.org/project/database-knotinfo/>

Type

optional

Dependencies

- \$(PYTHON)
- \$(PYTHON_TOOLCHAIN)

Version Information

package-version.txt:

```
2024.2.1
```

install-requires.txt:

```
database-knotinfo
```

Equivalent System Packages

(none known)

6.1.69 database_kohel: Database of modular and Hilbert polynomials

Description

Database of modular and Hilbert polynomials.

Upstream Contact

- David Kohel <David.Kohel@univ-amu.fr>

Type

optional

Dependencies

Version Information

package-version.txt:

```
20160724
```

Equivalent System Packages

See <https://repology.org/project/sage-data-kohel/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

6.1.70 `database_mutation_class`: Database of exceptional mutation classes of quivers

Description

Contains a database of all exceptional mutation classes of quivers.

Every file in the database is of the form `mutation_classes_n.dig6` for some `n` and

- contains a `cPickle.dump` of a dictionary where
 - the keys are tuples representing irreducible exceptional quiver mutation types of rank `n`, and
 - the values are all quivers in the given mutation class stored in canonical form as `(dig6, edges)` where
 - `dig6` is the `dig6` data of the given `DiGraph`, and
 - `edges` are the non-simply-laced edges thereof.
 - is obtained by running the function
- ```
sage.combinat.cluster_algebra_quiver.quiver_mutation_type._save_data_dig6(n, types='Exceptional', verbose=False)
```

### SPKG Maintainers

- C. Stump <[christian.stump@gmail.com](mailto:christian.stump@gmail.com)>

### Type

optional

### Dependencies

### Version Information

package-version.txt:

1.0

## Equivalent System Packages

See <https://repology.org/project/database-mutation-class/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

### 6.1.71 database\_odlyzko\_zeta: Table of zeros of the Riemann zeta function

#### Description

Table of zeros of the Riemann zeta function by Andrew Odlyzko.

This package contains the file ‘zeros6’ with the first 2,001,052 zeros of the Riemann zeta function, accurate to within  $4 \cdot 10^{(-9)}$ .

#### Type

optional

#### Dependencies

- \$(SAGERUNTIME)

#### Version Information

package-version.txt:

20061209

## Equivalent System Packages

See <https://repology.org/project/sage-data-odlyzko-zeta/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

### 6.1.72 database\_stein\_watkins: Database of elliptic curves (full version)

#### Description

The Stein-Watkins database of elliptic curves (full version)

See <http://modular.math.washington.edu/papers/stein-watkins/>

This is an optional (huge) package, not included by default.

## License

Public Domain

## Type

optional

## Dependencies

## Version Information

package-version.txt:

20110713

## Equivalent System Packages

See <https://repology.org/project/database-stein-watkins/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.73 database\_stein\_watkins\_mini: Database of elliptic curves (small version)

### Description

The Stein-Watkins database of elliptic curves (small version)

See <http://modular.math.washington.edu/papers/stein-watkins/>

This is an optional package, not included by default.

## License

Public Domain

## Type

optional

### Dependencies

### Version Information

package-version.txt:

```
20070827
```

### Equivalent System Packages

See <https://repology.org/project/database-stein-watkins-mini/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.74 database\_symbolic\_data: Database from the SymbolicData project

### Description

The SymbolicData project is set out

- to develop concepts and tools for profiling, testing and benchmarking Computer Algebra Software (CAS) and
- to collect and interlink relevant data and activities from different Computer Algebra Communities.

SymbolicData is an

- inter-community project that has its roots in the activities of different Computer Algebra Communities and
- aims at interlinking these activities using modern Semantic Web concepts.

Tools and data are designed to be used both

- on a local site for special testing and profiling purposes
- and to manage a central repository at [www.symbolicdata.org](http://www.symbolicdata.org).

### License

GNU General Public License

### Upstream Contact

- Andreas Nareike <[nareike@informatik.uni-leipzig.de](mailto:nareike@informatik.uni-leipzig.de)>

## Type

optional

## Dependencies

## Version Information

package-version.txt:

20070206

## Equivalent System Packages

See <https://repology.org/project/database-symbolic-data/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.75 dateutil: Extensions to the standard Python module datetime

### Description

The dateutil module provides powerful extensions to the standard datetime module.

### License

Simplified BSD License

### Upstream Contact

Author: Gustavo Niemeyer <[gustavo@niemeyer.net](mailto:gustavo@niemeyer.net)>

Home page: <http://labix.org/python-dateutil>

<https://pypi.org/project/python-dateutil/>

## Type

standard

### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *six: Python 2 and 3 compatibility utilities*

### Version Information

package-version.txt:

```
2.8.2
```

install-requires.txt:

```
python-dateutil >=2.8.1
```

### Equivalent System Packages

```
$ sudo pacman -S python-dateutil
```

```
$ conda install python-dateutil
```

```
$ sudo apt-get install python3-dateutil
```

```
$ sudo yum install python-dateutil
```

```
$ sudo pkg install devel/py-dateutil
```

```
$ sudo emerge dev-python/python-dateutil
```

```
$ sudo port install py-dateutil
```

```
$ sudo zypper install python3\${PYTHON_MINOR}-python-dateutil
```

```
$ sudo xbps-install python3-dateutil
```

See <https://repology.org/project/python:python-dateutil/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.



## 6.1.76 debugpy: An implementation of the Debug Adapter Protocol for Python

### Description

An implementation of the Debug Adapter Protocol for Python

### License

MIT

### Upstream Contact

<https://pypi.org/project/debugpy/>

### Type

standard

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

### Version Information

package-version.txt:

```
1.8.0
```

install-requires.txt:

```
debugpy
```

### Equivalent System Packages

```
$ conda install debugpy
```

```
$ sudo emerge dev-python/debugpy
```

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.77 decorator: Python library providing decorators

### Description

Better living through Python with decorators

### Type

standard

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

### Version Information

package-version.txt:

```
5.1.1
```

install-requires.txt:

```
decorator >=4.4.0
```

### Equivalent System Packages

```
$ sudo pacman -S python-decorator
```

```
$ conda install decorator
```

```
$ sudo apt-get install python3-decorator
```

```
$ sudo yum install python-decorator
```

```
$ sudo emerge dev-python/decorator
```

```
$ sudo port install py-decorator
```

```
$ sudo zypper install python3\${PYTHON_MINOR}-decorator
```

```
$ sudo xbps-install python3-decorator
```

See <https://repology.org/project/python:decorator/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.78 deformation: Count points on hypersurfaces using the deformation method

### Description

Deformation is a C library for counting points on hypersurfaces using the deformation method, developed by Sebastian Pancratz.

### License

GLPv3

### Upstream Contact

- Sebastian Pancratz: [sebastian.pancratz@gmail.com](mailto:sebastian.pancratz@gmail.com), [sage-devel@googlegroups.com](mailto:sage-devel@googlegroups.com)
- We use the fork at <https://github.com/sagemath/deformation> the fork uses GMP instead of MPIR, and Flint 2.7+.

### Type

experimental

### Dependencies

- `$(MP_LIBRARY)`
- *flint*: Fast Library for Number Theory
- *mpfr*: Multiple-precision floating-point computations with correct rounding

### Version Information

package-version.txt:

20210503

### Equivalent System Packages

See <https://repology.org/project/deformation/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.79 defusedxml: Addresses vulnerabilities of XML parsers and XML libraries

### Description

defusedxml addresses vulnerabilities of XML parsers and XML libraries.

It became a dependency of nbconvert starting with nbconvert 5.4.

### License

Python Software Foundation License (PSFL)

### Upstream Contact

<https://pypi.org/project/defusedxml/>

### Special Update/Build Instructions

None.

### Type

standard

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

### Version Information

package-version.txt:

```
0.7.1
```

install-requires.txt:

```
defusedxml >=0.6.0
```

### Equivalent System Packages

```
$ conda install defusedxml
```

```
$ sudo emerge dev-python/defusedxml
```

```
$ sudo port install py-defusedxml
```

```
$ sudo xbps-install python3-defusedxml
```

See <https://repology.org/project/python:defusedxml/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.80 distlib: Distribution utilities

### Description

Distribution utilities

### License

PSF-2.0

### Upstream Contact

<https://pypi.org/project/distlib/>

### Type

standard

### Dependencies

- `$(PYTHON)`
- *pip: Tool for installing and managing Python packages*

### Version Information

package-version.txt:

```
0.3.8
```

install-requires.txt:

```
distlib
```

### Equivalent System Packages

```
$ conda install distlib
```

```
$ sudo xbps-install python3-distlib
```

If the system package is installed, `./configure` will check if it can be used.

## 6.1.81 docutils: Processing plaintext documentation into useful formats, such as HTML or LaTeX

### Description

Docutils is a modular system for processing documentation into useful formats, such as HTML, XML, and LaTeX. For input Docutils supports reStructuredText, an easy-to-read, what-you-see-is-what-you-get plaintext markup syntax.

### License

public domain, Python, 2-Clause BSD, GPL 3 (see COPYING.txt)

### Upstream Contact

<https://pypi.org/project/docutils/>

Home Page: <http://docutils.sourceforge.net/>

### Type

standard

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

### Version Information

package-version.txt:

```
0.20.1
```

install-requires.txt:

```
docutils >=0.14
```

## Equivalent System Packages

```
$ conda install docutils
```

```
$ sudo emerge dev-python/docutils
```

```
$ brew install docutils
```

```
$ sudo port install py-docutils
```

```
$ sudo zypper install python3\${PYTHON_MINOR}-docutils
```

```
$ sudo xbps-install python3-docutils
```

See <https://repology.org/project/docutils/versions>, <https://repology.org/project/python:docutils/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.82 dot2tex: Create PGF/TikZ commands from Graphviz output

### Description

dot2tex is a Python module, whose purpose is to give graphs generated by Graphviz a more LaTeX friendly look and feel. This is accomplished by converting xdot output from Graphviz to a series of PSTricks or PGF/TikZ commands.

See <https://github.com/kjellmf/dot2tex/>

### License

- MIT

### Upstream Contact

- Kjell Magne Fauske, [km@fauskes.net](mailto:km@fauskes.net)

### Dependencies

graphviz ([www.graphviz.org](http://www.graphviz.org)) should be installed and in the path (for example via the graphviz spkg).

preview, a LaTeX package for extracting parts of a document.

Self-tests dependencies:

- graphviz
- texlive-latex-base
- texlive-pictures
- texlive-pstricks

### Patches

- `remove_test_semicolon.patch`:

Remove the failing semicolon test for the open dot2tex issue #5 - <https://github.com/kjellmf/dot2tex/issues/5>

### Special Update/Build Instructions

Make sure corresponding optional doctests still pass:

```
sage -t --long --optional=dot2tex,graphviz,sage src/
```

### Type

optional

### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *pyparsing: A Python parsing module*

### Version Information

package-version.txt:

```
2.11.3.p0
```

install-requires.txt:

```
dot2tex >=2.11.3
```

### Equivalent System Packages

```
$ sudo pacman -S dot2tex
```

```
$ conda install dot2tex
```

```
$ sudo port install dot2tex
```

See <https://repology.org/project/dot2tex/versions>, <https://repology.org/project/python:dot2tex/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.



### 6.1.83 dsdp: Semidefinite programming solver

#### Description

Implementation of an interior-point method for semidefinite programming. It provides primal and dual solutions, exploits low-rank structure and sparsity in the data, and has relatively low memory requirements for an interior-point method. It allows feasible and infeasible starting points and provides approximate certificates of infeasibility when no feasible solution exists. The dual-scaling algorithm implemented in this package has a convergence proof and worst-case polynomial complexity under mild assumptions on the data.

#### License

Permissive open source license <https://www.mcs.anl.gov/hs/software/DSDP/Copyright.txt>

#### Upstream Contact

<https://www.mcs.anl.gov/hs/software/DSDP/>

#### Type

optional

#### Dependencies

- \$(BLAS)
- *cmake: A cross-platform build system generator*

#### Version Information

package-version.txt:

```
5.8
```

#### Equivalent System Packages

```
$ sudo pacman -S dsdp
```

```
$ conda install dsdp
```

```
$ sudo apt-get install libdsdp-dev
```

```
$ sudo yum install DSDP-devel
```

```
$ sudo pkg install math/dsdp
```

```
$ sudo emerge sci-libs/dsdp
```

```
$ sudo port install DSDP
```

See <https://repology.org/project/dsdp/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

### 6.1.84 e\_antic: Real embedded number fields

#### Description

e-antic is a C library for exact computations with real embedded number field maintained by Vincent Delecroix.

Website: <https://github.com/videlec/e-antic>

#### License

e-antic is licensed GPL v3.

#### Upstream Contact

- <https://github.com/videlec/e-antic>

#### Type

optional

#### Dependencies

- `$(MP_LIBRARY)`
- *boost\_cropped: Portable C++ libraries (subset needed for Sage)*
- *flint: Fast Library for Number Theory*

#### Version Information

package-version.txt:

```
2.0.0
```

## Equivalent System Packages

```
$ sudo pacman -S e-antic
```

```
$ conda install libeantic
```

```
$ sudo apt-get install libeantic-dev
```

```
$ sudo yum install e-antic-devel
```

```
$ sudo pkg install math/e-antic
```

```
$ sudo zypper install e-antic-devel
```

See <https://repology.org/project/e-antic/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.85 ecl: An implementation of the Common Lisp language

### Description

ECL is an implementation of the Common Lisp language as defined by the ANSI X3J13 specification. The most relevant features:

- A bytecodes compiler and interpreter.
- Compiles Lisp also with any C/C++ compiler.
- It can build standalone executables and libraries.
- ASDF, Sockets, Gray streams, MOP, and other useful components.
- Extremely portable.
- A reasonable license.

ECL supports the operating systems Linux, FreeBSD, NetBSD, OpenBSD, Solaris and Windows, running on top of the Intel, Sparc, Alpha and PowerPC processors. Porting to other architectures should be rather easy.

Website: <https://common-lisp.net/project/ecl/>

### License

- LGPL V2+ or compatible - for details see <https://common-lisp.net/project/ecl/static/manual/Copyrights.html#Copyright-of-ECL>

### Upstream Contact

- the ECL mailing list - see <https://mailman.common-lisp.net/listinfo/ecl-devel>

### Special Update/Build Instructions

- Note: for the time being, ECL is built single threaded library as it seems to interact badly with the pexpect interface and Sage's signal handling when built multithreaded.
- Do NOT quote SAGE\_LOCAL when setting CPPFLAGS and/or LDFLAGS, in spkg-install as this caused the build to break. See [github issue #10187#comment:117](#)
- TODO: Add the ECL test suite, and an spkg-check file to run it.
- TODO: Make ECL use Sage's Boehm GC on MacOS X as well (but perhaps put some changes from ECL's into Sage's Boehm GC), then remove the src/src/gc directory, too.

### Type

standard

### Dependencies

- \$(MP\_LIBRARY)
- *gc*: The Boehm-Demers-Weiser conservative garbage collector
- *info*: stand-alone Info documentation reader
- *libffi*: A portable foreign-function interface library
- *readline*: Command line editing library

### Version Information

package-version.txt:

```
23.9.9
```

### Equivalent System Packages

```
$ apk add ecl-dev
```

```
$ sudo pacman -S ecl
```

```
$ conda install ecl
```

```
$ sudo apt-get install ecl
```

```
$ sudo yum install ecl
```

```
$ sudo pkg install lang/ecl
```

```
$ sudo emerge dev-lisp/ecl
```

```
$ brew install ecl
```

```
$ sudo port install ecl
```

```
$ nix-env --install ecl
```

```
$ sudo xbps-install ecl
```

See <https://repology.org/project/ecl/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.86 eclib: Enumerating and computing with elliptic curves defined over the rational numbers

### Description

John Cremona's programs for enumerating and computing with elliptic curves defined over the rational numbers.

mwrank is a program written in C++ for computing Mordell-Weil groups of elliptic curves over  $\mathbb{Q}$  via 2-descent. It is available as source code in the eclib package, which may be distributed under the GNU General Public License, version 2, or any later version.

mwrank is now only distributed as part of eclib. eclib is also included in Sage, and for most potential users the easiest way to run mwrank is to install Sage (which also of course gives you much much more). I no longer provide a source code distribution of mwrank by itself: use eclib instead.

### License

eclib is licensed GPL v2+.

### Upstream Contact

- Author: John Cremona
- Email: [john.cremona@gmail.com](mailto:john.cremona@gmail.com)
- Website: <http://homepages.warwick.ac.uk/staff/J.E.Cremona/mwrank/index.html>
- Repository: <https://github.com/JohnCremona/eclib>

### Type

standard

### Dependencies

- *flint*: Fast Library for Number Theory
- *ntl*: A library for doing number theory
- *pari*: Computer algebra system for fast computations in number theory

### Version Information

package-version.txt:

```
20231212
```

### Equivalent System Packages

```
$ sudo pacman -S eclib
```

```
$ conda install eclib
```

```
$ sudo apt-get install libec-dev eclib-tools
```

```
$ sudo yum install eclib eclib-devel
```

```
$ sudo pkg install math/eclib
```

```
$ sudo emerge sci-mathematics/eclib\[\flint\]
```

```
$ nix-env --install eclib
```

```
$ sudo xbps-install eclib-devel
```

See <https://repology.org/project/eclib/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.87 ecm: Elliptic curve method for integer factorization

### Description

GMP-ECM - Elliptic Curve Method for Integer Factorization

Sources can be obtained from <https://gitlab.inria.fr/zimmerma/ecm>

## License

LGPL V3+

## Upstream Contact

- [ecm-discuss@inria.fr](mailto:ecm-discuss@inria.fr)

## Special Update/Build Instructions

- GMP-ECM comes with a self-tuning feature; we could support that as an option (`$SAGE_TUNE_*=yes`) in the future.
- ECM currently does not (by itself) use the CC and CFLAGS settings from 'gmp.h' since we pass (other) options in CFLAGS, and CC is set by Sage and might get set by the user. We now at least partially fix that such that "optimized" code generation options ('-mcpu=...', '-mtune=...') are used by gcc. Of course a user can also manually enable them by setting the "global" CFLAGS to e.g. '-march=native' on x86[\_64] systems, or '-mcpu=...' and '-mtune=...' on other architectures where "native" isn't supported. Note that this doesn't affect the packages' selection of processor-specific optimized [assembly] code. 'spkg-install' already reads the settings from Sage's and also a system-wide GMP now, but doesn't (yet) use all of them. If `SAGE_FAT_BINARY="yes"`, we should avoid too specific settings of "-mcpu=...", and perhaps pass a more generic "-host=..." to 'configure'.
- We currently work around a linker bug on MacOS X 10.5 PPC (with GCC 4.2.1) which breaks 'configure' if debug symbols are enabled. This *might* get fixed in later upstream releases.
- We could save some space by removing the `src/build.vc10/` directory which isn't used in Sage. (It gets probably more worth in case also directories / files for later versions of Microsoft Visual C get added.)

## Type

standard

## Dependencies

- `$(MP_LIBRARY)`

## Version Information

package-version.txt:

7.0.5

### Equivalent System Packages

```
$ conda install ecm
```

```
$ sudo apt-get install gmp-ecm libecm-dev
```

```
$ sudo yum install gmp-ecm gmp-ecm-devel
```

```
$ sudo pkg install math/gmp-ecm
```

```
$ sudo port install gmp-ecm
```

```
$ nix-env --install ecm
```

```
$ sudo xbps-install ecm-devel
```

See <https://repology.org/project/gmp-ecm/versions>

If the system package is installed, `./configure` will check if it can be used.

### 6.1.88 ecos\_python: Embedded Cone Solver (Python wrapper)

#### Description

This is the Python package for ECOS: Embedded Cone Solver.

It vendors ECOS.

#### License

GPLv3

#### Upstream Contact

<https://pypi.org/project/ecos/>

#### Type

optional



## Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *numpy*: *Package for scientific computing with Python*
- *scipy*: *Scientific tools for Python*

## Version Information

package-version.txt:

```
2.0.12
```

install-requires.txt:

```
ecos
```

## Equivalent System Packages

```
$ conda install ecos
```

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.89 editables: Editable installations

### Description

Editable installations

### License

MIT

### Upstream Contact

<https://pypi.org/project/editables/>

### Type

standard

### Dependencies

- \$(PYTHON)
- *flit\_core*: Distribution-building parts of Flit. See *flit* package for more information

### Version Information

package-version.txt:

```
0.5
```

install-requires.txt:

```
editables
```

### Equivalent System Packages

```
$ conda install editables
```

```
$ sudo emerge dev-python/editables
```

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.90 elliptic\_curves: Databases of elliptic curves

### Description

Includes two databases:

- A small subset of John Cremona's database of elliptic curves up to conductor 10000.
- William Stein's database of interesting curves

### Upstream Contact

#### cremona\_mini

- Author: John Cremona
- Email: [john.cremona@gmail.com](mailto:john.cremona@gmail.com)
- Website: <http://johncremona.github.io/ecdata/>

**ellcurves**

- Author: William Stein
- Email: [wstein@gmail.com](mailto:wstein@gmail.com)

**Type**

standard

**Dependencies**

- \$(PYTHON)

**Version Information**

package-version.txt:

```
0.8.1
```

**Equivalent System Packages**

```
$ conda install sagemath-db-elliptic-curves
```

See <https://repology.org/project/sagemath-elliptic-curves/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

**6.1.91 entrypoints: Discover and load entry points from installed Python packages****Description**

Discover and load entry points from installed packages.

**Upstream Contact**

<https://github.com/takluyver/entrypoints>

### Special Update/Build Instructions

Upstream does not provide a source tarball, so the tarball was taken from github and renamed.

The source tarball does not contain setup.py, so we put the setup commands in spkg-install.

### Type

standard

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *flit\_core*: Distribution-building parts of Flit. See *flit* package for more information

### Version Information

package-version.txt:

```
0.4
```

install-requires.txt:

```
entrypoints >=0.3
```

### Equivalent System Packages

```
$ conda install entrypoints
```

```
$ sudo emerge dev-python/entrypoints
```

```
$ sudo port install py-entrypoints
```

```
$ sudo xbps-install python3-entrypoints
```

See <https://repology.org/project/entrypoints/versions>, <https://repology.org/project/python:entrypoints/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

### 6.1.92 exceptiongroup: Backport of PEP 654 (exception groups)

#### Description

Backport of PEP 654 (exception groups)

#### License

#### Upstream Contact

<https://pypi.org/project/exceptiongroup/>

#### Type

standard

#### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

#### Version Information

package-version.txt:

```
1.2.0
```

install-requires.txt:

```
exceptiongroup
```

#### Equivalent System Packages

(none known)

### 6.1.93 executing: Get the currently executing AST node of a frame, and other information

#### Description

Get the currently executing AST node of a frame, and other information

### License

MIT

### Upstream Contact

<https://pypi.org/project/executing/>

### Type

standard

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

### Version Information

package-version.txt:

```
1.2.0
```

install-requires.txt:

```
executing
```

### Equivalent System Packages

```
$ conda install executing
```

```
$ sudo emerge dev-python/executing
```

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.94 fastjsonschema: Fastest Python implementation of JSON schema

### Description

Fastest Python implementation of JSON schema

## License

BSD

## Upstream Contact

<https://pypi.org/project/fastjsonschema/>

## Type

standard

## Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

## Version Information

package-version.txt:

```
2.18.0
```

install-requires.txt:

```
fastjsonschema
```

## Equivalent System Packages

```
$ apk add py3-fastjsonschema
```

```
$ sudo pacman -S python-fastjsonschema
```

```
$ conda install python-fastjsonschema
```

```
$ sudo apt-get install python3-fastjsonschema
```

```
$ sudo yum install python-fastjsonschema
```

```
$ sudo pkg install devel/py-fastjsonschema
```

```
$ sudo emerge dev-python/fastjsonschema
```

```
$ sudo port install py-fastjsonschema
```

```
$ sudo zypper install python-fastjsonschema
```

```
$ sudo xbps-install python3-fastjsonschema
```

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

### 6.1.95 fflas\_ffpack: Dense linear algebra over word-size finite fields

#### Description

FFLAS-FFPACK is a LGPL-2.1+ source code library for dense linear algebra over word-size finite fields.

<http://inbox-team.github.io/fflas-ffpack/>

#### License

LGPL V2.1 or later

#### Upstream Contact

- [<ffpack-devel@googlegroups.com>](mailto:ffpack-devel@googlegroups.com)

#### Type

standard

#### Dependencies

- `$(BLAS)`
- `$(MP_LIBRARY)`
- *givaro: C++ library for arithmetic and algebraic computations*
- *gsl: The GNU Scientific Library*
- *pkgconf: An implementation of the pkg-config spec*

#### Version Information

package-version.txt:

```
2.4.3.p0
```



## Equivalent System Packages

```
$ sudo pacman -S fflas-ffpack
```

```
$ conda install fflas-ffpack
```

```
$ sudo apt-get install fflas-ffpack
```

```
$ sudo yum install fflas-ffpack-devel
```

```
$ sudo pkg install math/fflas-ffpack
```

```
$ sudo emerge sci-libs/fflas-ffpack
```

```
$ nix-env --install fflas-ffpack
```

```
$ sudo zypper install pkgconfig\ (fflas-ffpack\)
```

```
$ sudo xbps-install fflas-ffpack
```

See <https://repology.org/project/fflas-ffpack/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.96 ffmpeg: ffmpeg video converter

### Description

ffmpeg is a very fast video and audio converter that can also grab from a live audio/video source. It can also convert between arbitrary sample rates and resize video on the fly with a high quality polyphase filter.

### License

“FFmpeg is licensed under the GNU Lesser General Public License (LGPL) version 2.1 or later. However, FFmpeg incorporates several optional parts and optimizations that are covered by the GNU General Public License (GPL) version 2 or later. If those parts get used the GPL applies to all of FFmpeg.”

<http://ffmpeg.org/legal.html>

### Upstream Contact

<http://ffmpeg.org/>

### Type

optional

### Dependencies

### Version Information

### Equivalent System Packages

```
$ apk add ffmpeg
```

```
$ sudo pacman -S ffmpeg
```

```
$ conda install imageio-ffmpeg
```

```
$ sudo apt-get install ffmpeg
```

No package needed.

```
$ sudo pkg install multimedia/ffmpeg
```

```
$ brew install ffmpeg
```

```
$ sudo port install ffmpeg
```

```
$ nix-env --install ffmpeg
```

```
$ sudo zypper install ffmpeg
```

```
$ sudo xbps-install ffmpeg
```

See <https://repology.org/project/ffmpeg/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.97 filelock: A platform independent file lock

### Description

A platform independent file lock.

## License

Public Domain <<http://unlicense.org>>

## Upstream Contact

<https://pypi.org/project/filelock/>

## Type

standard

## Dependencies

- \$(PYTHON)
- *pip: Tool for installing and managing Python packages*

## Version Information

package-version.txt:

```
3.13.1
```

install-requires.txt:

```
filelock
```

## Equivalent System Packages

```
$ conda install filelock
```

```
$ sudo xbps-install python3-filelock
```

If the system package is installed, `./configure` will check if it can be used.

## 6.1.98 flint: Fast Library for Number Theory

### Description

FLINT is a C library for doing number theory, maintained by Fredrik Johansson.

Website: <http://www.flintlib.org>

### License

FLINT is licensed GPL v2+.

### Upstream Contact

- flint-devel Gougle Group (<http://groups.google.co.uk/group/flint-devel>)
- Fredrik Johansson

### Type

standard

### Dependencies

- \$(MP\_LIBRARY)
- *mpfr*: Multiple-precision floating-point computations with correct rounding

### Version Information

package-version.txt:

```
3.0.1
```

### Equivalent System Packages

```
$ apk add flint-dev
```

```
$ conda install libflint
```

```
$ apt-cyg install libflint-devel
```

```
$ sudo apt-get install libflint-dev
```

```
$ sudo yum install flint flint-devel
```

```
$ sudo pkg install math/flint2
```

```
$ sudo emerge sci-mathematics/flint\[\ntl\]
```

```
$ brew install flint
```

```
$ sudo port install flint
```

```
$ nix-env --install flint
```

```
$ sudo zypper install flint-devel
```

```
$ sudo xbps-install flintlib-devel
```

See <https://repology.org/project/flint/versions>

If the system package is installed, `./configure` will check if it can be used.

### 6.1.99 flit\_core: Distribution-building parts of Flit. See flit package for more information

#### Description

Distribution-building parts of Flit. See flit package for more information

#### License

#### Upstream Contact

<https://pypi.org/project/flit-core/>

#### Type

standard

#### Dependencies

- `$(PYTHON)`
- *pip: Tool for installing and managing Python packages*

#### Version Information

package-version.txt:

```
3.9.0
```

install-requires.txt:

```
flit-core >= 3.7.1
```

### Equivalent System Packages

```
$ conda install flit-core
```

```
$ sudo emerge dev-python/flit_core
```

```
$ sudo xbps-install python3-flit_core
```

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

### 6.1.100 fonttools: Tools to manipulate font files

#### Description

Tools to manipulate font files

#### License

MIT

#### Upstream Contact

<https://pypi.org/project/fonttools/>

#### Type

standard

#### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *cython: C-Extensions for Python, an optimizing static compiler*

#### Version Information

package-version.txt:

```
4.42.1
```

install-requires.txt:

```
fonttools
```

## Equivalent System Packages

```
$ conda install fonttools
```

```
$ sudo emerge dev-python/fonttools
```

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.101 fpLLL: Lattice algorithms, including LLL with floating-point orthogonalization

### Description

fpLLL contains implementations of several lattice algorithms. The implementation relies on floating-point orthogonalization, and LLL is central to the code, hence the name.

Website: <https://github.com/fplll/fplll>

### License

- LGPL V2.1+

### Upstream Contact

- Martin Albrecht <[martinralbrecht+fplll@gmail.com](mailto:martinralbrecht+fplll@gmail.com)>
- Mailing List <https://groups.google.com/forum/#!forum/fplll-devel>

### Type

standard

### Dependencies

- `$(MP_LIBRARY)`
- *mpfr: Multiple-precision floating-point computations with correct rounding*

### Version Information

package-version.txt:

```
5.4.5
```

### Equivalent System Packages

```
$ conda install fp111
```

```
$ sudo apt-get install libfp111-dev
```

```
$ sudo yum install libfp111 libfp111-devel
```

```
$ sudo pkg install math/fp111
```

```
$ sudo emerge sci-libs/fp111
```

```
$ brew install fp111
```

```
$ sudo zypper install pkgconfig\ (fp111\) fp111-devel fp111
```

```
$ sudo xbps-install fp111-devel
```

See <https://repology.org/project/fp111/versions>

If the system package is installed, `./configure` will check if it can be used.

### 6.1.102 fpylll: Python interface for FPLLL

#### Description

A Python interface for <https://github.com/fplll/fplll> (Lattice algorithms using floating-point arithmetic)

#### License

GPL version 2 or later

#### Upstream Contact

<https://github.com/fplll/fpylll>

#### Type

standard



## Dependencies

- `$(PYTHON)`
- *cysignals*: Interrupt and signal handling for Cython
- *cython*: C-Extensions for Python, an optimizing static compiler
- *fpLLL*: Lattice algorithms, including LLL with floating-point orthogonalization
- *numpy*: Package for scientific computing with Python

## Version Information

package-version.txt:

```
0.6.0
```

install-requires.txt:

```
fpYlll >=0.5.9
```

## Equivalent System Packages

```
$ conda install fpYlll\>=0.5.9
```

```
$ sudo emerge dev-python/fpYlll
```

See <https://repology.org/project/fpYlll/versions>, <https://repology.org/project/python:fpYlll/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.103 fqdn: Validates fully-qualified domain names against RFC 1123, so that they are acceptable to modern browsers

### Description

Validates fully-qualified domain names against RFC 1123, so that they are acceptable to modern browsers

### License

MPL 2.0

### Upstream Contact

<https://pypi.org/project/fqdn/>

### Type

standard

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

### Version Information

package-version.txt:

```
1.5.1
```

install-requires.txt:

```
fqdn
```

### Equivalent System Packages

(none known)

## 6.1.104 free\_fonts: a free family of scalable outline fonts

### Description

This dummy package represents the GNU free fonts: a free family of scalable outline fonts, suitable for general use on computers and for desktop publishing. It is Unicode-encoded for compatibility with all modern operating systems.

We do not have an SPKG for it. The purpose of this dummy package is to associate system package lists with it.

### License

GNU General Public License GPLv3+

## Upstream Contact

<https://www.gnu.org/software/freefont/>

## Type

optional

## Dependencies

## Version Information

## Equivalent System Packages

```
$ apk add ttf-freefont
```

```
$ sudo pacman -S gnu-free-fonts
```

```
$ conda install open-fonts
```

```
$ sudo apt-get install fonts-freefont-otf
```

```
$ sudo yum install gnu-free-mono-fonts gnu-free-sans-fonts \
 gnu-free-serif-fonts
```

```
$ sudo pkg install x11-fonts/freefont-ttf
```

```
$ sudo emerge media-fonts/freefont
```

```
$ sudo port install freefont-ttf
```

```
$ nix-env --install freefont-ttf
```

install the following packages: fonts/freefont-ttf

```
$ sudo zypper install gnu-free-fonts
```

```
$ sudo xbps-install freefont-ttf
```

See <https://repology.org/project/font-freefont/versions>, <https://repology.org/project/fonts:gnu-freefont/versions>, <https://repology.org/project/texlive:gnu-freefont/versions>

If the system package is installed, `./configure` will check if it can be used.

### 6.1.105 freetype: A free, high-quality, and portable font engine

#### Description

From the documentation:

FreeType is a software font engine that is designed to be small, efficient, highly customizable, and portable while capable of producing high-quality output (glyph images). It can be used in graphics libraries, display servers, font conversion tools, text image generation tools, and many other products as well.

Note that FreeType is a font service and doesn't provide APIs to perform higher-level features like text layout or graphics processing (e.g., colored text rendering, 'hollowing', etc.). However, it greatly simplifies these tasks by providing a simple, easy to use, and uniform interface to access the content of font files.

Please note that 'FreeType' is also called 'FreeType 2', to distinguish it from the old, deprecated 'FreeType 1' library, a predecessor no longer maintained and supported.

The package in Sage is called freetype (in lowercase).

#### License

- FreeType (BSD-like)
- GNU Public License v2

From the documentation:

FreeType is released under two open-source licenses: our own BSD-like FreeType License and the GNU Public License, Version 2. It can thus be used by any kind of projects, be they proprietary or not.

#### Upstream Contact

- home: <https://www.freetype.org>
- repo:
  - official: <http://git.savannah.gnu.org/cgit/freetype>
  - mirror: <https://github.com/aseprite/freetype2/>

#### Type

standard

#### Dependencies

- *bzip2*: High-quality data compressor
- *libpng*: Bitmap image support

## Version Information

package-version.txt:

```
2.10.4
```

## Equivalent System Packages

```
$ apk add freetype-dev
```

```
$ conda install freetype
```

```
$ apt-cyg install libfreetype-devel
```

```
$ sudo apt-get install libfreetype-dev
```

```
$ sudo pkg install print/freetype2
```

```
$ brew install freetype
```

No package needed.

```
$ nix-env --install freetype
```

```
$ sudo zypper install pkgconfig\ (freetype2\)
```

```
$ sudo slackpkg install freetype harfbuzz glib glib2
```

```
$ sudo xbps-install freetype-devel
```

See <https://repology.org/project/freetype/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.106 fricas: A general purpose computer algebra system

### Description

FriCAS is a general purpose computer algebra system.

### License

Modified BSD license.

### Upstream Contact

<http://fricas.sourceforge.net/>

### Type

optional

### Dependencies

- *ecl: An implementation of the Common Lisp language*

### Version Information

package-version.txt:

```
1.3.8.p1
```

### Equivalent System Packages

```
$ sudo apt-get install fricas
```

```
$ sudo pkg install math/fricas
```

```
$ sudo emerge sci-mathematics/fricas
```

```
$ sudo port install fricas
```

```
$ sudo zypper install fricas
```

See <https://repology.org/project/fricas/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.107 frobby: Computations on monomial ideals

### Description

The software package Frobby provides a number of computations on monomial ideals. The current main feature is the socle of a monomial ideal, which is largely equivalent to computing the maximal standard monomials, the Alexander dual or the irreducible decomposition.

Operations on monomial ideals are much faster than algorithms designed for ideals in general, which is what makes a specialized library for these operations on monomial ideals useful.

## License

- GPL version 2.0 or later

## Upstream Contact

- <http://www.broune.com/frobby/>
- <https://github.com/Macaulay2/frobby>

## Special Update/Build instructions

Download Frobby at [www.broune.com/](http://www.broune.com/) and then type “make spkg VER=blah” which will create an spkg named `frobby-VER.spkg` in `bin/`. The files related to doing this is in the `sage/` sub-directory of the Frobby source distribution.

## Type

optional

## Dependencies

- `$(MP_LIBRARY)`

## Version Information

package-version.txt:

```
0.9.0.p2
```

## Equivalent System Packages

See <https://repology.org/project/frobby/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.108 furo: A clean customizable Sphinx documentation theme

### Description

A clean customizable Sphinx documentation theme.

### License

Copyright (c) 2020 Pradyun Gedam <[mail@pradyunsg.me](mailto:mail@pradyunsg.me)> Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the “Software”), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions: The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software. THE SOFTWARE IS PROVIDED “AS IS”, WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NON-INFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

### Upstream Contact

<https://pypi.org/project/furo/>

### Type

standard

### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *beautifulsoup4: Screen-scraping library*
- *pygments: Generic syntax highlighter*
- *sphinx: Python documentation generator*
- *sphinx\_basic\_ng: A modern skeleton for Sphinx themes.*

### Version Information

package-version.txt:

```
2023.9.10
```

install-requires.txt:

```
furo
```



## Equivalent System Packages

```
$ sudo pacman -S python-sphinx-furo
```

```
$ conda install furo
```

```
$ sudo apt-get install furo
```

```
$ sudo yum install python-furo
```

```
$ sudo pkg install textproc/py-furo
```

```
$ sudo emerge dev-python/furo
```

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.109 gambit: Computations on finite, noncooperative games

### Description

Gambit is a set of software tools for doing computation on finite, noncooperative games. The Gambit Project was founded in the mid-1980s by Richard McKelvey at the California Institute of Technology.

### License

GPL v2+

### Upstream Contact

- Website: <http://www.gambit-project.org/>
- Mailing List: <http://sourceforge.net/p/gambit/mailman/gambit-devel/>

### Dependencies

- python
- cython
- setuptools
- IPython
- scipy

### Type

experimental

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *cython: C-Extensions for Python, an optimizing static compiler*

### Version Information

package-version.txt:

```
15.1.1.p0
```

### Equivalent System Packages

```
$ brew install gambit
```

See <https://repology.org/project/gambit-game-theory/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.110 gap: Groups, Algorithms, Programming - a system for computational discrete algebra

### Description

GAP is a system for computational discrete algebra, with particular emphasis on Computational Group Theory. GAP provides a programming language, a library of thousands of functions implementing algebraic algorithms written in the GAP language as well as large data libraries of algebraic objects. See also the overview and the description of the mathematical capabilities. GAP is used in research and teaching for studying groups and their representations, rings, vector spaces, algebras, combinatorial structures, and more. The system, including source, is distributed freely. You can study and easily modify or extend it for your special use.

This is a stripped-down version of GAP. The databases, which are architecture-independent, are in a separate package.

### Upstream Contact

<https://www.gap-system.org>

Mailing list at <https://mail.gap-system.org/mailman/listinfo/gap>

## Special Update/Build Instructions

This is a stripped-down version of GAP. The downloading of the sources and removal of unneeded parts is done by the script `spkg-src`. When you update GAP, please also update and use the `spkg-src` script.

- Do we really want to copy everything from the build directory???

You need the full GAP tree to compile/install many GAP packages.

- There's apparently a command missing (in `spkg-install`) building the (HTML?) documentation. Earlier changelog entries as well as the description above state the documentation was removed from the upstream sources... Since the (pre-)built HTML documentation is currently included, I've commented out some lines in that part of `spkg-install`. -leif

## Patches

### Type

standard

### Dependencies

- `$(MP_LIBRARY)`
- *ncurses: Classic terminal output library*
- *readline: Command line editing library*
- *zlib: Data compression library*

### Version Information

package-version.txt:

```
4.12.2
```

### Equivalent System Packages

```
$ sudo pacman -S gap
```

```
$ conda install gap-defaults\>=4.12.2
```

```
$ sudo apt-get install gap libgap-dev
```

```
$ sudo yum install gap gap-core gap-devel gap-libs libgap
```

```
$ sudo pkg install math/gap
```

```
$ nix-env --install gap
```

See <https://repology.org/project/gap/versions>

If the system package is installed, `./configure` will check if it can be used.

### 6.1.111 gap3: A minimal distribution of GAP 3 containing packages that have no equivalent in GAP 4

#### Description

This package installs Jean Michel's pre-packaged GAP3, which is a minimal GAP3 distribution containing packages that have no equivalent in GAP4.

Below is the full description from Jean Michel's webpage (accessed 23 July 2015).

A pre-packaged GAP3 with everything you need

To help people who are just interested in GAP3 because they need a package which has not been ported to GAP4, I have prepared an easy-to install minimal GAP3 distribution containing an up-to-date versions of the packages:

anusq, arep, autag, chevie, cryst, dce, grim, matrix, meataxe, monoid, nq, pcqa, sisyphe, specht, ve, vkcurve.

These packages have been chosen since most have no equivalent in GAP4. They are autoloaded when starting gap.

This distribution includes only partial lists of small groups, 2-groups, 3-groups, character tables from the Atlas and tables of marks. It does not include either the packages:

anupq, grape, kbmag, xgap, cohomolo, gliss, guava, xmod

which have some equivalent in GAP4. You can get these extra features at

<http://www.math.rwth-aachen.de/~Frank.Luebeck/gap/GAP3>

In this distribution:

- The on-line help includes the documentation of the included packages.
- The html documentation (htm/index.html) also does.
- The manual (manual.pdf) also does.

#### License

Most parts of the GAP distribution, including the core part of the GAP system, are distributed under the terms of the GNU General Public License (see <http://www.gnu.org/licenses/gpl.html> or the file GPL in the etc directory of the GAP installation).

#### SPKG Maintainers

- Christian Stump <[christian.stump@gmail.com](mailto:christian.stump@gmail.com)>

### Upstream Contact

Jean Michel <jmichel@math.jussieu.fr> <http://webusers.imj-prg.fr/~jean.michel/>

### Special Update/Build Instructions

The difference between the distributed tarball and Jean Michel's original tarball also contains the binaries

### Patches

None

### Type

experimental

### Dependencies

### Version Information

package-version.txt:

04jul17

### Equivalent System Packages

(none known)

## 6.1.112 gap\_jupyter: Jupyter kernel for GAP

### Description

Jupyter kernel for GAP

This wrapper-kernel is a Jupyter kernel for the GAP Computer Algebra System based on the same ideas as the bash wrapper kernel.

### License

3-Clause BSD License

### Upstream Contact

- <https://github.com/gap-packages/jupyter-gap>

### Type

optional

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *gap*: *Groups, Algorithms, Programming - a system for computational discrete algebra*
- *ipython*: *Interactive computing environment with an enhanced interactive Python shell*

### Version Information

package-version.txt:

```
0.9
```

install-requires.txt:

```
gap_jupyter >=0.9
```

### Equivalent System Packages

```
$ conda install gap
```

See <https://repology.org/project/gap-jupyterkernel/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.113 gap\_packages: A collection of GAP packages

### Description

Several “official” and “undeposited” GAP packages available from <https://www.gap-system.org/Packages/packages.html>

Installing this SPKG will install the corresponding GAP packages, but before you can use them in Sage, they still have to be loaded into either the GAP interface or libgap:

```
sage: gap.eval('LoadPackage("Grape")') # optional - gap_packages
 'true'
sage: libgap.LoadPackage("Grape") # optional - gap_packages
 true
```

Those correspond to:

```
gap> LoadPackage ("Grape") ;
```

within the GAP interface and libgap, respectively.

## Upstream Contact

Mailing list at <https://mail.gap-system.org/mailman/listinfo/gap>

## Dependencies

- GAP (a standard spkg)

## TODO

The crystallographic group packages are untested/untestable. They rely on polymake and the dependency “cryst” is missing. This needs to be cleaned up.

## Notes

A brief description of each package follows:

cohomolo - The cohomolo package is a GAP interface to some C programs for computing Schur multipliers and covering groups of finite groups and first and second cohomology groups of finite groups acting on finite modules. (Author: Max Horn, Markus Pfeiffer)

CoReLG - Contains functionality for working with real semisimple Lie algebras. (Author: Heiko Dietrich, Paolo Faccin, Willem Adriaan de Graaf)

crime - package to compute the cohomology ring of finite p-groups, induced maps, and Massey products. (Author: Marcus Bishop)

cryst - Computing with crystallographic groups (Authors: Bettina Eick, Franz Gähler, Werner Nickel)

CTblLib - The GAP Character Table Library (Author: Thomas Breuer)

DESIGN is a package for classifying, partitioning and studying block designs. (Author: Leonard H. Soicher)

FactInt is a package providing routines for factoring integers, in particular:

- Pollard’s p-1
- Williams’ p+1
- Elliptic Curves Method (ECM)
- Continued Fraction Algorithm (CFRAC)
- Multiple Polynomial Quadratic Sieve (MPQS)

(Author: Stefan Kohl)

GAPDoc is a package containing a definition of a structure for GAP documentation, based on XML. It also contains conversion programs for producing text-, DVI-, PDF- or HTML-versions of such documents, with hyperlinks if possible. (Authors: Frank Luebeck, Max Neunhoeffler)

GBNP - The GBNP package provides algorithms for computing Grobner bases of noncommutative polynomials with coefficients from a field implemented in GAP and with respect to the “total degree first then lexicographical” ordering. Further provided are some variations, such as a weighted and truncated version and a tracing facility. The word “algorithm”

is to be interpreted loosely here: in general one cannot expect such an algorithm to terminate, as it would imply solvability of the word problem for finitely presented (semi)groups. (Authors: A.M. Cohen, J.W. Knopper)

GRAPE is a package for computing with graphs and groups, and is primarily designed for constructing and analysing graphs related to groups, finite geometries, and designs. (Author: Leonard H. Soicher)

GUAVA is included here, and with Sage standard.

HAP (Homological Algebra Programming) is a GAP package providing some functions for group cohomology computation. (Author: Graham Ellis)

HAPcryst - an extension package for HAP, which allows for group cohomology computation for a wider class of groups. (Author: Marc Roeder)

hecke - Provides functions for calculating decomposition matrices of Hecke algebras of the symmetric groups and  $q$ -Schur algebras. Hecke is a port of the GAP 3 package Specht 2.4 to GAP 4. (Author: Dmitriy Traytel)

LAGUNA - this package provides functionality for calculation of the normalized unit group of the modular group algebra of the finite  $p$ -group and for investigation of Lie algebra associated with group algebras and other associative algebras. (Authors :Victor Bovdi, Alexander Konovalov, Richard Rossmanith, Csaba Schneider)

liealgdb - A database of Lie algebras (Author: Serena Cicalo', Willem Adriaan de Graaf, Csaba Schneider)

LiePRing - Database and algorithms for Lie  $p$ -rings (Author: Michael Vaughan-Lee, Bettina Eick)

LieRing - contains functionality for working with finitely presented Lie rings and the Lazard correspondence. (Author: Serena Cicalo', Willem Adriaan de Graaf)

loops - Provides researchers in nonassociative algebra with a computational tool that integrates standard notions of loop theory with libraries of loops and group-theoretical algorithms of GAP. The package also expands GAP toward nonassociative structures. (Authors: Gabor Nagy, Petr Vojtechovsky)

mapclass - The package calculates the mapping class group orbits for a given finite group. (Authors: Adam James, Kay Magaard, Sergey Shpectorov, Helmut Volklein)

polymake - an interface with the (standalone) polymake program used by HAPcryst. (Author: Marc Roeder)

qpa - Quivers and Path Algebras provides data structures and algorithms for doing computations with finite dimensional quotients of path algebras, and finitely generated modules over such algebras. The current version of the QPA package has data structures for quivers, quotients of path algebras, and modules, homomorphisms and complexes of modules over quotients of path algebras. (Authors: Edward Green, Oeyvind Solberg)

quagroup - Contains functionality for working with quantized enveloping algebras of finite-dimensional semisimple Lie algebras. (Author: Willem Adriaan de Graaf)

repsn - The package provides GAP functions for computing characteristic zero matrix representations of finite groups. (Author: Vahid Dabbaghian)

sla - a package for doing computations with simple Lie algebras (Author: Willem Adriaan de Graaf)

SONATA ("System Of Nearrings And Their Applications") is a package which constructs finite nearrings and related objects. (Authors: Erhard Aichinger, Franz Binder, Jürgen Ecker, Peter Mayr, Christof Noebauer)

TORIC is a GAP package for computing with toric varieties. (Author: David Joyner)



## Type

optional

## Dependencies

- `$(SAGERUNTIME)`
- *gap*: *Groups, Algorithms, Programming - a system for computational discrete algebra*
- *libsemigroups*: *Library for semigroups and monoids*
- *planarity*: *Planarity-related graph algorithms*

## Version Information

package-version.txt:

```
4.12.2
```

## Equivalent System Packages

```
$ conda install gap
```

See <https://repology.org/project/gap/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.114 gast: Python AST that abstracts the underlying Python version

### Description

Python AST that abstracts the underlying Python version

### License

BSD 3-Clause

### Upstream Contact

<https://pypi.org/project/gast/>

### Type

standard

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

### Version Information

package-version.txt:

```
0.5.4
```

install-requires.txt:

```
gast
```

### Equivalent System Packages

```
$ conda install gast
```

```
$ sudo emerge dev-python/gast
```

```
$ sudo xbps-install python3-gast
```

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.115 gc: The Boehm-Demers-Weiser conservative garbage collector

### Description

The Boehm-Demers-Weiser conservative garbage collector.

### License

- MIT-style (<https://github.com/ivmai/bdwgc/blob/master/LICENSE>)

## Upstream Contact

- Ivan Maidanski

Webpage: - <https://github.com/ivmai/bdwgc/> - <https://www.hboehm.info/gc/>

## Special Update/Build Instructions

None.

## Type

standard

## Dependencies

- *libatomic\_ops*: Access hardware-provided atomic memory update operations

## Version Information

package-version.txt:

```
8.2.4
```

## Equivalent System Packages

```
$ apk add gc-dev
```

```
$ sudo pacman -S gc
```

```
$ conda install bdw-gc
```

```
$ apt-cyg install libgc-devel
```

```
$ sudo apt-get install libgc-dev
```

```
$ sudo yum install gc gc-devel
```

```
$ sudo pkg install devel/boehm-gc devel/boehm-gc-threaded
```

```
$ sudo emerge dev-libs/boehm-gc
```

```
$ brew install bdw-gc
```

```
$ sudo port install boehm-gc
```

```
$ sudo zypper install pkgconfig\ (bdw-gc\)
```

```
$ sudo slackpkg install gc
```

```
$ sudo xbps-install gc-devel
```

See <https://repology.org/project/boehm-gc/versions>

If the system package is installed, `./configure` will check if it can be used.

### 6.1.116 gcc: The GNU Compiler Collection or other suitable C and C++ compilers

#### Description

This package represents the required C and C++ compilers.

- GCC (GNU Compiler Collection) versions 8.x ( $\geq 8.4.0$ ) to 13.x are supported.
- Clang (LLVM) is also supported.

The required Fortran compiler is represented by the package `gfortran`.

You can pass the names of compilers to use to `./configure` using the environment variables `CC`, `CXX`, and `FC`, for C, C++, and Fortran compilers, respectively.

For example, if your C compiler is `clang`, your C++ compiler is `clang++`, and your Fortran compiler is `flang`, then you would need to run:

```
$./configure CC=clang CXX=clang++ FC=flang
```

Vendor and versions of the C and C++ compilers should match.

Users of older Linux distributions (in particular, `ubuntu-xenial` or older, `debian-buster` or older, `linuxmint-18` or older) should upgrade their systems before attempting to install Sage from source. Users of `ubuntu-bionic`, `linuxmint-19.x`, and `opensuse-15.x` can install a versioned `gcc` system package and then use:

```
$./configure CC=gcc-8 CXX=g++-8 FC=gfortran-8
```

or similar. Users on `ubuntu` can also install a modern compiler toolchain using the `ubuntu-toolchain-r ppa`. On `ubuntu-trusty`, also the package `binutils-2.26` is required; after installing it, make it available using `export PATH="/usr/lib/binutils-2.26/bin:$PATH"`. Instead of upgrading their distribution, users of `centos-7` can install a modern compiler toolchain using Redhat's `devtoolset`.

This package uses the non-standard default `configure --with-system-gcc=force`, giving an error at `configure` time when no suitable system compilers are configured.

You can override this using `./configure --without-system-gcc`. In this case, Sage builds and installs the GNU Compiler Collection, including the C, C++ and Fortran compiler. This is not recommended. You will need suitable C and C++ compilers from which GCC can bootstrap itself. There are some known problems with old assemblers, in particular when building the `ecm` and `fflas_ffpack` packages. You should ensure that your assembler understands all instructions for your processor. On Linux, this means you need a recent version of `binutils` (not provided by an SPKG); on macOS you need a recent version of Xcode.

(Installing the `gfortran` SPKG becomes a no-op in this case.)

Building Sage from source on Apple Silicon (M1/M2) requires the use of Apple's Command Line Tools, and those tools include a suitable compiler. Sage's `gcc` SPKG is not suitable for M1/M2; building it will likely fail.

## License

GPL version 2 or version 3

## Upstream Contact

<https://gcc.gnu.org/>

## Type

standard

## Dependencies

- `$(MP_LIBRARY)`
- *mpc: Arithmetic of complex numbers with arbitrarily high precision and correct rounding*
- *mpfr: Multiple-precision floating-point computations with correct rounding*
- *xz: General-purpose data compression software*
- *zlib: Data compression library*

## Version Information

package-version.txt:

```
12.2.0
```

## Equivalent System Packages

```
$ sudo pacman -S gcc
```

```
$ apt-cyg install gcc-core gcc-g++ gcc-fortran
```

```
$ sudo apt-get install gcc g++
```

```
$ sudo yum install gcc gcc-c++ gcc-gfortran
```

```
$ sudo pkg install lang/gcc9
```

```
$ brew install gcc
```

```
$ sudo zypper install gcc-c++
```

```
$ sudo xbps-install gcc
```

See <https://repology.org/project/gcc/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.117 gdb: The GNU Project debugger

### Description

GDB, the GNU Project debugger, allows you to see what is going on “inside” another program while it executes – or what another program was doing at the moment it crashed.

### License

GPL v3+

### Upstream Contact

<http://www.gnu.org/software/gdb/>

### Special Update/Build Instructions

Current version needs makeinfo installed to build successfully.

### Type

experimental

### Dependencies

- \$(PYTHON)
- *mpfr: Multiple-precision floating-point computations with correct rounding*
- *ncurses: Classic terminal output library*
- *xz: General-purpose data compression software*
- *zlib: Data compression library*

### Version Information

package-version.txt:

8.2

## Equivalent System Packages

```
$ apk add gdb
```

No package needed.

```
$ brew install gdb
```

```
$ sudo port install gdb
```

```
$ sudo zypper install gdb
```

```
$ sudo xbps-install gdb
```

See <https://repology.org/project/gdb/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.118 gengetopt: getopt\_long parser generator

### Description

GNU Gengetopt converts a textual description of your program's arguments and options into a `getopt_long()` parser in C (or C++).

Website: <https://www.gnu.org/software/gengetopt/>

### License

GPL-3+ (<https://www.gnu.org/software/gengetopt/LICENSE>)

### Type

standard

### Dependencies

- *xz: General-purpose data compression software*

### Version Information

package-version.txt:

```
2.23
```

### Equivalent System Packages

```
$ apk add gengetopt
```

```
$ conda install gengetopt
```

```
$ apt-cyg install gengetopt
```

```
$ sudo apt-get install gengetopt
```

```
$ sudo yum install gengetopt
```

```
$ sudo emerge dev-util/gengetopt
```

```
$ brew install gengetopt
```

```
$ nix-env --install gengetopt
```

```
$ sudo xbps-install gengetopt
```

See <https://repology.org/project/gengetopt/versions>

If the system package is installed, `./configure` will check if it can be used.

### 6.1.119 gf2x: Fast arithmetic in $\text{GF}(2)[x]$ and searching for irreducible/primitive trinomials

#### Description

gf2x is a C/C++ software package containing routines for fast arithmetic in  $\text{GF}(2)[x]$  (multiplication, squaring, GCD) and searching for irreducible/primitive trinomials.

Website: <https://gitlab.inria.fr/gf2x/gf2x>

#### License

- GNU GPLv2+.

#### Upstream Contact

- Richard Brent
- Pierrick Gaudry
- Emmanuel Thomé
- Paul Zimmermann



## Type

standard

## Dependencies

## Version Information

package-version.txt:

```
1.3.0
```

## Equivalent System Packages

```
$ apk add gf2x-dev
```

```
$ sudo pacman -S gf2x
```

```
$ conda install gf2x
```

```
$ sudo apt-get install libgf2x-dev
```

```
$ sudo yum install gf2x gf2x-devel
```

```
$ sudo pkg install math/gf2x
```

```
$ sudo zypper install pkgconfig\ (gf2x\)
```

```
$ sudo xbps-install gf2x-devel
```

See <https://repology.org/project/gf2x/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.120 gfan: Groebner fans and tropical varieties

### Description

Gfan is a software package for computing Groebner fans and tropical varieties.

These are polyhedral fans associated to polynomial ideals. The maximal cones of a Groebner fan are in bijection with the marked reduced Groebner bases of its defining ideal. The software computes all marked reduced Groebner bases of an ideal. Their union is a universal Groebner basis. The tropical variety of a polynomial ideal is a certain subcomplex of the Groebner fan. Gfan contains algorithms for computing this complex for general ideals and specialized algorithms for tropical curves, tropical hypersurfaces and tropical varieties of prime ideals. In addition to the above core functions the package contains many tools which are useful in the study of Groebner bases, initial ideals and tropical geometry. The full list of commands can be found in Appendix B of the manual. For ordinary Groebner basis computations Gfan is not competitive in speed compared to programs such as CoCoA, Singular and Macaulay2.

### License

- GPL version 2 or version 3 (according to the gfan website)

### Upstream Contact

Anders Nedergaard Jensen

<https://users-math.au.dk/jensen/software/gfan/gfan.html>

### Special Update/Build Instructions

Remove the doc, homepage, and examples subdirectories, which take up most of the space.

### Type

standard

### Dependencies

- `$(MP_LIBRARY)`
- *cddlib: Double description method for polyhedral representation conversion*

### Version Information

package-version.txt:

```
0.6.2.p1
```

### Equivalent System Packages

```
$ sudo pacman -S gfan
```

```
$ conda install gfan
```

```
$ sudo apt-get install gfan
```

```
$ sudo yum install gfan
```

```
$ sudo pkg install math/gfan
```

```
$ sudo emerge sci-mathematics/gfan
```

```
$ nix-env --install gfan
```

```
$ sudo zypper install gfan
```

```
$ sudo xbps-install gfan
```

See <https://repology.org/project/gfan/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.121 gfortran: Fortran compiler from the GNU Compiler Collection

### Description

This package represents the required Fortran compiler.

Officially we support `gfortran` from [GNU Compiler Collection \(GCC\)](#). It has also been reported that using `flang` (from LLVM) might work.

You can pass the names of compilers to use to `./configure` using the environment variables `CC`, `CXX`, and `FC`, for C, C++, and Fortran compilers, respectively.

For example, if your C compiler is `clang`, your C++ compiler is `clang++`, and your Fortran compiler is `flang`, then you would need to run:

```
$./configure CC=clang CXX=clang++ FC=flang
```

### License

GPL version 2 or version 3

### Upstream Contact

<http://gcc.gnu.org/>

### Special Update/Build Instructions

None.

### Type

standard

### Dependencies

- `$(MP_LIBRARY)`
- *mpc*: Arithmetic of complex numbers with arbitrarily high precision and correct rounding
- *mpfr*: Multiple-precision floating-point computations with correct rounding
- *xz*: General-purpose data compression software
- *zlib*: Data compression library

### Version Information

package-version.txt:

```
12.2.0
```

### Equivalent System Packages

```
$ apk add gfortran
```

```
$ sudo pacman -S gcc-fortran
```

```
$ conda install fortran-compiler
```

```
$ apt-cyg install gcc-fortran
```

```
$ sudo apt-get install gfortran
```

```
$ sudo yum install gcc-gfortran
```

```
$ sudo pkg install lang/gcc9
```

```
$ brew install gfortran
```

```
$ sudo port install gcc10 +gfortran
```

```
$ sudo zypper install gcc-fortran
```

```
$ sudo slackpkg install gcc-gfortran
```

```
$ sudo xbps-install gcc-fortran
```

See <https://repology.org/project/gfortran/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.122 giac: A general purpose computer algebra system

### Description

- Giac is a general purpose Computer algebra system by Bernard Parisse. It consists of:
- a C++ library (libgiac).
- a command line interpreter (icas or giac).
- the built of the FLTK-based GUI (xcas) has been disabled in the spkg-install file.
- The english documentation will be installed in:  
\$SAGE\_LOCAL/share/giac/doc/en/cascmd\_en/index.html

- Author's website with debian, ubuntu, macosx, windows package:  
<http://www-fourier.ujf-grenoble.fr/~parisse/giac.html>
- The FreeBSD port is math/giacxcas

## Licence

GPLv3+

Note: except the french html documentation which is freely redistributable for non commercial only purposes. This doc has been removed in the Sage package, see spkg-src

## Upstream Contact

- Bernard Parisse: <http://www-fourier.ujf-grenoble.fr/~parisse/giac.html>
- Source file (giac-x.y.z-t.tar.gz) in:  
<http://www-fourier.ujf-grenoble.fr/~parisse/debian/dists/stable/main/source/>

## Dependencies

- gettext, readline
- giac will benefit of ntl, pari, mpfr, gsl, lapack but they should be already installed by sage.
- giac can also benefit of mpfi for arithmetic on intervals.
- The Documentation is pre-built, hevea or latex or ... are not needed to install the package.

## Special Update/Build Instructions

- Use spkg-src to update this package

## Type

standard

## Dependencies

- $(MP\_LIBRARY)$
- *cliquer*: Routines for clique searching
- *curl*: Multiprotocol data transfer library and utility
- *ecm*: Elliptic curve method for integer factorization
- *glpk*: GNU Linear Programming Kit
- *gsl*: The GNU Scientific Library
- *libpng*: Bitmap image support
- *mpfi*: Multiple precision interval arithmetic library based on MPFR

- *mpfr*: Multiple-precision floating-point computations with correct rounding
- *ntl*: A library for doing number theory
- *pari*: Computer algebra system for fast computations in number theory
- *readline*: Command line editing library

### Version Information

package-version.txt:

```
1.9.0.15p0
```

### Equivalent System Packages

```
$ sudo pacman -S libgiac giac
```

```
$ conda install giac
```

```
$ sudo apt-get install libgiac-dev xcas
```

```
$ sudo yum install giac giac-devel
```

```
$ sudo pkg install math/giacxcas
```

```
$ nix-env --install giac
```

```
$ sudo zypper install giac-devel
```

```
$ sudo xbps-install giac-devel
```

See <https://repology.org/project/giac/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.123 git: Version control system

### Description

Git is a fast, scalable, distributed revision control system with an unusually rich command set that provides both high-operations and full access to internals.

- `man git`

## Upstream Contact

- Website: <https://git-scm.com/>

## Type

optional

## Dependencies

## Version Information

## Equivalent System Packages

```
$ sudo pacman -S git
```

```
$ conda install git
```

```
$ apt-cyg install git
```

```
$ sudo apt-get install git
```

```
$ sudo yum install git
```

```
$ sudo pkg install devel/git
```

```
$ brew install git
```

```
$ sudo port install git
```

```
$ sudo zypper install git
```

```
$ sudo slackpkg install git
```

```
$ sudo xbps-install git
```

See <https://repology.org/project/git/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.124 github\_cli: Command-line interface for GitHub

### Description

`gh` is GitHub on the command line. It brings pull requests, issues, and other GitHub concepts to the terminal next to where you are already working with `git` and your code.

### License

MIT

### Upstream Contact

<https://github.com/cli/cli>

### Type

optional

### Dependencies

### Version Information

### Equivalent System Packages

```
$ apk add github-cli
```

```
$ sudo pacman -S github-cli
```

```
$ conda install gh
```

```
$ sudo apt-get install gh
```

```
$ sudo yum install gh
```

```
$ sudo pkg install devel/gh
```

```
$ sudo emerge dev-util/github-cli
```

```
$ brew install gh
```

```
$ sudo port install gh
```

```
$ nix-env --install gh
```

```
$ sudo zypper install gh
```

```
$ sudo xbps-install github-cli
```

See <https://repology.org/project/github-cli/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.



### 6.1.125 gitpython: GitPython is a python library used to interact with Git repositories

#### Description

GitPython is a python library used to interact with Git repositories

#### License

BSD

#### Upstream Contact

<https://pypi.org/project/GitPython/>

#### Type

optional

#### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

#### Version Information

requirements.txt:

```
GitPython
```

#### Equivalent System Packages

(none known)

### 6.1.126 givaro: C++ library for arithmetic and algebraic computations

#### Description

Givaro is a C++ library for arithmetic and algebraic computations. Its main features are implementations of the basic arithmetic of many mathematical entities: Primes fields, Extensions Fields, Finite Fields, Finite Rings, Polynomials, Algebraic numbers, Arbitrary precision integers and rationals (C++ wrappers over gmp) It also provides data-structures and templated classes for the manipulation of basic algebraic objects, such as vectors, matrices (dense, sparse, structured), univariate polynomials (and therefore recursive multivariate).

Website: <https://casys.gricad-pages.univ-grenoble-alpes.fr/givaro/>

SPKG Repository: <https://bitbucket.org/malb/givaro-spkg>

### License

- GNU GPL

### Upstream Contact

- Clement Pernet

### Type

standard

### Dependencies

- \$(MP\_LIBRARY)

### Version Information

package-version.txt:

```
4.1.1
```

### Equivalent System Packages

```
$ conda install givaro
```

```
$ sudo apt-get install libgivaro-dev
```

```
$ sudo yum install givaro givaro-devel
```

```
$ sudo pkg install math/givaro
```

```
$ sudo emerge sci-libs/givaro
```

```
$ nix-env --install givaro
```

```
$ sudo zypper install pkgconfig\ (givaro\)
```

```
$ sudo xbps-install givaro-devel
```

See <https://repology.org/project/givaro/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.127 glpk: GNU Linear Programming Kit

### Description

The GLPK (GNU Linear Programming Kit) package is intended for solving large-scale linear programming (LP), mixed integer programming (MIP), and other related problems. It is a set of routines written in ANSI C and organized in the form of a callable library.

GLPK supports the GNU MathProg modelling language, which is a subset of the AMPL language.

The GLPK package includes the following main components:

- primal and dual simplex methods
- primal-dual interior-point method
- branch-and-cut method
- translator for GNU MathProg
- application program interface (API)
- stand-alone LP/MIP solver

### License

The GLPK package is GPL version 3.

### Upstream Contact

GLPK is currently being maintained by:

- Andrew Makhorin ([mao@gnu.org](mailto:mao@gnu.org), [mao@mai2.rcnet.ru](mailto:mao@mai2.rcnet.ru))

<http://www.gnu.org/software/glpk/#maintainer>

### Special Update/Build Instructions

- `configure` doesn't support specifying the location of the GMP library to use; only `--with-gmp[=yes]` or `--with-gmp=no` are valid options. (So we *have to* add Sage's include and library directories to `CPPFLAGS` and `LDFLAGS`, respectively.)
- Do we need the `--disable-static`? The stand-alone solver presumably runs faster when built with a static library; also other (stand-alone) programs using it would. (Instead, we should perhaps use `--enable-static` `--enable-shared` to go safe.)

### Patches

- All patches below are currently used by `spkg-src`
- `src/01-zlib.patch`: don't build the included zlib library.

The numbering reflect the order in which they have been created from glpk pristine's sources

### Type

standard

### Dependencies

- \$(MP\_LIBRARY)
- *zlib*: Data compression library

### Version Information

package-version.txt:

```
5.0.p0
```

### Equivalent System Packages

```
$ apk add glpk-dev
```

```
$ sudo pacman -S glpk
```

```
$ conda install glpk
```

```
$ apt-cyg install glpk libglpk-devel
```

```
$ sudo apt-get install glpk-utils libglpk-dev
```

```
$ sudo yum install glpk glpk-devel glpk-utils
```

```
$ sudo pkg install math/glpk
```

```
$ sudo emerge sci-mathematics/glpk
```

```
$ brew install glpk
```

```
$ sudo port install glpk
```

```
$ nix-env --install glpk
```

```
$ sudo zypper install glpk glpk-devel
```

```
$ sudo xbps-install glpk-devel
```

See <https://repology.org/project/glpk/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.128 glucose: A SAT solver

### Description

Glucose is a SAT solver.

Citing its website:

The name of the solver is a contraction of the concept of “glue clauses”, a particular kind of clauses that glucose detects and preserves during search. Glucose is heavily based on Minisat, so please do cite Minisat also if you want to cite Glucose.

### License

- nonparallel glucose: MIT
- parallel glucose-syrup: MIT modified with:

The parallel version of Glucose (all files modified since Glucose 3.0 releases, 2013) cannot be used in any competitive event (sat competitions/evaluations) without the express permission of the authors (Gilles Audemard / Laurent Simon). This is also the case for any competitive event using Glucose Parallel as an embedded SAT engine (single core or not).

### Upstream Contact

Website: <http://www.labri.fr/perso/lsimon/glucose/>

### Special Update/Build Instructions

None.

### Type

optional

### Dependencies

- *zlib*: Data compression library

### Version Information

package-version.txt:

4.1

### Equivalent System Packages

See <https://repology.org/project/glucose/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.129 gmp: Library for arbitrary precision arithmetic

### Description

GMP is a free library for arbitrary precision arithmetic, operating on signed integers, rational numbers, and floating-point numbers. There is no practical limit to the precision except the ones implied by the available memory in the machine GMP runs on. GMP has a rich set of functions, and the functions have a regular interface.

### License

- LGPL V3

### Upstream Contact

- <http://gmplib.org>

### Type

standard

### Dependencies

- *xz: General-purpose data compression software*

### Version Information

package-version.txt:

```
6.3.0
```

### Equivalent System Packages

```
$ apk add gmp-dev
```

```
$ conda install gmp
```

```
$ apt-cyg install libgmp-devel
```

```
$ sudo apt-get install libgmp-dev
```

```
$ sudo yum install gmp gmp-devel
```

```
$ sudo pkg install math/gmp
```

```
$ sudo emerge dev-libs/gmp
```

```
$ brew install gmp
```

```
$ sudo port install gmp
```

```
$ sudo zypper install gmp-devel
```

```
$ sudo slackpkg install gmp
```

```
$ sudo xbps-install gmp-devel gmpxx-devel
```

See <https://repology.org/project/gmp/versions>

If the system package is installed, `./configure` will check if it can be used.

### 6.1.130 gmpy2: Python interface to GMP/MPFR, MPFR, and MPC

#### Description

GMP/MPFR, MPFR, and MPC interface to Python

gmpy2 is a C-coded Python extension module that supports multiple-precision arithmetic. In addition to supporting GMP or MPFR for multiple-precision integer and rational arithmetic, gmpy2 adds support for the MPFR (correctly rounded real floating-point arithmetic) and MPC (correctly rounded complex floating-point arithmetic) libraries.

#### License

LGPL-3.0+

#### Upstream Contact

<https://pypi.org/project/gmpy2/>

#### Type

standard

### Dependencies

- \$(MP\_LIBRARY)
- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *mpc*: Arithmetic of complex numbers with arbitrarily high precision and correct rounding
- *mpfr*: Multiple-precision floating-point computations with correct rounding

### Version Information

package-version.txt:

```
2.2.0a1
```

install-requires.txt:

```
gmpy2 ~2.1.b999
```

### Equivalent System Packages

```
$ sudo pacman -S python-gmpy2
```

```
$ conda install gmpy2
```

```
$ sudo apt-get install python3-gmpy2
```

```
$ sudo yum install python-gmpy2
```

```
$ sudo pkg install math/py-gmpy2
```

```
$ sudo emerge dev-python/gmpy
```

```
$ sudo port install py-gmpy2
```

```
$ sudo zypper install python3\${PYTHON_MINOR}-gmpy2
```

```
$ sudo xbps-install python3-gmpy2
```

See <https://repology.org/project/python:gmpy2/versions>, <https://repology.org/project/python:gmpy2-devel/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.



### 6.1.131 gnulib: Modules imported from Gnulib

This script package represents the modules imported into the Sage source tree from Gnulib.

#### Upstream Contact

<https://www.gnu.org/software/gnulib/>

#### Type

standard

#### Dependencies

#### Version Information

package-version.txt:

```
f9b39c4e337f1dc0dd07c4f3985c476fb875d799
```

#### Equivalent System Packages

(none known)

### 6.1.132 gnumake\_tokenpool: Jobclient and jobserver for the GNU make tokenpool protocol

#### Description

The project has implementations in multiple languages.

We only install the implementation in Python.

#### License

MIT

#### Upstream Contact

- <https://github.com/milahu/gnumake-tokenpool> (upstream)

### Type

standard

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

### Version Information

package-version.txt:

```
0.0.4
```

install-requires.txt:

```
gnumake-tokenpool >= 0.0.4
```

### Equivalent System Packages

(none known)

## 6.1.133 gp2c: A compiler for translating GP routines to C

### Description

The gp2c compiler is a package for translating GP routines into the C programming language, so that they can be compiled and used with the PARI system or the GP calculator.

### License

GPL version 2+

### Upstream Contact

- <http://pari.math.u-bordeaux.fr/>

### Dependencies

- PARI
- Perl

## Type

optional

## Dependencies

- *pari*: Computer algebra system for fast computations in number theory

## Version Information

package-version.txt:

```
0.0.10.p0
```

## Equivalent System Packages

```
$ sudo apt-get install pari-gp2c
```

```
$ sudo pkg install math/gp2c
```

```
$ sudo emerge sci-mathematics/gp2c
```

```
$ sudo zypper install gp2c
```

```
$ sudo xbps-install gp2c
```

See <https://repology.org/project/gp2c/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.134 graphs: A database of combinatorial graphs

### Description

A database of graphs. Created by Emily Kirkman based on the work of Jason Grout. Since April 2012 it also contains the ISGCI graph database.

### Upstream Contact

- [https://jasongrout.org/graph\\_database](https://jasongrout.org/graph_database)
- For ISGCI:  
H.N. de Ridder ([hnridder@graphclasses.org](mailto:hnridder@graphclasses.org))
- For Andries Brouwer's database:

The data is taken from from Andries E. Brouwer's website (<https://www.win.tue.nl/~aeb/>). Anything related to the data should be reported to him directly ([aeb@cw.nl](mailto:aeb@cw.nl))

The code used to parse the data and create the `.json` file is available at [https://github.com/nathanncohen/strongly\\_regular\\_graphs\\_database](https://github.com/nathanncohen/strongly_regular_graphs_database).

### Type

standard

### Dependencies

### Version Information

package-version.txt:

```
20210214.p0
```

### Equivalent System Packages

```
$ sudo pacman -S sage-data-graphs
```

```
$ conda install sagemath-db-graphs
```

See <https://repology.org/project/sagemath-graphs/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.135 graphviz: Graph visualization software

### Description

Graphviz is open source graph visualization software. It has several main graph layout programs. They take descriptions of graphs in a simple text language, and make diagrams in several useful formats.

### License

Eclipse Public License 1.0

### Upstream Contact

<https://graphviz.org/about/>

### Type

optional

## Dependencies

## Version Information

## Equivalent System Packages

```
$ apk add graphviz
```

```
$ sudo pacman -S graphviz
```

```
$ conda install graphviz
```

```
$ apt-cyg install graphviz
```

```
$ sudo apt-get install graphviz
```

```
$ sudo yum install graphviz
```

```
$ sudo pkg install graphics/graphviz
```

```
$ brew install graphviz
```

```
$ sudo port install graphviz
```

```
$ nix-env --install graphviz
```

```
$ sudo zypper install graphviz
```

```
$ sudo xbps-install graphviz graphviz-devel
```

See <https://repology.org/project/graphviz/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.136 gsl: The GNU Scientific Library

### Description

The GNU Scientific Library

Website: <http://www.gnu.org/software/gsl/>

From the website above: The GNU Scientific Library (GSL) is a numerical library for C and C++ programmers. It is free software under the GNU General Public License.

The library provides a wide range of mathematical routines such as random number generators, special functions and least-squares fitting. There are over 1000 functions in total with an extensive test suite. If the variable `SAGE_CHECK` is exported to the value “yes” when building Sage, GSL’s test suite is run.

### License

- GPL V3

### Upstream Contact

- <http://www.gnu.org/software/gsl/>

GSL mailing lists:

- Bug-gsl <[bug-gsl@gnu.org](mailto:bug-gsl@gnu.org)> mailing list – bug reports for the GNU Scientific Library should be sent to [bug-gsl@gnu.org](mailto:bug-gsl@gnu.org)
- Help-gsl <[help-gsl@gnu.org](mailto:help-gsl@gnu.org)> users mailing list – for questions about installation, how GSL works and how it is used, or general questions concerning GSL.
- Info-gsl <[info-gsl@gnu.org](mailto:info-gsl@gnu.org)> mailing list – announcements of new releases are made there.

### Special Update/Build Instructions

#### Type

standard

#### Dependencies

- \$(BLAS)
- *pkgconf*: An implementation of the pkg-config spec

#### Version Information

package-version.txt:

```
2.7.1
```

#### Equivalent System Packages

```
$ apk add gsl-dev
```

```
$ sudo pacman -S gsl
```

```
$ conda install gsl
```

```
$ apt-cyg install libgsl-devel
```

```
$ sudo apt-get install libgsl-dev
```

```
$ sudo yum install gsl gsl-devel
```

```
$ sudo pkg install math/gsl
```

```
$ sudo emerge sci-libs/gsl
```

```
$ brew install gsl
```

```
$ sudo port install gsl
```

```
$ nix-env --install gsl
```

```
$ sudo zypper install pkgconfig\ (gsl\)
```

```
$ sudo slackpkg install gsl
```

```
$ sudo xbps-install gsl-devel
```

See <https://repology.org/project/gsl/versions>

If the system package is installed, `./configure` will check if it can be used.

### 6.1.137 h11: A pure-Python, bring-your-own-I/O implementation of HTTP/1.1

#### Description

A pure-Python, bring-your-own-I/O implementation of HTTP/1.1

#### License

MIT

#### Upstream Contact

<https://pypi.org/project/h11/>

#### Type

standard

#### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

### Version Information

package-version.txt:

```
0.14.0
```

install-requires.txt:

```
h11
```

### Equivalent System Packages

(none known)

## 6.1.138 hatch\_fancy\_pypi\_readme: Fancy PyPI READMEs with Hatch

### Description

Fancy PyPI READMEs with Hatch

### License

MIT

### Upstream Contact

<https://pypi.org/project/hatch-fancy-pypi-readme/>

### Type

standard

### Dependencies

- \$(PYTHON)
- *hatchling*: Modern, extensible Python build backend
- *pip*: Tool for installing and managing Python packages



## Version Information

package-version.txt:

```
23.1.0
```

install-requires.txt:

```
hatch-fancy-pypi-readme
```

## Equivalent System Packages

```
$ apk add py3-hatch-fancy-pypi-readme
```

```
$ sudo pacman -S python-hatch-fancy-pypi-readme
```

```
$ sudo apt-get install python3-hatch-fancy-pypi-readme
```

```
$ sudo yum install python-hatch-fancy-pypi-readme
```

```
$ sudo pkg install devel/py-hatch-fancy-pypi-readme
```

```
$ sudo emerge dev-python/hatch-fancy-pypi-readme
```

```
$ sudo port install py-hatch-fancy-pypi-readme
```

```
$ sudo zypper install python-hatch-fancy-pypi-readme
```

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.139 hatch\_vcs: Hatch plugin for versioning with your preferred VCS

### Description

Hatch plugin for versioning with your preferred VCS

### License

MIT

### Upstream Contact

<https://pypi.org/project/hatch-vcs/>

### Type

standard

### Dependencies

- `$(PYTHON)`
- *hatchling: Modern, extensible Python build backend*
- *pip: Tool for installing and managing Python packages*

### Version Information

package-version.txt:

```
0.4.0
```

install-requires.txt:

```
hatch-vcs
```

### Equivalent System Packages

```
$ apk add py3-hatch-vcs
```

```
$ sudo pacman -S python-hatch-vcs
```

```
$ sudo apt-get install python3-hatch-vcs
```

```
$ sudo yum install python-hatch-vcs
```

```
$ sudo pkg install devel/py-hatch-vcs
```

```
$ sudo emerge dev-python/hatch-vcs
```

```
$ sudo port install py-hatch-vcs
```

```
$ sudo zypper install python-hatch_vcs
```

```
$ sudo xbps-install hatch-vcs
```

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

### 6.1.140 hatchling: Modern, extensible Python build backend

#### Description

Modern, extensible Python build backend

#### License

MIT

#### Upstream Contact

<https://pypi.org/project/hatchling/>

#### Type

standard

#### Dependencies

- `$(PYTHON)`
- *editables: Editable installations*
- *packaging: Core utilities for Python packages*
- *pathspec: Utility library for gitignore style pattern matching of file paths.*
- *pip: Tool for installing and managing Python packages*
- *pluggy: plugin and hook calling mechanisms for python*
- *tomli: A lil' TOML parser*
- *trove\_classifiers: Canonical source for classifiers on PyPI (pypi.org).*

#### Version Information

package-version.txt:

```
1.20.0
```

install-requires.txt:

```
hatchling
```

### Equivalent System Packages

```
$ conda install hatchling
```

```
$ sudo emerge dev-python/hatchling
```

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

### 6.1.141 httpcore: A minimal low-level HTTP client.

#### Description

A minimal low-level HTTP client.

#### License

#### Upstream Contact

<https://pypi.org/project/httpcore/>

#### Type

standard

#### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *h11: A pure-Python, bring-your-own-I/O implementation of HTTP/1.1*

#### Version Information

package-version.txt:

```
1.0.4
```

install-requires.txt:

```
httpcore
```

## Equivalent System Packages

(none known)

### 6.1.142 httpx: The next generation HTTP client.

#### Description

The next generation HTTP client.

#### License

#### Upstream Contact

<https://pypi.org/project/httpx/>

#### Type

standard

#### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *httpcore: A minimal low-level HTTP client.*

#### Version Information

package-version.txt:

```
0.27.0
```

install-requires.txt:

```
httpx
```

## Equivalent System Packages

(none known)

### 6.1.143 hypothesis: A library for property-based testing

#### Description

A library for property-based testing

#### License

MPL-2.0

#### Upstream Contact

<https://pypi.org/project/hypothesis/>

#### Type

optional

#### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *attrs: Decorator for Python classes with attributes*

#### Version Information

requirements.txt:

```
hypothesis
```

#### Equivalent System Packages

(none known)

### 6.1.144 iconv: Library for language/country-dependent character encodings

#### Description

GNU libiconv is a library that is used to enable different languages, with different characters to be handled properly.

## License

- GPL 3 and LGPL 3. So we can safely link against the library in Sage.

## Upstream Contact

- <http://www.gnu.org/software/libiconv/>
- Bug reports to [bug-gnu-libiconv@gnu.org](mailto:bug-gnu-libiconv@gnu.org)

## Type

standard

## Dependencies

## Version Information

## Equivalent System Packages

```
$ apt-cyg install libiconv-devel
```

```
$ brew install libiconv
```

```
$ sudo port install libiconv
```

See <https://repology.org/project/libiconv/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.145 idna: Internationalized Domain Names in Applications (IDNA)

### Description

Internationalized Domain Names in Applications (IDNA)

### License

BSD-3-Clause

### Upstream Contact

<https://pypi.org/project/idna/>

### Type

standard

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

### Version Information

package-version.txt:

```
3.6
```

install-requires.txt:

```
idna
```

### Equivalent System Packages

```
$ sudo pacman -S python-idna
```

```
$ conda install idna
```

```
$ sudo apt-get install python3-idna
```

```
$ sudo yum install python-idna
```

```
$ sudo emerge dev-python/idna
```

```
$ sudo zypper install python3\${PYTHON_MINOR}-idna
```

```
$ sudo xbps-install python3-idna
```

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.



## 6.1.146 igraph: A library for creating and manipulating graphs

### Description

igraph is a library for creating and manipulating graphs. It is intended to be as powerful (ie. fast) as possible to enable the analysis of large graphs.

### License

GPL version 2

### Upstream Contact

<http://igraph.org/c/>

### Dependencies

igraph can optionally use libxml2 for providing a GraphML importer.

### Special Update/Build Instructions

#### Type

optional

### Dependencies

- `$(BLAS)`
- `$(MP_LIBRARY)`
- *cmake: A cross-platform build system generator*
- *glpk: GNU Linear Programming Kit*

### Version Information

package-version.txt:

0.10.8

### Equivalent System Packages

```
$ sudo pacman -S igraph
```

```
$ conda install igraph
```

```
$ sudo apt-get install libigraph-dev
```

```
$ sudo yum install igraph igraph-devel
```

```
$ sudo pkg install math/igraph
```

```
$ sudo emerge dev-libs/igraph
```

```
$ brew install igraph
```

```
$ sudo port install igraph
```

```
$ sudo xbps-install igraph-devel
```

See <https://repology.org/project/igraph/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.147 ImageMagick: A collection of tools and libraries for many image file formats

### Description

A collection of tools and libraries for many image file formats

### License

Copyright [yyyy] [name of copyright owner]

Licensed under the ImageMagick License (the “License”); you may not use this file except in compliance with the License. You may obtain a copy of the License at

<https://imagemagick.org/script/license.php>

Unless required by applicable law or agreed to in writing, software distributed under the License is distributed on an “AS IS” BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License.

## Upstream Contact

<http://www.imagemagick.org/>

## Type

optional

## Dependencies

## Version Information

## Equivalent System Packages

```
$ apk add imagemagick
```

```
$ sudo pacman -S imagemagick
```

```
$ conda install imagemagick
```

```
$ apt-cyg install ImageMagick
```

```
$ sudo apt-get install imagemagick
```

```
$ sudo yum install ImageMagick
```

```
$ sudo pkg install graphics/ImageMagick7
```

```
$ brew install imagemagick
```

```
$ sudo port install ImageMagick
```

```
$ nix-env --install imagemagick
```

```
$ sudo zypper install ImageMagick
```

```
$ sudo xbps-install ImageMagick
```

See <https://repology.org/project/imagemagick/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.148 image-size: Getting image size from png/jpeg/jpeg2000/gif file

### Description

Getting image size from png/jpeg/jpeg2000/gif file

### License

MIT

### Upstream Contact

<https://pypi.org/project/image-size/>

### Type

standard

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

### Version Information

package-version.txt:

```
1.4.1
```

install-requires.txt:

```
image-size
```

### Equivalent System Packages

```
$ conda install image-size
```

```
$ sudo emerge dev-python/image-size
```

```
$ sudo port install py-image-size
```

```
$ sudo xbps-install python3-image-size
```

See <https://repology.org/project/python:image-size/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.149 iml: Integer Matrix Library

### Description

IML is a free library of C source code which implements algorithms for computing exact solutions to dense systems of linear equations over the integers. IML is designed to be used with the ATLAS/BLAS library and GMP bignum library.

Written in portable C, IML can be used on both 32-bit and 64-bit machines. It can be called from C++.

Website: <https://www.cs.uwaterloo.ca/~astorjoh/iml.html>

### License

- GPLv2+

### Upstream Contact

- Zhuliang Chen [z4chen@uwaterloo.ca](mailto:z4chen@uwaterloo.ca)
- Arne Storjohann [astorjoh@uwaterloo.ca](mailto:astorjoh@uwaterloo.ca)

### Special Update/Build Instructions

- As of version 1.0.4, you need to repackage the upstream tarball using the spkg-src script because there was a bugfix version of 1.0.4 reposted upstream without version number bump.

### Patches

- examples.patch: Modified some of the examples.

### Type

standard

### Dependencies

- \$(BLAS)
- \$(MP\_LIBRARY)
- *pkgconf: An implementation of the pkg-config spec*

### Version Information

package-version.txt:

```
1.0.4p2.p2
```

### Equivalent System Packages

```
$ sudo pacman -S iml
```

```
$ conda install iml
```

```
$ sudo apt-get install libiml-dev
```

```
$ sudo yum install iml iml-devel
```

```
$ sudo pkg install math/impl
```

```
$ sudo emerge sci-libs/impl
```

```
$ nix-env --install iml
```

```
$ sudo zypper install iml-devel
```

```
$ sudo xbps-install iml-devel
```

See <https://repology.org/project/impl/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.150 `importlib_metadata`: Library to access the metadata for a Python package

### Description

This is a backport package, supplying access to the functionality of `importlib.metadata` including improvements added to subsequent Python versions.

### License

Apache Software License

## Upstream Contact

- <https://pypi.org/project/importlib-metadata/>
- <http://importlib-metadata.readthedocs.io/>

## Type

standard

## Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *tomli: A lil' TOML parser*
- *typing\_extensions: Backported and Experimental Type Hints for Python 3.8+*
- *zippp: A pathlib-compatible zipfile object wrapper*

## Version Information

package-version.txt:

```
7.0.1
```

install-requires.txt:

```
According to https://pypi.org/project/importlib-metadata/,
4.13 provides the features of Python 3.11 importlib.metadata
importlib_metadata >=4.13; python_version<"3.11"
```

## Equivalent System Packages

```
$ sudo pacman -S python-importlib-metadata
```

```
$ conda install importlib_metadata
```

```
$ sudo apt-get install python3-importlib-metadata
```

```
$ sudo yum install python-importlib-metadata
```

```
$ sudo pkg install devel/py-importlib-metadata
```

```
$ sudo emerge dev-python/importlib_metadata
```

```
$ sudo zypper install python3\${PYTHON_MINOR}-importlib-metadata
```

```
$ sudo xbps-install python3-importlib_metadata
```

See <https://repology.org/project/python:importlib-metadata/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

### 6.1.151 importlib\_resources: Read resources from Python packages

#### Description

Read resources from Python packages

#### License

Apache2

#### Upstream Contact

<https://pypi.org/project/importlib-resources/>

#### Type

standard

#### Dependencies

- `$(PYTHON)`
- *pip: Tool for installing and managing Python packages*
- *zip: A pathlib-compatible zipfile object wrapper*

#### Version Information

package-version.txt:

```
6.1.1
```

install-requires.txt:

```
According to https://pypi.org/project/importlib-resources/,
version 5.7 provides the features of Python 3.11 importlib.resources
importlib_resources >= 5.7; python_version<"3.11"
```



## Equivalent System Packages

```
$ conda install importlib-resources
```

```
$ sudo apt-get install python3-importlib-resources
```

```
$ sudo emerge dev-python/importlib_resources
```

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.152 info: stand-alone Info documentation reader

### Description

GNU Info is the stand-alone “info” reader that is part of the GNU Texinfo suite of tools. Several packages (Maxima, Singular, ...) install documentation in “info” format, which can be read either with Emacs, the stand-alone “info” reader, and some other software. In particular, the interactive help system of `singular_console()` uses the `info` program in environments in which a web browser is not available; if `info` is not installed, it falls back to a basic pager with limited capabilities.

Website: <https://www.gnu.org/software/texinfo/manual/info-std/info-std.html>

### License

GPL-3+ (`info/* .c` comments in the source repository)

### Type

standard

### Dependencies

- *ncurses*: Classic terminal output library
- *xz*: General-purpose data compression software

### Version Information

package-version.txt:

```
6.8
```

### Equivalent System Packages

```
$ conda install texinfo
```

```
$ apt-cyg install info
```

```
$ sudo apt-get install texinfo
```

```
$ sudo yum install texinfo info
```

```
$ sudo emerge sys-apps/texinfo
```

```
$ brew install texinfo
```

```
$ sudo port install texinfo
```

```
$ nix-env --install texinfo
```

```
$ sudo zypper install texinfo
```

```
$ sudo xbps-install texinfo
```

See <https://repology.org/project/texinfo/versions>

If the system package is installed, `./configure` will check if it can be used.

### 6.1.153 ipykernel: IPython Kernel for Jupyter

#### Description

This package provides the IPython kernel for Jupyter.

#### Type

standard

#### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *appnobe: Disable App Nap on macOS >= 10.9*
- *comm: Jupyter Python Comm implementation, for usage in ipykernel, xeus-python etc.*
- *debugpy: An implementation of the Debug Adapter Protocol for Python*
- *hatchling: Modern, extensible Python build backend*
- *ipython: Interactive computing environment with an enhanced interactive Python shell*
- *jupyter\_client: Jupyter protocol implementation and client libraries*

- *jupyter\_core*: Jupyter core package
- *matplotlib\_inline*: Inline Matplotlib backend for Jupyter
- *nest\_asyncio*: Patch asyncio to allow nested event loops
- *packaging*: Core utilities for Python packages
- *psutil*: Cross-platform lib for process and system monitoring in Python.
- *pyzmq*: Python bindings for the zeromq networking library
- *tornado*: Python web framework and asynchronous networking library
- *traitlets*: Traitlets Python configuration system

## Version Information

package-version.txt:

```
6.27.1
```

install-requires.txt:

```
ipykernel >=5.2.1
```

## Equivalent System Packages

```
$ sudo pacman -S python-ipykernel
```

```
$ conda install ipykernel
```

```
$ sudo apt-get install python3-ipykernel
```

```
$ sudo yum install python-ipykernel
```

```
$ sudo pkg install devel/py-ipykernel
```

```
$ sudo emerge dev-python/ipykernel
```

```
$ sudo port install py-ipykernel
```

```
$ sudo zypper install python3\${PYTHON_MINOR}\-ipykernel
```

```
$ sudo xbps-install python3-ipython-ipykernel
```

See <https://repology.org/project/python:ipykernel/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.154 ipympl: Matplotlib Jupyter Extension

### Description

Matplotlib Jupyter Extension

### License

BSD License

### Upstream Contact

<https://pypi.org/project/ipympl/>

### Type

standard

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *ipython*: Interactive computing environment with an enhanced interactive Python shell
- *ipython\_genutils*: Vestigial utilities from IPython
- *ipywidgets*: Interactive HTML widgets for Jupyter notebooks and the IPython kernel
- *matplotlib*: Python 2D plotting library
- *numpy*: Package for scientific computing with Python
- *pillow*: Python Imaging Library
- *traitlets*: Traitlets Python configuration system

### Version Information

package-version.txt:

```
0.9.3
```

install-requires.txt:

```
ipympl
```

## Equivalent System Packages

```
$ sudo pacman -S python-ipympl
```

```
$ conda install ipympl
```

```
$ sudo pkg install devel/py-ipympl
```

```
$ sudo port install py-ipympl
```

See <https://repology.org/project/python:ipympl/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.155 ipython: Interactive computing environment with an enhanced interactive Python shell

### Description

Interactive computing environment with an enhanced interactive Python shell

From the IPython website:

IPython is a multiplatform, Free Software project (BSD licensed) that offers:

- An enhanced Python shell designed for efficient interactive work. It includes many enhancements over the default Python shell, including the ability for controlling interactively all major GUI toolkits in a non-blocking manner.
- A library to build customized interactive environments using Python as the basic language (but with the possibility of having extended or alternate syntaxes).
- A system for interactive distributed and parallel computing (this is part of IPython's new development).

### License

BSD

### Upstream Contact

<http://ipython.org>

[ipython-dev@scipy.org](mailto:ipython-dev@scipy.org)

[ipython-user@scipy.org](mailto:ipython-user@scipy.org)

### Type

standard

### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *decorator*: Python library providing decorators
- *exceptiongroup*: Backport of PEP 654 (exception groups)
- *jedi*: Static analysis tool providing IDE support for Python
- *matplotlib\_inline*: Inline Matplotlib backend for Jupyter
- *pexpect*: Python module for controlling and automating other programs
- *pickleshare*: A 'shelve' like datastore with concurrency support
- *prompt\_toolkit*: Interactive command lines for Python
- *pygments*: Generic syntax highlighter
- *pyzmq*: Python bindings for the zeromq networking library
- *stack\_data*: Extract data from python stack frames and tracebacks for informative displays
- *tornado*: Python web framework and asynchronous networking library
- *traitlets*: Traitlets Python configuration system
- *wcwidth*: Measures the displayed width of unicode strings in a terminal

### Version Information

package-version.txt:

```
8.18.1
```

install-requires.txt:

```
ipython >=7.13.0
```

### Equivalent System Packages

```
$ sudo pacman -S ipython
```

```
$ conda install ipython
```

```
$ sudo apt-get install python3-ipython
```

```
$ sudo yum install ipython
```

```
$ sudo pkg install devel/ipython
```

```
$ sudo emerge dev-python/ipython
```

```
$ brew install ipython
```

```
$ sudo port install py-ipython
```

```
$ sudo zypper install python3\${PYTHON_MINOR}-ipython
```

```
$ sudo xbps-install python3-ipython
```

See <https://repology.org/project/ipython/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

### 6.1.156 ipython\_genutils: Vestigial utilities from IPython

#### Description

Vestigial utilities from IPython

#### Type

standard

#### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`

#### Version Information

package-version.txt:

```
0.2.0
```

install-requires.txt:

```
ipython_genutils >=0.2.0
```

### Equivalent System Packages

```
$ conda install ipython_genutils
```

```
$ sudo emerge dev-python/ipython_genutils
```

```
$ sudo port install py-ipython_genutils
```

```
$ sudo xbps-install python3-ipython_genutils
```

See <https://repology.org/project/python:ipython-genutils/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.157 ipywidgets: Interactive HTML widgets for Jupyter notebooks and the IPython kernel

### Description

Interactive HTML widgets for Jupyter notebooks and the IPython kernel.

### Type

standard

### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *comm*: Jupyter Python Comm implementation, for usage in *ipykernel*, *xeus-python* etc.
- *ipykernel*: IPython Kernel for Jupyter
- *ipython*: Interactive computing environment with an enhanced interactive Python shell
- *jupyterlab\_widgets*: Jupyter interactive widgets for JupyterLab
- *traitlets*: Traitlets Python configuration system
- *widgetsnbextension*: Jupyter interactive widgets for Jupyter Notebook



## Version Information

package-version.txt:

```
8.1.1
```

install-requires.txt:

```
ipywidgets >=7.5.1
```

## Equivalent System Packages

```
$ conda install ipywidgets\>=7.5.1
```

```
$ sudo emerge dev-python/ipywidgets
```

```
$ sudo port install py-ipywidgets
```

```
$ sudo xbps-install python3-jupyter_ipywidgets
```

See <https://repology.org/project/python:ipywidgets/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.158 isl: Sets and relations of integer points bounded by affine constraints

### Description

isl is a thread-safe C library for manipulating sets and relations of integer points bounded by affine constraints. The descriptions of the sets and relations may involve both parameters and existentially quantified variables. All computations are performed in exact integer arithmetic using GMP.

### License

isl is released under the MIT license, but depends on the LGPL GMP library.

### Upstream Contact

- <http://groups.google.com/group/isl-development>

### Citation

```
@incollection{Verdoolaege2010isl,
 author = {Verdoolaege, Sven},
 title = {isl: An Integer Set Library for the Polyhedral Model},
 booktitle = {Mathematical Software - ICMS 2010},
 series = {Lecture Notes in Computer Science},
 editor = {Fukuda, Komei and Hoeven, Joris and Joswig, Michael and
 Takayama, Nobuki},
 publisher = {Springer},
 isbn = {978-3-642-15581-9},
 pages = {299-302},
 volume = {6327},
 year = {2010}
}
```

### Type

optional

### Dependencies

- \$(MP\_LIBRARY)

### Version Information

package-version.txt:

```
0.20
```

### Equivalent System Packages

```
$ conda install isl
```

```
$ apt-cyg install libisl-devel
```

```
$ sudo apt-get install libisl-dev
```

```
$ sudo yum install isl-devel
```

```
$ sudo pkg install devel/isl
```

```
$ sudo emerge dev-libs/isl
```

```
$ brew install isl
```

```
$ sudo port install isl
```

```
$ sudo zypper install pkgconfig\isl\)
```

```
$ sudo xbps-install isl-devel
```

See <https://repology.org/project/isl/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.159 isoduration: Operations with ISO 8601 durations

### Description

Operations with ISO 8601 durations

### License

### Upstream Contact

<https://pypi.org/project/isoduration/>

### Type

standard

### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *arrow: Better dates & times for Python*

### Version Information

package-version.txt:

```
20.11.0
```

install-requires.txt:

```
isoduration
```

### Equivalent System Packages

(none known)

### 6.1.160 jedi: Static analysis tool providing IDE support for Python

#### Description

Jedi is a static analysis tool for Python that is typically used in IDEs/editors plugins. Jedi has a focus on autocompletion and goto functionality. Other features include refactoring, code search and finding references.

#### Type

standard

#### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *parso: A Python parser*

#### Version Information

package-version.txt:

```
0.19.1
```

install-requires.txt:

```
jedi >=0.17.0
```

### Equivalent System Packages

```
$ conda install jedi
```

```
$ sudo emerge dev-python/jedi
```

```
$ sudo port install py-jedi
```

```
$ sudo xbps-install python3-jedi
```

See <https://repology.org/project/jedi/versions>, <https://repology.org/project/python:jedi/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.161 jinja2: General purpose template engine for Python

### Description

Jinja2 is a library for Python 2.4 and onwards that is designed to be flexible, fast and secure.

If you have any exposure to other text-based template languages, such as Smarty or Django, you should feel right at home with Jinja2. It's both designer and developer friendly by sticking to Python's principles and adding functionality useful for templating environments.

### License

BSD-3-Clause

### Upstream Contact

<https://pypi.org/project/Jinja2/>

### Type

standard

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *docutils: Processing plaintext documentation into useful formats, such as HTML or LaTeX*
- *markupsafe: Safely add untrusted strings to HTML/XML markup*

### Version Information

package-version.txt:

```
3.1.3
```

install-requires.txt:

```
jinja2 >=3.0
for sphinx
```

### Equivalent System Packages

```
$ conda install jinja2
```

```
$ sudo apt-get install python3-jinja2
```

```
$ sudo yum install python-jinja2
```

```
$ sudo emerge dev-python/jinja
```

```
$ sudo port install py-jinja2
```

```
$ sudo zypper install python3\${PYTHON_MINOR}-jinja2
```

```
$ sudo xbps-install python3-Jinja2
```

See <https://repology.org/project/python:jinja2/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

### 6.1.162 jmol: Java viewer for chemical structures in 3D

#### Description

Java viewer for chemical structures in 3D.

This provides files necessary for Jmol (java).

This package does not install JSmol (javascript), which upstream bundles with Jmol.

#### License

GPLv2+

#### Upstream Contact

- <http://jmol.sourceforge.net>
- Bob Hanson
- e-mail: [hansonr@stolaf.edu](mailto:hansonr@stolaf.edu)
- Homepage: <https://www.stolaf.edu/people/hansonr/>
- Development page: <https://github.com/BobHanson/Jmol-SwingJS>
- Download page: <https://sourceforge.net/projects/jmol/files/Jmol/>

## Dependencies

No build-time dependencies.

The commandline jmol requires java at runtime.

## Special Build Instructions

To avoid depending on `unzip` at build time, we have to repack the tarball, see `spkg-src`. We take the opportunity to remove some unnecessary subdirectories, see [http://wiki.jmol.org/index.php/Jmol\\_JavaScript\\_Object#In\\_detail](http://wiki.jmol.org/index.php/Jmol_JavaScript_Object#In_detail)

## Type

standard

## Dependencies

### Version Information

package-version.txt:

```
14.29.52
```

## Equivalent System Packages

```
$ sudo pacman -S jmol
```

```
$ conda install jmol
```

```
$ sudo port install jmol
```

```
$ nix-env --install jmol
```

```
$ sudo zypper install jmol
```

```
$ sudo xbps-install jmol
```

See <https://repology.org/project/jmol/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

### 6.1.163 json5: A Python implementation of the JSON5 data format.

#### Description

A Python implementation of the JSON5 data format.

#### License

Apache

#### Upstream Contact

<https://pypi.org/project/json5/>

#### Type

standard

#### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

#### Version Information

package-version.txt:

```
0.9.14
```

install-requires.txt:

```
json5
```

#### Equivalent System Packages

(none known)

### 6.1.164 jsonpointer: Identify specific nodes in a JSON document (RFC 6901)

#### Description

Identify specific nodes in a JSON document (RFC 6901)



## License

Modified BSD License

## Upstream Contact

<https://pypi.org/project/jsonpointer/>

## Type

standard

## Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

## Version Information

package-version.txt:

2.4

install-requires.txt:

jsonpointer

## Equivalent System Packages

(none known)

## 6.1.165 jsonschema: Python implementation of JSON Schema

### Description

jsonschema is an implementation of JSON Schema for Python

### License

MIT License

### Upstream Contact

Home page: <http://github.com/Julian/jsonschema>

### Type

standard

### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *attrs*: Decorator for Python classes with attributes
- *fqdn*: Validates fully-qualified domain names against RFC 1123, so that they are acceptable to modern browsers
- *hatch\_fancy\_pypi\_readme*: Fancy PyPI READMEs with Hatch
- *hatch\_vcs*: Hatch plugin for versioning with your preferred VCS
- *hatchling*: Modern, extensible Python build backend
- *importlib\_metadata*: Library to access the metadata for a Python package
- *isoduration*: Operations with ISO 8601 durations
- *jsonpointer*: Identify specific nodes in a JSON document (RFC 6901)
- *jsonschema\_specifications*: The JSON Schema meta-schemas and vocabularies, exposed as a Registry
- *pyrsistent*: Persistent data structures in Python
- *uri\_template*: RFC 6570 URI Template Processor
- *webcolors*: A library for working with the color formats defined by HTML and CSS.

### Version Information

package-version.txt:

```
4.17.3
```

install-requires.txt:

```
jsonschema >=3.2.0
```

## Equivalent System Packages

```
$ sudo pacman -S python-jsonschema
```

```
$ conda install jsonschema
```

```
$ sudo apt-get install python3-jsonschema
```

```
$ sudo yum install python-jsonschema
```

```
$ sudo emerge dev-python/jsonschema
```

```
$ sudo port install py-jsonschema
```

```
$ sudo zypper install python3\${PYTHON_MINOR}-jsonschema
```

```
$ sudo xbps-install python3-jsonschema
```

See <https://repology.org/project/python:jsonschema/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.166 jsonschema\_specifications: The JSON Schema meta-schemas and vocabularies, exposed as a Registry

### Description

The JSON Schema meta-schemas and vocabularies, exposed as a Registry

### License

MIT

### Upstream Contact

<https://pypi.org/project/jsonschema-specifications/>

### Type

standard

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *referencing: JSON Referencing + Python*

### Version Information

package-version.txt:

```
2023.3.3
```

install-requires.txt:

```
jsonschema-specifications
```

### Equivalent System Packages

(none known)

## 6.1.167 jupymake: A Python wrapper for the polymake shell

### Description

The Python module JuPyMake provides an interface to polymake.

### License

- GPL v2

### Upstream Contact

<https://github.com/polymake/JuPyMake>

### Special Update/Build Instructions

### Type

optional

## Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *polymake: Computations with polyhedra, fans, simplicial complexes, matroids, graphs, tropical hypersurfaces*

## Version Information

package-version.txt:

```
0.9
```

install-requires.txt:

```
jupymake >=0.9
```

## Equivalent System Packages

See <https://repology.org/project/jupymake/versions>, <https://repology.org/project/python:jupymake/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.168 jupyter\_client: Jupyter protocol implementation and client libraries

### Description

Jupyter protocol implementation and client libraries

### License

BSD 3-Clause License

### Upstream Contact

<https://pypi.org/project/jupyter-client/>

### Type

standard

### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *dateutil*: Extensions to the standard Python module *datetime*
- *importlib\_metadata*: Library to access the metadata for a Python package
- *jupyter\_core*: Jupyter core package
- *pyzmq*: Python bindings for the *zeromq* networking library
- *tornado*: Python web framework and asynchronous networking library
- *traitlets*: Traitlets Python configuration system

### Version Information

package-version.txt:

```
8.3.1
```

install-requires.txt:

```
jupyter-client
```

### Equivalent System Packages

```
$ conda install jupyter_client
```

```
$ sudo emerge dev-python/jupyter_client
```

```
$ sudo port install py-jupyter_client
```

```
$ sudo zypper install python3\${PYTHON_MINOR}-jupyter-client
```

```
$ sudo xbps-install python3-jupyter_client
```

See <https://repology.org/project/jupyter-client/versions>, <https://repology.org/project/python:jupyter-client/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.169 jupyter\_core: Jupyter core package

### Description

Jupyter core package. A base package on which Jupyter projects rely.

## Type

standard

## Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *hatchling: Modern, extensible Python build backend*
- *platformdirs: A small Python module for determining appropriate platform-specific dirs, e.g. a “user data dir”.*
- *traitlets: Traitlets Python configuration system*

## Version Information

package-version.txt:

```
5.3.2
```

install-requires.txt:

```
jupyter_core >=4.6.3
```

## Equivalent System Packages

```
$ conda install jupyter_core
```

```
$ sudo emerge dev-python/jupyter_core
```

```
$ sudo port install py-jupyter_core
```

```
$ sudo zypper install python3\${PYTHON_MINOR}\-jupyter-core
```

```
$ sudo xbps-install python3-jupyter_core
```

See <https://repology.org/project/jupyter-core/versions>, <https://repology.org/project/python:jupyter-core/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.170 jupyter\_events: Jupyter Event System library

### Description

Jupyter Event System library

### License

BSD 3-Clause License

### Upstream Contact

<https://pypi.org/project/jupyter-events/>

### Type

standard

### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *jsonschema: Python implementation of JSON Schema*
- *python\_json\_logger: A python library adding a json log formatter*
- *pyyaml: YAML parser and emitter for Python*
- *referencing: JSON Referencing + Python*
- *rfc3339\_validator: A pure python RFC3339 validator*
- *rfc3986\_validator: Pure python rfc3986 validator*

### Version Information

package-version.txt:

```
0.6.3
```

install-requires.txt:

```
jupyter-events
```



## Equivalent System Packages

(none known)

### 6.1.171 jupyter\_jsmol: JSmol viewer widget for Jupyter

#### Description

JSmol viewer widget for Jupyter

#### License

MIT

#### Upstream Contact

<https://pypi.org/project/jupyter-jsmol/>

#### Type

standard

#### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *ipywidgets: Interactive HTML widgets for Jupyter notebooks and the IPython kernel*

#### Version Information

package-version.txt:

```
2022.1.0
```

install-requires.txt:

```
jupyter-jsmol
```

### Equivalent System Packages

```
$ sudo pacman -S jupyter-ismol
```

```
$ conda install jupyter-ismol
```

```
$ sudo pkg install science/py-jupyter_ismol
```

See <https://repology.org/project/jupyter-ismol/versions>, <https://repology.org/project/python:jupyter-ismol/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

### 6.1.172 jupyter\_lsp: Multi-Language Server WebSocket proxy for Jupyter Notebook/Lab server

#### Description

Multi-Language Server WebSocket proxy for Jupyter Notebook/Lab server

#### License

BSD-3-Clause

#### Upstream Contact

<https://pypi.org/project/jupyter-lsp/>

#### Type

standard

#### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *jupyter\_server: The backend (core services, APIs, REST endpoints) to Jupyter web applications*

#### Version Information

package-version.txt:

```
2.2.0
```

install-requires.txt:

```
jupyter-lsp
```

## Equivalent System Packages

(none known)

### 6.1.173 jupyter\_server: The backend (core services, APIs, REST endpoints) to Jupyter web applications

#### Description

The backend, i.e., core services, APIs, and REST endpoints, to Jupyter web applications.

#### License

BSD 3-Clause License

#### Upstream Contact

<https://pypi.org/project/jupyter-server/>

#### Type

standard

#### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *anyio*: High level compatibility layer for multiple asynchronous event loop implementations
- *argon2\_cffi*: The secure Argon2 password hashing algorithm
- *jinja2*: General purpose template engine for Python
- *jupyter\_client*: Jupyter protocol implementation and client libraries
- *jupyter\_core*: Jupyter core package
- *jupyter\_events*: Jupyter Event System library
- *jupyter\_server\_terminals*: A Jupyter Server Extension Providing Terminals
- *nbconvert*: Converting Jupyter Notebooks
- *nbformat*: The Jupyter Notebook format
- *overrides*: A decorator to automatically detect mismatch when overriding a method.
- *platformdirs*: A small Python module for determining appropriate platform-specific dirs, e.g. a “user data dir”.
- *prometheus\_client*: Python client for the systems monitoring and alerting toolkit Prometheus
- *pyzmq*: Python bindings for the zeromq networking library
- *send2trash*: Send file to trash natively under Mac OS X, Windows and Linux

- *terminado*: Tornado websocket backend for the term.js Javascript terminal emulator library
- *tornado*: Python web framework and asynchronous networking library
- *traitlets*: Traitlets Python configuration system
- *websocket\_client*: WebSocket client for Python with low level API options

### Version Information

package-version.txt:

```
2.7.3
```

install-requires.txt:

```
jupyter-server
```

### Equivalent System Packages

(none known)

## 6.1.174 jupyter\_server\_terminals: A Jupyter Server Extension Providing Terminals

### Description

A Jupyter Server Extension Providing Terminals.

### License

Modified BSD License (also known as New or Revised or 3-Clause BSD)

### Upstream Contact

<https://pypi.org/project/jupyter-server-terminals/>

### Type

standard

### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *terminado*: Tornado websocket backend for the term.js Javascript terminal emulator library

## Version Information

package-version.txt:

```
0.4.4
```

install-requires.txt:

```
jupyter-server-terminals
```

## Equivalent System Packages

(none known)

## 6.1.175 jupyter\_sphinx: Jupyter Sphinx Extension

### Description

Jupyter Sphinx Extension

### License

BSD

### Upstream Contact

<https://pypi.org/project/jupyter-sphinx/>

### Type

standard

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *ipython*: Interactive computing environment with an enhanced interactive Python shell
- *ipywidgets*: Interactive HTML widgets for Jupyter notebooks and the IPython kernel
- *nbconvert*: Converting Jupyter Notebooks
- *nbformat*: The Jupyter Notebook format
- *sphinx*: Python documentation generator

### Version Information

package-version.txt:

```
0.4.0.p0
```

install-requires.txt:

```
jupyter-sphinx
```

### Equivalent System Packages

```
$ sudo pacman -S python-jupyter-sphinx
```

```
$ conda install jupyter_sphinx
```

```
$ sudo yum install python-jupyter-sphinx
```

```
$ sudo pkg install textproc/py-jupyter_sphinx
```

```
$ sudo port install py-jupyter_sphinx
```

```
$ sudo zypper install python-jupyter-sphinx
```

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.176 jupyterlab: JupyterLab computational environment

### Description

JupyterLab computational environment

### License

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Semver File License: The semver.py file is from <https://github.com/podhmo/python-semver> which is licensed under the “MIT” license. See the semver.py file for details.

## Upstream Contact

<https://pypi.org/project/jupyterlab/>

## Type

standard

## Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *async\_lru*: Simple LRU cache for asyncio
- *httpx*: The next generation HTTP client.
- *importlib\_metadata*: Library to access the metadata for a Python package
- *ipykernel*: IPython Kernel for Jupyter
- *jinja2*: General purpose template engine for Python
- *jupyter\_core*: Jupyter core package
- *jupyter\_lsp*: Multi-Language Server WebSocket proxy for Jupyter Notebook/Lab server
- *jupyter\_server*: The backend (core services, APIs, REST endpoints) to Jupyter web applications
- *jupyterlab\_server*: A set of server components for JupyterLab and JupyterLab like applications.
- *notebook\_shim*: A shim layer for notebook traits and config
- *packaging*: Core utilities for Python packages
- *tomli*: A lil' TOML parser
- *tornado*: Python web framework and asynchronous networking library
- *traitlets*: Traitlets Python configuration system

## Version Information

package-version.txt:

4.1.3

install-requires.txt:

jupyterlab

### Equivalent System Packages

```
$ conda install jupyterlab
```

```
$ brew install jupyterlab
```

```
$ sudo port install py-jupyterlab
```

```
$ sudo xbps-install jupyterlab
```

See <https://repology.org/project/jupyterlab/versions>, <https://repology.org/project/python:jupyterlab/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

### 6.1.177 jupyterlab\_mathjax2: A MathJax Typesetting provider for JupyterLab 4 and above

#### Description

A MathJax Typesetting provider for JupyterLab 4 and above

#### License

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#### Upstream Contact

<https://pypi.org/project/jupyterlab-mathjax2/>



## Type

standard

## Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

## Version Information

package-version.txt:

```
4.0.0
```

install-requires.txt:

```
jupyterlab-mathjax2
```

## Equivalent System Packages

(none known)

## 6.1.178 jupyterlab\_pygments: Pygments theme using JupyterLab CSS variables

### Description

Pygments theme using JupyterLab CSS variables

### License

BSD

### Upstream Contact

<https://pypi.org/project/jupyterlab-pygments/>

## Type

standard

### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *pygments: Generic syntax highlighter*

### Version Information

package-version.txt:

```
0.2.2
```

install-requires.txt:

```
jupyterlab-pygments
```

### Equivalent System Packages

```
$ conda install jupyterlab_pygments
```

```
$ sudo emerge dev-python/jupyterlab_pygments
```

```
$ sudo xbps-install python3-jupyterlab_pygments
```

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.179 jupyterlab\_server: A set of server components for JupyterLab and JupyterLab like applications.

### Description

A set of server components for JupyterLab and JupyterLab like applications.

### License

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CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

## Upstream Contact

<https://pypi.org/project/jupyterlab-server/>

## Type

standard

## Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *babel*: Internationalization utilities
- *json5*: A Python implementation of the JSON5 data format.
- *jsonschema*: Python implementation of JSON Schema
- *jupyter\_events*: Jupyter Event System library
- *jupyter\_server*: The backend (core services, APIs, REST endpoints) to Jupyter web applications
- *requests*: An HTTP library for Python

## Version Information

package-version.txt:

```
2.24.0
```

install-requires.txt:

```
jupyterlab-server
```

## Equivalent System Packages

(none known)

## 6.1.180 jupyterlab\_widgets: Jupyter interactive widgets for JupyterLab

### Description

Jupyter interactive widgets for JupyterLab

### License

BSD-3-Clause

### Upstream Contact

<https://pypi.org/project/jupyterlab-widgets/>

### Type

standard

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

### Version Information

package-version.txt:

```
3.0.9
```

install-requires.txt:

```
jupyterlab-widgets
```

### Equivalent System Packages

```
$ sudo pacman -S jupyterlab-widgets
```

```
$ sudo pkg install devel/py-jupyterlab-widgets
```

```
$ sudo port install py-jupyterlab_widgets
```

```
$ sudo zypper install python3${PYTHON_MINOR}-jupyterlab-widgets
```

See <https://repology.org/project/jupyterlab-widgets/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

### 6.1.181 kenzo: Construct topological spaces and compute homology groups

#### Description

Kenzo is a package to compute properties (mainly homology groups) of topological spaces. It allows defining spaces created from others by constructions like loop spaces, classifying spaces and so on.

#### License

GPL

#### Upstream Contact

- <https://github.com/gheber/kenzo>
- <https://github.com/miguelmarco/kenzo/>

#### Type

optional

#### Dependencies

- *ecl*: An implementation of the Common Lisp language

#### Version Information

package-version.txt:

```
1.1.10
```

#### Equivalent System Packages

See <https://repology.org/project/kenzo/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

### 6.1.182 kissat: SAT solver

#### Description

From the package README:

```
KISSAT is a "keep it simple and clean bare metal SAT solver" written in C.
It is a port of CaDiCaL back to C with improved data structures, better
scheduling of inprocessing and optimized algorithms and implementation.
```

```
Coincidentally 'kissat' also means 'cats' in Finnish.
```

From the website:

The Kissat SAT solver is a condensed and improved reimplementation of CaDiCaL in C.

Kissat won first place in the main track of the SAT Competition 2020 and first place on unsatisfiable instances.

### License

MIT license.

### Upstream Contact

Website: <http://fmv.jku.at/kissat/>

### Type

optional

### Dependencies

### Version Information

package-version.txt:

```
3.1.0
```

### Equivalent System Packages

```
$ sudo yum install kissat
```

```
$ sudo emerge sci-mathematics/kissat
```

```
$ nix-env --install kissat
```

See <https://repology.org/project/kissat/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

### 6.1.183 kiwisolver: An implementation of the Cassowary constraint solving algorithm

#### Description

From <https://pypi.org/project/kiwisolver/>

A fast implementation of the Cassowary constraint solver

Kiwi is an efficient C++ implementation of the Cassowary constraint solving algorithm. Kiwi is an implementation of the algorithm based on the seminal Cassowary paper. It is not a refactoring of the original C++ solver. Kiwi has been designed from the ground up to be lightweight and fast. Kiwi ranges from 10x to 500x faster than the original Cassowary solver with typical use cases gaining a 40x improvement. Memory savings are consistently > 5x.

In addition to the C++ solver, Kiwi ships with hand-rolled Python bindings.

#### License

Modified BSD License

#### Upstream Contact

<https://github.com/nucleic/kiwi>

#### Type

standard

#### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *cppy: C++ headers for C extension development*

#### Version Information

package-version.txt:

```
1.4.5
```

install-requires.txt:

```
kiwisolver >=1.0.1
```

### Equivalent System Packages

```
$ conda install kiwisolver
```

```
$ sudo emerge dev-python/kiwisolver
```

```
$ sudo port install py-kiwisolver
```

```
$ sudo xbps-install python3-kiwisolver
```

See <https://repology.org/project/python:kiwisolver/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

### 6.1.184 `latte_int`: Count lattice points, compute volumes, and integrate over convex polytopes

#### Description

LattE (Lattice point Enumeration) Integrale solves the problems of counting lattice points in and integration over convex polytopes.

#### License

GPLv2

#### Upstream Contact

Matthias Köppe, UC Davis, CA, USA

#### Type

optional

#### Dependencies

- `$(MP_LIBRARY)`
- *4ti2: Algebraic, geometric and combinatorial problems on linear spaces*
- *cddlib: Double description method for polyhedral representation conversion*
- *lidia: A library for computational number theory*
- *ntl: A library for doing number theory*



## Version Information

package-version.txt:

```
1.7.6
```

## Equivalent System Packages

```
$ sudo pacman -S latte-integrale
```

```
$ conda install latte-integrale
```

```
$ sudo zypper install latte
```

See <https://repology.org/project/latte-integrale/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.185 lcalc: L-function calculator

### Description

Michael Rubinstein's L-function calculator.

### License

- LGPL V2+

### Upstream contact

Michael Rubinstein <[mrubinst@uwaterloo.ca](mailto:mrubinst@uwaterloo.ca)>

Sources: [http://oto.math.uwaterloo.ca/~mrubinst/L\\_function\\_public/L.html](http://oto.math.uwaterloo.ca/~mrubinst/L_function_public/L.html)

Newer beta version 1.3 (not yet in Sage): <http://code.google.com/p/l-calc/>

### Dependencies

- GMP/MPFR
- MPFR
- PARI
- GNU patch

## Special Update/Build Instructions

- There is some garbage in the upstream sources which should be removed:

```
src/include/.Lexplicit_formula.h.swp
src/include/.Lvalue.h.swp
src/include/._.DS_Store
src/include/.DS_Store
src/include/Lexplicit_formula.h.swap.crap
src/include/Lvalue.h.bak
src/src/Makefile.old
src/src/.Makefile.old.swp
src/src/._.DS_Store
src/src/.DS_Store
src/src/.Lcommandline.ggo.swp
src/src/libLfunction.a
```

- We (and apparently also upstream) currently don't build Lcalc's tests (see Makefile), hence there's no spkg-check. This might change in newer upstream versions.
- The original Makefile uses \$(CC) to compile C++ (also using \$(CCFLAGS)), which it defines to 'g++', and hard-codes 'g++' when linking the shared library. (It should use \$(CXX) instead, which might \*default\* to 'g++'.) We now (lcalc-1.23.p10) patch the Makefile also to use \$(CXX) for compiling and linking C++; \$(CXX) now \*defaults\* to 'g++', and \$(CC) to 'gcc', but both can be overridden by simply setting their respective environment variables. (Same for \$(INSTALL\_DIR) btw.)

## Patches

- Makefile.patch:

We change a lot there, since Lcalc doesn't have a 'configure' script, and hence the Makefile is supposed to be edited to customize Lcalc (build options, locations of headers and libraries etc.). Besides that, we

- put CXXFLAGS into Lcalc's "CCFLAGS" used for compiling C++,
- remove some stuff involving LDFLAGS1 and LDFLAGS2, setting just LDFLAGS,
- use \$(MAKE) instead of 'make' in the crude build receipts,
- use CXXFLAG64 when linking the shared library,
- now use \$(CXX) for compiling and linking C++, which \*defaults\* to 'g++', but can be overridden by setting the environment variable of the same name. (\$(CC) now \*defaults\* to 'gcc', although currently not really used as far as I can see.)
- \$(INSTALL\_DIR) can now be overridden by simply setting the environment variable of the same name.

- Lcommon.h.patch:

Uncomment the definition of lcalc\_to\_double(const long double& x). (Necessary for GCC >= 4.6.0, cf. #10892.) Comment from there: The reason is the following code horror from src/src/include/Lcommon.h: [...] But somebody who is familiar with the codebase should really rewrite lcalc to not redefine the double() cast, thats just fragile and will sooner or later again fail inside some system headers.

- pari-2.7.patch:

Various changes to port to newer versions of PARI.

- time.h.patch:

(Patches `src/include/Lcommandline_numbertheory.h`) Include also `<time.h>` in `Lcommandline_numbertheory.h` (at least required on Cygwin, cf. #9845). This should get reported upstream.

- `lcalc-1.23_default_parameters_1.patch`: Make `Lcalc` (1.23) build with GCC 4.9

## Type

standard

## Dependencies

- *gengetopt*: *getopt\_long* parser generator
- *pari*: *Computer algebra system for fast computations in number theory*

## Version Information

package-version.txt:

```
2.0.5
```

## Equivalent System Packages

```
$ sudo pacman -S lcalc
```

```
$ conda install lcalc
```

```
$ sudo apt-get install lcalc liblfunction-dev
```

```
$ sudo yum install L-function-devel L-function
```

```
$ sudo pkg install math/lcalc
```

```
$ sudo emerge sci-mathematics/lcalc
```

```
$ nix-env --install lcalc
```

```
$ sudo xbps-install lcalc-devel
```

See <https://repology.org/project/lcalc/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.186 libatomic\_ops: Access hardware-provided atomic memory update operations

### Description

This package provides semi-portable access to hardware-provided atomic memory update operations on a number of architectures.

### License

- MIT + GPL 2.0+

### Upstream Contact

[https://github.com/ivmai/libatomic\\_ops/](https://github.com/ivmai/libatomic_ops/)

### Special Update/Build Instructions

None.

### Type

standard

### Dependencies

### Version Information

package-version.txt:

```
7.8.0
```

### Equivalent System Packages

```
$ apk add libatomic_ops-dev
```

```
$ sudo pacman -S libatomic_ops
```

```
$ conda install libatomic_ops
```

```
$ apt-cyg install libatomic_ops-devel
```

```
$ sudo apt-get install libatomic-ops-dev
```

```
$ sudo yum install libatomic_ops libatomic_ops-devel
```

```
$ sudo pkg install devel/libatomic_ops
```

```
$ sudo emerge dev-libs/libatomic_ops
```

```
$ brew install libatomic_ops
```

```
$ sudo port install libatomic_ops
```

```
$ sudo zypper install pkgconfig\ (atomic_ops\)
```

```
$ sudo slackpkg install libatomic_ops
```

```
$ sudo xbps-install libatomic_ops-devel
```

See <https://repology.org/project/libatomic-ops/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.187 libbraiding: Computing with braids

### Description

libbraiding is a library to compute several properties of braids, including centralizer and conjugacy check.

### License

GPLv3+

### SPKG Maintainers

- Miguel Marco

### Upstream Contact

Miguel Marco ([mmarco@unizar.es](mailto:mmarco@unizar.es))

### Type

standard

### Dependencies

#### Version Information

package-version.txt:

```
1.2
```

#### Equivalent System Packages

```
$ sudo pacman -S libbraiding
```

```
$ conda install libbraiding
```

```
$ sudo apt-get install libbraiding-dev
```

```
$ sudo yum install libbraiding
```

```
$ sudo pkg install math/libbraiding
```

```
$ sudo emerge sci-libs/libbraiding
```

```
$ nix-env --install libbraiding
```

```
$ sudo zypper install libbraiding-devel
```

```
$ sudo xbps-install libbraiding-devel
```

See <https://repology.org/project/libbraiding/versions>

If the system package is installed, `./configure` will check if it can be used.

### 6.1.188 libffi: A portable foreign-function interface library

#### Description

Compilers for high level languages generate code that follow certain conventions. These conventions are necessary, in part, for separate compilation to work. One such convention is the “calling convention”. The “calling convention” is essentially a set of assumptions made by the compiler about where function arguments will be found on entry to a function. A “calling convention” also specifies where the return value for a function is found.

Some programs may not know at the time of compilation what arguments are to be passed to a function. For instance, an interpreter may be told at run-time about the number and types of arguments used to call a given function. Libffi can be used in such programs to provide a bridge from the interpreter program to compiled code.

The libffi library provides a portable, high level programming interface to various calling conventions. This allows a programmer to call any function specified by a call interface description at run time.

FFI stands for Foreign Function Interface. A foreign function interface is the popular name for the interface that allows code written in one language to call code written in another language. The libffi library really only provides the lowest, machine dependent layer of a fully featured foreign function interface. A layer must exist above libffi that handles type conversions for values passed between the two languages.

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## Upstream Contact

- <https://sourceware.org/libffi/>
- <https://github.com/libffi/libffi>

## Type

standard

## Dependencies

### Version Information

package-version.txt:

```
3.2.1
```

## Equivalent System Packages

```
$ apk add libffi-dev
```

```
$ conda install libffi
```

```
$ apt-cyg install libffi-devel
```

```
$ sudo apt-get install libffi-dev
```

```
$ sudo yum install libffi libffi-devel
```

```
$ sudo pkg install devel/libffi
```

```
$ brew install libffi
```

```
$ sudo port install libffi
```

```
$ sudo zypper install pkgconfig\ (libffi\)
```

```
$ sudo slackpkg install libffi
```

```
$ sudo xbps-install libffi-devel
```

See <https://repology.org/project/libffi/versions>

If the system package is installed, `./configure` will check if it can be used.

### 6.1.189 libgd: Dynamic graphics generation tool

#### Description

GD is an open source code library for the dynamic creation of images by programmers. GD is written in C, and “wrappers” are available for Perl, PHP and other languages. GD creates PNG, JPEG, GIF, WebP, XPM, BMP images, among other formats. GD is commonly used to generate charts, graphics, thumbnails, and most anything else, on the fly. While not restricted to use on the web, the most common applications of GD involve website development.

#### License

- Custom (BSD-ish)

#### Upstream Contact

- <https://libgd.github.io>
- Pierre Joye (<http://blog.thepimp.net>)
- <https://github.com/libgd/libgd>

#### Type

standard

#### Dependencies

- *libpng: Bitmap image support*
- *xz: General-purpose data compression software*



## Version Information

package-version.txt:

```
2.3.3
```

## Equivalent System Packages

```
$ apk add gd-dev
```

```
$ sudo pacman -S gd
```

```
$ conda install libgd
```

```
$ apt-cyg install libgd-devel
```

```
$ sudo apt-get install libgd-dev
```

```
$ sudo yum install gd gd-devel
```

```
$ sudo pkg install graphics/gd
```

```
$ sudo emerge media-libs/gd
```

```
$ brew install gd
```

No package needed.

```
$ nix-env --install gd
```

```
$ sudo zypper install gd pkgconfig\ (gdlib\)
```

```
$ sudo slackpkg install gd fontconfig libXpm libX11 libxcb libXau \
libXdmcp
```

```
$ sudo xbps-install gd-devel
```

See <https://repology.org/project/gd/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.190 libgraphviz: Graph visualization software (callable library)

### Description

Graphviz is open source graph visualization software. It has several main graph layout programs. They take descriptions of graphs in a simple text language, and make diagrams in several useful formats.

This script package represents the callable library.

### License

Eclipse Public License 1.0

### Upstream Contact

<https://graphviz.org/about/>

### Type

optional

### Dependencies

### Version Information

### Equivalent System Packages

```
$ apk add graphviz-dev
```

```
$ sudo pacman -S graphviz
```

```
$ conda install graphviz
```

```
$ apt-cyg install graphviz
```

```
$ sudo apt-get install libgraphviz-dev
```

```
$ sudo yum install graphviz
```

```
$ sudo pkg install graphics/graphviz
```

```
$ brew install graphviz
```

```
$ sudo port install graphviz
```

```
$ nix-env --install graphviz
```

```
$ sudo zypper install graphviz
```

```
$ sudo xbps-install graphviz
```

See <https://repology.org/project/graphviz/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.191 libhomfly: Compute the homfly polynomial of knots and links

### Description

libhomfly is a library to compute the homfly polynomial of knots and links.

### License

Public domain

### SPKG Maintainers

- Miguel Marco

### Upstream Contact

Miguel Marco ([mmarco@unizar.es](mailto:mmarco@unizar.es))

### Type

standard

### Dependencies

- *gc: The Boehm-Demers-Weiser conservative garbage collector*

### Version Information

package-version.txt:

```
1.02r6
```

### Equivalent System Packages

```
$ sudo pacman -S libhomfly
```

```
$ conda install libhomfly
```

```
$ sudo apt-get install libhomfly-dev
```

```
$ sudo yum install libhomfly-devel
```

```
$ sudo pkg install math/libhomfly
```

```
$ sudo emerge sci-libs/libhomfly
```

```
$ nix-env --install libhomfly
```

```
$ sudo zypper install libhomfly-devel
```

```
$ sudo xbps-install libhomfly-devel
```

See <https://repology.org/project/libhomfly/versions>, <https://repology.org/project/libhomfly/versions>

If the system package is installed, `./configure` will check if it can be used.

### 6.1.192 libjpeg: JPEG image support

#### Description

This dummy package represents the image library `libjpeg`.

We do not have an SPKG for it. The purpose of this dummy package is to associate system package lists with it.

If the system package is installed, the package `pillow` will include support for JPEG images.

#### Type

optional

#### Dependencies

#### Version Information

#### Equivalent System Packages

```
$ apk add libjpeg-turbo-dev
```

```
$ sudo pacman -S libjpeg-turbo
```

```
$ sudo apt-get install libjpeg-dev
```

```
$ sudo yum install libjpeg-turbo-devel
```

```
$ sudo emerge media-libs/libjpeg-turbo
```

```
$ brew install jpeg-turbo
```

```
$ nix-env --install libjpeg-turbo
```

```
$ sudo zypper install libjpeg-devel
```

```
$ sudo slackpkg install libjpeg-turbo
```

```
$ sudo xbps-install libjpeg-turbo-devel
```

If the system package is installed, `./configure` will check if it can be used.

### 6.1.193 liblzma: General-purpose data compression software

#### Description

This packages represents liblzma, a part of XZ Utils, the free general-purpose data compression software with a high compression ratio.

#### License

Some parts public domain, other parts GNU LGPLv2.1, GNU GPLv2, or GNU GPLv3.

#### Upstream Contact

<http://tukaani.org/xz/>

#### Type

standard

#### Dependencies

#### Version Information

package-version.txt:

```
5.2.5
```

#### Equivalent System Packages

```
$ apk add xz-dev
```

```
$ conda install xz
```

```
$ apt-cyg install xz liblzma-devel
```

```
$ sudo apt-get install xz-utils liblzma-dev
```

```
$ sudo yum install xz xz-devel
```

```
$ brew install xz
```

```
$ sudo port install xz
```

```
$ sudo zypper install xz pkgconfig\liblzma\
```

```
$ sudo slackpkg install xz
```

```
$ sudo xbps-install xz liblzma-devel
```

See <https://repology.org/project/xz/versions>

If the system package is installed, `./configure` will check if it can be used.

### 6.1.194 libnauty: Find automorphism groups of graphs, generate non-isomorphic graphs (callable library)

#### Description

Nauty has various tools for finding the automorphism group of a graph, generating non-isomorphic graphs with certain properties, etc.

This script package represents the callable library of nauty.

#### License

Since version 2.6, nauty license is GPL-compatible, see

<http://users.cecs.anu.edu.au/~bdm/nauty/COPYRIGHT.txt>

(a copy of this file, called COPYRIGHT, is also present in the tarball)

#### Special Packaging Instruction

Upstream distribute tarball named `nauty${version}.tar.gz`. We cannot deal with that so rename it `nauty-${version}.tar.gz` (notice the “-”) without any changes.

#### Upstream Contact

Brendan D. McKay Computer Science Department Australian National University [bdm@cs.anu.edu.au](mailto:bdm@cs.anu.edu.au)

Adolfo Piperno Dipartimento di Informatica Sapienza - Università di Roma [piperno@di.uniroma1.it](mailto:piperno@di.uniroma1.it)

See <http://cs.anu.edu.au/~bdm/nauty/> or <http://pallini.di.uniroma1.it/>

## Type

optional

## Dependencies

## Version Information

## Equivalent System Packages

```
$ sudo apt-get install libnauty-dev
```

```
$ sudo yum install libnauty-devel
```

```
$ brew install nauty
```

```
$ sudo port install nauty
```

```
$ sudo xbps-install nauty-devel
```

See <https://repology.org/project/nauty/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.195 libogg: Library for the Ogg multimedia container format

### Description

libogg is the official reference library for the Ogg multimedia container format, and the native file and stream format for the Xiph.org multimedia codecs. As with all Xiph.org technology is it an open format free for anyone to use.

Website: <http://www.xiph.org/ogg>

### License

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### Upstream Contact

The Xiph.org mailing lists - see <http://lists.xiph.org/mailman/listinfo>

### Special Update/Build Instructions

- No changes went into src.

### Type

optional

### Dependencies

### Version Information

package-version.txt:

```
1.3.1.p0
```

### Equivalent System Packages

```
$ conda install libogg
```

```
$ brew install libogg
```

```
$ sudo port install libogg
```

```
$ sudo zypper install pkgconfig\ogg\
```

```
$ sudo xbps-install libogg-devel
```

See <https://repology.org/project/libogg/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.



## 6.1.196 libpng: Bitmap image support

### Description

libpng is the official PNG reference library. It supports almost all PNG features, is extensible, and has been extensively tested for over 13 years. The home site for development versions (i.e., may be buggy or subject to change or include experimental features) is <http://libpng.sourceforge.net/>, and the place to go for questions about the library is the [png-mng-implement](#) mailing list.

Website: <http://www.libpng.org/pub/png/libpng.html>

### License

The libpng license - see <http://www.libpng.org/pub/png/src/libpng-LICENSE.txt>

### Upstream Contact

<https://libpng.sourceforge.io>

The png mailing lists - see <http://www.libpng.org/pub/png/pngmisc.html#lists>

### Special Update/Build Instructions

- On old versions of Darwin, the symbolic links `libpng.*` created by `libpng16` may interfere with a system-wide `libPng.dylib`.

– the following is very likely to be obsolete in 2014 —

This system-wide library is likely to be a different version and on top of that, the symbols exported there are prefixed with “\_cg” (for “Core Graphics”). So even if by chance the functionalities of the two libraries were interchangeable, libraries or applications looking for one and being presented the other won’t find the symbols they expect. Note the uppercase “P” which could prevent this conflict; unfortunately, the default filesystem used by Apple is case-insensitive.

Note there would be no problem if the system-wide library was not looked for when Sage is being built or run, but that’s not the case either; it is at least looked for by the “ImageIO” framework:

- when Python is built with Mac OS extensions, fixed in #4008;
- when Mercurial is built because it uses `$EDITOR`, cf. #4678;
- when R is built and it finds `-lpng`, cf. #4409 and #11696.

– this is no longer done, as of #27186 —

As not all of these problems are easily dealt with and new ones may arise, we chose to delete the `$SAGE_LOCAL/lib/libpng.*` symlinks. Therefore, some packages like Tachyon, which by default look for `-lpng` are patched to look for `-lpng16` instead.

### Type

standard

### Dependencies

- *zlib*: Data compression library

### Version Information

package-version.txt:

```
1.6.29.p1
```

### Equivalent System Packages

```
$ apk add libpng-dev
```

```
$ conda install libpng
```

```
$ sudo pkg install graphics/png
```

```
$ brew install libpng
```

```
$ sudo port install libpng
```

```
$ sudo zypper install pkgconfig\libpng16\
```

```
$ sudo slackpkg install libpng
```

```
$ sudo xbps-install libpng-devel
```

See <https://repology.org/project/libpng/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.197 libsemigroups: Library for semigroups and monoids

### Description

C++ library for semigroups and monoids; used in GAP's package Semigroups.

## License

GPL-3.0

## Upstream Contact

<http://james-d-mitchell.github.io/libsemigroups> <https://github.com/james-d-mitchell/libsemigroups>

## Type

optional

## Dependencies

## Version Information

package-version.txt:

```
2.3.2
```

## Equivalent System Packages

```
$ conda install libsemigroups
```

```
$ sudo pkg install math/libsemigroups
```

```
$ sudo zypper install pkgconfig\ (libsemigroups\)
```

See <https://repology.org/project/libsemigroups/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.198 libtheora: Library for the Theora video codec

### Description

libtheora is the official reference library for the Theora video codec. Theora is a free and open video compression format from the Xiph.org Foundation.

Website: <http://www.xiph.org/theora>

### License

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### Upstream Contact

The Xiph.org mailing lists - see <http://lists.xiph.org/mailman/listinfo>

### Special Update/Build Instructions

- No changes went into src.

### Type

experimental

### Dependencies

- *libogg*: Library for the Ogg multimedia container format
- *libpng*: Bitmap image support

## Version Information

package-version.txt:

```
1.1.1
```

## Equivalent System Packages

```
$ conda install libtheora
```

```
$ brew install theora
```

```
$ sudo port install libtheora
```

```
$ sudo zypper install pkgconfig\theora\
```

```
$ sudo xbps-install libtheora-devel
```

See <https://repology.org/project/libtheora/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.199 libxml2: XML parser and toolkit

### Description

XML C parser and toolkit

### License

MIT

### Upstream Contact

<http://www.xmlsoft.org/index.html>

### Type

optional

### Dependencies

- *iconv*: Library for language/country-dependent character encodings
- *zlib*: Data compression library

### Version Information

### Equivalent System Packages

```
$ apk add libxml2-dev
```

```
$ sudo pacman -S libxml2
```

```
$ apt-cyg install libxml2-devel
```

```
$ sudo apt-get install libxml2-dev
```

```
$ sudo yum install libxml2-devel
```

```
$ sudo pkg install libxml2
```

```
$ sudo emerge dev-libs/libxml2
```

```
$ brew install libxml2
```

```
$ sudo port install py-libxml2
```

```
$ nix-env --install libxml2
```

```
$ sudo zypper install libxml2
```

```
$ sudo slackpkg install libxml2
```

```
$ sudo xbps-install libxml2-devel
```

See <https://repology.org/project/libxml2/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.200 lidia: A library for computational number theory

### Description

A library for computational number theory.

Abandoned upstream and has disappeared from the web at TU Darmstadt.

We use as our new upstream a version minimally maintained for the LattE project.

<https://www.math.ucdavis.edu/~latte/software/packages/lidia/current/lidia-2.3.0+latte-patches-2014-10-04.tar.gz>

## License

lidia is released under the GPL, or so it is claimed. See [https://groups.google.com/forum/#!msg/sage-devel/kTxgPSqrbUM/5Txj3\\_IKhlQJ](https://groups.google.com/forum/#!msg/sage-devel/kTxgPSqrbUM/5Txj3_IKhlQJ) and <https://lists.debian.org/debian-legal/2007/07/msg00120.html>

## Upstream Contact

Matthias Köppe, UC Davis, CA, USA

## Type

optional

## Dependencies

- \$(MP\_LIBRARY)

## Version Information

package-version.txt:

```
2.3.0+latte-patches-2019-05-02
```

## Equivalent System Packages

See <https://repology.org/project/lidia/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.201 lie: Library for the representation theory of complex semisimple Lie groups and algebras

### Description

LiE is the name of a software package that enables mathematicians and physicists to perform computations of a Lie group theoretic nature. It focuses on the representation theory of complex semisimple (reductive) Lie groups and algebras, and on the structure of their Weyl groups and root systems.

LiE does not compute directly with elements of the Lie groups and algebras themselves; it rather computes with weights, roots, characters and similar objects. Some specialities of LiE are: tensor product decompositions, branching to subgroups, Weyl group orbits, reduced elements in Weyl groups, distinguished coset representatives and much more. These operations have been compiled into the program which results in fast execution: typically one or two orders of magnitude faster than similar programs written in a general purpose program.

The LiE programming language makes it possible to customise and extend the package with more mathematical functions. A user manual is provided containing many examples.

LiE establishes an interactive environment from which commands can be given that involve basic programming primitives and powerful built-in functions. These commands are read by an interpreter built into the package and passed to the core of

the system. This core consists of programs representing some 100 mathematical functions. The interpreter offers on-line facilities which explain operations and functions, and which give background information about Lie group theoretical concepts and about currently valid definitions and values.

(from <http://www-math.univ-poitiers.fr/~maavl/LiE/description.html> )

### License

GNU Lesser General Public License (LGPL), version unspecified

### Upstream Contact

- Marc van Leeuwen, <http://www-math.univ-poitiers.fr/~maavl/>

### Dependencies

- readline
- ncurses
- bison (not included in this package or in Sage!)

### Type

experimental

### Dependencies

- *ncurses: Classic terminal output library*
- *readline: Command line editing library*

### Version Information

package-version.txt:

```
2.2.2
```

### Equivalent System Packages

```
$ sudo apt-get install lie
```

```
$ sudo emerge sci-mathematics/lie
```

```
$ sudo port install LiE
```

```
$ nix-env --install lie
```



```
$ sudo zypper install LiE
```

See <https://repology.org/project/lie/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

### 6.1.202 linbox: Linear algebra with dense, sparse, structured matrices over the integers and finite fields

#### Description

LinBox is a C++ template library for exact, high-performance linear algebra computation with dense, sparse, and structured matrices over the integers and over finite fields.

#### License

LGPL V2 or later

#### Upstream Contact

- <https://linalg.org/>
- [<linbox-devel@googlegroups.com>](mailto:linbox-devel@googlegroups.com)
- [<linbox-use@googlegroups.com>](mailto:linbox-use@googlegroups.com)

#### SPKG Repository

<https://bitbucket.org/malb/linbox-spkg>

#### Dependencies

- GNU patch
- GMP/MPFR
- MPFR
- NTL
- fpLLL
- IML
- M4RI
- M4RIE
- Givaro
- FFLAS/FFPACK
- a BLAS implementation such as openblas

### Special Update/Build Instructions

TODO:

- spkg-check is disabled for now, should work in the next release after 1.3.2.
- Check whether `make fullcheck` works/builds, is worth running, and doesn't take ages. (Version 1.1.6 doesn't seem to have such a target.)

### Type

standard

### Dependencies

- `$(MP_LIBRARY)`
- *fflas\_ffpack: Dense linear algebra over word-size finite fields*
- *flint: Fast Library for Number Theory*
- *givaro: C++ library for arithmetic and algebraic computations*
- *iml: Integer Matrix Library*
- *mpfr: Multiple-precision floating-point computations with correct rounding*
- *ntl: A library for doing number theory*

### Version Information

package-version.txt:

```
1.6.3.p1
```

### Equivalent System Packages

```
$ sudo pacman -S linbox
```

```
$ conda install linbox
```

```
$ sudo apt-get install liblinbox-dev
```

```
$ sudo yum install linbox
```

```
$ sudo pkg install math/linbox
```

```
$ sudo emerge sci-libs/linbox
```

```
$ nix-env --install linbox
```

```
$ sudo zypper install pkgconfig\ (linbox\)
```

```
$ sudo xbps-install linbox-devel
```

See <https://repology.org/project/linbox/versions>

If the system package is installed, `./configure` will check if it can be used.

### 6.1.203 llvm: The LLVM Compiler Infrastructure, including the Clang C/C++/Objective-C compiler

#### Description

The LLVM Project is a collection of modular and reusable compiler and toolchain technologies.

Clang is an “LLVM native” C/C++/Objective-C compiler.

The libc++ and libc++ ABI projects provide a standard conformant and high-performance implementation of the C++ Standard Library, including full support for C++11 and C++14.

#### License

Apache 2.0 License with LLVM exceptions

#### Upstream Contact

<https://llvm.org/>

#### Type

optional

#### Dependencies

#### Version Information

#### Equivalent System Packages

```
$ apk add clang
```

```
$ sudo pacman -S clang
```

```
$ apt-cyg install clang
```

```
$ sudo apt-get install clang
```

```
$ sudo yum install clang
```

```
$ sudo pkg install devel/llvm
```

```
$ sudo emerge sys-devel/clang
```

```
$ brew install llvm
```

```
$ sudo port install clang
```

```
$ nix-env --install clang
```

install the following packages: devel/llvm

```
$ sudo zypper install llvm
```

```
$ sudo slackpkg install llvm
```

```
$ sudo xbps-install clang
```

If the system package is installed, `./configure` will check if it can be used.

### 6.1.204 lrcalc: Littlewood-Richardson calculator

#### Description

Littlewood-Richardson Calculator

<http://sites.math.rutgers.edu/~asbuch/lrcalc/>

#### License

GNU General Public License V2+

#### Upstream Contact

Anders S. Buch ([asbuch@math.rutgers.edu](mailto:asbuch@math.rutgers.edu))

<https://bitbucket.org/asbuch/lrcalc>

#### Type

standard

#### Dependencies

#### Version Information

package-version.txt:

```
2.1
```

## Equivalent System Packages

```
$ sudo pacman -S lrcalc
```

```
$ conda install lrcalc
```

```
$ sudo apt-get install liblrcalc-dev
```

```
$ sudo yum install lrcalc-devel
```

```
$ sudo pkg install math/lrcalc
```

```
$ sudo emerge sci-mathematics/lrcalc
```

```
$ nix-env --install lrcalc
```

```
$ sudo xbps-install lrcalc-devel
```

See <https://repology.org/project/lrcalc/versions>

If the system package is installed, `./configure` will check if it can be used.

### 6.1.205 lrcalc\_python: Littlewood-Richardson calculator

#### Description

Python bindings for the Littlewood-Richardson Calculator

<http://sites.math.rutgers.edu/~asbuch/lrcalc/>

#### License

GNU General Public License V3

#### Upstream Contact

Anders S. Buch ([asbuch@math.rutgers.edu](mailto:asbuch@math.rutgers.edu))

<https://bitbucket.org/asbuch/lrcalc>

#### Type

standard

### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *cython: C-Extensions for Python, an optimizing static compiler*
- *lrcalc: Littlewood-Richardson calculator*

### Version Information

package-version.txt:

```
2.1
```

install-requires.txt:

```
lrcalc ~=2.1
```

### Equivalent System Packages

```
$ conda install python-lrcalc~=2.1
```

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.206 lrslib: Reverse search algorithm for vertex enumeration and convex hull problems

### Description

lrslib implements the linear reverse search algorithm of Avis and Fukuda.

See the homepage (<http://cgm.cs.mcgill.ca/~avis/C/lrs.html>) for details.

We use an autotoolized version from <https://github.com/mkoeppelrslib/tree/autoconfiscation>

### License

lrslib is released under a GPL v2+ license.

### Upstream Contact

David Avis, [avis at cs dot mcgill dot edu](mailto:avis@cs.mcgill.edu).

## Dependencies

To build and install the “plrs” binary, a multi-thread version of lrs, need to first install the full Boost package (“sage -i boost”).

If the package finds an MPI C++ compiler script (mpic++), it also builds and installs the “mplrs” binary, a distributed version of lrs using MPI.

(Sage currently does not make use of plrs and mplrs.)

## Special Update/Build Instructions

### Type

optional

### Dependencies

- \$(MP\_LIBRARY)

### Version Information

package-version.txt:

```
071b+autotools-2021-07-13
```

### Equivalent System Packages

```
$ sudo pacman -S lrs
```

```
$ conda install lrslib
```

```
$ sudo apt-get install lrslib
```

```
$ sudo yum install lrslib
```

```
$ sudo pkg install math/lrslib
```

```
$ sudo emerge sci-libs/lrslib
```

```
$ nix-env --install lrs
```

```
$ sudo zypper install lrslib lrslib-devel
```

See <https://repology.org/project/lrslib/versions>

If the system package is installed, ./configure will check if it can be used.

## 6.1.207 m4ri: fast arithmetic with dense matrices over GF(2)

### Description

M4RI: Library for matrix multiplication, reduction and inversion over GF(2). (See also m4ri/README for a brief overview.)

### License

- GNU General Public License Version 2 or later (see src/COPYING)

### Upstream Contact

- Authors: Martin Albrecht et al.
- Email: <m4ri-devel@googlegroups.com>
- Website: <https://bitbucket.org/malb/m4ri>

### Special Update/Build Instructions

- Delete the upstream Mercurial repositories (file m4ri/.hgtags, directory m4ri/.hg).
- Delete the directory m4ri/autom4te.cache (if present).
- Delete m4ri.vcproj (and perhaps other unnecessary baggage).
- Touch m4ri/configure to make sure it is newer than its sources.

### Type

standard

### Dependencies

- *libpng: Bitmap image support*

### Version Information

package-version.txt:

20200115



## Equivalent System Packages

```
$ sudo pacman -S m4ri
```

```
$ conda install m4ri
```

```
$ sudo apt-get install libm4ri-dev
```

```
$ sudo yum install m4ri-devel
```

```
$ sudo pkg install math/m4ri
```

```
$ sudo emerge sci-libs/m4ri\[png\]
```

```
$ nix-env --install m4ri
```

```
$ sudo zypper install pkgconfig\m4ri\
```

```
$ sudo xbps-install m4ri-devel
```

See <https://repology.org/project/libm4ri/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.208 m4rie: Arithmetic with dense matrices over $\text{GF}(2^e)$

### Description

M4RIE: Library for matrix multiplication, reduction and inversion over  $\text{GF}(2^k)$  for  $2 \leq k \leq 10$ .

### License

- GNU General Public License Version 2 or later (see `src/COPYING`)

### Upstream Contact

- Authors: Martin Albrecht
- Email: [<m4ri-devel@googlegroups.com>](mailto:m4ri-devel@googlegroups.com)
- Website: <http://m4ri.sagemath.org>

### Dependencies

- M4RI
- Givaro

### Type

standard

### Dependencies

- *m4ri: fast arithmetic with dense matrices over GF(2)*

### Version Information

package-version.txt:

```
20200115
```

### Equivalent System Packages

```
$ sudo pacman -S m4rie
```

```
$ conda install m4rie
```

```
$ sudo apt-get install libm4rie-dev
```

```
$ sudo yum install m4rie-devel
```

```
$ sudo pkg install math/m4rie
```

```
$ sudo emerge sci-libs/m4rie
```

```
$ nix-env --install m4rie
```

```
$ sudo zypper install pkgconfig\ (m4rie\)
```

```
$ sudo xbps-install m4rie-devel
```

See <https://repology.org/project/libm4rie/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.209 markupsafe: Safely add untrusted strings to HTML/XML markup

### Description

Implements a XML/HTML/XHTML Markup safe string for Python

### License

BSD-3-Clause

### Upstream Contact

<https://pypi.org/project/MarkupSafe/>

### Type

standard

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

### Version Information

package-version.txt:

```
2.1.4
```

install-requires.txt:

```
markupsafe >=2.0
```

### Equivalent System Packages

```
$ conda install markupsafe
```

```
$ sudo emerge dev-python/markupsafe
```

```
$ sudo port install py-markupsafe
```

```
$ sudo zypper install python3\${PYTHON_MINOR}-MarkupSafe
```

```
$ sudo xbps-install python3-MarkupSafe
```

See <https://repology.org/project/python:markupsafe/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

### 6.1.210 mathics: A general-purpose computer algebra system

#### Description

A general-purpose computer algebra system.

#### License

GPL

#### Upstream Contact

<https://pypi.org/project/Mathics3/>

#### Type

optional

#### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *mathics\_scanner*: Character Tables and Tokenizer for Mathics and the Wolfram Language.
- *palettable*: Color palettes for Python
- *pint*: Physical quantities module

#### Version Information

package-version.txt:

```
4.0.0
```

install-requires.txt:

```
Mathics3
```

#### Equivalent System Packages

```
$ conda install mathics3
```

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

### 6.1.211 mathics\_scanner: Character Tables and Tokenizer for Mathics and the Wolfram Language.

#### Description

Character Tables and Tokenizer for Mathics and the Wolfram Language.

#### License

GPL-3.0-only

#### Upstream Contact

<https://pypi.org/project/Mathics-Scanner/>

#### Type

optional

#### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

#### Version Information

package-version.txt:

```
1.2.4
```

install-requires.txt:

```
Mathics-Scanner
```

#### Equivalent System Packages

(none known)

### 6.1.212 mathjax: A JavaScript library for displaying mathematical formulas

#### Description

MathJax is a JavaScript library for displaying mathematical formulas.

MathJax is used in the Sage documentation built by Sphinx.

### License

Apache License, version 2.0

### Upstream Contact

Home page: <https://www.mathjax.org/>

### Type

standard

### Dependencies

### Version Information

package-version.txt:

```
3.2.0
```

### Equivalent System Packages

```
$ conda install mathjax
```

```
$ sudo emerge \>=dev-libs/mathjax-3
```

```
$ sudo zypper install mathjax
```

```
$ sudo xbps-install mathjax
```

See <https://repology.org/project/mathjax/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.213 matplotlib: Python 2D plotting library

### Description

From the Matplotlib website: matplotlib is a python 2D plotting library which produces publication quality figures in a variety of hardcopy formats and interactive environments across platforms. matplotlib can be used in python scripts, the python and ipython shell (ala matlab or mathematica), web application servers, and six graphical user interface toolkits.

## License

The Matplotlib license - see <http://matplotlib.sourceforge.net/users/license.html>: Matplotlib only uses BSD compatible code, and its license is based on the PSF license. See the Open Source Initiative licenses page for details on individual licenses. Non-BSD compatible licenses (eg LGPL) are acceptable in matplotlib Toolkits. For a discussion of the motivations behind the licencing choice, see Licenses.

## Upstream Contact

<https://matplotlib.org>

The matplotlib mailing lists: see <http://sourceforge.net/projects/matplotlib>

## Dependencies

- python
- numpy
- setuptools ( $\geq 0.7$ )
- freetype
- patch (used in spkg-install)
- dateutil
- pyparsing
- tornado
- kiwisolver

## Build Instructions/Changes

- NOTE: To drastically cut down on spkg size, we delete the internal testing images. To do this, we repackage the tarball by removing the contents of `lib/matplotlib/tests/baseline_images/*`, this is done by the `spkg-src` script.
- `setup.py.patch`: disable loading of Tests. Otherwise, `setup.py` raises an error because it can't find the deleted files from `src/lib/matplotlib/tests/baseline_images/*`
- NOTE: as of matplotlib-1.0.0 and Sage 4.6, Sage does not use `$HOME/.matplotlib` by default. Instead, it sets `MPLCONFIGDIR` to a subdirectory in `$DOT_SAGE`, see `src/bin/sage-env`

## Type

standard

### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *certifi*: Python package for providing Mozilla's CA Bundle
- *contourpy*: Python library for calculating contours of 2D quadrilateral grids
- *cycler*: Composable cycles
- *dateutil*: Extensions to the standard Python module *datetime*
- *fonttools*: Tools to manipulate font files
- *freetype*: A free, high-quality, and portable font engine
- *kiwisolver*: An implementation of the Cassowary constraint solving algorithm
- *numpy*: Package for scientific computing with Python
- *pillow*: Python Imaging Library
- *pyparsing*: A Python parsing module
- *qhull*: Compute convex hulls, Delaunay triangulations, Voronoi diagrams
- *setuptools\_scm*: Python build system extension to obtain package version from version control
- *tornado*: Python web framework and asynchronous networking library

### Version Information

package-version.txt:

```
3.8.0
```

install-requires.txt:

```
Issue #33642: Set lower bound for use of matplotlib color maps introduced in #33491,
and to suppress deprecation warnings (https://github.com/matplotlib/matplotlib/pull/
↪21073)
matplotlib >=3.5.1
```

### Equivalent System Packages

```
$ sudo pacman -S python-matplotlib
```

```
$ conda install matplotlib\>=3.5.1
```

```
$ sudo apt-get install python3-matplotlib
```

```
$ sudo yum install python-matplotlib
```

```
$ sudo emerge dev-python/matplotlib
```



```
$ sudo port install py-matplotlib
```

```
$ sudo zypper install python3\${PYTHON_MINOR}\-matplotlib
```

```
$ sudo xbps-install python3-matplotlib
```

See <https://repology.org/project/python:matplotlib/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

### 6.1.214 matplotlib\_inline: Inline Matplotlib backend for Jupyter

#### Description

Inline Matplotlib backend for Jupyter

#### License

BSD 3-Clause

#### Upstream Contact

<https://pypi.org/project/matplotlib-inline/>

#### Type

standard

#### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *traitlets: Traitlets Python configuration system*

#### Version Information

package-version.txt:

```
0.1.6
```

install-requires.txt:

```
matplotlib-inline
```

### Equivalent System Packages

```
$ conda install matplotlib-inline
```

```
$ sudo emerge dev-python/matplotlib-inline
```

```
$ sudo xbps-install python3-matplotlib-inline
```

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

### 6.1.215 `matroid_database`: Python interface to matroid database

#### Description

Python interface to matroid database.

This database was retrieved from <https://www-imai.is.s.u-tokyo.ac.jp/~ymatsu/matroid/index.html> (Yoshitake Matsumoto, Database of Matroids, 2012; accessed: 2023.12.02).

#### License

GPL version 3 or later

#### Upstream Contact

<https://pypi.org/project/matroid-database>

<https://github.com/gmou3/matroid-database>

#### Type

optional

#### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`

#### Version Information

package-version.txt:

```
0.2
```

install-requires.txt:

```
matroid-database
```

## Equivalent System Packages

(none known)

### 6.1.216 maxima: System for manipulating symbolic and numerical expressions

#### Description

Maxima is a system for the manipulation of symbolic and numerical expressions, including differentiation, integration, Taylor series, Laplace transforms, ordinary differential equations, systems of linear equations, polynomials, and sets, lists, vectors, matrices, and tensors. Maxima yields high precision numeric results by using exact fractions, arbitrary precision integers, and variable precision floating point numbers. Maxima can plot functions and data in two and three dimensions.

For more information, see the Maxima web site

<http://maxima.sourceforge.net>

#### License

Maxima is distributed under the GNU General Public License, with some export restrictions from the U.S. Department of Energy. See the file COPYING.

#### Upstream Contact

- The Maxima mailing list - see <http://maxima.sourceforge.net/maximalist.html>

#### Special Update/Build Instructions

1. Go to <http://sourceforge.net/projects/maxima/files/Maxima-source/> and download the source tarball maxima-x.y.z.tar.gz; place it in the upstream/ directory.
2. Update package-version.txt and run 'sage --package fix-checksum'.
3. Make sure the patches still apply cleanly, and update them if necessary.
4. Test the resulting package.

All patch files in the patches/ directory are applied. Descriptions of these patches are either in the patch files themselves or below.

- 0001-taylor2-Avoid-blowing-the-stack-when-diff-expand-isn.patch: Fix for Maxima bug #2520 (abs\_integrate fails on abs(sin(x)) and abs(cos(x))). Introduced in Issue #13364 (Upgrade Maxima to 5.29.1).
- build-fasl.patch: Build a fasl library for ecl in addition to an executable program. Introduced in Issue #16178 (Build maxima fasl without asdf).
- infodir.patch: Correct the path to the Info directory. Introduced in Issue #11348 (maxima test fails when install tree is moved).
- matrixexp.patch: Fix matrixexp(matrix([%i\*%pi])), which broke after Maxima 5.29.1. Introduced in Issue #13973.
- maxima.system.patch: Set c::\*compile-in-constants\* to t. Introduced in Issue #11966 (OS X 10.7 Lion: Maxima fails to build).

- `undoing_true_false_printing_patch.patch`: Revert an upstream change causing “?” to be printed around some words. Introduced in Trac #13364 (Upgrade Maxima to 5.29.1).

### Type

standard

### Dependencies

- *ecl*: An implementation of the Common Lisp language
- *info*: stand-alone Info documentation reader

### Version Information

package-version.txt:

```
5.46.0
```

### Equivalent System Packages

```
$ sudo pacman -S maxima-fas
```

```
$ conda install maxima
```

```
$ apt-cyg install maxima
```

```
$ sudo apt-get install maxima-sage maxima
```

```
$ sudo pkg install math/maxima
```

```
$ sudo emerge sci-mathematics/maxima\[ecl\]
```

```
$ brew install maxima
```

```
$ sudo port install maxima
```

```
$ nix-env --install maxima-ecl
```

```
$ sudo zypper install maxima-exec-clisp
```

```
$ sudo xbps-install maxima-ecl
```

See <https://repology.org/project/maxima/versions>, <https://repology.org/project/maxima-ecl/versions>, <https://repology.org/project/maxima-sage/versions>

If the system package is installed, `./configure` will check if it can be used.

### 6.1.217 mcqd: An exact algorithm for finding a maximum clique in an undirected graph

#### Description

MaxCliqueDyn is a fast exact algorithm for finding a maximum clique in an undirected graph.

#### License

GPL 3

#### Upstream Contact

MCQD is currently being maintained by Janez Konc. <https://gitlab.com/janezkonc/mcqd>

#### Type

optional

#### Dependencies

#### Version Information

package-version.txt:

```
1.0.p0
```

#### Equivalent System Packages

```
$ sudo pacman -S mcqd
```

```
$ sudo zypper install mcqd
```

See <https://repology.org/project/mcqd/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

### 6.1.218 meataxe: Library for computing with modular representations

#### Description

SharedMeatAxe 1.0 is an autotoolized shared library version of C MeatAxe 2.4.24, a set of programs for computing with modular representations. The package comprises a shared library “libmtx”, as well as several executables.

See <http://users.minet.uni-jena.de/~king/SharedMeatAxe/> for the package documentation.

### Licence

The Shared Meat-Axe is free software: you can redistribute it and/or modify it under the terms of the GNU General Public License as published by the Free Software Foundation, either version 2 of the License, or (at your option) any later version. See the file COPYING.

### Upstream contact

- Simon King <[simon.king@uni-jena.de](mailto:simon.king@uni-jena.de)>

### Type

optional

### Dependencies

### Version Information

package-version.txt:

```
1.0.1
```

### Equivalent System Packages

```
$ sudo pacman -S shared_meataxe
```

```
$ sudo yum install sharedmeataxe
```

See <https://repology.org/project/shared-meataxe/versions>, <https://repology.org/project/sharedmeataxe/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.219 `memory_allocator`: An extension class to allocate memory easily with Cython

This extension class started as part of the Sage software.

### Description

development website: [https://github.com/sagemath/memory\\_allocator](https://github.com/sagemath/memory_allocator)

PyPI page: [https://pypi.org/project/memory\\_allocator](https://pypi.org/project/memory_allocator)

## License

GPL-3.0

## Upstream Contact

[https://github.com/sagemath/memory\\_allocator](https://github.com/sagemath/memory_allocator)

## Type

standard

## Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *cython: C-Extensions for Python, an optimizing static compiler*

## Version Information

package-version.txt:

```
0.1.3
```

install-requires.txt:

```
memory_allocator
```

## Equivalent System Packages

```
$ conda install memory-allocator
```

```
$ sudo emerge dev-python/memory-allocator
```

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.220 meson: A high performance build system

### Description

A high performance build system

### License

Apache License, Version 2.0

### Upstream Contact

<https://pypi.org/project/meson/>

### Type

standard

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

### Version Information

package-version.txt:

```
1.3.1
```

install-requires.txt:

```
meson
```

### Equivalent System Packages

```
$ apk add meson
```

```
$ sudo pacman -S meson
```

```
$ sudo apt-get install meson
```

```
$ sudo yum install meson
```

```
$ sudo pkg install devel/meson
```

```
$ sudo emerge dev-build/meson
```

```
$ brew install meson
```

```
$ nix-env --install meson
```

```
$ sudo zypper install meson
```



```
$ sudo slackpkg install meson
```

See <https://repology.org/project/meson/versions>

If the system package is installed, `./configure` will check if it can be used.

### 6.1.221 meson\_python: Meson Python build backend (PEP 517)

#### Description

Meson Python build backend (PEP 517)

#### License

#### Upstream Contact

<https://pypi.org/project/meson-python/>

#### Type

standard

#### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *meson: A high performance build system*
- *ninja\_build: A build system with a focus on speed*
- *patchelf: A small utility to modify the dynamic linker and RPATH of ELF executables*
- *pyproject\_metadata: PEP 621 metadata parsing*
- *tomli: A lil' TOML parser*

#### Version Information

package-version.txt:

```
0.15.0
```

install-requires.txt:

```
meson-python
```

### Equivalent System Packages

```
$ apk add py3-meson-python
```

```
$ sudo pacman -S meson-python
```

```
$ sudo apt-get install meson-python
```

```
$ sudo yum install python-meson-python
```

```
$ sudo pkg install devel/meson-python
```

```
$ sudo emerge dev-python/meson-python
```

```
$ sudo zypper install python-meson-python
```

```
$ sudo xbps-install python3-meson-python
```

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

### 6.1.222 mistune: A markdown parser in pure Python

#### Description

The fastest markdown parser in pure Python

#### License

BSD License

#### Upstream Contact

Home Page: <https://github.com/lepture/mistune>

#### Type

standard

## Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *cython: C-Extensions for Python, an optimizing static compiler*

## Version Information

package-version.txt:

```
2.0.4
```

install-requires.txt:

```
mistune >=0.8.4
```

## Equivalent System Packages

```
$ conda install mistune
```

```
$ sudo emerge dev-python/mistune
```

```
$ sudo xbps-install python3-mistune
```

See <https://repology.org/project/mistune/versions>, <https://repology.org/project/python:mistune/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.223 modular\_decomposition: A modular decomposition algorithm

### Description

This is an implementation of a modular decomposition algorithm.

<http://www.liafa.jussieu.fr/~fm/> (in french)

### License

GPL

### Upstream Contact

Fabien de Montgolfier

<http://www.liafa.jussieu.fr/~fm/>

### Type

experimental

### Dependencies

### Version Information

package-version.txt:

20100607

### Equivalent System Packages

See <https://repology.org/project/modular-decomposition/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.224 p\_group\_cohomology: Modular cohomology rings of finite groups

### Description

Modular Cohomology Rings of Finite Groups

The package is located at <http://users.fmi.uni-jena.de/cohomology/>, that's to say the tarball `p_group_cohomology-x.y.tar.xz` can be found there and the documentation of the package is provided at <http://users.fmi.uni-jena.de/cohomology/documentation/>

### License

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David J. Green <[david.green@uni-jena.de](mailto:david.green@uni-jena.de)>

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The full text of the GPL is available at:

<http://www.gnu.org/licenses/>

The package includes a data base of cohomology rings of the groups of order 64 and provides access to a data base of cohomology rings of the groups of order 128 and 243, located at

<http://cohomology.uni-jena.de/db/>

These data bases are distributed under the Creative Commons Attribution-Share Alike 3.0 License. The full text of this licence is available at

<http://creativecommons.org/licenses/by-sa/3.0/>

## SPKG Maintainers

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We thank William Stein for giving us access to various computers on which we could build test the SPKG and on which some huge computations could be completed, and acknowledge the support by National Science Foundation Grant No. DMS-0821725.

We thank Mathieu Dutour Sikirić for hints on how to use GAP more efficiently.

We owe Peter Symonds the idea of using the Poincaré series in a rather efficient completeness criterion.

We are grateful to John Palmieri for his help on making `p_group_cohomology` work with python-3.

## Dependencies

- The SharedMeatAxe needs to be installed, as a build time dependency.

This can be met by installing the `meataxe` spkg

## Testing

Our package provides a very short test suite for David Green's routines for the computation of minimal projective resolutions. The majority of this package's tests is formed by doc tests in the Cython code. In fact, any class, method and function is covered by tests.

Note that internet access is required for these tests, as it is attempted to download cohomology rings from a public data base in the web.

The script `spkg-check` calls `sage -t --force_lib` on the files in `pGroupCohomology`.

### Documentation

The documentation of this package is automatically built, if the environment variable `SAGE_SPKG_INSTALL_DOCS` is yes (do “`export SAGE_SPKG_INSTALL_DOCS=yes`” on the command line before installation). The documents are put into `SAGE_ROOT/local/share/doc/p_group_cohomology/`.

### Type

optional

### Dependencies

- *meataxe*: Library for computing with modular representations
- *singular*: Computer algebra system for polynomial computations, algebraic geometry, singularity theory

### Version Information

package-version.txt:

1.1

### Equivalent System Packages

(none known)

## 6.1.225 mpc: Arithmetic of complex numbers with arbitrarily high precision and correct rounding

### Description

From <https://www.multiprecision.org/mpc>: GNU MPC is a C library for the arithmetic of complex numbers with arbitrarily high precision and correct rounding of the result. It extends the principles of the IEEE-754 standard for fixed precision real floating point numbers to complex numbers, providing well-defined semantics for every operation. At the same time, speed of operation at high precision is a major design goal.

### License

LGPLv3+ for the code and GFDLv1.3+ (with no invariant sections) for the documentation.

## Upstream Contact

The MPC website is located at <https://www.multiprecision.org/mpc> .

The MPC team can be contacted via the MPC mailing list: [mpc-discuss@inria.fr](mailto:mpc-discuss@inria.fr)

## Special Update/Build Instructions

- `mpc_mul_faster.patch`: Patch from Paul Zimmermann to speed up MPC multiplication (for small precisions) by reducing overhead in MPFR operations.

## Type

standard

## Dependencies

- `$(MP_LIBRARY)`
- *mpfr: Multiple-precision floating-point computations with correct rounding*

## Version Information

package-version.txt:

```
1.3.1
```

## Equivalent System Packages

```
$ apk add mpc1 mpc1-dev
```

```
$ conda install mpc
```

```
$ apt-cyg install libmpc-devel
```

```
$ sudo apt-get install libmpc-dev
```

```
$ sudo yum install libmpc libmpc-devel
```

```
$ sudo pkg install math/mpc
```

```
$ sudo emerge dev-libs/mpc
```

```
$ brew install libmpc
```

```
$ nix-env --install libmpc
```

```
$ sudo zypper install mpc-devel
```

```
$ sudo xbps-install libmpc-devel
```

See <https://repology.org/project/gnumpc/versions>, <https://repology.org/project/libmpc/versions>

If the system package is installed, `./configure` will check if it can be used.

### 6.1.226 mpfi: Multiple precision interval arithmetic library based on MPFR

#### Description

MPFI is a library for interval arithmetic, which is built upon the MPFR multiple precision floating-point arithmetic.

MPFI is intended to be a portable library written in C for arbitrary precision interval arithmetic with intervals represented using MPFR reliable floating-point numbers. It is based on the GNU MP library and on the MPFR library. The purpose of an arbitrary precision interval arithmetic is on the one hand to get “guaranteed” results, thanks to interval computation, and on the other hand to obtain accurate results, thanks to multiple precision arithmetic. The MPFI library is built upon MPFR in order to benefit from the correct rounding provided, for each operation or function, by MPFR. Further advantages of using MPFR are its portability and compliance with the IEEE 754 standard for floating-point arithmetic.

#### License

This version of MPFI is released under the GNU Lesser General Public License. It is permitted to link MPFI to non-free programs, as long as when distributing them the MPFI source code and a means to re-link with a modified MPFI is provided.

#### Upstream Contact

<http://perso.ens-lyon.fr/nathalie.revol/software.html>

The MPFI website is located at <https://gitlab.inria.fr/mpfi/mpfi>

The MPFI team can be contacted via the MPFI mailing list: [mpfi-users@inria.fr](mailto:mpfi-users@inria.fr)

#### Type

standard

#### Dependencies

- `$(MP_LIBRARY)`
- *mpfr: Multiple-precision floating-point computations with correct rounding*



## Version Information

package-version.txt:

```
1.5.2
```

## Equivalent System Packages

```
$ conda install mpfi
```

```
$ sudo apt-get install libmpfi-dev
```

```
$ sudo pkg install math/mpfi
```

```
$ sudo emerge sci-libs/mpfi
```

```
$ brew install mpfi
```

```
$ nix-env --install mpfi
```

```
$ sudo zypper install mpfi-devel
```

```
$ sudo xbps-install mpfi-devel
```

See <https://repology.org/project/mpfi/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.227 mpfr: Multiple-precision floating-point computations with correct rounding

### Description

The MPFR library is a C library for multiple-precision floating-point computations with correct rounding. MPFR has continuously been supported by the INRIA and the current main authors come from the Caramba and AriC project-teams at Loria (Nancy, France) and LIP (Lyon, France) respectively; see more on the credit page. MPFR is based on the GMP multiple-precision library.

The main goal of MPFR is to provide a library for multiple-precision floating-point computation which is both efficient and has a well-defined semantics. It copies the good ideas from the ANSI/IEEE-754 standard for double-precision floating-point arithmetic (53-bit significand).

### License

MPFR is free. It is distributed under the GNU Lesser General Public License (GNU Lesser GPL), version 3 or later (2.1 or later for MPFR versions until 2.4.x). The library has been registered in France by the Agence de Protection des Programmes under the number IDDN FR 001 120020 00 R P 2000 000 10800, on 15 March 2000. This license guarantees your freedom to share and change MPFR, to make sure MPFR is free for all its users. Unlike the ordinary General Public License, the Lesser GPL enables developers of non-free programs to use MPFR in their programs. If you have written a new function for MPFR or improved an existing one, please share your work!

### Upstream Contact

The MPFR website is located at <http://mpfr.org/>

The MPFR team can be contacted via the MPFR mailing list: [mpfr@loria.fr](mailto:mpfr@loria.fr)

### Special Update/Build Instructions

- Make sure MPFR's settings of `CC` and `CFLAGS` still get properly extracted, currently from its `config.log` in the `src/` directory.
- We should remove the configure option `--disable-thread-safe` in case the issues without that have meanwhile been fixed. (Then we should actually pass `--enable-thread-safe`.)

### TODO

- `--disable-thread-safe` should be switched to `--enable-thread-safe`, need to check that this works on the buildbot machines

### Type

standard

### Dependencies

- `$(MP_LIBRARY)`

### Version Information

package-version.txt:

```
4.2.1
```

### Equivalent System Packages

```
$ apk add mpfr-dev
```

```
$ conda install mpfr
```

```
$ apt-cyg install libmpfr-devel
```

```
$ sudo apt-get install libmpfr-dev
```

```
$ sudo yum install mpfr-devel
```

```
$ sudo pkg install math/mpfr
```

```
$ sudo emerge dev-libs/mpfr
```

```
$ brew install mpfr
```

```
$ sudo zypper install pkgconfig\ (mpfr\)
```

```
$ sudo slackpkg install mpfr
```

```
$ sudo xbps-install mpfr-devel
```

See <https://repology.org/project/mpfr/versions>

If the system package is installed, `./configure` will check if it can be used.

### 6.1.228 mpfrcx: Arithmetic of univariate polynomials over arbitrary precision real or complex numbers

#### Description

Mpfrcx is a library for the arithmetic of univariate polynomials over arbitrary precision real (Mpfr) or complex (Mpc) numbers, without control on the rounding. For the time being, only the few functions needed to implement the floating point approach to complex multiplication are implemented. On the other hand, these comprise asymptotically fast multiplication routines such as Toom–Cook and the FFT.

#### License

MPFRCX is distributed under the Gnu Lesser General Public License, either version 2.1 of the licence, or (at your option) any later version (LGPLv2.1+).

#### Upstream Contact

The MPFRCX website is located at <http://www.multiprecision.org/mpfrcx> .

#### Type

optional

#### Dependencies

- `$(MP_LIBRARY)`
- *mpc: Arithmetic of complex numbers with arbitrarily high precision and correct rounding*
- *mpfr: Multiple-precision floating-point computations with correct rounding*

### Version Information

package-version.txt:

```
0.6.3
```

### Equivalent System Packages

```
$ sudo zypper install mpfrcx-devel
```

See <https://repology.org/project/mpfrcx/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.229 mpmath: Pure Python library for multiprecision floating-point arithmetic

### Description

Mpmath is a pure-Python library for multiprecision floating-point arithmetic. It provides an extensive set of transcendental functions, unlimited exponent sizes, complex numbers, interval arithmetic, numerical integration and differentiation, root-finding, linear algebra, and much more. Almost any calculation can be performed just as well at 10-digit or 1000-digit precision, and in many cases mpmath implements asymptotically fast algorithms that scale well for extremely high precision work. If available, mpmath will (optionally) use gmpy to speed up high precision operations.

### Upstream Contact

- Author: Fredrik Johansson
- Email: [fredrik.johansson@gmail.com](mailto:fredrik.johansson@gmail.com)
- <https://mpmath.org>
- Website: <https://github.com/mpmath/mpmath>

### Type

standard

### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`

## Version Information

package-version.txt:

```
1.3.0
```

install-requires.txt:

```
mpmath >=1.1.0
```

## Equivalent System Packages

```
$ sudo pacman -S python-mpmath
```

```
$ conda install mpmath
```

```
$ sudo apt-get install python3-mpmath
```

```
$ sudo yum install python-mpmath
```

```
$ sudo emerge dev-python/mpmath
```

```
$ sudo zypper install python3\${PYTHON_MINOR}-mpmath
```

```
$ sudo xbps-install python3-mpmath
```

See <https://repology.org/project/mpmath/versions>, <https://repology.org/project/python:mpmath/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.230 msolve: Multivariate polynomial system solver

### Description

Open source C library implementing computer algebra algorithms for solving polynomial systems (with rational coefficients or coefficients in a prime field).

### License

GPL v2+

### Upstream Contact

<https://github.com/algebraic-solving/msolve>

### Type

optional

### Dependencies

- `$(MP_LIBRARY)`
- *flint: Fast Library for Number Theory*
- *mpfr: Multiple-precision floating-point computations with correct rounding*

### Version Information

package-version.txt:

0.5.0

### Equivalent System Packages

(none known)

## 6.1.231 nauty: Find automorphism groups of graphs, generate non-isomorphic graphs

### Description

Nauty has various tools for finding the automorphism group of a graph, generating non-isomorphic graphs with certain properties, etc.

### License

Since version 2.6, nauty license is GPL-compatible, see

<http://users.cecs.anu.edu.au/~bdm/nauty/COPYRIGHT.txt>

(a copy of this file, called COPYRIGHT, is also present in the tarball)

## Special Packaging Instruction

Upstream distribute tarball named `nauty${version}.tar.gz`. We cannot deal with that so rename it `nauty-${version}.tar.gz` (notice the “-”) without any changes.

## Upstream Contact

Brendan D. McKay, Computer Science Department Australian National University [bdm@cs.anu.edu.au](mailto:bdm@cs.anu.edu.au)

Adolfo Piperno, Dipartimento di Informatica Sapienza - Università di Roma [piperno@di.uniroma1.it](mailto:piperno@di.uniroma1.it)

See <http://cs.anu.edu.au/~bdm/nauty/> Or <http://pallini.di.uniroma1.it/>

## Type

standard

## Dependencies

## Version Information

package-version.txt:

```
2.8.8.p0
```

## Equivalent System Packages

```
$ sudo pacman -S nauty
```

```
$ conda install nauty
```

```
$ sudo apt-get install nauty
```

```
$ sudo yum install nauty
```

```
$ sudo pkg install math/nauty
```

```
$ brew install nauty
```

```
$ nix-env --install nauty
```

```
$ sudo zypper install nauty nauty-devel
```

```
$ sudo xbps-install nauty
```

See <https://repology.org/project/nauty/versions>

If the system package is installed, `./configure` will check if it can be used.

### 6.1.232 nbclient: A client library for executing notebooks. Formerly nbconvert's ExecutePreprocessor.

#### Description

A client library for executing notebooks. Formerly nbconvert's ExecutePreprocessor.

#### License

BSD

#### Upstream Contact

<https://pypi.org/project/nbclient/>

#### Type

standard

#### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *jupyter\_client: Jupyter protocol implementation and client libraries*
- *nbformat: The Jupyter Notebook format*

#### Version Information

package-version.txt:

```
0.8.0
```

install-requires.txt:

```
nbclient
```

#### Equivalent System Packages

```
$ conda install nbclient
```

```
$ sudo emerge dev-python/nbclient
```

```
$ sudo xbps-install python3-nbclient
```

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.



### 6.1.233 nbconvert: Converting Jupyter Notebooks

#### Description

jupyter nbconvert converts notebooks to various other formats via Jinja templates.

#### License

BSD

#### Upstream Contact

<https://pypi.org/project/nbconvert/>

#### Type

standard

#### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *beautifulsoup4*: Screen-scraping library
- *bleach*: An HTML-sanitizing tool
- *defusedxml*: Addresses vulnerabilities of XML parsers and XML libraries
- *entrypoints*: Discover and load entry points from installed Python packages
- *jinja2*: General purpose template engine for Python
- *jupyter\_client*: Jupyter protocol implementation and client libraries
- *jupyter\_core*: Jupyter core package
- *jupyterlab\_pygments*: Pygments theme using JupyterLab CSS variables
- *markupsafe*: Safely add untrusted strings to HTML/XML markup
- *mistune*: A markdown parser in pure Python
- *nbclient*: A client library for executing notebooks. Formerly nbconvert's *ExecutePreprocessor*.
- *nbformat*: The Jupyter Notebook format
- *pandocfilters*: A Python module for writing pandoc filters
- *pygments*: Generic syntax highlighter
- *tinycss2*: A tiny CSS parser
- *traitlets*: Traitlets Python configuration system

### Version Information

package-version.txt:

```
7.9.2
```

install-requires.txt:

```
nbconvert >=5.6.1
```

### Equivalent System Packages

```
$ conda install nbconvert
```

```
$ sudo emerge dev-python/nbconvert
```

```
$ sudo zypper install jupyter-nbconvert
```

```
$ sudo xbps-install python3-jupyter_nbconvert
```

See <https://repology.org/project/nbconvert/versions>, <https://repology.org/project/python:nbconvert/versions>, <https://repology.org/project/jupyter-nbconvert/versions>, <https://repology.org/project/python:jupyter-nbconvert/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.234 nbformat: The Jupyter Notebook format

### Description

The Jupyter Notebook format

### License

BSD 3-Clause License

### Upstream Contact

<https://pypi.org/project/nbformat/>

### Type

standard

## Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *fastjsonschema: Fastest Python implementation of JSON schema*
- *jsonschema: Python implementation of JSON Schema*
- *jupyter\_core: Jupyter core package*
- *traitlets: Traitlets Python configuration system*

## Version Information

package-version.txt:

```
5.9.2
```

install-requires.txt:

```
nbformat >=5.0.7
```

## Equivalent System Packages

```
$ conda install nbformat
```

```
$ sudo emerge dev-python/nbformat
```

```
$ sudo zypper install jupyter-nbformat
```

```
$ sudo xbps-install python3-jupyter_nbformat
```

See <https://repology.org/project/nbformat/versions>, <https://repology.org/project/python:nbformat/versions>, <https://repology.org/project/jupyter-nbformat/versions>, <https://repology.org/project/python:jupyter-nbformat/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.235 ncurses: Classic terminal output library

### Description

Ncurses (new curses, pronounced “enn-curses”) started as a freely distributable “clone” of System V Release 4.0 (SVr4) curses. It has outgrown the “clone” description, and now contains many features which are not in SVr4 curses. Curses is a pun on the term “cursor optimization”. It is a library of functions that manage an application’s display on character-cell terminals (e.g., VT100).

The name “ncurses” was first used as the name of the curses library in Pavel Curtis’s `pcurses`, dated 1982. It was apparently developed on a BSD 4.4 system, at Cornell. Parts of `pcurses` are readily identifiable in `ncurses`, including the basics for the terminfo compiler (named `compile` in that package):

- the Caps, used to define the terminfo capabilities

- awk scripts MKcatab.awk, MKnames.awk
- the library modules used for the terminfo compiler.

Besides ncurses, parts of pcurses still survive in 2010, in recognizable form in Solaris.

Website: <http://invisible-island.net/ncurses>

### License

- MIT-style

### Upstream Contact

- [bug-ncurses@gnu.org](mailto:bug-ncurses@gnu.org)

### Special Update/Build Instructions

None

### Type

standard

### Dependencies

### Version Information

package-version.txt:

```
6.3
```

### Equivalent System Packages

```
$ apk add ncurses-dev
```

```
$ conda install ncurses
```

```
$ apt-cyg install libncurses-devel
```

```
$ sudo apt-get install libncurses5-dev
```

```
$ sudo yum install ncurses-devel
```

```
$ sudo pkg install devel/ncurses
```

```
$ brew install ncurses
```

```
$ sudo port install ncurses
```

```
$ sudo zypper install pkgconfig\ncurses\ pkgconfig\ncursesw\
```

```
$ sudo slackpkg install ncurses
```

```
$ sudo xbps-install ncurses-devel
```

See <https://repology.org/project/ncurses/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.236 nest\_asyncio: Patch asyncio to allow nested event loops

### Description

Patch asyncio to allow nested event loops

### License

BSD

### Upstream Contact

<https://pypi.org/project/nest-asyncio/>

### Type

standard

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

### Version Information

package-version.txt:

```
1.5.8
```

install-requires.txt:

```
nest-asyncio
```

### Equivalent System Packages

```
$ conda install nest-asyncio
```

```
$ sudo emerge dev-python/nest_asyncio
```

```
$ sudo xbps-install python3-nest_asyncio
```

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

### 6.1.237 networkx: Python package for complex networks

#### Description

NetworkX (NX) is a Python package for the creation, manipulation, and study of the structure, dynamics, and functions of complex networks.

#### License

BSD

#### Upstream Contact

<https://networkx.github.io/>

#### Type

standard

#### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *scipy: Scientific tools for Python*

#### Version Information

package-version.txt:

```
3.2.1
```

install-requires.txt:

```
networkx >=2.4, <3.3
```

## Equivalent System Packages

```
$ sudo pacman -S python-networkx
```

```
$ conda install networkx<3.3, >=2.4
```

```
$ sudo apt-get install python3-networkx
```

```
$ sudo yum install python-networkx
```

```
$ sudo emerge dev-python/networkx
```

```
$ sudo port install py-networkx
```

```
$ sudo zypper install python3\${PYTHON_MINOR}-networkx
```

```
$ sudo xbps-install python3-networkx
```

See <https://repology.org/project/python:networkx/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.238 nibabel: Access a multitude of neuroimaging data formats

### Description

Access a multitude of neuroimaging data formats

### License

MIT License

### Upstream Contact

<https://pypi.org/project/nibabel/>

### Type

optional

### Dependencies

### Version Information

requirements.txt:

```
nibabel
```

### Equivalent System Packages

```
$ conda install nibabel
```

```
$ sudo port install py-nibabel
```

```
$ sudo zypper install python3\${PYTHON_MINOR}\-nibabel
```

See <https://repology.org/project/nibabel/versions>, <https://repology.org/project/python:nibabel/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.239 ninja\_build: A build system with a focus on speed

### Description

Ninja is a small build system with a focus on speed.

### License

Apache License 2.0

### Upstream Contact

<https://ninja-build.org/>

### Type

standard

### Dependencies

- `$(PYTHON)`



## Version Information

package-version.txt:

```
1.11.1
```

## Equivalent System Packages

```
$ sudo pacman -S ninja
```

```
$ conda install ninja
```

```
$ apt-cyg install ninja
```

```
$ sudo apt-get install ninja-build
```

```
$ sudo yum install ninja-build
```

```
$ sudo pkg install devel/ninja
```

```
$ sudo emerge dev-build/ninja
```

```
$ brew install ninja
```

```
$ sudo port install ninja
```

```
$ sudo zypper install ninja
```

```
$ sudo xbps-install ninja
```

See <https://repology.org/project/ninja/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.240 normaliz: Computations in affine monoids, vector configurations, lattice polytopes, and rational cones

### Description

Normaliz is a tool for computations in affine monoids, vector configurations, lattice polytopes, and rational cones.

For more details see <http://www.mathematik.uni-osnabrueck.de/normaliz/>

### License

- GPL v3

### Upstream Contact

- [normaliz@uos.de](mailto:normaliz@uos.de)
- Winfried Bruns <[wbruns@uos.de](mailto:wbruns@uos.de)>
- Christof Söger <[csoeger@uos.de](mailto:csoeger@uos.de)>
- see also <https://www.normaliz.uni-osnabrueck.de/home/contact/>  
and <https://github.com/Normaliz>

### Special Update/Build Instructions

- The spkg currently disables features that require packages SCIP and CoCoA, for which we don't have packages (yet).

### Type

optional

### Dependencies

- `$(MP_LIBRARY)`
- *e\_antic*: Real embedded number fields
- *flint*: Fast Library for Number Theory
- *libnauty*: Find automorphism groups of graphs, generate non-isomorphic graphs (callable library)

### Version Information

package-version.txt:

```
3.10.1.p0
```

### Equivalent System Packages

```
$ sudo pacman -S normaliz
```

```
$ conda install normaliz
```

```
$ sudo apt-get install libnormaliz-dev
```

```
$ sudo yum install libnormaliz-devel
```

```
$ sudo emerge sci-mathematics/normaliz
```

```
$ sudo zypper install normaliz-devel
```

See <https://repology.org/project/normaliz/versions>, <https://repology.org/project/libnormaliz/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

### 6.1.241 notebook: Jupyter notebook, a web-based notebook environment for interactive computing

#### Description

The Jupyter HTML notebook is a web-based notebook environment for interactive computing.

#### License

BSD 3-Clause License

#### Upstream Contact

<https://pypi.org/project/notebook/>

#### Type

standard

#### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *jupyter\_server*: The backend (core services, APIs, REST endpoints) to Jupyter web applications
- *jupyterlab*: JupyterLab computational environment
- *jupyterlab\_server*: A set of server components for JupyterLab and JupyterLab like applications.
- *notebook\_shim*: A shim layer for notebook traits and config

### Version Information

package-version.txt:

```
7.1.1
```

install-requires.txt:

```
notebook >=6.1.1
```

### Equivalent System Packages

```
$ sudo pacman -S jupyter-notebook
```

```
$ conda install notebook
```

```
$ sudo emerge dev-python/notebook
```

```
$ sudo port install py-notebook
```

```
$ sudo xbps-install python3-jupyter_notebook
```

See <https://repology.org/project/python:notebook/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.242 notebook\_shim: A shim layer for notebook traits and config

### Description

A shim layer for notebook traits and config

### License

BSD 3-Clause License

### Upstream Contact

<https://pypi.org/project/notebook-shim/>

## Type

standard

## Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *jupyter\_server*: The backend (core services, APIs, REST endpoints) to Jupyter web applications

## Version Information

package-version.txt:

```
0.2.3
```

install-requires.txt:

```
notebook-shim
```

## Equivalent System Packages

(none known)

## 6.1.243 notedown: Create IPython notebooks from markdown

### Description

Notedown is a simple tool to create IPython notebooks from markdown.

### License

BSD 2-Clause License

### Upstream Contact

Author: Aaron O’Leary Home page: <https://github.com/aaren/notedown>

### Type

optional

### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *nbconvert: Converting Jupyter Notebooks*
- *nbformat: The Jupyter Notebook format*
- *pandoc\_attributes: A parser and generator for pandoc block attributes*
- *six: Python 2 and 3 compatibility utilities*

### Version Information

package-version.txt:

```
1.5.1
```

install-requires.txt:

```
notedown >=1.5.1
```

### Equivalent System Packages

```
$ conda install notedown
```

See <https://repology.org/project/python:notedown/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.244 ntl: A library for doing number theory

### Description

NTL is a high-performance, portable C++ library providing data structures and algorithms for manipulating signed, arbitrary length integers, and for vectors, matrices, and polynomials over the integers and over finite fields.

Website: <http://www.shoup.net/ntl/>

## License

- GNU LGPLv2.1+

## Upstream Contact

- Victor Shoup - for contact info see <http://www.shoup.net/>

## Special Update/Build Instructions

- None

## Type

standard

## Dependencies

- $\$(MP\_LIBRARY)$
- *gf2x: Fast arithmetic in  $GF(2)[x]$  and searching for irreducible/primitive trinomials*

## Version Information

package-version.txt:

```
11.4.3
```

## Equivalent System Packages

```
$ conda install ntl
```

```
$ apt-cyg install libntl-devel
```

```
$ sudo apt-get install libntl-dev
```

```
$ sudo yum install ntl-devel
```

```
$ sudo pkg install math/ntl
```

```
$ sudo emerge dev-libs/ntl
```

```
$ brew install ntl
```

```
$ sudo port install ntl
```

```
$ nix-env --install ntl
```

```
$ sudo zypper install ntl-devel
```

```
$ sudo xbps-install ntl-devel
```

See <https://repology.org/project/ntl/versions>

If the system package is installed, `./configure` will check if it can be used.

### 6.1.245 numpy: Package for scientific computing with Python

#### Description

This package adds numerical linear algebra and other numerical computing capabilities to python.

#### Upstream Contact

- <https://numpy.org/>
- Travis Oliphant
- Fernando Perez
- Brian Granger

#### Special Update/Build Instructions

- Scipy uses numpy's distutils to control its compilation of fortran code.  
Whenever numpy is updated it is necessary to make sure that scipy still builds ok.

#### Type

standard

#### Dependencies

- `$(BLAS)`
- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *cython: C-Extensions for Python, an optimizing static compiler*
- *gfortran: Fortran compiler from the GNU Compiler Collection*
- *meson\_python: Meson Python build backend (PEP 517)*
- *pkgconfig: Python interface to pkg-config*



## Version Information

package-version.txt:

```
1.26.3
```

install-requires.txt:

```
numpy >=1.19
```

## Equivalent System Packages

```
$ sudo pacman -S python-numpy
```

```
$ conda install numpy
```

```
$ sudo apt-get install python3-numpy
```

```
$ sudo yum install python-numpy
```

```
$ sudo emerge dev-python/numpy
```

```
$ brew install numpy
```

```
$ sudo port install py-numpy
```

```
$ sudo zypper install python3\${PYTHON_MINOR}-numpy
```

```
$ sudo xbps-install python3-numpy
```

See <https://repology.org/project/python:numpy/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.246 onetbb: oneAPI Threading Building Blocks

### Description

C++ parallelization library

### License

Apache License, Version 2.0

### Upstream Contact

<https://github.com/oneapi-src/oneTBB>

### Type

optional

### Dependencies

- *cmake: A cross-platform build system generator*

### Version Information

package-version.txt:

```
2021.9.0
```

### Equivalent System Packages

```
$ apk add libtbb-dev
```

```
$ sudo pacman -S intel-oneapi-tbb
```

```
$ conda install tbb
```

```
$ sudo apt-get install libtbb-dev
```

```
$ sudo yum install tbb-devel
```

```
$ sudo pkg install devel/onetbb
```

```
$ sudo emerge dev-cpp/tbb
```

```
$ brew install tbb
```

```
$ sudo port install onetbb
```

```
$ nix-env --install tbb
```

```
$ sudo zypper install tbb
```

```
$ sudo xbps-install tbb-devel
```

If the system package is installed, `./configure` will check if it can be used.

### 6.1.247 openblas: An optimized implementation of BLAS (Basic Linear Algebra Subprograms)

#### Description

OpenBLAS is an optimized open library implementing the Basic Linear Algebra Subprograms (BLAS) specification. It is based on GotoBLAS2 1.13 BSD version.

#### License

3-clause BSD license

#### SPKG Repository

<https://www.openblas.net>

GitHub page: <https://github.com/xianyi/OpenBLAS>

Releases: <https://github.com/xianyi/OpenBLAS/releases>

#### Upstream Contact

- OpenBLAS users mailing list:  
<https://groups.google.com/forum/#!forum/openblas-users>
- OpenBLAS developers mailing list:  
<https://groups.google.com/forum/#!forum/openblas-dev>

#### Type

standard

#### Dependencies

- *gfortran*: Fortran compiler from the GNU Compiler Collection

### Version Information

package-version.txt:

```
0.3.26
```

### Equivalent System Packages

```
$ apk add openblas-dev
```

```
$ sudo pacman -S openblas lapack cblas
```

```
$ conda install openblas blas=2.*=openblas
```

```
$ apt-cyg install liblapack-devel libopenblas
```

```
$ sudo apt-get install libopenblas-dev
```

```
$ sudo yum install openblas-devel
```

```
$ sudo pkg install math/openblas
```

```
$ sudo emerge sci-libs/openblas
```

```
$ brew install openblas
```

```
$ sudo port install OpenBLAS-devel
```

```
$ nix-env --install blas lapack
```

```
$ sudo zypper install openblas-devel
```

```
$ sudo xbps-install openblas-devel
```

See <https://repology.org/project/openblas/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.248 openssl: Implementation of the SSL and TLS protocols

### Description

From wikipedia: OpenSSL is an open source implementation of the SSL and TLS protocols. The core library (written in the C programming language) implements the basic cryptographic functions and provides various utility functions. Wrappers allowing the use of the OpenSSL library in a variety of computer languages are available.

## License

- Apache License v2 (considered compatible with GPL v3)

## Upstream Contact

- <http://openssl.org/>

## Type

standard

## Dependencies

## Version Information

package-version.txt:

```
3.0.12
```

## Equivalent System Packages

```
$ apk add openssl-dev
```

```
$ sudo pacman -S openssl
```

```
$ conda install openssl
```

```
$ apt-cyg install libssl-devel
```

```
$ sudo apt-get install openssl libssl-dev
```

```
$ sudo yum install openssl openssl-devel
```

```
$ sudo pkg install security/openssl
```

```
$ brew install openssl
```

```
$ sudo port install openssl
```

```
$ nix-env --install openssl
```

```
$ sudo zypper install libopenssl-3-devel
```

```
$ sudo slackpkg install openssl openssl-solibs
```

```
$ sudo xbps-install openssl-devel
```

See <https://repology.org/project/openssl/versions>

If the system package is installed, `./configure` will check if it can be used.

### 6.1.249 ore\_algebra: Ore algebra

#### Description

A Sage implementation of Ore algebras, Ore polynomials, and differentially finite functions.

Main features for the most common algebras include basic arithmetic and actions; `gcd` and `lcm`; D-finite closure properties; creative telescoping; natural transformations between related algebras; guessing; desingularization; solvers for polynomials, rational functions and (generalized) power series. Univariate differential operators also support the numerical computation of analytic solutions with rigorous error bounds and related features.

#### License

- GPL-2.0+

#### Upstream Contact

- Website: [https://github.com/mkauers/ore\\_algebra/](https://github.com/mkauers/ore_algebra/)
- Sage accounts: `mkauers`, `mmezzarobba`

#### Type

optional

#### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- `$(SAGERUNTIME)`

#### Version Information

requirements.txt:

```
git+https://github.com/mkauers/ore_algebra@01c357f590685ff362c008229681ee08269457da
→ #egg=ore_algebra
```

## Equivalent System Packages

See <https://repology.org/project/ore-algebra/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

### 6.1.250 osqp\_python: The Operator Splitting QP Solver (Python wrapper)

#### Description

This is the Python wrapper for OSQP: The Operator Splitting QP Solver.

It vendors OSQP.

#### License

Apache 2.0

#### Upstream Contact

<https://pypi.org/project/osqp/>

#### Type

optional

#### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *cmake: A cross-platform build system generator*
- *numpy: Package for scientific computing with Python*
- *qlddl\_python: QDLDL, a free LDL factorization routine (Python wrapper)*
- *scipy: Scientific tools for Python*

#### Version Information

package-version.txt:

```
0.6.3
```

install-requires.txt:

```
osqp
```

### Equivalent System Packages

```
$ conda install osqp
```

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

### 6.1.251 overrides: A decorator to automatically detect mismatch when overriding a method.

#### Description

A decorator to automatically detect mismatch when overriding a method.

#### License

Apache License, Version 2.0

#### Upstream Contact

<https://pypi.org/project/overrides/>

#### Type

standard

#### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`

#### Version Information

package-version.txt:

```
7.4.0
```

install-requires.txt:

```
overrides
```



## Equivalent System Packages

(none known)

### 6.1.252 p\_group\_cohomology: Modular cohomology rings of finite groups

#### Description

Modular Cohomology Rings of Finite Groups

The package is located at <http://users.fmi.uni-jena.de/cohomology/>, that's to say the tarball p\_group\_cohomology-x.y.tar.xz can be found there and the documentation of the package is provided at <http://users.fmi.uni-jena.de/cohomology/documentation/>

#### License

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David J. Green <[david.green@uni-jena.de](mailto:david.green@uni-jena.de)>

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The full text of the GPL is available at:

<http://www.gnu.org/licenses/>

The package includes a data base of cohomology rings of the groups of order 64 and provides access to a data base of cohomology rings of the groups of order 128 and 243, located at

<http://cohomology.uni-jena.de/db/>

These data bases are distributed under the Creative Commons Attribution-Share Alike 3.0 License. The full text of this licence is available at

<http://creativecommons.org/licenses/by-sa/3.0/>

#### SPKG Maintainers

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#### Upstream Contact

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### Acknowledgements

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Since version 1.0.1, the further work on this SPKG was funded by Marie Curie grant MTKD-CT-2006-042685 and was pursued at the National University of Ireland, Galway. Since November 2010, it is moved back to Jena.

We thank William Stein for giving us access to various computers on which we could build test the SPKG and on which some huge computations could be completed, and acknowledge the support by National Science Foundation Grant No. DMS-0821725.

We thank Mathieu Dutour Sikirić for hints on how to use GAP more efficiently.

We owe Peter Symonds the idea of using the Poincaré series in a rather efficient completeness criterion.

We are grateful to John Palmieri for his help on making `p_group_cohomology` work with python-3.

### Dependencies

- The SharedMeatAxe needs to be installed, as a build time dependency.

This can be met by installing the `meataxe` spkg

### Testing

Our package provides a very short test suite for David Green's routines for the computation of minimal projective resolutions. The majority of this package's tests is formed by doc tests in the Cython code. In fact, any class, method and function is covered by tests.

Note that internet access is required for these tests, as it is attempted to download cohomology rings from a public data base in the web.

The script `spkg-check` calls `sage -t --force_lib` on the files in `pGroupCohomology`.

### Documentation

The documentation of this package is automatically built, if the environment variable `SAGE_SPKG_INSTALL_DOCS` is yes (do "export `SAGE_SPKG_INSTALL_DOCS=yes`" on the command line before installation). The documents are put into `SAGE_ROOT/local/share/doc/p_group_cohomology/`.

### Type

optional

## Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- `$(SAGERUNTIME)`
- *cysignals: Interrupt and signal handling for Cython*
- *cython: C-Extensions for Python, an optimizing static compiler*
- *gap: Groups, Algorithms, Programming - a system for computational discrete algebra*
- *ipywidgets: Interactive HTML widgets for Jupyter notebooks and the IPython kernel*
- *matplotlib: Python 2D plotting library*
- *meataxe: Library for computing with modular representations*
- *p\_group\_cohomology: Modular cohomology rings of finite groups*
- *singular: Computer algebra system for polynomial computations, algebraic geometry, singularity theory*
- *xz: General-purpose data compression software*

## Version Information

package-version.txt:

```
3.3.3.p1
```

install-requires.txt:

```
p_group_cohomology >=3.3
```

## Equivalent System Packages

See <https://repology.org/project/sagemath-p-group-cohomology/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.253 packaging: Core utilities for Python packages

### Description

Core utilities for Python packages

### License

### Upstream Contact

<https://pypi.org/project/packaging/>

### Type

standard

### Dependencies

- `$(PYTHON)`
- *pip: Tool for installing and managing Python packages*

### Version Information

package-version.txt:

```
23.2
```

install-requires.txt:

```
packaging >=21.0
Issue #30975: packaging 20.5 is known to work but we have to silence
↪ "DeprecationWarning: Creating a LegacyVersion"
Sphinx needs >= 21
```

### Equivalent System Packages

```
$ sudo pacman -S python-packaging
```

```
$ conda install packaging
```

```
$ sudo apt-get install python3-packaging
```

```
$ sudo yum install python-packaging
```

```
$ sudo emerge dev-python/packaging
```

```
$ sudo port install py-packaging
```

```
$ sudo zypper install python3\${PYTHON_MINOR}-packaging
```

```
$ sudo xbps-install python3-packaging
```

See <https://repology.org/project/packaging/versions>, <https://repology.org/project/python:packaging/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

### 6.1.254 palettable: Color palettes for Python

#### Description

Color palettes for Python

#### License

#### Upstream Contact

<https://pypi.org/project/palettable/>

#### Type

optional

#### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

#### Version Information

package-version.txt:

```
3.3.0
```

install-requires.txt:

```
palettable
```

#### Equivalent System Packages

```
$ conda install palettable
```

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

### 6.1.255 palp: A package for Analyzing Lattice Polytopes

#### Description

A Package for Analyzing Lattice Polytopes (PALP) is a set of C programs for calculations with lattice polytopes and applications to toric geometry.

It contains routines for vertex and facet enumeration, computation of incidences and symmetries, as well as completion of the set of lattice points in the convex hull of a given set of points. In addition, there are procedures specialised to reflexive polytopes such as the enumeration of reflexive subpolytopes, and applications to toric geometry and string

theory, like the computation of Hodge data and fibration structures for toric Calabi-Yau varieties. The package is well tested and optimised in speed as it was used for time consuming tasks such as the classification of reflexive polyhedra in 4 dimensions and the creation and manipulation of very large lists of 5-dimensional polyhedra.

While originally intended for low-dimensional applications, the algorithms work in any dimension and our key routine for vertex and facet enumeration compares well with existing packages.

### License

- When released, GPL 2 was in force.
- There is a link to a web page, which now points to GPL 3, but would have pointed to GPL 2 at the time the package was released.
- Therefore one can deduce the authors were happy for this to be released under GPL 2 or a later version.

### Upstream Contact

- Author: Harald Skarke ([skarke@maths.ox.ac.uk](mailto:skarke@maths.ox.ac.uk))
- Home page: <http://hep.itp.tuwien.ac.at/~kreuzer/CY/CYpalp.html>

### Type

standard

### Dependencies

#### Version Information

package-version.txt:

```
2.11
```

### Equivalent System Packages

```
$ sudo pacman -S palp
```

```
$ conda install palp
```

```
$ sudo apt-get install palp
```

```
$ sudo yum install palp
```

```
$ nix-env --install palp
```

```
$ sudo xbps-install palp
```

See <https://repology.org/project/palp/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.256 pandoc: A document converter

### Description

This dummy package represents the document converter pandoc.

We do not have an SPKG for it. The purpose of this dummy package is to associate system package lists with it.

### Type

optional

### Dependencies

### Version Information

### Equivalent System Packages

```
$ apk add pandoc
```

```
$ sudo pacman -S pandoc
```

```
$ conda install pandoc
```

```
$ sudo apt-get install pandoc
```

```
$ sudo yum install pandoc
```

```
$ sudo pkg install textproc/hs-pandoc
```

```
$ sudo emerge app-text/pandoc
```

```
$ brew install pandoc
```

```
$ sudo port install pandoc
```

```
$ sudo zypper install pandoc
```

```
$ sudo xbps-install pandoc
```

See <https://repology.org/project/pandoc/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.257 pandoc\_attributes: A parser and generator for pandoc block attributes

### Description

This is a simple parser / emitter for pandoc block attributes, intended for use with pandocfilters.

### License

BSD 2-Clause License

### Upstream Contact

- Author: Aaron O’Leary
- Home page: <https://github.com/aaren/pandoc-attributes>

### Special Update/Build Instructions

There are no release numbers, hence find the latest commit, download [https://github.com/aaren/pandoc-attributes/archive/\\${COMMIT}.zip](https://github.com/aaren/pandoc-attributes/archive/${COMMIT}.zip) and rename it `pandoc_attributes-${COMMIT:0:8}.zip`

### Type

optional

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *pandocfilters: A Python module for writing pandoc filters*

### Version Information

package-version.txt:

```
8bc82f6d
```

install-requires.txt:

```
pandoc_attributes >=8bc82f6d
```



## Equivalent System Packages

```
$ conda install pandoc-attributes
```

See <https://repology.org/project/pandoc-attributes/versions>, <https://repology.org/project/python:pandoc-attributes/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.258 pandocfilters: A Python module for writing pandoc filters

### Description

A python module for writing pandoc filters.

### License

BSD 3-Clause License

### Upstream Contact

Author: John MacFarlane Home page: <https://github.com/jgm/pandocfilters>

### Special Update/Build Instructions

Download the last release from <https://pypi.python.org/pypi/pandocfilters>

### Type

standard

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

### Version Information

package-version.txt:

```
1.5.0
```

install-requires.txt:

```
pandocfilters >=1.4.2
```

### Equivalent System Packages

```
$ sudo pacman -S python-pandocfilters
```

```
$ conda install pandocfilters
```

```
$ sudo apt-get install python3-pandocfilters
```

```
$ sudo yum install python-pandocfilters
```

```
$ sudo emerge dev-python/pandocfilters
```

```
$ sudo port install py-pandocfilters
```

```
$ sudo zypper install python3\${PYTHON_MINOR}-pandocfilters
```

```
$ sudo xbps-install python3-pandocfilters
```

See <https://repology.org/project/python:pandocfilters/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

### 6.1.259 papilo: Parallel presolve for integer and linear optimization

#### Description

parallel presolve routines for (mixed integer) linear programming problems. The routines are implemented using templates which allows switching to higher precision or rational arithmetic using the boost multiprecision package.

#### License

LGPL 3.0

#### Upstream Contact

<https://github.com/scipopt/papilo/>

#### Type

optional

## Dependencies

- \$(BLAS)
- \$(MP\_LIBRARY)
- *boost\_cropped*: Portable C++ libraries (subset needed for Sage)
- *cmake*: A cross-platform build system generator
- *gfortran*: Fortran compiler from the GNU Compiler Collection
- *onetbb*: oneAPI Threading Building Blocks

## Version Information

package-version.txt:

```
2.1.1
```

## Equivalent System Packages

(none known)

## 6.1.260 pari: Computer algebra system for fast computations in number theory

### Description

PARI/GP is a widely used computer algebra system designed for fast computations in number theory (factorizations, algebraic number theory, elliptic curves...), but also contains a large number of other useful functions to compute with mathematical entities such as matrices, polynomials, power series, algebraic numbers etc., and a lot of transcendental functions. PARI is also available as a C library to allow for faster computations.

Originally developed by Henri Cohen and his co-workers (Université Bordeaux I, France), PARI is now under the GPL and maintained by Karim Belabas with the help of many volunteer contributors.

### License

GPL version 2+

### Upstream Contact

- <http://pari.math.u-bordeaux.fr/>

### Dependencies

- Perl
- MPIR or GMP
- Readline
- GNU patch (shipped with Sage)

### Special Update/Build Instructions

See patches/README.txt for a list of patches.

The current upstream tarball was created from the PARI git repository by running “make snapshot”.

### Type

standard

### Dependencies

- `$(MP_LIBRARY)`
- *pari\_galdata*: PARI data package needed to compute Galois groups in degrees 8 through 11
- *pari\_seadata\_small*: PARI data package needed by ellap for large primes (small version)
- *readline*: Command line editing library

### Version Information

package-version.txt:

```
2.15.4
```

### Equivalent System Packages

```
$ apk add pari-dev
```

```
$ sudo pacman -S pari pari-galdata pari-seadata pari-elldata \
 pari-galpol
```

```
$ conda install pari=**_pthread pari-elldata pari-galdata \
 pari-galpol pari-seadata
```

```
$ sudo apt-get install pari-gp2c libpari-dev pari-doc pari-elldata \
 pari-galdata pari-galpol pari-seadata
```

```
$ sudo yum install pari-devel pari-gp --setopt=tsflags= pari-galdata \
 pari-galpol pari-seadata pari-elldata
```

```
$ sudo pkg install math/pari
```

```
$ sudo emerge sci-mathematics/pari sci-mathematics/pari-data
```

```
$ brew install pari pari-elldata pari-galdata pari-galpol pari-seadata
```

No package needed.

```
$ nix-env --install pari
```

```
$ sudo zypper install pari-devel pari-gp
```

```
$ sudo xbps-install pari pari-devel pari-elldata-small pari-galdata \
 pari-galpol-small pari-seadata
```

See <https://repology.org/project/pari/versions>, <https://repology.org/project/pari-gp/versions>, <https://repology.org/project/pari-data/versions>, <https://repology.org/project/pari-elldata/versions>, <https://repology.org/project/pari-galdata/versions>, <https://repology.org/project/pari-galpol/versions>, <https://repology.org/project/pari-nftables/versions>, <https://repology.org/project/pari-seadata/versions>, <https://repology.org/project/pari-seadata-big/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.261 pari\_elldata: PARI data package for elliptic curves

### Description

PARI/GP version of J. E. Cremona Elliptic Curve Data, needed by `ellsearch` and `ellidentify`.

### License

GNU General Public License (GPL version 2 or any later version).

### Upstream Contact

<http://pari.math.u-bordeaux.fr/>

### Dependencies

- Installation: None
- Runtime: PARI/GP

### Type

optional

### Dependencies

### Version Information

package-version.txt:

```
20161017
```

### Equivalent System Packages

```
$ sudo pacman -S pari-elldata
```

```
$ conda install pari-elldata
```

```
$ sudo pkg install math/pari-elldata
```

```
$ sudo zypper install pari-elldata
```

```
$ sudo xbps-install pari-elldata-small
```

See <https://repology.org/project/pari-elldata/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.262 pari\_galdata: PARI data package needed to compute Galois groups in degrees 8 through 11

### Description

PARI package “galdata”: Needed by polgalois to compute Galois group in degrees 8 through 11.

### License

GPL version 2+

### Upstream Contact

<http://pari.math.u-bordeaux.fr/>

**Type**

standard

**Dependencies****Version Information**

package-version.txt:

20080411.p0

**Equivalent System Packages**

```
$ sudo pacman -S pari-galdata
```

```
$ conda install pari-galdata
```

```
$ sudo yum install pari-galdata
```

```
$ sudo pkg install pari_galdata
```

```
$ sudo zypper install pari-galdata
```

```
$ sudo xbps-install pari-galdata
```

See <https://repology.org/project/pari-galdata/versions>If the system package is installed, `./configure` will check if it can be used.**6.1.263 pari\_galpol: PARI data package for polynomials defining Galois extensions of the rationals****Description**

PARI package of the GALPOL database of polynomials defining Galois extensions of the rationals, accessed by `galoisgetpol`, `galoisgetgroup`, `galoisgetname`.

**License**

GNU General Public License (GPL version 2 or any later version).

### Upstream Contact

<http://pari.math.u-bordeaux.fr/>

### Dependencies

- Installation: None
- Runtime: PARI/GP

### Type

optional

### Dependencies

### Version Information

package-version.txt:

```
20180625
```

### Equivalent System Packages

```
$ sudo pacman -S pari-galpol
```

```
$ conda install pari-galpol
```

```
$ sudo yum install pari-galpol
```

```
$ sudo pkg install math/pari_galpol
```

```
$ sudo zypper install pari-galpol
```

```
$ sudo xbps-install pari-galpol-small
```

See <https://repology.org/project/pari-galpol/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.264 pari\_jupyter: A Jupyter kernel for PARI/GP

### Description

A Jupyter kernel for PARI/GP



## License

GPL version 3 or later

## Upstream Contact

- <https://github.com/sagemath/pari-jupyter>

## Dependencies

- Python  $\geq 3.6.1$
- Jupyter 4
- PARI version 2.13 or later
- Readline (any version which works with PARI)
- Optional: Cython version 0.25 or later

## Type

optional

## Dependencies

- $\$(PYTHON)$
- $\$(PYTHON\_TOOLCHAIN)$
- *cython*: C-Extensions for Python, an optimizing static compiler
- *jupyter\_core*: Jupyter core package
- *notebook*: Jupyter notebook, a web-based notebook environment for interactive computing
- *pari*: Computer algebra system for fast computations in number theory

## Version Information

package-version.txt:

```
1.4.0
```

install-requires.txt:

```
pari_jupyter >=1.3.2
```

### Equivalent System Packages

```
$ conda install pari_jupyter
```

See <https://repology.org/project/pari-jupyter/versions>, <https://repology.org/project/python:pari-jupyter/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

### 6.1.265 pari\_nftables: PARI data package for number fields

#### Description

Repackaging of the historical megrez number field tables (errors fixed, 1/10th the size, easier to use).

#### License

GNU General Public License (GPL version 2 or any later version).

#### Upstream Contact

<http://pari.math.u-bordeaux.fr/>

#### Dependencies

- Installation: None
- Runtime: PARI/GP

#### Type

optional

#### Dependencies

#### Version Information

package-version.txt:

```
20080929
```

## Equivalent System Packages

```
$ conda install pari-nftables
```

```
$ sudo pkg install math/pari_nftables
```

```
$ sudo zypper install pari-nftables
```

```
$ sudo xbps-install pari-nftables
```

See <https://repology.org/project/pari-nftables/versions>

If the system package is installed, `./configure` will check if it can be used.

### 6.1.266 **pari\_seadata**: PARI data package needed by ellap for large primes (full version)

#### Description

Needed by ellap for large primes. These polynomials were extracted from the ECHIDNA databases and computed by David R. Kohel. This covers finite fields of cardinality  $q$  up to 750 bits. PARI/GP 2.9 contains fallback code to go on when all modular polynomials in the database have been exhausted and can handle larger fields (with an important slowdown).

#### License

GNU General Public License (GPL version 2 or any later version).

#### Upstream Contact

<http://pari.math.u-bordeaux.fr/>

#### Dependencies

- Installation: None
- Runtime: PARI/GP

#### Type

optional

### Dependencies

### Version Information

package-version.txt:

```
20090618
```

### Equivalent System Packages

```
$ sudo pacman -S pari-seadata
```

```
$ conda install pari-seadata
```

```
$ sudo yum install pari-seadata
```

```
$ sudo pkg install math/pari_seadata
```

```
$ sudo zypper install pari-seadata
```

```
$ sudo xbps-install pari-seadata
```

See <https://repology.org/project/pari-seadata/versions>, <https://repology.org/project/pari-seadata-big/versions>

If the system package is installed, `./configure` will check if it can be used.

### 6.1.267 `pari_seadata_small`: PARI data package needed by `ellap` for large primes (small version)

#### Description

PARI package “`seadata_small`”: Needed by `ellap` for large primes. This “small” one is a much smaller version that should be suitable for primes up to 350 bits. These polynomials were extracted from the ECHIDNA databases and computed by David R. Kohel.

#### License

GPL version 2+

#### Upstream Contact

<http://pari.math.u-bordeaux.fr/>

**Type**

standard

**Dependencies****Version Information**

package-version.txt:

```
20090618.p0
```

**Equivalent System Packages**

```
$ sudo pacman -S pari-seadata
```

```
$ conda install pari-seadata-small
```

```
$ sudo pkg install math/pari_seadata
```

```
$ sudo xbps-install pari-seadata
```

See <https://repology.org/project/pari-seadata-small/versions>

If the system package is installed, `./configure` will check if it can be used.

**6.1.268 parso: A Python parser****Description**

Parso is a Python parser that supports error recovery and round-trip parsing for different Python versions (in multiple Python versions). Parso is also able to list multiple syntax errors in your python file.

**Type**

standard

**Dependencies**

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

### Version Information

package-version.txt:

```
0.8.3
```

install-requires.txt:

```
parso >=0.7.0
```

### Equivalent System Packages

```
$ conda install parso
```

```
$ sudo emerge dev-python/parso
```

```
$ sudo port install py-parso
```

```
$ sudo xbps-install python3-parso
```

See <https://repology.org/project/python:parso/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.269 patch: Applies diffs and patches to files

### Description

‘patch’ takes a patch file containing a difference listing produced by the ‘diff’ program and applies those differences to one or more original files, producing patched versions.

The version of ‘patch’ included is the GNU one. Some of the ‘diff’ files produced by GNU ‘diff’ are not acceptable to some versions of the ‘patch’ command, such as the ‘patch’ command that comes with Solaris.

### License

This program is free software: you can redistribute it and/or modify it under the terms of the GNU General Public License as published by the Free Software Foundation; either version 2, or (at your option) any later version.

### Upstream Contact

Main web site: <http://savannah.gnu.org/projects/patch/>

Bug database: <http://savannah.gnu.org/bugs/?group=patch>

Submit bugs: <http://savannah.gnu.org/bugs/?func=additem&group=patch>

Mailing lists: [bug-patch@gnu.org](mailto:bug-patch@gnu.org)

## Special Update/Build Instructions

In the event patches ever need to be made to this package, the method of applying the patches should not rely on the 'patch' existing on the system.

## Type

standard

## Dependencies

## Version Information

package-version.txt:

```
2.7.5
```

## Equivalent System Packages

```
$ apk add patch
```

```
$ sudo pacman -S patch
```

```
$ conda install patch
```

```
$ apt-cyg install patch
```

```
$ sudo apt-get install patch
```

```
$ sudo yum install patch
```

```
$ sudo pkg install devel/patch
```

```
$ brew install gpatch
```

```
$ sudo port install gpatch
```

```
$ sudo zypper install patch
```

```
$ sudo slackpkg install patch
```

```
$ sudo xbps-install patch
```

See <https://repology.org/project/patch/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.270 patchelf: A small utility to modify the dynamic linker and RPATH of ELF executables

### Description

A small utility to modify the dynamic linker and RPATH of ELF executables.

### License

GPL-3.0-or-later

### Upstream Contact

<https://github.com/NixOS/patchelf>

### Type

standard

### Dependencies

- *bzip2: High-quality data compressor*

### Version Information

package-version.txt:

```
0.13.1
```

### Equivalent System Packages

```
$ sudo apt-get install patchelf
```

```
$ sudo yum install patchelf
```

```
$ sudo pkg install sysutils/patchelf
```

```
$ sudo emerge dev-util/patchelf
```

```
$ brew install patchelf
```

```
$ sudo port install patchelf
```

```
$ nix-env --install patchelf
```

```
$ sudo zypper install patchelf
```



```
$ sudo xbps-install patchelf
```

See <https://repology.org/project/patchelf/versions>

If the system package is installed, `./configure` will check if it can be used.

### 6.1.271 pathspec: Utility library for gitignore style pattern matching of file paths.

#### Description

Utility library for gitignore style pattern matching of file paths.

#### License

MPL 2.0

#### Upstream Contact

<https://pypi.org/project/pathspec/>

#### Type

standard

#### Dependencies

- `$(PYTHON)`
- *pip: Tool for installing and managing Python packages*

#### Version Information

package-version.txt:

```
0.12.1
```

install-requires.txt:

```
pathspec
```

### Equivalent System Packages

```
$ conda install pathspec
```

```
$ sudo emerge dev-python/pathspec
```

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.272 pdf2svg - PDF to SVG convertor

### Description

pdf2svg is a tiny command-line utility using Cairo and Poppler to convert PDF documents into SVG files. Multi-page PDF can be split up to one SVG per page by passing a file naming specification.

### License

GPL

### Upstream Contact

<http://cityinthesky.co.uk/opensource/pdf2svg/>

### Type

optional

### Dependencies

### Version Information

### Equivalent System Packages

```
$ apk add pdf2svg
```

```
$ sudo pacman -S pdf2svg
```

```
$ conda install pdf2svg
```

```
$ sudo apt-get install pdf2svg
```

```
$ sudo yum install pdf2svg
```

```
$ sudo pkg install graphics/pdf2svg
```

```
$ brew install pdf2svg
```

```
$ sudo port install pdf2svg
```

```
$ nix-env --install pdf2svg
```

```
$ sudo zypper install pdf2svg
```

See <https://repology.org/project/pdf2svg/versions>

If the system package is installed, `./configure` will check if it can be used.

### 6.1.273 perl\_cpan\_polymake\_prereq: Represents all Perl packages that are prerequisites for polymake

#### Description

This script package represents all Perl packages that are prerequisites for polymake.

#### License

Various free software licenses

#### Type

optional

#### Dependencies

#### Version Information

#### Equivalent System Packages

```
$ apk add perl-term-readkey perl-dev perl-file-slurp perl-json \
 perl-xml-writer perl-xml-libxslt
```

```
$ cpan -i XML::Writer XML::LibXML XML::LibXSLT File::Slurp JSON SVG \
 Term::ReadKey
```

```
$ sudo apt-get install libxml-libxslt-perl libxml-writer-perl \
 libxml2-dev libperl-dev libfile-slurp-perl libjson-perl \
 libsvg-perl libterm-readkey-perl libterm-readline-gnu-perl
```

```
$ sudo yum install perl-ExtUtils-Embed perl-File-Slurp perl-JSON \
 perl-Term-ReadLine-Gnu perl-TermReadKey perl-XML-Writer \
 perl-XML-LibXML perl-XML-LibXSLT
```

```
$ sudo pkg install textproc/p5-XML-Writer textproc/p5-XML-LibXML \
textproc/p5-XML-LibXSLT devel/p5-File-Slurp converters/p5-JSON \
textproc/p5-SVG devel/p5-Term-ReadKey
```

```
$ sudo emerge XML-Writer XML-LibXML XML-LibXSLT File-Slurp \
dev-perl/Term-ReadLine-Gnu dev-perl/TermReadKey JSON SVG
```

```
$ sudo xbps-install perl-File-Slurp perl-JSON perl-SVG \
perl-Term-ReadKey perl-XML-LibXML perl-XML-LibXSLT \
perl-XML-Writer
```

If the system package is installed, `./configure` will check if it can be used.

### 6.1.274 perl\_mongodb: A prerequisite for polymake's PolyDB feature

#### Description

This script package represents the Perl package MongoDB, which is needed for the PolyDB feature of polymake.

#### License

Various free software licenses

#### Type

optional

#### Dependencies

#### Version Information

#### Equivalent System Packages

```
$ cpan -i MongoDB
```

```
$ sudo apt-get install libmongodb-perl
```

```
$ sudo yum install perl-MongoDB
```

```
$ sudo pkg install databases/p5-MongoDB
```

```
$ sudo emerge dev-perl/MongoDB
```

If the system package is installed, `./configure` will check if it can be used.

## 6.1.275 perl\_term\_readline\_gnu: Perl extension for the GNU Readline/History libraries

### Description

Perl extension for the GNU Readline/History Library

Available on CPAN

### License

The Perl 5 License (Artistic 1 & GPL 1)

### Upstream Contact

Hiroo HAYASHI

### Type

optional

### Dependencies

- *readline: Command line editing library*

### Version Information

package-version.txt:

```
1.35
```

### Equivalent System Packages

```
$ apk add perl-term-readline-gnu
```

```
$ sudo pacman -S perl-term-readline-gnu
```

```
$ cpan -i Term::ReadLine::Gnu
```

```
$ apt-cyg install perl-Term-ReadLine-Gnu
```

```
$ sudo apt-get install libterm-readline-gnu-perl
```

```
$ sudo yum install perl-Term-ReadLine-Gnu
```

```
$ sudo pkg install devel/p5-Term-ReadLine-Gnu
```

```
$ sudo emerge dev-perl/Term-ReadLine-Gnu
```

```
$ sudo port install p5-term-readline-gnu
```

```
$ sudo zypper install perl\ (Term::ReadLine::Gnu\)
```

```
$ sudo xbps-install perl-Term-ReadLine-Gnu
```

See <https://repology.org/project/perl:term-readline-gnu/versions>, <https://repology.org/project/perl:termreadline-gnu/versions>

If the system package is installed, `./configure` will check if it can be used.

### 6.1.276 pexpect: Python module for controlling and automating other programs

#### Description

Pexpect is a pure Python module for spawning child applications; controlling them; and responding to expected patterns in their output.

#### License

ISC license: <http://opensource.org/licenses/isc-license.txt> This license is approved by the OSI and FSF as GPL-compatible.

#### Upstream Contact

- <http://pexpect.readthedocs.org/en/stable/>
- <https://github.com/pexpect/pexpect>

#### Type

standard

#### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *ptyprocess: Python interaction with subprocesses in a pseudoterminal*

## Version Information

package-version.txt:

```
4.9.0
```

install-requires.txt:

```
pexpect >=4.8.0
```

## Equivalent System Packages

```
$ sudo pacman -S python-pexpect
```

```
$ conda install pexpect
```

```
$ sudo yum install python-pexpect
```

```
$ sudo pkg install misc/py-pexpect
```

```
$ sudo emerge dev-python/pexpect
```

```
$ sudo port install py-pexpect
```

```
$ sudo zypper install python3\${PYTHON_MINOR}-pexpect
```

```
$ sudo xbps-install python3-pexpect
```

See <https://repology.org/project/pexpect/versions>, <https://repology.org/project/python:pexpect/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.277 phitigra: A graph editor for SageMath/Jupyter

### Description

A graph editor for SageMath/Jupyter

### License

### Upstream Contact

<https://pypi.org/project/phitigra/>

### Type

optional

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *ipywidgets: Interactive HTML widgets for Jupyter notebooks and the IPython kernel*
- *numpy: Package for scientific computing with Python*
- *pillow: Python Imaging Library*

### Version Information

requirements.txt:

```
phitigra>=0.2.6
```

### Equivalent System Packages

(none known)

## 6.1.278 pickleshare: A ‘shelve’ like datastore with concurrency support

### Description

PickleShare - a small ‘shelve’ like datastore with concurrency support

Like shelve, a PickleShareDB object acts like a normal dictionary. Unlike shelve, many processes can access the database simultaneously. Changing a value in database is immediately visible to other processes accessing the same database.

Concurrency is possible because the values are stored in separate files. Hence the “database” is a directory where all files are governed by PickleShare.

### Type

standard

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)



## Version Information

package-version.txt:

```
0.7.5
```

install-requires.txt:

```
pickleshare >=0.7.5
```

## Equivalent System Packages

```
$ sudo pacman -S python-pickleshare
```

```
$ conda install pickleshare
```

```
$ sudo apt-get install python3-pickleshare
```

```
$ sudo yum install python-pickleshare
```

```
$ sudo emerge dev-python/pickleshare
```

```
$ sudo port install py-pickleshare
```

```
$ sudo zypper install python3\${PYTHON_MINOR}-pickleshare
```

```
$ sudo xbps-install python3-pickleshare
```

See <https://repology.org/project/pickleshare/versions>, <https://repology.org/project/python:pickleshare/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.279 pillow: Python Imaging Library

### Description

Pillow is the “friendly” PIL fork by Alex Clark and Contributors.

The Python Imaging Library (PIL) adds powerful image processing and graphics capabilities to Python. The library supports many file formats.

### License

Standard PIL License

### Upstream Contact

- Author: Alex Clark <aclark@aclark.net>
- <https://python-pillow.org/>
- Homepage: <http://python-imaging.github.io/>

### Type

standard

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *freetype: A free, high-quality, and portable font engine*
- *pkgconf: An implementation of the pkg-config spec*
- *zlib: Data compression library*

### Version Information

package-version.txt:

```
10.1.0
```

install-requires.txt:

```
pillow >=7.2.0
```

### Equivalent System Packages

```
$ sudo pacman -S python-pillow
```

```
$ conda install pillow
```

```
$ sudo apt-get install python3-pillow
```

```
$ sudo yum install python-pillow
```

```
$ sudo emerge dev-python/pillow
```

```
$ sudo port install py-Pillow
```

```
$ sudo zypper install python3\${PYTHON_MINOR}\-Pillow
```

```
$ sudo xbps-install python3-Pillow
```

See <https://repology.org/project/python:pillow/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.280 pint: Physical quantities module

### Description

Physical quantities module

### License

BSD

### Upstream Contact

<https://pypi.org/project/Pint/>

### Type

optional

### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`

### Version Information

package-version.txt:

```
0.20.1
```

install-requires.txt:

```
Pint
```

### Equivalent System Packages

```
$ conda install pint
```

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

### 6.1.281 pip: Tool for installing and managing Python packages

#### Description

This package installs pip, the tool for installing and managing Python packages, such as those found in the Python Package Index. It's a replacement for `easy_install`.

#### License

MIT

#### Upstream Contact

- Project Page: <https://github.com/pypa/pip>
- Install howto: <https://pip.pypa.io/en/latest/installing.html>
- Changelog: <https://pip.pypa.io/en/latest/news.html>
- Bug Tracking: <https://github.com/pypa/pip/issues>
- Mailing list: <http://groups.google.com/group/python-virtualenv>
- Docs: <https://pip.pypa.io/>

#### Type

standard

#### Dependencies

- `$(PYTHON)`

#### Version Information

package-version.txt:

```
23.3.1
```

install-requires.txt:

```
pip >=23.1.0
for use of the "in-tree-build" feature, default since 21.3, by the Sage distribution
for use of --config-settings, 22.1
for use of -C as a shortcut for --config-settings, 23.1.0
```

## Equivalent System Packages

```
$ sudo pacman -S python-pip
```

```
$ conda install pip
```

```
$ sudo apt-get install python3-pip
```

```
$ sudo yum install python-pip
```

```
$ sudo pkg install devel/py-pip
```

```
$ sudo emerge dev-python/pip
```

```
$ sudo port install py-pip
```

```
$ sudo zypper install python3\${PYTHON_MINOR}-pip
```

```
$ sudo xbps-install python3-pip
```

See <https://repology.org/project/pip3/versions>, <https://repology.org/project/python:pip/versions>, <https://repology.org/project/python3x-pip/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.282 pkgconf: An implementation of the pkg-config spec

### Description

Pkgconf is an implementation of the pkg-config spec with minimal dependencies.

### License

ISC License (equivalent to Simplified BSD)

### Upstream Contact

<https://github.com/pkgconf/pkgconf>

### Special Update/Build Instructions

- `install.patch`: Use install script from `AC_PROG_INSTALL`

Pkgconf is used in `bzip2`, so we must not use the `bzip2`-compressed tarball.

### Type

standard

### Dependencies

- *patch*: Applies diffs and patches to files
- *xz*: General-purpose data compression software

### Version Information

package-version.txt:

```
1.8.0
```

### Equivalent System Packages

```
$ sudo pacman -S pkgconf
```

```
$ conda install pkg-config
```

```
$ sudo apt-get install pkg-config
```

```
$ sudo yum install pkg-config
```

```
$ sudo pkg install devel/pkgconf
```

```
$ brew install pkg-config
```

```
$ sudo port install pkgconfig
```

```
$ sudo zypper install pkgconf
```

```
$ sudo xbps-install pkgconf
```

See <https://repology.org/project/pkgconf/versions>, <https://repology.org/project/pkg-config/versions>

If the system package is installed, `./configure` will check if it can be used.

### 6.1.283 pkgconfig: Python interface to pkg-config

#### Description

Pkgconfig is a Python module to interface with the pkg-config command line tool.

#### License

MIT License

#### Upstream Contact

<https://github.com/matze/pkgconfig>

#### Type

standard

#### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *pkgconf: An implementation of the pkg-config spec*

#### Version Information

package-version.txt:

```
1.5.5
```

install-requires.txt:

```
pkgconfig
```

#### Equivalent System Packages

```
$ sudo pacman -S python-pkgconfig
```

```
$ conda install pkgconfig
```

```
$ sudo apt-get install python3-pkgconfig
```

```
$ sudo yum install python-pkgconfig
```

```
$ sudo pkg install devel/py-pkgconfig
```

```
$ sudo emerge dev-python/pkgconfig
```

```
$ sudo port install py-pkgconfig
```

```
$ sudo zypper install pkg-config
```

```
$ sudo xbps-install python3-pkgconfig
```

See <https://repology.org/project/python:pkgconfig/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

### 6.1.284 planarity: Planarity-related graph algorithms

#### Description

This code project provides a library for implementing graph algorithms as well as implementations of several planarity-related graph algorithms. The origin of this project is the reference implementation for the Edge Addition Planarity Algorithm [1], which is now the fastest and simplest linear-time method for planar graph embedding and planarity obstruction isolation (i.e. Kuratowski subgraph isolation).

[1] <http://dx.doi.org/10.7155/jgaa.00091>

#### License

New BSD License

#### Upstream Contact

- <https://github.com/graph-algorithms/edge-addition-planarity-suite/>
- John Boyer <John.Boyer.PhD@gmail.com>

#### Special Update/Build Instructions

The tarballs can be found at, <https://github.com/graph-algorithms/edge-addition-planarity-suite/releases> sage tarball is repackaged after running `autogen.sh`

#### Type

standard



## Dependencies

### Version Information

package-version.txt:

```
3.0.1.0
```

### Equivalent System Packages

```
$ sudo pacman -S planarity
```

```
$ conda install planarity
```

```
$ sudo apt-get install libplanarity-dev planarity
```

```
$ sudo yum install planarity planarity-devel
```

```
$ sudo pkg install math/planarity
```

```
$ sudo emerge sci-mathematics/planarity
```

```
$ nix-env --install planarity
```

```
$ sudo zypper install edge-addition-planarity-suite edge-addition-planarity-suite-
→devel
```

```
$ sudo xbps-install planarity-devel
```

See <https://repology.org/project/planarity/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.285 plantri: Generate non-isomorphic sphere-embdedded graphs

### Description

Plantri is a program that generates certain types of graphs that are imbedded on the sphere.

Exactly one member of each isomorphism class is output, using an amount of memory almost independent of the number of graphs produced. This, together with the exceptionally fast operation and careful validation, makes the program suitable for processing very large numbers of graphs.

Isomorphisms are defined with respect to the embeddings, so in some cases outputs may be isomorphic as abstract graphs.

### License

Plantri is distributed without a license.

### Upstream Contact

Gunnar Brinkmann

- University of Ghent
- [Gunnar.Brinkmann@ugent.be](mailto:Gunnar.Brinkmann@ugent.be)

Brendan McKay

- Australian National University
- [bdm@cs.anu.edu.au](mailto:bdm@cs.anu.edu.au)

See <http://cs.anu.edu.au/~bdm/plantri>

### Type

optional

### Dependencies

### Version Information

package-version.txt:

```
5.3
```

### Equivalent System Packages

```
$ sudo pacman -S plantri
```

See <https://repology.org/project/plantri/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.286 platformdirs: A small Python module for determining appropriate platform-specific dirs, e.g. a “user data dir”.

### Description

A small Python module for determining appropriate platform-specific dirs, e.g. a “user data dir”.

## License

## Upstream Contact

<https://pypi.org/project/platformdirs/>

## Type

standard

## Dependencies

- `$(PYTHON)`
- *pip: Tool for installing and managing Python packages*

## Version Information

package-version.txt:

```
4.1.0
```

install-requires.txt:

```
platformdirs
```

## Equivalent System Packages

```
$ conda install platformdirs
```

```
$ sudo emerge dev-python/platformdirs
```

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.287 pluggy: plugin and hook calling mechanisms for python

### Description

plugin and hook calling mechanisms for python

### License

MIT license

### Upstream Contact

<https://pypi.org/project/pluggy/>

### Type

standard

### Dependencies

- \$(PYTHON)
- *pip: Tool for installing and managing Python packages*

### Version Information

package-version.txt:

```
1.3.0
```

install-requires.txt:

```
pluggy
```

### Equivalent System Packages

```
$ sudo pacman -S python-pluggy
```

```
$ conda install pluggy
```

```
$ sudo apt-get install python3-pluggy
```

```
$ sudo yum install python-pluggy
```

```
$ sudo emerge dev-python/pluggy
```

```
$ sudo zypper install python3\${PYTHON_MINOR}\-pluggy
```

```
$ sudo xbps-install python3-pluggy
```

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.288 ply: Python Lex & Yacc

### Description

Python Lex & Yacc

### License

BSD

### Upstream Contact

<https://pypi.org/project/ply/>

### Type

standard

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

### Version Information

package-version.txt:

```
3.11
```

install-requires.txt:

```
ply
```

### Equivalent System Packages

```
$ conda install ply
```

```
$ sudo emerge dev-python/ply
```

```
$ sudo xbps-install python3-ply
```

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.289 polylib: Operations on unions of polyhedra

### Description

The Polyhedral Library (PolyLib for short) operates on objects made up of unions of polyhedra of any dimension. polylib is a C library.

### License

GPL v3

### Upstream Contact

- <https://groups.google.com/forum/#!forum/isl-development>

### Type

experimental

### Dependencies

- `$(MP_LIBRARY)`
- *mpfr: Multiple-precision floating-point computations with correct rounding*
- *ntl: A library for doing number theory*

### Version Information

package-version.txt:

```
5.22.5
```

### Equivalent System Packages

```
$ sudo port install polylib
```

```
$ sudo zypper install polylib pkgconfig\polylibgmp\
```

See <https://repology.org/project/polylib/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.290 polymake: Computations with polyhedra, fans, simplicial complexes, matroids, graphs, tropical hypersurfaces

### Description

polymake is open source software for research in polyhedral geometry. It deals with polytopes, polyhedra and fans as well as simplicial complexes, matroids, graphs, tropical hypersurfaces, and other objects. Supported platforms include various flavors of Linux, Free BSD and Mac OS.

### License

- GPL v3

### Upstream Contact

- <https://polymake.org/>

### Dependencies

Polymake needs a working installation of Perl, including its shared library and some modules (XML::Writer XML::LibXML XML::LibXSLT Term::ReadLine::Gnu JSON SVG). The Polymake interface in Sage additionally needs File::Slurp. For full functionality including polymake's polyDB, also the Perl module MongoDB is needed.

These are not provided by a Sage package. The dummy package perl\_cpan\_polymake\_prereq will signal an error at build time if the required prerequisites are not met.

The configure script will inform you about the equivalent system packages that you should install. Otherwise, you can use CPAN (see below).

Sage might install the Term::ReadLine::Gnu module, however, when you install polymake, if it is not provided by the system, or if Sage installs its own readline library.

A distribution-independent way to install Perl modules (into a user's home directory or /usr/local) is using CPAN. This is also the way to install the modules on macOS. For this, if you don't have root access, you will need the local::lib Perl module installed:

```
cpan -i XML::Writer XML::LibXML XML::LibXSLT File::Slurp Term::ReadLine::Gnu JSON SVG_
↪MongoDB
```

Several Sage packages should be installed before installing the polymake package to give a more featureful Polymake installation:

```
sage -i 4ti2 latte_int topcom qhull
```

Software that would need to be installed manually (no Sage package available) for a more featureful Polymake installation: azove, porta, vinci, SplitsTree4.

Information on missing Polymake prerequisites after installing polymake:

```
$ sage -sh
(sage-sh) $ polymake
polytope> show_unconfigured;
```

In order to use Polymake from Sage, you will also need the jupymake package:

```
sage -i jupymake
```

### Debugging polymake install problems

```
apt-get install libdevel-trace-perl
$ cd src
$ perl -d:Trace support/configure.pl
```

### Type

optional

### Dependencies

- `$(MP_LIBRARY)`
- *bliss*: Computing automorphism groups and canonical forms of graphs
- *cddlib*: Double description method for polyhedral representation conversion
- *libxml2*: XML parser and toolkit
- *lrslib*: Reverse search algorithm for vertex enumeration and convex hull problems
- *ninja\_build*: A build system with a focus on speed
- *normaliz*: Computations in affine monoids, vector configurations, lattice polytopes, and rational cones
- *perl\_cpan\_polymake\_prereq*: Represents all Perl packages that are prerequisites for polymake
- *perl\_term\_readline\_gnu*: Perl extension for the GNU Readline/History libraries
- *ppl*: Parma Polyhedra Library

### Version Information

package-version.txt:

```
4.11
```

### Equivalent System Packages

```
$ sudo pacman -S polymake
```

```
$ sudo apt-get install polymake libpolymake-dev
```

```
$ sudo yum install polymake
```

```
$ brew install apaffenholz/polymake/polymake
```



```
$ nix-env --install polymake
```

```
$ sudo zypper install polymake
```

See <https://repology.org/project/polymake/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.291 `polytopes_db`: Databases of 2- and 3-dimensional reflexive polytopes

### Description

This package includes lists of 2- and 3-dimensional reflexive polytopes.

The list of polygons is quite easy to get and it has been known for a while. The list of 3-polytopes was originally obtained by Maximilian Kreuzer and Harald Skarke using their software PALP, which is included into the standard distribution of Sage. To work with lattice and reflexive polytopes from Sage you can use `sage.geometry.lattice_polytope` module, which relies on PALP for some of its functionality. To get access to the databases of this package, use `ReflexivePolytope` and `ReflexivePolytopes` commands.

### License

GPL

### Upstream Contact

<http://hep.itp.tuwien.ac.at/~kreuzer/CY/CYpalp.html>

### Type

standard

### Dependencies

### Version Information

package-version.txt:

```
20170220.p0
```

### Equivalent System Packages

```
$ sudo pacman -S sage-data-polytopes_db
```

```
$ conda install sagemath-db-polytopes
```

See <https://repology.org/project/sagemath-polytopes-db/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

### 6.1.292 polytopes\_db\_4d: Database of 4-dimensional reflexive polytopes

#### Description

This package contains the database of 4-d reflexive polytopes with Hodge numbers as index.

Based on the original list by Maximilian Kreuzer and Harald Skarke using their software PALP.

#### License

GPL v2+

#### SPKG Maintainers

Volker Braun <[vbraun.name@gmail.com](mailto:vbraun.name@gmail.com)>

#### Type

optional

#### Dependencies

#### Version Information

package-version.txt:

```
1.0
```

### Equivalent System Packages

See <https://repology.org/project/polytopes-db-4d/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

### 6.1.293 ppl: Parma Polyhedra Library

#### Description

The Parma Polyhedra Library (PPL) provides numerical abstractions especially targeted at applications in the field of analysis and verification of complex systems. These abstractions include convex polyhedra, defined as the intersection of a finite number of (open or closed) halfspaces, each described by a linear inequality (strict or non-strict) with rational coefficients; some special classes of polyhedra shapes that offer interesting complexity/precision tradeoffs; and grids which represent regularly spaced points that satisfy a set of linear congruence relations. The library also supports finite powersets and products of (any kind of) polyhedra and grids, a mixed integer linear programming problem solver using an exact-arithmetic version of the simplex algorithm, a parametric integer programming solver, and primitives for the termination analysis via the automatic synthesis of linear ranking functions.

It is written in C++, but comes with interfaces to C, Java, OCaml, and Prolog. PPL is one of the fastest implementations of polyhedral computations.

Benchmarks are included in this paper: [arXiv cs/0612085](https://arxiv.org/abs/cs/0612085)

#### License

GPL v3+

#### Upstream Contact

- <https://www.bugseng.com/ppl>

Core Development Team

- Roberto Bagnara (University of Parma)
- Patricia M. Hill (University of Parma)
- Enea Zaffanella (University of Parma)

#### Type

standard

#### Dependencies

- \$(MP\_LIBRARY)
- *glpk: GNU Linear Programming Kit*

### Version Information

package-version.txt:

```
1.2.p1
```

### Equivalent System Packages

```
$ sudo pacman -S ppl
```

```
$ conda install ppl
```

```
$ sudo apt-get install libppl-dev ppl-dev
```

```
$ sudo yum install ppl ppl-devel
```

```
$ sudo pkg install devel/ppl
```

```
$ sudo emerge dev-libs/ppl
```

```
$ brew install ppl
```

```
$ sudo port install ppl
```

```
$ nix-env --install ppl
```

```
$ sudo zypper install ppl-devel
```

```
$ sudo xbps-install ppl-devel
```

See <https://repology.org/project/ppl/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.294 pplpy: Python interface to the Parma Polyhedra Library

### Description

PPL Python wrapper

This Python package provides a wrapper to the C++ Parma Polyhedra Library (PPL).

The whole package started as a fork of a tiny part of the Sage software.

## License

GPL version 3

## Upstream Contact

- <https://github.com/sagemath/pplpy>

## Type

standard

## Dependencies

- `$(MP_LIBRARY)`
- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *cysignals: Interrupt and signal handling for Cython*
- *gmpy2: Python interface to GMP/MPPIR, MPFR, and MPC*
- *mpc: Arithmetic of complex numbers with arbitrarily high precision and correct rounding*
- *mpfr: Multiple-precision floating-point computations with correct rounding*
- *ppl: Parma Polyhedra Library*
- *sphinx: Python documentation generator*

## Version Information

package-version.txt:

```
0.8.9
```

install-requires.txt:

```
Issue #30922: pplpy 0.8.4 and earlier do not declare dependencies correctly
pplpy >=0.8.6
```

## Equivalent System Packages

```
$ sudo pacman -S python-pplpy
```

```
$ conda install pplpy
```

```
$ sudo yum install python-pplpy
```

```
$ sudo pkg install math/py-pplpy
```

```
$ sudo emerge dev-python/pplpy
```

```
$ sudo xbps-install python3-pplpy
```

See <https://repology.org/project/pplpy/versions>, <https://repology.org/project/python:pplpy/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

### 6.1.295 pplpy\_doc: Python interface to the Parma Polyhedra Library (documentation)

#### Description

PPL Python wrapper (documentation)

#### License

GPL version 3

#### Upstream Contact

- <https://github.com/sagemath/pplpy>

#### Type

standard

#### Dependencies

- *pplpy*: Python interface to the Parma Polyhedra Library
- *sphinx*: Python documentation generator

#### Version Information

package-version.txt:

```
0.8.9
```

## Equivalent System Packages

(none known)

### 6.1.296 primecount: Algorithms for counting primes

#### Description

primecount is a C++ implementation of several algorithms for counting primes maintained by Kim Walisch.

Website: <https://github.com/kimwalisch/primecount/>

#### License

primecount is licensed BSD 2

#### Upstream Contact

- <https://github.com/kimwalisch/primecount/>

#### Type

standard

#### Dependencies

- *cmake: A cross-platform build system generator*
- *primesieve: CLI program and C/C++ library for generating primes*

#### Version Information

package-version.txt:

```
7.6
```

## Equivalent System Packages

```
$ sudo pacman -S primecount
```

```
$ conda install primecount
```

```
$ sudo yum install primecount primecount-devel
```

```
$ sudo emerge sci-mathematics/primecount
```

```
$ brew install primecount
```

```
$ sudo zypper install primecount libprimecount-devel
```

```
$ sudo xbps-install primecount-devel
```

See <https://repology.org/project/primecount/versions>

If the system package is installed, `./configure` will check if it can be used.

### 6.1.297 primecountpy: Cython interface for C++ primecount library

#### Description

Cython interface for C++ primecount library

#### License

GPLv3

#### Upstream Contact

<https://pypi.org/project/primecountpy/>

#### Type

standard

#### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *cysignals: Interrupt and signal handling for Cython*
- *cython: C-Extensions for Python, an optimizing static compiler*
- *primecount: Algorithms for counting primes*

#### Version Information

package-version.txt:

```
0.1.0
```

install-requires.txt:

```
primecountpy
```



## Equivalent System Packages

```
$ conda install primecountpy
```

```
$ sudo emerge dev-python/primecountpy
```

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.298 primesieve: CLI program and C/C++ library for generating primes

### Description

A CLI program and C/C++ library for quickly generating prime numbers. <https://github.com/kimwalisch/primesieve>

A dependency of the standard spkg primecount.

### License

BSD-2-clause

### Upstream Contact

- <https://github.com/kimwalisch/primesieve>

### Type

standard

### Dependencies

- *cmake: A cross-platform build system generator*

### Version Information

package-version.txt:

```
11.0
```

### Equivalent System Packages

```
$ apk add primesieve-dev primesieve
```

```
$ sudo pacman -S primesieve
```

```
$ conda install primesieve
```

```
$ sudo apt-get install libprimesieve-dev
```

```
$ sudo yum install primesieve-devel primesieve
```

```
$ sudo emerge sci-mathematics/primesieve
```

```
$ brew install primesieve
```

```
$ sudo zypper install primesieve
```

```
$ sudo xbps-install primesieve-devel
```

See <https://repology.org/project/primesieve/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.299 **prometheus\_client**: Python client for the systems monitoring and alerting toolkit Prometheus

### Description

The official Python 2 and 3 client for Prometheus (see <https://prometheus.io>), an open-source systems monitoring and alerting toolkit.

### Type

standard

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

## Version Information

package-version.txt:

```
0.14.1
```

install-requires.txt:

```
prometheus_client >=0.8.0
```

## Equivalent System Packages

```
$ conda install prometheus_client
```

```
$ sudo emerge dev-python/prometheus_client
```

```
$ sudo port install py-prometheus_client
```

```
$ sudo zypper install python3\${PYTHON_MINOR}\-prometheus_client
```

```
$ sudo xbps-install python3-prometheus_client
```

See <https://repology.org/project/python:prometheus-client/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.300 prompt\_toolkit: Interactive command lines for Python

### Description

Library for building powerful interactive command lines in Python

[https://pypi.python.org/pypi/prompt\\_toolkit](https://pypi.python.org/pypi/prompt_toolkit)

### Type

standard

### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *six: Python 2 and 3 compatibility utilities*
- *wcwidth: Measures the displayed width of unicode strings in a terminal*

### Version Information

package-version.txt:

```
3.0.43
```

install-requires.txt:

```
prompt_toolkit >=3.0.38
```

### Equivalent System Packages

```
$ sudo pacman -S python-importlib_resources
```

```
$ conda install prompt_toolkit\>=3.0.38
```

```
$ sudo apt-get install importlib-resources
```

```
$ sudo yum install python-prompt-toolkit
```

```
$ sudo pkg install devel/py-importlib-resources
```

```
$ sudo emerge dev-python/prompt_toolkit
```

```
$ sudo port install py-prompt_toolkit
```

```
$ sudo zypper install python3\${PYTHON_MINOR}\-importlib_resources
```

```
$ sudo xbps-install python3-prompt_toolkit
```

See <https://repology.org/project/python:prompt-toolkit/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.301 psutil: Cross-platform lib for process and system monitoring in Python.

### Description

Cross-platform lib for process and system monitoring in Python.

## License

BSD-3-Clause

## Upstream Contact

<https://pypi.org/project/psutil/>

## Type

standard

## Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

## Version Information

package-version.txt:

```
5.9.6
```

install-requires.txt:

```
psutil
```

## Equivalent System Packages

(none known)

## 6.1.302 ptyprocess: Python interaction with subprocesses in a pseudoterminal

### Description

Launch a subprocess in a pseudo terminal (pty), and interact with both the process and its pty.

Sometimes, piping stdin and stdout is not enough. There might be a password prompt that doesn't read from stdin, output that changes when it's going to a pipe rather than a terminal, or curses-style interfaces that rely on a terminal. If you need to automate these things, running the process in a pseudo terminal (pty) is the answer.

### License

Ptyprocess is under the ISC license, as code derived from Pexpect.

<http://opensource.org/licenses/ISC>

### Upstream Contact

<https://github.com/pexpect/ptyprocess>

### Type

standard

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

### Version Information

package-version.txt:

```
0.7.0
```

install-requires.txt:

```
ptyprocess > 0.5
```

### Equivalent System Packages

```
$ sudo pacman -S python-ptyprocess
```

No package needed.

```
$ sudo yum install python-ptyprocess
```

```
$ sudo pkg install sysutils/py-ptyprocess
```

```
$ sudo emerge dev-python/ptyprocess
```

```
$ sudo port install py-ptyprocess
```

```
$ sudo zypper install python3\${PYTHON_MINOR}-ptyprocess
```

```
$ sudo xbps-install python3-ptyprocess
```

See <https://repology.org/project/ptyprocess/versions>, <https://repology.org/project/python:ptyprocess/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

### 6.1.303 pure\_eval: Safely evaluate AST nodes without side effects

#### Description

Safely evaluate AST nodes without side effects

#### License

MIT

#### Upstream Contact

<https://pypi.org/project/pure-eval/>

#### Type

standard

#### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`

#### Version Information

package-version.txt:

```
0.2.2
```

install-requires.txt:

```
pure-eval
```

#### Equivalent System Packages

```
$ conda install pure_eval
```

```
$ sudo emerge dev-python/pure_eval
```

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

### 6.1.304 py: library with cross-python path, ini-parsing, io, code, log facilities

#### Description

library with cross-python path, ini-parsing, io, code, log facilities

#### License

MIT license

#### Upstream Contact

<https://pypi.org/project/py/>

#### Type

standard

#### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *setuptools\_scm: Python build system extension to obtain package version from version control*

#### Version Information

package-version.txt:

```
1.11.0
```

install-requires.txt:

```
py
```

#### Equivalent System Packages

```
$ sudo pacman -S python-py
```

```
$ conda install py
```

```
$ sudo apt-get install python3-py
```

```
$ sudo yum install python-py
```

```
$ sudo emerge dev-python/py
```



```
$ sudo zypper install python3\${PYTHON_MINOR}\-py
```

```
$ sudo xbps-install python3-py
```

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.305 pybind11: Create Python bindings to C++ code

### Description

**pybind11** is a lightweight header-only library that exposes C++ types in Python and vice versa, mainly to create Python bindings of existing C++ code. Its goals and syntax are similar to the excellent [Boost.Python]([http://www.boost.org/doc/libs/1\\_58\\_0/libs/python/doc/](http://www.boost.org/doc/libs/1_58_0/libs/python/doc/)) library by David Abrahams: to minimize boilerplate code in traditional extension modules by inferring type information using compile-time introspection.

### License

pybind11 is provided under a BSD-style license that can be found in the `LICENSE` file. By using, distributing, or contributing to this project, you agree to the terms and conditions of this license.

### Upstream Contact

<https://github.com/pybind/pybind11>

### Type

standard

### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`

### Version Information

package-version.txt:

```
2.11.1
```

install-requires.txt:

```
pybind11 >=2.6
```

### Equivalent System Packages

```
$ conda install pybind11
```

```
$ sudo emerge dev-python/pybind11
```

```
$ brew install pybind11
```

```
$ sudo port install py-pybind11
```

```
$ sudo xbps-install python3-pybind11
```

See <https://repology.org/project/python:pybind11/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

### 6.1.306 pybtex: A BibTeX-compatible bibliography processor in Python

#### Description

A BibTeX-compatible bibliography processor in Python

#### License

MIT

#### Upstream Contact

<https://pypi.org/project/pybtex/>

#### Type

optional

#### Dependencies

#### Version Information

requirements.txt:

```
pybtex
```

## Equivalent System Packages

```
$ conda install pybtex
```

```
$ sudo port install py-pybtex
```

```
$ sudo zypper install python3\${PYTHON_MINOR}\-pybtex
```

See <https://repology.org/project/python:pybtex/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.307 pycosat: SAT solver picosat with Python bindings

### Description

PicoSAT is a popular SAT solver written by Armin Biere in pure C. This package provides efficient Python bindings to picosat on the C level, i.e. when importing pycosat, the picosat solver becomes part of the Python process itself. For ease of deployment, the picosat source (namely `picosat.c` and `picosat.h`) is included in this project. These files have been extracted from the picosat source.

### License

MIT

### Upstream Contact

- PicoSAT: <http://fmv.jku.at/picosat/>
- pycosat: <https://github.com/ContinuumIO/pycosat>

### Special Update/Build Instructions

None.

### Type

optional

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

### Version Information

package-version.txt:

```
0.6.3
```

install-requires.txt:

```
pycosat >=0.6.3
```

### Equivalent System Packages

```
$ apk add py3-pycosat
```

```
$ sudo pacman -S python-pycosat
```

```
$ conda install pycosat
```

```
$ sudo yum install python-pycosat
```

```
$ sudo pkg install math/py-pycosat
```

See <https://repology.org/project/pycosat/versions>, <https://repology.org/project/python:pycosat/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.308 pycparser: Parser of the C language in Python

### Description

development website: <https://github.com/eliben/pycparser>

PyPI page: <https://pypi.org/project/pycparser/>

### License

BSD

## Upstream Contact

<https://github.com/eliben/pycparser>

## Type

standard

## Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

## Version Information

package-version.txt:

```
2.21
```

install-requires.txt:

```
pycparser >=2.20
```

## Equivalent System Packages

```
$ conda install pycparser
```

```
$ sudo emerge dev-python/pycparser
```

```
$ sudo port install py-pycparser
```

```
$ sudo zypper install python3\${PYTHON_MINOR}-pycparser
```

```
$ sudo xbps-install python3-pycparser
```

See <https://repology.org/project/pycparser/versions>, <https://repology.org/project/python:pycparser/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

### 6.1.309 pycryptosat: Python module of cryptominisat

#### Description

Build and install pycryptosat into appropriate venv. See cryptominisat for more details.

#### License

MIT License

#### Upstream Contact

- Authors: Mate Soos
- Email: [soos.mate@gmail.com](mailto:soos.mate@gmail.com)
- Website: <http://www.msoos.org/>
- Releases: <https://github.com/msoos/cryptominisat/releases>

#### Type

optional

#### Dependencies

- $\$(PYTHON)$
- $\$(PYTHON\_TOOLCHAIN)$
- *boost\_cropped*: Portable C++ libraries (subset needed for Sage)
- *cmake*: A cross-platform build system generator
- *cryptominisat*: A SAT solver
- *libpng*: Bitmap image support
- *m4ri*: fast arithmetic with dense matrices over  $GF(2)$
- *zlib*: Data compression library

#### Version Information

package-version.txt:

```
5.8.0
```

install-requires.txt:

```
pycryptosat
```

## Equivalent System Packages

```
$ conda install cryptominisat
```

```
$ brew install cryptominisat
```

See <https://repology.org/project/cryptominisat/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.310 pygments: Generic syntax highlighter

### Description

Pygments is a syntax highlighting package written in Python.

It is a generic syntax highlighter suitable for use in code hosting, forums, wikis or other applications that need to prettify source code. Highlights are:

- a wide range of over 300 languages and other text formats is supported
- special attention is paid to details, increasing quality by a fair amount
- support for new languages and formats are added easily
- a number of output formats, presently HTML, LaTeX, RTF, SVG, all image formats that PIL supports and ANSI sequences
- it is usable as a command-line tool and as a library

### License

BSD-2-Clause

### Upstream Contact

<https://pypi.org/project/Pygments/>

### Type

standard

### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`

### Version Information

package-version.txt:

```
2.17.2
```

install-requires.txt:

```
pygments >=2.12
```

### Equivalent System Packages

```
$ sudo pacman -S python-pygments
```

```
$ conda install pygments
```

```
$ sudo apt-get install python3-pygments
```

```
$ sudo yum install python-pygments
```

```
$ sudo emerge dev-python/pygments
```

```
$ brew install pygments
```

```
$ sudo port install py-pygments
```

```
$ sudo zypper install python3\${PYTHON_MINOR}-pygments
```

```
$ sudo xbps-install python3-Pygments
```

See <https://repology.org/project/pygments/versions>, <https://repology.org/project/python:pygments/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

### 6.1.311 pygraphviz: Python interface to Graphviz

#### Description

Python interface to Graphviz



## License

BSD

## Upstream Contact

<https://pypi.org/project/pygraphviz/>

## Type

optional

## Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *libgraphviz: Graph visualization software (callable library)*

## Version Information

requirements.txt:

```
pygraphviz
```

install-requires.txt:

```
pygraphviz
```

## Equivalent System Packages

```
$ conda install pygraphviz
```

```
$ sudo port install py-pygraphviz
```

See <https://repology.org/project/python:pygraphviz/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.312 pynormaliz: Python bindings for the normaliz library

### Description

The Python module PyNormaliz provides wrappers for normaliz.

### License

- GPL v2 or later

### Upstream Contact

<https://github.com/sebasguts/PyNormaliz>

### Special Update/Build Instructions

#### Type

optional

#### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *normaliz: Computations in affine monoids, vector configurations, lattice polytopes, and rational cones*

#### Version Information

package-version.txt:

```
2.18.p0
```

install-requires.txt:

```
pynormaliz ==2.18
```

#### Equivalent System Packages

```
$ sudo pacman -S python-pynormaliz
```

```
$ conda install pynormaliz
```

See <https://repology.org/project/pynormaliz/versions>, <https://repology.org/project/python:pynormaliz/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

### 6.1.313 pyparsing: A Python parsing module

#### Description

A Python Parsing Module

#### License

MIT License

#### Upstream Contact

<https://pypi.org/project/pyparsing/>

#### Type

standard

#### Dependencies

- \$(PYTHON)
- *pip: Tool for installing and managing Python packages*

#### Version Information

package-version.txt:

```
3.1.1
```

install-requires.txt:

```
pyparsing >=2.3.0
```

#### Equivalent System Packages

```
$ sudo pacman -S python-pyparsing
```

```
$ conda install pyparsing
```

```
$ sudo pkg install devel/py-pyparsing
```

```
$ sudo emerge dev-python/pyparsing
```

```
$ sudo zypper install python3\${PYTHON_MINOR}-pyparsing
```

```
$ sudo xbps-install python3-parsing
```

See <https://repology.org/project/pyarsing/versions>, <https://repology.org/project/python:pyarsing/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

### 6.1.314 pyppeteer: Headless chrome/chromium automation library

#### Description

Headless chrome/chromium automation library (unofficial port of puppeteer)

#### License

MIT

#### Upstream Contact

<https://pypi.org/project/pyppeteer/>

#### Type

optional

#### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *appdirs*: A small Python module for determining appropriate platform-specific dirs, e.g. a “user data dir”.
- *certifi*: Python package for providing Mozilla’s CA Bundle
- *importlib\_metadata*: Library to access the metadata for a Python package
- *urllib3*: HTTP library with thread-safe connection pooling, file post, and more.

#### Version Information

requirements.txt:

```
pyppeteer
```

## Equivalent System Packages

```
$ conda install pyppeteer
```

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.315 pyproject\_api: API to interact with the python pyproject.toml based projects

### Description

API to interact with the python pyproject.toml based projects

### License

### Upstream Contact

<https://pypi.org/project/pyproject-api/>

### Type

standard

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

### Version Information

package-version.txt:

```
1.6.1
```

install-requires.txt:

```
pyproject-api
```

## Equivalent System Packages

(none known)

### 6.1.316 pyproject\_metadata: PEP 621 metadata parsing

#### Description

PEP 621 metadata parsing

#### License

MIT

#### Upstream Contact

<https://pypi.org/project/pyproject-metadata/>

#### Type

standard

#### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *packaging*: Core utilities for Python packages
- *pyparsing*: A Python parsing module

#### Version Information

package-version.txt:

```
0.7.1
```

install-requires.txt:

```
pyproject-metadata
```

## Equivalent System Packages

```
$ sudo emerge dev-python/pyproject-metadata
```

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

### 6.1.317 pyrsistent: Persistent data structures in Python

#### Description

Pyrsistent is a number of persistent collections (by some referred to as functional data structures). Persistent in the sense that they are immutable.

#### License

MIT License

#### Upstream Contact

Home page: <http://github.com/tobgu/pyrsistent/>

#### Dependencies

- Python
- Setuptools
- hypothesis
- memory-profiler
- pyperform
- pytest
- Sphinx
- sphinx-rtd-theme
- tox

#### Type

standard

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

### Version Information

package-version.txt:

```
0.19.3
```

install-requires.txt:

```
pyrsistent >=0.16.0
```

### Equivalent System Packages

```
$ conda install pyrsistent
```

```
$ sudo emerge dev-python/pyrsistent
```

```
$ sudo port install py-pyrsistent
```

```
$ sudo xbps-install python3-pyrsistent
```

See <https://repology.org/project/pyrsistent/versions>, <https://repology.org/project/python:pyrsistent/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.318 pypscipopt: Python interface and modeling environment for SCIP

### Description

Python interface and modeling environment for SCIP

### License

MIT



## Upstream Contact

<https://pypi.org/project/PySCIPOpt/>

## Dependencies

scipoptsuite

## Type

optional

## Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *cython: C-Extensions for Python, an optimizing static compiler*
- *scip: Mixed integer programming solver*

## Version Information

package-version.txt:

```
4.3.0
```

install-requires.txt:

```
PySCIPOpt
```

## Equivalent System Packages

```
$ conda install pyscipopt
```

```
$ sudo pkg install math/py-PySCIPOpt
```

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.319 pysingular: A basic Python interface to Singular

### Description

A basic interface to call Singular from python

This python module is meant to be used in Singulars Jupyter interface.

### License

GPL version 2 or later

### Upstream Contact

- <https://github.com/sebasguts/SingularPython>

### Type

optional

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *singular: Computer algebra system for polynomial computations, algebraic geometry, singularity theory*

### Version Information

package-version.txt:

```
0.9.7
```

install-requires.txt:

```
pysingular >=0.9.5
```

### Equivalent System Packages

```
$ conda install pysingular
```

See <https://repology.org/project/pysingular/versions>, <https://repology.org/project/python:pysingular/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.320 pytest: Simple powerful testing with Python

### Description

pytest: simple powerful testing with Python

## License

MIT

## Upstream Contact

<https://pypi.org/project/pytest/>

## Type

optional

## Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *attrs*: Decorator for Python classes with attributes
- *importlib\_metadata*: Library to access the metadata for a Python package
- *packaging*: Core utilities for Python packages
- *pluggy*: plugin and hook calling mechanisms for python
- *py*: library with cross-python path, ini-parsing, io, code, log facilities
- *pyparsing*: A Python parsing module
- *tomli*: A lil' TOML parser

## Version Information

requirements.txt:

```
pytest
```

## Equivalent System Packages

```
$ conda install pytest
```

```
$ sudo port install py-pytest
```

```
$ sudo xbps-install python3-pytest
```

See <https://repology.org/project/python:pytest/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

### 6.1.321 **pytest\_mock**: Thin-wrapper around the mock package for easier use with pytest

#### Description

Thin-wrapper around the mock package for easier use with pytest

#### License

MIT

#### Upstream Contact

<https://pypi.org/project/pytest-mock/>

#### Type

optional

#### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *attrs*: Decorator for Python classes with attributes
- *packaging*: Core utilities for Python packages
- *pluggy*: plugin and hook calling mechanisms for python
- *py*: library with cross-python path, ini-parsing, io, code, log facilities
- *pyparsing*: A Python parsing module
- *pytest*: Simple powerful testing with Python
- *tomli*: A lil' TOML parser

#### Version Information

requirements.txt:

```
pytest-mock
```

## Equivalent System Packages

(none known)

### 6.1.322 `pytest_xdist`: pytest xdist plugin for distributed testing and loop-on-failing modes

#### Description

pytest xdist plugin for distributed testing and loop-on-failing modes

#### License

MIT

#### Upstream Contact

<https://pypi.org/project/pytest-xdist/>

#### Type

optional

#### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *pytest: Simple powerful testing with Python*

#### Version Information

requirements.txt:

```
pytest-xdist
```

## Equivalent System Packages

```
$ conda install pytest-xdist
```

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

### 6.1.323 python3: The Python programming language

#### Description

By default, Sage will try to use system's `python3` to set up a virtual environment, a.k.a. `venv` rather than building a Python 3 installation from scratch.

Sage will accept versions 3.9.x to 3.12.x.

You can also use `--with-python=/path/to/python3_binary` to tell Sage to use `/path/to/python3_binary` to set up the `venv`. Note that setting up the `venv` requires a number of Python modules to be available within the Python in question. Currently, as of Sage 10.3, these modules are as follows: `sqlite3`, `ctypes`, `math`, `hashlib`, `socket`, `zlib`, `ssl`, `ensurepip`.

Use the configure option `--without-system-python3` if you want Python 3 built from scratch.

#### Upstream Contact

<https://www.python.org>

#### Type

standard

#### Dependencies

- *bzip2: High-quality data compressor*
- *libffi: A portable foreign-function interface library*
- *liblzma: General-purpose data compression software*
- *libpng: Bitmap image support*
- *openssl: Implementation of the SSL and TLS protocols*
- *readline: Command line editing library*
- *sqlite: An SQL database engine*
- *xz: General-purpose data compression software*
- *zlib: Data compression library*

#### Version Information

package-version.txt:

3.11.1

## Equivalent System Packages

```
$ apk add python3-dev py3-setuptools
```

```
$ apt-cyg install python39-devel python-pip-wheel python-setuptools-wheel
```

```
$ sudo apt-get install python3 libpython3-dev python3-setuptools \
python3-venv
```

```
$ sudo yum install python3-devel python-setuptools
```

```
$ sudo pkg install lang/python devel/py-setuptools
```

```
$ brew install python3 python-setuptools
```

```
$ sudo port install python310 py-setuptools
```

```
$ sudo zypper install python3\${PYTHON_MINOR}\-devel python3\${PYTHON_MINOR}\-
→setuptools
```

```
$ sudo xbps-install python3-devel python3-setuptools
```

See <https://repology.org/project/python/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.324 python\_build: A simple, correct PEP517 package builder

### Description

`build` is a simple, correct PEP517 package builder

### License

MIT

### Upstream Contact

<https://pypi.org/project/build/>

### Type

optional

### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *packaging: Core utilities for Python packages*
- *pyparsing: A Python parsing module*
- *tomli: A lil' TOML parser*

### Version Information

requirements.txt:

```
build
```

### Equivalent System Packages

```
$ conda install build
```

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.325 python\_igraph: Python bindings for igraph

### Description

igraph is a library for creating and manipulating graphs. It is intended to be as powerful (ie. fast) as possible to enable the analysis of large graphs.

### License

GPL version 2

### Upstream Contact

<http://igraph.org/python/>



## Special Update/Build Instructions

### Type

optional

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *igraph*: A library for creating and manipulating graphs
- *texttable*: Python module for creating simple ASCII tables

### Version Information

package-version.txt:

```
0.11.3
```

install-requires.txt:

```
igraph
```

### Equivalent System Packages

```
$ sudo pacman -S python-igraph
```

```
$ conda install python-igraph
```

```
$ sudo apt-get install python3-igraph
```

```
$ sudo yum install python-igraph
```

```
$ sudo pkg install math/py-igraph
```

```
$ sudo port install py-igraph
```

See <https://repology.org/project/python:igraph/versions>, <https://repology.org/project/python:python-igraph/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

### 6.1.326 python\_json\_logger: A python library adding a json log formatter

#### Description

A python library adding a json log formatter

#### License

BSD

#### Upstream Contact

<https://pypi.org/project/python-json-logger/>

#### Type

standard

#### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

#### Version Information

package-version.txt:

```
2.0.7
```

install-requires.txt:

```
python-json-logger
```

#### Equivalent System Packages

(none known)

### 6.1.327 pythran: Ahead of Time compiler for numeric kernels

#### Description

Ahead of Time compiler for numeric kernels

## License

BSD 3-Clause

## Upstream Contact

<https://pypi.org/project/pythran/>

## Type

standard

## Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *beniget*: Extract semantic information about static Python code
- *gast*: Python AST that abstracts the underlying Python version
- *ply*: Python Lex & Yacc

## Version Information

package-version.txt:

```
0.14.0
```

install-requires.txt:

```
pythran >=0.12.1
```

## Equivalent System Packages

```
$ conda install pythran
```

```
$ sudo emerge dev-python/pythran
```

```
$ sudo xbps-install pythran
```

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.328 pytz: Timezone definitions for Python

### Description

World Timezone Definitions for Python See <https://pypi.org/project/pytz/>

### Special Update/Build Instructions

The upstream tarball was repackaged after sanitizing the file permissions with  
\$ chmod go-w

### Type

standard

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

### Version Information

package-version.txt:

```
2023.3.post1
```

install-requires.txt:

```
pytz >=2020.1
```

### Equivalent System Packages

```
$ sudo pacman -S python-pytz
```

```
$ conda install pytz
```

```
$ sudo apt-get install python3-tz
```

```
$ sudo yum install python-pytz
```

```
$ sudo emerge dev-python/pytz
```

```
$ sudo port install py-tz
```

```
$ sudo zypper install python3\${PYTHON_MINOR}-pytz
```

```
$ sudo xbps-install python3-pytz
```

See <https://repology.org/project/python:pytz/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

### 6.1.329 pytz\_deprecation\_shim: Shims to make deprecation of pytz easier

#### Description

Shims to make deprecation of pytz easier

#### License

Apache-2.0

#### Upstream Contact

<https://pypi.org/project/pytz-deprecation-shim/>

#### Type

standard

#### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *tzdata: Provider of IANA time zone data*

#### Version Information

package-version.txt:

```
0.1.0.post0
```

install-requires.txt:

```
pytz-deprecation-shim
```

### Equivalent System Packages

```
$ conda install pytz-deprecation-shim
```

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

### 6.1.330 pyx: Generate PostScript, PDF, and SVG files in Python

#### Description

Python package for the generation of PostScript, PDF, and SVG files

<https://pypi.python.org/pypi/PyX>

#### Type

optional

#### Dependencies

#### Version Information

requirements.txt:

```
pyx
```

### Equivalent System Packages

```
$ sudo port install py-pyx
```

```
$ sudo zypper install python3\${PYTHON_MINOR}\-PyX
```

```
$ sudo xbps-install python3-pyx
```

See <https://repology.org/project/python:pyx/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

### 6.1.331 pyyaml: YAML parser and emitter for Python

#### Description

YAML parser and emitter for Python

## License

MIT

## Upstream Contact

<https://pypi.org/project/PyYAML/>

## Type

standard

## Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *cython: C-Extensions for Python, an optimizing static compiler*

## Version Information

package-version.txt:

6.0.1

install-requires.txt:

PyYAML

## Equivalent System Packages

(none known)

## 6.1.332 pyzmq: Python bindings for the zeromq networking library

### Description

Python bindings for the zeromq networking library.

### License

LGPLv3+

### Upstream Contact

<http://www.zeromq.org>

### Special Update/Build Instructions

None.

### Type

standard

### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *cython: C-Extensions for Python, an optimizing static compiler*
- *zeromq: A modern networking library*

### Version Information

package-version.txt:

```
25.1.1
```

install-requires.txt:

```
pyzmq >=19.0.2
```

### Equivalent System Packages

```
$ sudo pacman -S python-pyzmq
```

```
$ conda install pyzmq
```

```
$ sudo yum install python-pyzmq
```

```
$ sudo emerge dev-python/pyzmq
```

```
$ sudo zypper install python3\${PYTHON_MINOR}\-pyzmq
```



```
$ sudo xbps-install python3-pyzmq
```

See <https://repology.org/project/pyzmq/versions>, <https://repology.org/project/python:pyzmq/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

### 6.1.333 qdldl\_python: QDLDL, a free LDL factorization routine (Python wrapper)

#### Description

QDLDL, a free LDL factorization routine.

#### License

Apache 2.0

#### Upstream Contact

<https://pypi.org/project/qdldl/>

#### Type

optional

#### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *cmake: A cross-platform build system generator*
- *numpy: Package for scientific computing with Python*
- *pybind11: Create Python bindings to C++ code*
- *scipy: Scientific tools for Python*

#### Version Information

package-version.txt:

```
0.1.5.post3
```

install-requires.txt:

```
qdldl
```

### Equivalent System Packages

```
$ conda install qdldl-python
```

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

### 6.1.334 qepcad: Quantifier elimination by partial cylindrical algebraic decomposition

#### Description

Qepcad is an implementation of quantifier elimination by partial cylindrical algebraic decomposition

#### License

ICS [Wikipedia article](#) [ISC\\_license](#)

#### Upstream Contact

- Repository: <https://github.com/chriswestbrown/qepcad>
- Tarballs: <https://www.usna.edu/Users/cs/wcbrown/qepcad/INSTALL/IQ.html>
- Website: (outdated) <https://www.usna.edu/Users/cs/wcbrown/qepcad/B/QEPCAD.html>

#### Type

optional

#### Dependencies

- *readline*: Command line editing library
- *saclib*: Computations with real algebraic numbers

#### Version Information

package-version.txt:

```
1.74
```

## Equivalent System Packages

```
$ sudo apt-get install qepcad
```

```
$ sudo yum install qepcad-B
```

```
$ sudo port install qepcad
```

See <https://repology.org/project/qepcad-b/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.335 qhull: Compute convex hulls, Delaunay triangulations, Voronoi diagrams

### Description

From the README.txt of Qhull:

Qhull computes convex hulls, Delaunay triangulations, Voronoi diagrams, furthest-site Voronoi diagrams, and halfspace intersections about a point. It runs in 2-d, 3-d, 4-d, or higher. It implements the Quickhull algorithm for computing convex hulls. Qhull handles round-off errors from floating point arithmetic. It can approximate a convex hull.

The program includes options for hull volume, facet area, partial hulls, input transformations, randomization, tracing, multiple output formats, and execution statistics.

Further notes:

The qhull library is already shipped with the Python library `scipy` (from version 1.4), see

- <http://docs.scipy.org/doc/scipy/reference/generated/scipy.spatial.ConvexHull.html>
- <http://docs.scipy.org/doc/scipy/reference/generated/scipy.spatial.Delaunay.html>
- <http://docs.scipy.org/doc/scipy/reference/generated/scipy.spatial.Voronoi.html>

There is also the Python interface `Pyhull` available on PyPI <https://pypi.python.org/pypi/pyhull> (see also documentation at <http://pythonhosted.org/pyhull/>).

### Upstream Contact

<http://www.qhull.org/html>

C. Bradford Barber [bradb@shore.net](mailto:bradb@shore.net) or [qhull@qhull.org](mailto:qhull@qhull.org)

### Dependencies

Can be compiled with Qt support, but the Sage version currently doesn't try to do this.

### License

Not a standard license, but Sage compatible. See the COPYING.txt file in the source directory for details.

### Type

standard

### Dependencies

- *cmake: A cross-platform build system generator*

### Version Information

package-version.txt:

```
2020-src-8.0.2
```

### Equivalent System Packages

```
$ apk add qhull-dev qhull
```

```
$ sudo pacman -S qhull
```

```
$ conda install qhull
```

```
$ apt-cyg install qhull
```

```
$ sudo apt-get install libqhull-dev
```

```
$ sudo yum install qhull qhull-devel
```

```
$ sudo pkg install math/qhull
```

```
$ sudo emerge media-libs/qhull
```

```
$ brew install qhull
```

No package needed.

```
$ nix-env --install qhull
```

```
$ sudo zypper install qhull-devel
```

```
$ sudo xbps-install qhull libqhull-devel
```

See <https://repology.org/project/qhull/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.336 r: A free software environment for statistical computing and graphics

### Description

R is a language and environment for statistical computing and graphics. It is a GNU project which is similar to the S language and environment which was developed at Bell Laboratories (formerly AT&T, now Lucent Technologies) by John Chambers and colleagues. R can be considered as a different implementation of S. There are some important differences, but much code written for S runs unaltered under R.

(taken from <http://www.r-project.org/>)

### License

- GPL v2 or GPL v3

### Upstream Contact

- <https://www.r-project.org>
- R mailing list, #R in IRC

### Type

optional

### Dependencies

### Version Information

### Equivalent System Packages

```
$ apk add R-dev R
```

```
$ sudo pacman -S r
```

```
$ conda install r r-essentials
```

```
$ apt-cyg install R libtirpc-devel
```

```
$ sudo apt-get install r-base-dev r-cran-lattice
```

```
$ sudo yum install R R-devel
```

```
$ sudo pkg install math/R
```

```
$ sudo emerge dev-lang/R
```

```
$ brew install r
```

No package needed.

```
$ nix-env --install R
```

```
$ sudo zypper install R-base
```

```
$ sudo xbps-install R
```

See <https://repology.org/project/r/versions>

If the system package is installed, `./configure` will check if it can be used.

### 6.1.337 r\_jupyter: Jupyter kernel for R

#### Description

This package installs IRkernel, the R Jupyter kernel.

It gets installed via R's package installer on top of Jupyter.

#### License

MIT

#### Upstream Contact

- <https://github.com/IRkernel/IRkernel>
- <https://irkernel.github.io/>

#### Dependencies

- R
- notebook

#### Type

experimental

#### Dependencies

- *notebook*: Jupyter notebook, a web-based notebook environment for interactive computing
- *r*: A free software environment for statistical computing and graphics

## Version Information

### Equivalent System Packages

See <https://repology.org/project/r:irkernel/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.338 readline: Command line editing library

### Description

The GNU Readline library provides a set of functions for use by applications that allow users to edit command lines as they are typed in. Both Emacs and vi editing modes are available. The Readline library includes additional functions to maintain a list of previously-entered command lines, to recall and perhaps reedit those lines, and perform csh-like history expansion on previous commands.

Website: <http://tiswww.case.edu/php/chet/readline/rltop.html>

### License

- GPL V3+

### Upstream Contact

- Chet Ramey at <http://cnswww.cns.cwru.edu/~chet>

### Special Update/Build Instructions

We build readline using ncurses. Readline needs to be told to link with libtinfo (part of ncurses), this is what the patch 0002-ltinfo.patch does.

### Patches

- 0001-macports.patch: Changes to shobj.conf for OS/X, from macports:  
<https://trac.macports.org/browser/trunk/dports/devel/readline/files/patch-shobj-conf.diff>
- 0002-ltinfo.patch: We build readline using ncurses, and for that it needs to be told to link with libtinfo (part of ncurses).

### Type

standard

### Dependencies

- *ncurses*: Classic terminal output library

### Version Information

package-version.txt:

```
8.1.2
```

### Equivalent System Packages

```
$ sudo pacman -S readline
```

```
$ conda install readline
```

```
$ apt-cyg install libreadline-devel
```

```
$ sudo apt-get install libreadline-dev
```

```
$ sudo yum install readline-devel
```

```
$ sudo pkg install devel/readline
```

```
$ brew install readline
```

```
$ sudo port install readline
```

```
$ nix-env --install readline
```

```
$ sudo zypper install readline-devel pkgconfig\ (readline\)
```

```
$ sudo slackpkg install readline
```

```
$ sudo xbps-install readline-devel
```

See <https://repology.org/project/readline/versions>

If the system package is installed, `./configure` will check if it can be used.



### 6.1.339 referencing: JSON Referencing + Python

#### Description

JSON Referencing + Python

#### License

MIT

#### Upstream Contact

<https://pypi.org/project/referencing/>

#### Type

standard

#### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *attrs: Decorator for Python classes with attributes*
- *pypersistent: Persistent data structures in Python*

#### Version Information

package-version.txt:

```
0.23.0
```

install-requires.txt:

```
referencing
```

#### Equivalent System Packages

(none known)

## 6.1.340 requests: An HTTP library for Python

### Description

Python HTTP for Humans.

### License

Apache 2.0

### Upstream Contact

<https://pypi.org/project/requests/>

### Type

standard

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *certifi*: Python package for providing Mozilla's CA Bundle
- *charset\_normalizer*: The Real First Universal Charset Detector. Open, modern and actively maintained alternative to Chardet.
- *idna*: Internationalized Domain Names in Applications (IDNA)
- *urllib3*: HTTP library with thread-safe connection pooling, file post, and more.

### Version Information

package-version.txt:

```
2.31.0
```

install-requires.txt:

```
requests >=2.13.0
```

### Equivalent System Packages

```
$ sudo pacman -S python-requests
```

```
$ conda install requests
```

```
$ sudo apt-get install python3-requests
```

```
$ sudo yum install python-requests
```

```
$ sudo emerge dev-python/requests
```

```
$ sudo port install py-requests
```

```
$ sudo zypper install python3\${PYTHON_MINOR}-requests
```

```
$ sudo xbps-install python3-requests
```

See <https://repology.org/project/requests/versions>, <https://repology.org/project/python:requests/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.341 rfc3339\_validator: A pure python RFC3339 validator

### Description

A pure python RFC3339 validator

### License

MIT license

### Upstream Contact

<https://pypi.org/project/rfc3339-validator/>

### Type

standard

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

### Version Information

package-version.txt:

```
0.1.4
```

install-requires.txt:

```
rfc3339-validator
```

### Equivalent System Packages

(none known)

## 6.1.342 rfc3986\_validator: Pure python rfc3986 validator

### Description

Pure python rfc3986 validator

### License

MIT license

### Upstream Contact

<https://pypi.org/project/rfc3986-validator/>

### Type

standard

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

## Version Information

package-version.txt:

```
0.1.1
```

install-requires.txt:

```
rfc3986-validator
```

## Equivalent System Packages

(none known)

## 6.1.343 rpy2: Python interface to R

### Description

rpy2 is a redesign and rewrite of rpy. It is providing a low-level interface to R, a proposed high-level interface, including wrappers to graphical libraries, as well as R-like structures and functions.

### License

- GPL 2+
- Note that we have deleted references to Mozilla PL as an option, which we are allowed to do by the full rpy2 license in order to remain GPL-compatible

### Upstream Contact

- <https://rpy2.bitbucket.io>

### Type

standard

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *cffi*: Foreign Function Interface for Python calling C code
- *jinja2*: General purpose template engine for Python
- *pycparser*: Parser of the C language in Python
- *pytz*: Timezone definitions for Python
- *r*: A free software environment for statistical computing and graphics
- *tzlocal*: Python timezone information for the local timezone

### Version Information

package-version.txt:

```
3.4.5
```

install-requires.txt:

```
rpy2 >=3.3
```

### Equivalent System Packages

```
$ sudo pacman -S python-rpy2
```

```
$ conda install rpy2
```

```
$ sudo apt-get install python3-rpy2
```

```
$ sudo pkg install math/py-rpy2
```

```
$ sudo port install py-rpy2
```

```
$ sudo zypper install python3\${PYTHON_MINOR}\-rpy2
```

See <https://repology.org/project/rpy2/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.344 rst2ipynb: Convert reStructuredText files to Jupyter notebooks

### Description

The `rst2ipynb` program converts a standalone reStructuredText file to a Jupyter notebook file.

This is currently achieved by converting to markdown with `pandoc` and then to Jupyter notebook using `notedown`, plus some configuration and tweaks.

### License

BSD 3-Clause License

## Upstream Contact

Authors: Scott Sievert and Nicolas M. Thiéry Home page: <https://github.com/nthiery/rst-to-ipynb>

## Special Update/Build Instructions

Fetch tarball from <https://pypi.python.org/pypi/rst2ipynb/>

As it is written in Haskell, pandoc must be installed from the distro.

The main rationale for having a notedown package in Sage (rather than just let pip fetch it) is that the version on pipy (1.5.0, 2015-10-07) is outdated and lacks important features / fixes for us.

## Type

optional

## Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *notedown*: Create IPython notebooks from markdown
- *pandoc*: A document converter

## Version Information

package-version.txt:

```
0.2.3
```

install-requires.txt:

```
rst2ipynb >=0.2.2
```

## Equivalent System Packages

See <https://repology.org/project/python:rst2ipynb/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

### 6.1.345 rubiks: Programs for Rubik's cube

#### Description

There are several programs for working with Rubik's cubes, by three different people. Look inside the directories under /src to see specific info and licensing. In summary the three contributors are:

Michael Reid (GPL) [http://www.cflmath.com/~reid/Rubik/optimal\\_solver.html](http://www.cflmath.com/~reid/Rubik/optimal_solver.html)

- optimal - uses many pre-computed tables to find an optimal solution to the 3x3x3 Rubik's cube

Dik T. Winter (MIT License)

- cube - uses Kociemba's algorithm to iteratively find a short solution to the 3x3x3 Rubik's cube
- size222 - solves a 2x2x2 Rubik's cube

Eric Dietz (GPL) <https://web.archive.org/web/20121212175710/http://www.wrongway.org/?rubiksource>

- cu2 - A fast, non-optimal 2x2x2 solver
- cubex - A fast, non-optimal 3x3x3 solver
- mcube - A fast, non-optimal 4x4x4 solver

#### Type

optional

#### Dependencies

#### Version Information

package-version.txt:

```
20070912.p21
```

#### Equivalent System Packages

```
$ sudo pacman -S rubiks
```

```
$ conda install rubiks
```

```
$ sudo apt-get install rubiks
```

```
$ sudo yum install rubiks
```

```
$ sudo pkg install math/rubiks
```

```
$ nix-env --install rubiks
```

See <https://repology.org/project/rubiks/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.



## 6.1.346 rw: Compute rank-width and rank-decompositions

### Description

rw is a program that calculates rank-width and rank-decompositions.

<https://sourceforge.net/projects/rankwidth/>

### License

GPL version 2 or later

### Upstream Contact

Philipp Klaus Krause ([philipp@informatik.uni-frankfurt.de](mailto:philipp@informatik.uni-frankfurt.de))

### Type

standard

### Dependencies

#### Version Information

package-version.txt:

```
0.9
```

### Equivalent System Packages

```
$ sudo pacman -S rankwidth
```

```
$ conda install rw
```

```
$ sudo apt-get install libr-w-dev
```

```
$ sudo yum install rw-devel
```

```
$ sudo pkg install math/rankwidth
```

```
$ nix-env --install rankwidth
```

```
$ sudo xbps-install rankwidth-devel
```

See <https://repology.org/project/rankwidth/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.347 saclib: Computations with real algebraic numbers

### Description

Saclib is a library of C programs for computer algebra derived from the SAC2 system. It is mainly used as a dependency of qepcad.

### License

ICS [Wikipedia article ISC\\_license](#)

### Upstream Contact

- Repository: <https://github.com/chriswestbrown/saclib>
- Tarballs: <https://www.usna.edu/Users/cs/wcbrown/qepcad/INSTALL/IQ.html>
- Website: (outdated) <https://www.usna.edu/Users/cs/wcbrown/qepcad/B/QEPCAD.html>

### Type

optional

### Dependencies

### Version Information

package-version.txt:

```
2.2.8
```

### Equivalent System Packages

```
$ sudo apt-get install libsaclib-dev
```

```
$ sudo yum install saclib saclib-devel
```

See <https://repology.org/project/saclib/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.348 `sage_conf`: Configuration module for the SageMath library (distributable version)

### Description

This distribution package provides:

- a single Python module, `sage_conf`, providing configuration information to the SageMath library at the time of its installation and at its runtime
- a console script `sage-config`, for querying the variables of `sage_conf` from the shell
- a sourcable shell script `sage-env-config`, providing additional configuration information in the form of environment variables

The `sage_conf` distribution package is polymorphic: It has several implementations.

### `sage_conf` sdist on PyPI

This implementation of the `sage_conf` distribution package comes from [github issue #29039](#), which added the directory `pkgs/sage-conf_pypi`.

To install, use `pip install -v sage_conf`. Using `-v` ensures that diagnostic messages are displayed.

On installation (or building a wheel), it invokes `sage_bootstrap` to establish a build tree (`SAGE_ROOT`) and installation tree (`SAGE_LOCAL`) for the SageMath distribution. By default, it uses a subdirectory of `$HOME/.sage` that is specific to the version of the distribution and the version of Python in use. If several virtual environments over the same version of Python install `sage_conf`, they will share these trees.

After installation of `sage_conf`, a wheelhouse containing wheels of various libraries is available; type `ls $(sage-config SAGE_SPKG_WHEELS)` to list them and `pip install $(sage-config SAGE_SPKG_WHEELS)/*.whl` to install them. After this, you can install the Sage library, for example, using `pip install sagemath-standard`.

### `sage_conf` wheels

Prebuilt binary wheels of the `sage_conf` distribution package are available at <https://github.com/sagemath/sage-wheels/releases/>

This implementation of `sage_conf` comes from [github issue #31396](#), which adds the directory `pkgs/sage-conf_relocatable/`.

On building a wheel, it invokes `sage_bootstrap` to establish a build and installation tree (`SAGE_ROOT`, `SAGE_LOCAL`) in a subdirectory of the directory `/var/tmp/`, whose name is specific to the version of the distribution and the version of Python in use.

The wheel distributes a copy of the prebuilt `SAGE_ROOT` and `SAGE_LOCAL`. Importing `sage_conf` (or using the installed `sage-config` script), makes sure that a symlink from the `/var/tmp` location to the actual persistent installation location is created. As the relocated libraries and programs contain the hardcoded path `SAGE_LOCAL` in various ways (including as `rpaths`), this symlink is necessary for the prebuilt libraries and programs to work.

`/var/tmp` is a sticky directory on all Linux distributions following the Filesystem Hierarchy Standard, as well as on macOS. On multi-user systems, only one user can use a given version of the distribution; other installation schemes are recommended for systems with multiple Sage users.

### sage\_conf in the SageMath distribution

The original version of the distribution package `sage_conf` is used internally in the SageMath distribution. It is provided in the directory `pkgs/sage-conf`. This version of the package is generated by the Sage distribution's `./configure` script.

### sage\_conf for conda

The version of the distribution package in the directory `pkgs/sage-conf_conda` is used in an experimental installation method of SageMath, where all packages are provided by conda. This method is described in <https://doc.sagemath.org/html/en/installation/conda.html#using-conda-to-provide-all-dependencies-for-the-sage-library-experimental>

### sage\_conf in downstream distributions

Downstream packagers and advanced developers and users may want to provide their own implementation of the distribution package to support the intended deployment of the SageMath library.

### License

GNU General Public License (GPL) v3 or later

### Upstream Contact

<https://www.sagemath.org>

This package is included in the source code of the Sage distribution, in `pkgs/sage-conf*`.

### Type

standard

### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`

### Version Information

package-version.txt:

```
10.3
```

install-requires.txt:

```
This file is updated on every release by the sage-update-version script
sage-conf ~= 10.3
```

## Equivalent System Packages

(none known)

### 6.1.349 sage\_docbuild: Build system of the Sage documentation

#### About SageMath

“Creating a Viable Open Source Alternative to  
Magma, Maple, Mathematica, and MATLAB”

Copyright (C) 2005-2020 The Sage Development Team

<https://www.sagemath.org>

SageMath fully supports all major Linux distributions, recent versions of macOS, and Windows (using Windows Subsystem for Linux).

The traditional and recommended way to install SageMath is from source via Sage-the-distribution (<https://www.sagemath.org/download-source.html>). Sage-the-distribution first builds a large number of open source packages from source (unless it finds suitable versions installed in the system) and then installs the Sage Library (sagelib, implemented in Python and Cython).

#### About this pip-installable source distribution

This is the build system of the Sage documentation, based on Sphinx.

#### Type

standard

#### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- sagelib
- *sphinx: Python documentation generator*

#### Version Information

package-version.txt:

```
10.3
```

install-requires.txt:

```
This file is updated on every release by the sage-update-version script
sage-docbuild ~= 10.3
```

### Equivalent System Packages

See <https://repology.org/project/sage-docbuild/versions>, <https://repology.org/project/python:sage-docbuild/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

### 6.1.350 `sage_flatsurf`: computation with flat surfaces

#### Description

SageMath package for studying the geometry of flat surfaces and the dynamics of their foliations.

#### License

GNU General Public License, version 2

#### Upstream Contact

<https://pypi.org/project/sage-flatsurf/>

#### Type

optional

#### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- `$(SAGERUNTIME)`
- *surface\_dynamics: dynamics on surfaces (measured foliations, interval exchange transformation, Teichmüller flow, etc)*

#### Version Information

requirements.txt:

```
sage-flatsurf
```

## Equivalent System Packages

(none known)

### 6.1.351 `sage_numerical_backends_coin`: COIN-OR backend for Sage MixedIntegerLinearProgram

#### Description

COIN-OR backend for Sage MixedIntegerLinearProgram

#### License

GPLv2+

#### Upstream Contact

<https://pypi.org/project/sage-numerical-backends-coin/>

#### Type

optional

#### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- `$(SAGERUNTIME)`
- *cbc: COIN-OR branch and cut solver for mixed-integer programs*
- *cysignals: Interrupt and signal handling for Cython*
- *cython: C-Extensions for Python, an optimizing static compiler*
- *ipywidgets: Interactive HTML widgets for Jupyter notebooks and the IPython kernel*

#### Version Information

package-version.txt:

```
9.0b12
```

install-requires.txt:

```
sage_numerical_backends_coin >=9.0b12
```

### Equivalent System Packages

See <https://repology.org/project/sage-numerical-backends-coin/versions>, <https://repology.org/project/python:sage-numerical-backends-coin/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

### 6.1.352 `sage_numerical_backends_cplex`: Cplex backend for Sage MixedIntegerLinearProgram

#### Description

Cplex backend for Sage MixedIntegerLinearProgram

#### License

GPLv2+

#### Upstream Contact

<https://pypi.org/project/sage-numerical-backends-cplex/>

#### Type

optional

#### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- `$(SAGERUNTIME)`
- *cysignals: Interrupt and signal handling for Cython*
- *cython: C-Extensions for Python, an optimizing static compiler*
- *ipywidgets: Interactive HTML widgets for Jupyter notebooks and the IPython kernel*

#### Version Information

package-version.txt:

```
9.0b12
```

install-requires.txt:

```
sage_numerical_backends_cplex >=9.0b12
```



## Equivalent System Packages

See <https://repology.org/project/python:sage-numerical-backends-cplex/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.353 `sage_numerical_backends_gurobi`: Gurobi backend for Sage MixedIntegerLinearProgram

### Description

Gurobi backend for Sage MixedIntegerLinearProgram

### License

GPLv2+

### Upstream Contact

<https://pypi.org/project/sage-numerical-backends-gurobi/>

### Type

optional

### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- `$(SAGERUNTIME)`
- *cysignals: Interrupt and signal handling for Cython*
- *cython: C-Extensions for Python, an optimizing static compiler*
- *ipywidgets: Interactive HTML widgets for Jupyter notebooks and the IPython kernel*

### Version Information

package-version.txt:

```
9.3.1
```

install-requires.txt:

```
sage_numerical_backends_gurobi >=9.0.0
```

### Equivalent System Packages

See <https://repology.org/project/sage-numerical-backends-gurobi/versions>, <https://repology.org/project/python:sage-numerical-backends-gurobi/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

### 6.1.354 sage-setup: Build system of the SageMath library

This is the build system of the Sage library, based on `setuptools`.

#### Type

standard

#### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *cython: C-Extensions for Python, an optimizing static compiler*
- *jinja2: General purpose template engine for Python*
- *pkgconfig: Python interface to pkg-config*

#### Version Information

package-version.txt:

```
10.3
```

install-requires.txt:

```
This file is updated on every release by the sage-update-version script
sage-setup ~= 10.3
```

### Equivalent System Packages

(none known)

### 6.1.355 sage\_sws2rst: Translate legacy Sage worksheet files (.sws) to reStructuredText (.rst) files

#### Description

Provides a script `sage - sws2rst`, which translates a Sage worksheet file (.sws) into a reStructuredText (.rst) file.

Sage worksheet files (.sws) are a file format that was used by the now-obsolete Sage notebook (<https://github.com/sagemath/sagenb>), superseded by the Jupyter notebook. SageNB was dropped in the course of the transition of SageMath to Python 3.

This package was extracted from the SageNB sources in [github issue #28838](#) to provide a way to convert pedagogical material written available in Sage worksheet format.

#### Type

optional

#### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *beautifulsoup4*: Screen-scraping library

#### Version Information

package-version.txt:

```
10.3
```

install-requires.txt:

```
This file is updated on every release by the sage-update-version script
sage-sws2rst ~= 10.3
```

#### Equivalent System Packages

(none known)

### 6.1.356 sagemath\_bliss: Graph (iso/auto)morphisms with bliss

#### About SageMath

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<https://www.sagemath.org>

SageMath fully supports all major Linux distributions, recent versions of macOS, and Windows (Windows Subsystem for Linux).

The traditional and recommended way to install SageMath is from source via Sage-the-distribution (<https://www.sagemath.org/download-source.html>). Sage-the-distribution first builds a large number of open source packages from source (unless it finds suitable versions installed in the system) and then installs the Sage Library (sagelib, implemented in Python and Cython).

### About this pip-installable source distribution

This pip-installable source distribution `sagemath-bliss` is a small optional distribution for use with `sage-math-standard`.

It provides a Cython interface to the `bliss` library for the purpose of computing graph (iso/auto)morphisms.

### Type

optional

### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *bliss: Computing automorphism groups and canonical forms of graphs*
- *cysignals: Interrupt and signal handling for Cython*
- *cython: C-Extensions for Python, an optimizing static compiler*
- *pkgconfig: Python interface to pkg-config*
- *sage\_conf: Configuration module for the SageMath library (distributable version)*
- *sage-setup: Build system of the SageMath library*
- *sagemath\_environment: System and software environment*

### Version Information

package-version.txt:

```
10.3
```

install-requires.txt:

```
This file is updated on every release by the sage-update-version script
sagemath-bliss ~= 10.3
```

## Equivalent System Packages

```
$ conda install sagemath-bliss
```

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.357 sagemath\_categories: Sage categories and basic rings

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SageMath fully supports all major Linux distributions, recent versions of macOS, and Windows (Windows Subsystem for Linux).

The traditional and recommended way to install SageMath is from source via Sage-the-distribution (<https://www.sagemath.org/download-source.html>). Sage-the-distribution first builds a large number of open source packages from source (unless it finds suitable versions installed in the system) and then installs the Sage Library (sagelib, implemented in Python and Cython).

### About this experimental pip-installable source distribution

This pip-installable source distribution *sagemath – categories* is an experimental distribution of a small part of the Sage Library. Use at your own risk. It provides a small subset of the modules of the Sage library (“sagelib”, *sagemath – standard*). It is a superset of the *sagemath – objects* (providing Sage objects, the element/parent framework, categories, the coercion system and the related metaclasses), making various additional categories available without introducing dependencies on additional mathematical libraries.

### Dependencies

When building from source, development packages of *gmp*, *mpfr*, and *mpc* are needed.

### Documentation

- [Categories](#)
- [Structure](#)
- [Coercion](#)
- [Classes, Metaclasses](#)

### Type

experimental

### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *cython: C-Extensions for Python, an optimizing static compiler*
- *pkgconfig: Python interface to pkg-config*
- *python\_build: A simple, correct PEP517 package builder*
- *sage-setup: Build system of the SageMath library*
- *sagemath\_environment: System and software environment*
- *sagemath\_objects: Sage objects, elements, parents, categories, coercion, metaclasses*

### Version Information

package-version.txt:

```
10.3
```

install-requires.txt:

```
This file is updated on every release by the sage-update-version script
sagemath-categories ~= 10.3
```

### Equivalent System Packages

(none known)

## 6.1.358 sagemath\_coxeter3: Coxeter groups, Bruhat ordering, Kazhdan-Lusztig polynomials with coxeter3

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SageMath fully supports all major Linux distributions, recent versions of macOS, and Windows (Windows Subsystem for Linux).

The traditional and recommended way to install SageMath is from source via Sage-the-distribution (<https://www.sagemath.org/download-source.html>). Sage-the-distribution first builds a large number of open source packages from source (unless it finds suitable versions installed in the system) and then installs the Sage Library (sagelib, implemented in Python and Cython).

## About this pip-installable source distribution

This pip-installable source distribution `sagemath-coxeter3` is a small optional distribution for use with `sagemath-standard`.

It provides a Cython interface to the `coxeter3` library.

## Type

optional

## Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *coxeter3: Library for Coxeter groups, Bruhat ordering, Kazhdan-Lusztig polynomials*
- *cython: C-Extensions for Python, an optimizing static compiler*
- *pkgconfig: Python interface to pkg-config*
- *sage-setup: Build system of the SageMath library*
- *sagemath\_environment: System and software environment*

## Version Information

package-version.txt:

```
10.3
```

install-requires.txt:

```
This file is updated on every release by the sage-update-version script
sagemath-coxeter3 ~= 10.3
```

## Equivalent System Packages

(none known)

## 6.1.359 sagemath\_doc\_html: SageMath documentation in HTML format

Upon installation, this package builds the SageMath documentation in HTML format.

It is a standard package. It is built on every invocation of `make` or `make all`, but not on `make build`. The documentation build can also be run separately using `make doc-html`.

### Type

standard

### Dependencies

- `$(SAGERUNTIME)`
- *conway\_polynomials*: Python interface to Frank Lübeck's Conway polynomial database
- *elliptic\_curves*: Databases of elliptic curves
- *fpylll*: Python interface for FPLLL
- *furo*: A clean customizable Sphinx documentation theme
- *graphs*: A database of combinatorial graphs
- *ipykernel*: IPython Kernel for Jupyter
- *ipywidgets*: Interactive HTML widgets for Jupyter notebooks and the IPython kernel
- *jmol*: Java viewer for chemical structures in 3D
- *jupyter\_client*: Jupyter protocol implementation and client libraries
- *jupyter\_sphinx*: Jupyter Sphinx Extension
- *mathjax*: A JavaScript library for displaying mathematical formulas
- *matplotlib*: Python 2D plotting library
- *maxima*: System for manipulating symbolic and numerical expressions
- *mpmath*: Pure Python library for multiprecision floating-point arithmetic
- *networkx*: Python package for complex networks
- *pillow*: Python Imaging Library
- *pplpy\_doc*: Python interface to the Parma Polyhedra Library (documentation)
- *sage\_docbuild*: Build system of the Sage documentation
- *sagelib*
- *scipy*: Scientific tools for Python
- *sphinx*: Python documentation generator
- *sphinx\_copybutton*: Add a copy button to each of your code cells.
- *sphinx\_inline\_tabs*: Add inline tabbed content to your Sphinx documentation.
- *sympy*: Python library for symbolic mathematics
- *tachyon*: A ray tracing system



## Version Information

### Equivalent System Packages

(none known)

### 6.1.360 `sagemath_doc_pdf`: SageMath documentation in PDF format

Upon installation, this package builds the SageMath documentation in PDF format.

It is an optional package. It can be enabled at configuration time using `./configure --enable-sagemath_doc_pdf`. Alternatively, it can be installed by using `make doc-pdf`.

## Type

optional

## Dependencies

- *free\_fonts*: a free family of scalable outline fonts
- *sagemath\_doc\_html*: SageMath documentation in HTML format
- *texlive*: A comprehensive TeX system
- *texlive luatex*: LuaTeX packages
- *xindy*: a general-purpose index processor

## Version Information

### Equivalent System Packages

(none known)

### 6.1.361 `sagemath_environment`: System and software environment

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The traditional and recommended way to install SageMath is from source via Sage-the-distribution (<https://www.sagemath.org/download-source.html>). Sage-the-distribution first builds a large number of open source packages from source (unless it finds suitable versions installed in the system) and then installs the Sage Library (sagelib, implemented in Python and Cython).

### About this experimental pip-installable source distribution

This pip-installable source distribution *sagemath – environment* is an experimental distribution of a small part of the Sage Library. Use at your own risk. It provides a small, fundamental subset of the modules of the Sage library (“sagelib”, *sagemath – standard*), providing the connection to the system and software environment. It also includes the *sage* script for launching the Sage REPL and accessing various developer tools (see *sage – –help*).

### Type

experimental

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *python\_build*: A simple, correct PEP517 package builder

### Version Information

package-version.txt:

```
10.3
```

install-requires.txt:

```
This file is updated on every release by the sage-update-version script
sagemath-environment ~= 10.3
```

### Equivalent System Packages

(none known)

## 6.1.362 sagemath\_mcqd: Finding maximum cliques with mcqd

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The traditional and recommended way to install SageMath is from source via Sage-the-distribution (<https://www.sagemath.org/download-source.html>). Sage-the-distribution first builds a large number of open source packages from source (unless it finds suitable versions installed in the system) and then installs the Sage Library (sagelib, implemented in Python and Cython).

## About this pip-installable source distribution

This pip-installable source distribution `sagemath-mcqd` is a small optional distribution for use with `sagemath-standard`.

It provides a Cython interface to the `mcqd` library, providing a fast exact algorithm for finding a maximum clique in an undirected graph.

## Type

optional

## Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *cysignals: Interrupt and signal handling for Cython*
- *cython: C-Extensions for Python, an optimizing static compiler*
- *mcqd: An exact algorithm for finding a maximum clique in an undirected graph*
- *memory\_allocator: An extension class to allocate memory easily with Cython*
- *pkgconfig: Python interface to pkg-config*
- *sage-setup: Build system of the SageMath library*

## Version Information

package-version.txt:

```
10.3
```

install-requires.txt:

```
This file is updated on every release by the sage-update-version script
sagemath-mcqd ~= 10.3
```

## Equivalent System Packages

(none known)

### 6.1.363 sagemath\_meataxe: Matrices over small finite fields with meataxe

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The traditional and recommended way to install SageMath is from source via Sage-the-distribution (<https://www.sagemath.org/download-source.html>). Sage-the-distribution first builds a large number of open source packages from source (unless it finds suitable versions installed in the system) and then installs the Sage Library (sagelib, implemented in Python and Cython).

#### About this pip-installable source distribution

This pip-installable source distribution `sagemath-meataxe` is a small optional distribution for use with `sage-math-standard`.

This distribution provides the SageMath modules `sage.libs.meataxe` and `sage.matrix.matrix_gfpn_dense`.

It provides a specialized implementation of matrices over the finite field  $F_q$ , where  $q \leq 255$ , using the *SharedMeatAxe* < <http://users.minet.uni-jena.de/king/SharedMeatAxe/> > library.

#### Type

optional

#### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *cython: C-Extensions for Python, an optimizing static compiler*
- *meataxe: Library for computing with modular representations*
- *pkgconfig: Python interface to pkg-config*
- *sage-setup: Build system of the SageMath library*
- *sagemath\_environment: System and software environment*

## Version Information

package-version.txt:

```
10.3
```

install-requires.txt:

```
This file is updated on every release by the sage-update-version script
sagemath-meataxe ~= 10.3
```

## Equivalent System Packages

(none known)

## 6.1.364 sagemath\_objects: Sage objects, elements, parents, categories, coercion, metaclasses

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The traditional and recommended way to install SageMath is from source via Sage-the-distribution (<https://www.sagemath.org/download-source.html>). Sage-the-distribution first builds a large number of open source packages from source (unless it finds suitable versions installed in the system) and then installs the Sage Library (sagelib, implemented in Python and Cython).

### About this experimental pip-installable source distribution

This pip-installable source distribution *sagemath – objects* is an experimental distribution of a small part of the Sage Library. Use at your own risk. It provides a small, fundamental subset of the modules of the Sage library (“sagelib”, *sagemath – standard*), making Sage objects, the element/parent framework, categories, the coercion system and the related metaclasses available.

### Dependencies

When building from source, development packages of *gmp*, *mpfr*, and *mpc* are needed.

### Documentation

- [Categories](#)
- [Structure](#)
- [Coercion](#)
- [Classes, Metaclasses](#)

### Type

experimental

### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *cysignals: Interrupt and signal handling for Cython*
- *cython: C-Extensions for Python, an optimizing static compiler*
- *gmpy2: Python interface to GMP/MPFR, MPFR, and MPC*
- *pkgconfig: Python interface to pkg-config*
- *python\_build: A simple, correct PEP517 package builder*
- *sage-setup: Build system of the SageMath library*
- *sagemath\_environment: System and software environment*

### Version Information

package-version.txt:

```
10.3
```

install-requires.txt:

```
This file is updated on every release by the sage-update-version script
sagemath-objects ~= 10.3
```

### Equivalent System Packages

(none known)

## 6.1.365 sagemath\_repl: IPython kernel, Sage preparer, doctester

### About SageMath

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SageMath fully supports all major Linux distributions, recent versions of macOS, and Windows (Windows Subsystem for Linux).

The traditional and recommended way to install SageMath is from source via Sage-the-distribution (<https://www.sagemath.org/download-source.html>). Sage-the-distribution first builds a large number of open source packages from source (unless it finds suitable versions installed in the system) and then installs the Sage Library (sagelib, implemented in Python and Cython).

### About this experimental pip-installable source distribution

This pip-installable source distribution *sagemath – repl* is an experimental distribution of a small part of the Sage Library. Use at your own risk. It provides a small, fundamental subset of the modules of the Sage library (“sagelib”, *sagemath – standard*), providing the IPython kernel, Sage preparer, and doctester.

### Type

experimental

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *ipython*: Interactive computing environment with an enhanced interactive Python shell
- *ipywidgets*: Interactive HTML widgets for Jupyter notebooks and the IPython kernel
- *python\_build*: A simple, correct PEP517 package builder
- *sagemath\_environment*: System and software environment
- *sagemath\_objects*: Sage objects, elements, parents, categories, coercion, metaclasses

### Version Information

package-version.txt:

```
10.3
```

install-requires.txt:

```
This file is updated on every release by the sage-update-version script
sagemath-repl ~= 10.3
```

## Equivalent System Packages

(none known)

### 6.1.366 sagemath\_sirocco: Certified root continuation with sirocco

#### About SageMath

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<https://www.sagemath.org>

SageMath fully supports all major Linux distributions, recent versions of macOS, and Windows (Windows Subsystem for Linux).

The traditional and recommended way to install SageMath is from source via Sage-the-distribution (<https://www.sagemath.org/download-source.html>). Sage-the-distribution first builds a large number of open source packages from source (unless it finds suitable versions installed in the system) and then installs the Sage Library (sagelib, implemented in Python and Cython).

#### About this pip-installable source distribution

This pip-installable source distribution `sagemath-sirocco` is a small optional distribution for use with `sagemath-standard`.

It provides a Cython interface to the `sirocco` library for the purpose of compute topologically certified root continuation of bivariate polynomials.

#### Type

optional

#### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *cypari2: Python interface to the number theory library libpari*
- *cysignals: Interrupt and signal handling for Cython*
- *cython: C-Extensions for Python, an optimizing static compiler*
- *mpfr: Multiple-precision floating-point computations with correct rounding*
- *pkgconfig: Python interface to pkg-config*
- *sage-setup: Build system of the SageMath library*
- *sagemath\_environment: System and software environment*
- *sirocco: Compute topologically certified root continuation of bivariate polynomials*



## Version Information

package-version.txt:

```
10.3
```

install-requires.txt:

```
This file is updated on every release by the sage-update-version script
sagemath-sirocco ~= 10.3
```

## Equivalent System Packages

```
$ conda install sagemath-sirocco
```

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.367 sagemath\_tdlb: Tree decompositions with tdlb

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SageMath fully supports all major Linux distributions, recent versions of macOS, and Windows (Windows Subsystem for Linux).

The traditional and recommended way to install SageMath is from source via Sage-the-distribution (<https://www.sagemath.org/download-source.html>). Sage-the-distribution first builds a large number of open source packages from source (unless it finds suitable versions installed in the system) and then installs the Sage Library (sagelib, implemented in Python and Cython).

### About this pip-installable source distribution

This pip-installable source distribution `sagemath-tdlib` is a small optional distribution for use with `sage-math-standard`.

It provides a Cython interface to the `tdlib` library, providing algorithms concerning tree decompositions.

### Type

optional

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *cysignals*: Interrupt and signal handling for Cython
- *cython*: C-Extensions for Python, an optimizing static compiler
- *pkgconfig*: Python interface to pkg-config
- *sage-setup*: Build system of the SageMath library
- *sagemath\_environment*: System and software environment
- *tdlib*: Algorithms for computing tree decompositions

### Version Information

package-version.txt:

```
10.3
```

install-requires.txt:

```
This file is updated on every release by the sage-update-version script
sagemath-tdlib ~= 10.3
```

### Equivalent System Packages

(none known)

## 6.1.368 **sagenb\_export**: Convert legacy SageNB notebooks to Jupyter notebooks and other formats

### Description

This is a tool to convert SageNB notebooks to other formats, in particular IPython/Jupyter notebooks.

It includes a Jupyter notebook extension to provide a UI for the import of SageNB notebooks.

## Upstream Contact

<https://github.com/vbraun/ExportSageNB>

## Type

standard

## Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *ipython: Interactive computing environment with an enhanced interactive Python shell*
- *nbconvert: Converting Jupyter Notebooks*
- *notebook: Jupyter notebook, a web-based notebook environment for interactive computing*
- *six: Python 2 and 3 compatibility utilities*

## Version Information

package-version.txt:

3.3

install-requires.txt:

`git+https://github.com/vbraun/ExportSageNB.git#egg=sagenb_export`

## Equivalent System Packages

See <https://repology.org/project/sagenb-export/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.369 sagetex: Embed code, results of computations, and plots from Sage into LaTeX documents

### Description

The SageTeX package allows you to embed code, results of computations, and plots from Sage into LaTeX documents.

### License

The *source code* of the SageTeX package may be redistributed and/or modified under the terms of the GNU General Public License as published by the Free Software Foundation, either version 2 of the License, or (at your option) any later version. To view a copy of this license, see <http://www.gnu.org/licenses/> or send a letter to the Free Software Foundation, Inc., 51 Franklin Street, Fifth Floor, Boston, MA 02110-1301, USA.

The *documentation* of the SageTeX package is licensed under the Creative Commons Attribution-Share Alike 3.0 License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-sa/3.0/> or send a letter to Creative Commons, 171 Second Street, Suite 300, San Francisco, California, 94105, USA.

### SPKG Maintainers

Dan Drake (dr.dan.drake at gmail) and SageMath developers (sage-devel@googlegroups.com)

### Upstream Contact

Author: Dan Drake.

Web: <https://github.com/sagemath/sagetex>

### Dependencies

To install, nothing more than a standard Sage install. The `spkg-check` script will exit without actually testing anything if it cannot find “`latex`” in your path.

### Notes

To use SageTeX, both Sage and LaTeX need to know about it. SageTeX comes standard with Sage, so you only need to make sure LaTeX can find what it needs. Full details are in the Sage installation guide at <http://doc.sagemath.org/html/en/installation/> and <http://doc.sagemath.org/html/en/tutorial/sagetex.html>.

The directory `$SAGE_ROOT/venv/share/doc/sagetex` contains documentation and an example file. See `$SAGE_ROOT/venv/share/texmf/tex/latex/sagetex` for the source code and some possibly useful scripts. If you have problems or suggestions see [the sage-support group](#).

If you want to help develop SageTeX, please clone the github repository (see the “Upstream Contact” above) and send me patches based on that.

### Type

standard

## Dependencies

- `$(PYTHON)`
- *matplotlib*: Python 2D plotting library
- *maxima*: System for manipulating symbolic and numerical expressions
- *pillow*: Python Imaging Library
- *pyparsing*: A Python parsing module
- *scipy*: Scientific tools for Python
- *tachyon*: A ray tracing system

## Version Information

package-version.txt:

```
3.6.1
```

install-requires.txt:

```
sagetex >=3.5
```

## Equivalent System Packages

```
$ conda install sagetex
```

See <https://repology.org/project/sagetex/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.370 scip: Mixed integer programming solver

### Description

SCIP is currently one of the fastest open source mixed integer programming (MIP) solvers. It is also a framework for constraint integer programming and branch-cut-and-price. It allows total control of the solution process and the access of detailed information down to the guts of the solver.

### License

Apache 2.0

### Upstream Contact

<https://scipopt.org/#scipoptsuite>

### Dependencies

scip brings its own patched version of the bliss library. This will conflict with the optional package bliss.

### Type

optional

### Dependencies

- `$(MP_LIBRARY)`
- *cmake*: A cross-platform build system generator
- *papilo*: Parallel presolve for integer and linear optimization
- *readline*: Command line editing library
- *soplex*: Linear optimization solver using the revised simplex method
- *zlib*: Data compression library

### Version Information

package-version.txt:

```
802
```

### Equivalent System Packages

```
$ conda install scip
```

See <https://repology.org/project/scipoptsuite/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.371 scip\_sdp: Mixed integer semidefinite programming plugin for SCIP

### Description

SCIP-SDP allows to solve MISOs using a nonlinear branch-and-bound approach or a linear programming cutting-plane approach.

- In the first case (the default), the semidefinite programming (SDP) relaxations are solve using interior-point SDP-solvers.
- In the second case, cutting planes based on eigenvector are generated.

SCIP-SDP is based on the branch-and-cut framework SCIP. In addition to providing a constraint handler for SDP-constraints and a relaxator to solve continuous SDP-relaxations using interior-point solvers, SCIP-SDP adds several heuristics and propagators to SCIP.

## License

Apache 2.0

## Upstream Contact

<http://www.opt.tu-darmstadt.de/scipsdp/>

<https://github.com/scipopt/SCIP-SDP>

## Type

optional

## Dependencies

- *cmake*: A cross-platform build system generator
- *dsdp*: Semidefinite programming solver
- *scip*: Mixed integer programming solver

## Version Information

package-version.txt:

4.1.0

## Equivalent System Packages

(none known)

## 6.1.372 scipy: Scientific tools for Python

### Description

SciPy (pronounced “Sigh Pie”) is open-source software for mathematics, science, and engineering. The SciPy library depends on NumPy, which provides convenient and fast N-dimensional array manipulation. The SciPy library is built to work with NumPy arrays, and provides many user-friendly and efficient numerical routines such as routines for numerical integration and optimization. Together, they run on all popular operating systems, are quick to install, and are free of charge. NumPy and SciPy are easy to use, but powerful enough to be depended upon by some of the world’s leading scientists and engineers.

### License

SciPy's license is free for both commercial and non-commercial use, under the BSD terms. See [http://www.scipy.org/License\\_Compatibility](http://www.scipy.org/License_Compatibility)

### Upstream Contact

<https://www.scipy.org/>

### Dependencies

- Python, which in Sage has numerous dependencies
- Numpy
- Fortran
- GNU patch

### Special Update/Build Instructions

- None.

### Type

standard

### Dependencies

- \$(BLAS)
- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *cython*: C-Extensions for Python, an optimizing static compiler
- *gfortran*: Fortran compiler from the GNU Compiler Collection
- *meson\_python*: Meson Python build backend (PEP 517)
- *numpy*: Package for scientific computing with Python
- *pybind11*: Create Python bindings to C++ code
- *pythran*: Ahead of Time compiler for numeric kernels



## Version Information

package-version.txt:

```
1.11.4
```

install-requires.txt:

```
1.8 is known good version.
Per https://docs.scipy.org/doc/scipy/dev/core-dev/index.html#version-numbering
and https://docs.scipy.org/doc/scipy/dev/core-dev/index.html#deprecations,
deprecations cannot be introduced in micro releases.
SciPy devs wait "at least 6 months", "in practice two (minor) releases"
from deprecation to removal of a feature.
scipy >=1.5
```

## Equivalent System Packages

```
$ sudo pacman -S python-scipy
```

```
$ conda install scipy<1.12\, \>=1.5
```

```
$ sudo apt-get install python3-scipy
```

```
$ sudo yum install python-scipy
```

```
$ sudo emerge dev-python/scipy
```

```
$ brew install scipy
```

```
$ sudo port install py-scipy
```

```
$ sudo zypper install python3\$\{PYTHON_MINOR\}-scipy
```

```
$ sudo xbps-install python3-scipy
```

See <https://repology.org/project/python:scipy/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.373 scs: Splitting conic solver

### Description

scs: splitting conic solver

### License

MIT

### Upstream Contact

<https://pypi.org/project/scs/>

### Type

optional

### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *cmake: A cross-platform build system generator*
- *numpy: Package for scientific computing with Python*

### Version Information

package-version.txt:

```
3.2.3
```

install-requires.txt:

```
scs
```

### Equivalent System Packages

```
$ conda install scs
```

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.374 send2trash: Send file to trash natively under Mac OS X, Windows and Linux

### Description

Send file to trash natively under Mac OS X, Windows and Linux.

## License

BSD License

## Upstream Contact

<https://pypi.org/project/Send2Trash/>

## Type

standard

## Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

## Version Information

package-version.txt:

```
1.8.2
```

install-requires.txt:

```
send2trash >=1.5.0
```

## Equivalent System Packages

```
$ conda install send2trash
```

```
$ sudo emerge dev-python/send2trash
```

```
$ sudo port install py-send2trash
```

```
$ sudo zypper install python3\${PYTHON_MINOR}\-Send2Trash
```

```
$ sudo xbps-install python3-send2trash
```

See <https://repology.org/project/send2trash/versions>, <https://repology.org/project/python:send2trash/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.375 setuptools: Build system for Python packages

### Description

setuptools is the classical build system for Python packages, a collection of enhancements to the Python distutils.

### License

MIT License

### Upstream Contact

<http://pypi.python.org/pypi/setuptools/>

<https://github.com/pypa/setuptools>

### Type

standard

### Dependencies

- \$(PYTHON)
- *pip: Tool for installing and managing Python packages*

### Version Information

package-version.txt:

```
69.0.2
```

install-requires.txt:

```
68.1.0 Promote pyproject.toml's [tool.setuptools] out of beta.
68.1.1 Fix editable install finder handling of nested packages
setuptools >= 68.1.1
```

### Equivalent System Packages

```
$ sudo pacman -S python-setuptools
```

```
$ conda install setuptools
```

```
$ sudo apt-get install python3-setuptools
```

```
$ sudo yum install python-setuptools
```

```
$ sudo emerge dev-python/setuptools
```

```
$ sudo port install py-setuptools
```

```
$ sudo zypper install python3\${PYTHON_MINOR}-setuptools
```

```
$ sudo xbps-install python3-setuptools
```

See <https://repology.org/project/python:setuptools/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

### 6.1.376 `setuptools_scm`: Python build system extension to obtain package version from version control

#### Description

the blessed package to manage your versions by scm tags

#### License

MIT

#### Upstream Contact

<https://pypi.org/project/setuptools-scm/>

#### Type

standard

#### Dependencies

- `$(PYTHON)`
- *packaging*: Core utilities for Python packages
- *pip*: Tool for installing and managing Python packages
- *setuptools*: Build system for Python packages
- *tomli*: A lil' TOML parser
- *typing\_extensions*: Backported and Experimental Type Hints for Python 3.8+

### Version Information

package-version.txt:

```
8.0.4
```

install-requires.txt:

```
matplotlib-3.6.2 needs >= 7
setuptools_scm >=7
```

### Equivalent System Packages

```
$ sudo pacman -S python-setuptools-scm
```

```
$ conda install setuptools_scm
```

```
$ sudo apt-get install python3-setuptools-scm
```

```
$ sudo yum install python-setuptools_scm
```

```
$ sudo pkg install devel/py-setuptools_scm
```

```
$ sudo emerge dev-python/setuptools-scm
```

```
$ sudo port install py-setuptools_scm
```

```
$ sudo zypper install python3\${PYTHON_MINOR}-setuptools_scm
```

```
$ sudo xbps-install python3-setuptools_scm
```

See <https://repology.org/project/python:setuptools-scm/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.377 singular: Computer algebra system for polynomial computations, algebraic geometry, singularity theory

### Description

Singular is a computer algebra system for polynomial computations, with special emphasis on commutative and non-commutative algebra, algebraic geometry, and singularity theory.

## License

GPLv2 or GPLv3

## Upstream Contact

[libsingular-devel@mathematik.uni-kl.de](mailto:libsingular-devel@mathematik.uni-kl.de)

<https://www.singular.uni-kl.de/>

## Special Update/Build Instructions

Other notes:

- If the environment variable SAGE\_DEBUG is set to “yes”, then omalloc will be replaced by xalloc. The resulting Singular executable and libsingular library will be slower than with omalloc, but allow for easier debugging of memory corruptions.

## Type

standard

## Dependencies

- \$(MP\_LIBRARY)
- *cddlib*: Double description method for polyhedral representation conversion
- *flint*: Fast Library for Number Theory
- *mpfr*: Multiple-precision floating-point computations with correct rounding
- *ntl*: A library for doing number theory
- *readline*: Command line editing library

## Version Information

package-version.txt:

```
4.3.2p8
```

## Equivalent System Packages

```
$ sudo pacman -S singular
```

```
$ conda install singular
```

```
$ apt-cyg install singular-devel singular
```

```
$ sudo apt-get install singular singular-doc libsingular4-dev
```

```
$ sudo yum install Singular Singular-devel
```

```
$ sudo pkg install math/singular
```

```
$ sudo emerge sci-mathematics/singular\[readline\]
```

```
$ brew install singular
```

```
$ sudo port install singular
```

```
$ nix-env --install singular
```

```
$ sudo xbps-install singular
```

See <https://repology.org/project/singular/versions>

If the system package is installed, `./configure` will check if it can be used.

### 6.1.378 singular\_jupyter: Jupyter kernel for Singular

#### Description

This is a beta version of a jupyter kernel for Singular.

#### License

GPL version 2 or later

#### Upstream Contact

- [https://github.com/sebasguts/jupyter\\_kernel\\_singular](https://github.com/sebasguts/jupyter_kernel_singular)

#### Type

optional

#### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *ipython: Interactive computing environment with an enhanced interactive Python shell*
- *ipywidgets: Interactive HTML widgets for Jupyter notebooks and the IPython kernel*
- *jupyter\_client: Jupyter protocol implementation and client libraries*
- *pysingular: A basic Python interface to Singular*



## Version Information

package-version.txt:

```
0.9.7
```

install-requires.txt:

```
singular_jupyter >=0.9.7
```

## Equivalent System Packages

```
$ conda install jupyter-kernel-singular
```

See <https://repology.org/project/jupyter-singular/versions>, <https://repology.org/project/python:jupyter-kernel-singular/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.379 sirocco: Compute topologically certified root continuation of bivariate polynomials

### Description

sirocco is a library to compute topologically certified root continuation of bivariate polynomials.

### License

GPLv3+

### SPKG Maintainers

- Miguel Marco

### Upstream Contact

Miguel Marco ([mmarco@unizar.es](mailto:mmarco@unizar.es))

### Dependencies

- gcc

### Type

optional

### Dependencies

### Version Information

package-version.txt:

```
2.1.0
```

### Equivalent System Packages

```
$ sudo pacman -S sirocco
```

```
$ conda install sirocco
```

```
$ sudo yum install sirocco
```

```
$ sudo zypper install sirocco-devel
```

See <https://repology.org/project/sirocco/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.380 six: Python 2 and 3 compatibility utilities

### Description

Python 2 and 3 compatibility utilities

### License

MIT License

### Upstream Contact

- Author: Benjamin Peterson
- Home page: <http://pypi.python.org/pypi/six/>

## Dependencies

Python

## Type

standard

## Dependencies

- `$(PYTHON)`
- *pip: Tool for installing and managing Python packages*

## Version Information

package-version.txt:

```
1.16.0
```

install-requires.txt:

```
six >=1.15.0
```

## Equivalent System Packages

```
$ sudo pacman -S python-six
```

```
$ conda install six
```

```
$ sudo apt-get install python3-six
```

```
$ sudo yum install python-six
```

```
$ sudo emerge dev-python/six
```

```
$ sudo port install py-six
```

```
$ sudo zypper install python3\${PYTHON_MINOR}\-six
```

```
$ sudo xbps-install python3-six
```

See <https://repology.org/project/python:six/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.381 slabbe: Sébastien Labbé's Research code

### Description

This SageMath package contains various modules for experimentation with

- discrete dynamical systems
- combinatorics
- digital geometry
- visualization
- miscellaneous development tools

### License

GPLv2+

### Upstream Contact

<https://pypi.org/project/slabbe/>

### Type

optional

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- \$(SAGERUNTIME)

### Version Information

requirements.txt:

```
slabbe
```

### Equivalent System Packages

See <https://repology.org/project/python:slabbe/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.382 snappy: Topology and geometry of 3-manifolds, with a focus on hyperbolic structures

### Description

Studying the topology and geometry of 3-manifolds, with a focus on hyperbolic structures.

### License

GPLv2+

### Upstream Contact

<https://pypi.org/project/snappy/>

### Type

optional

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *cypari2: Python interface to the number theory library libpari*
- *decorator: Python library providing decorators*
- *ipython: Interactive computing environment with an enhanced interactive Python shell*
- *sagelib*

### Version Information

requirements.txt:

```
Note: As of 2021-01, snappy will pull in cypari (!= cypari2) as a dependency
if installed as a wheel but will actually use Sage's cypari2.
cypari contains a statically linked copy of pari and other libraries
and will remain completely unused (wastes 30M). Snappy is about 165M.
See https://github.com/sagemath/sage/issues/31180
snappy
cypari 2.4.0 has a broken sdist, https://github.com/sagemath/sage/issues/31180
cypari !=2.4.0
An optional database (110M uncompressed)
snappy_15_knots
```

## Equivalent System Packages

(none known)

### 6.1.383 sniffio: Sniff out which async library your code is running under

#### Description

Sniff out which async library your code is running under

#### License

MIT OR Apache-2.0

#### Upstream Contact

<https://pypi.org/project/sniffio/>

#### Type

standard

#### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

#### Version Information

package-version.txt:

```
1.3.0
```

install-requires.txt:

```
sniffio
```

## Equivalent System Packages

(none known)

## 6.1.384 snowballstemmer: Stemmer algorithms for natural language processing in Python

### Description

This package provides 29 stemmers for 28 languages generated from Snowball algorithms.

### License

BSD-3-Clause

### Upstream Contact

<https://pypi.org/project/snowballstemmer/>

This is a pure Python stemming library. If PyStemmer is available, this module uses it to accelerate.

### Type

standard

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

### Version Information

package-version.txt:

```
2.2.0
```

install-requires.txt:

```
snowballstemmer >=1.2.1
```

### Equivalent System Packages

```
$ conda install snowballstemmer
```

```
$ sudo emerge dev-python/snowballstemmer
```

```
$ sudo port install py-snowballstemmer
```

```
$ sudo zypper install python3\${PYTHON_MINOR}-snowballstemmer
```

```
$ sudo xbps-install python3-snowballstemmer
```

See <https://repology.org/project/python:snowballstemmer/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

### 6.1.385 soplex: Linear optimization solver using the revised simplex method

#### Description

SoPlex is an optimization package for solving linear programming problems (LPs) based on an advanced implementation of the primal and dual revised simplex algorithm. It provides special support for the exact solution of LPs with rational input data.

#### License

Apache License, Version 2.0

#### Upstream Contact

<https://github.com/scipopt/soplex>

#### Type

optional

#### Dependencies

- `$(MP_LIBRARY)`
- *boost\_cropped*: Portable C++ libraries (subset needed for Sage)
- *cmake*: A cross-platform build system generator
- *mpfr*: Multiple-precision floating-point computations with correct rounding
- *papilo*: Parallel presolve for integer and linear optimization
- *zlib*: Data compression library

#### Version Information

package-version.txt:

602



## Equivalent System Packages

```
$ conda install soplex
```

```
$ sudo pkg install math/SoPlex
```

See <https://repology.org/project/soplex/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.386 soupsieve: A modern CSS selector implementation for BeautifulSoup.

### Description

A modern CSS selector implementation for BeautifulSoup.

### License

### Upstream Contact

<https://pypi.org/project/soupsieve/>

### Type

standard

### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`

### Version Information

package-version.txt:

```
2.5
```

install-requires.txt:

```
soupsieve
```

### Equivalent System Packages

```
$ conda install soupsieve
```

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

### 6.1.387 sphinx: Python documentation generator

#### Description

Sphinx is a tool that makes it easy to create intelligent and beautiful documentation for Python projects (or other documents consisting of multiple reStructuredText sources), written by Georg Brandl. It was originally created to translate the new Python documentation, but has now been cleaned up in the hope that it will be useful to many other projects.

#### License

Modified BSD; see e.g. its egg-info file for other options

#### Upstream Contact

<https://pypi.org/project/Sphinx/>

#### Type

standard

#### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *alabaster: Default theme for the Sphinx documentation system*
- *babel: Internationalization utilities*
- *docutils: Processing plaintext documentation into useful formats, such as HTML or LaTeX*
- *imagesize: Getting image size from png/jpeg/jpeg2000/gif file*
- *importlib\_metadata: Library to access the metadata for a Python package*
- *jinja2: General purpose template engine for Python*
- *packaging: Core utilities for Python packages*
- *pygments: Generic syntax highlighter*
- *requests: An HTTP library for Python*
- *snowballstemmer: Stemmer algorithms for natural language processing in Python*
- *sphinxcontrib\_applehelp: Sphinx extension which outputs Apple help book*
- *sphinxcontrib\_devhelp: Sphinx extension which outputs Devhelp documents*

- *sphinxcontrib\_htmlhelp*: Sphinx extension which outputs HTML help book
- *sphinxcontrib\_jsmath*: Sphinx extension which renders display math in HTML via JavaScript
- *sphinxcontrib\_qthelp*: Sphinx extension which outputs QtHelp documents
- *sphinxcontrib\_serializinghtml*: Sphinx extension which outputs serialized HTML files
- *sphinxcontrib\_websupport*: Sphinx API for Web apps

## Version Information

package-version.txt:

```
7.2.6
```

install-requires.txt:

```
sphinx >=5.2, <8
```

## Equivalent System Packages

```
$ sudo pacman -S python-sphinx
```

```
$ conda install sphinx\>=5.2
```

```
$ sudo apt-get install sphinx
```

```
$ sudo yum install python-sphinx
```

```
$ sudo pkg install textproc/py-sphinx
```

```
$ sudo emerge dev-python/sphinx
```

```
$ brew install sphinx-doc
```

```
$ sudo port install py-sphinx
```

```
$ sudo zypper install python3\${PYTHON_MINOR}\-Sphinx
```

```
$ sudo xbps-install python3-Sphinx
```

See <https://repology.org/project/python:sphinx/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

### 6.1.388 sphinx\_basic\_ng: A modern skeleton for Sphinx themes.

#### Description

A modern skeleton for Sphinx themes.

#### License

#### Upstream Contact

<https://pypi.org/project/sphinx-basic-ng/>

#### Type

standard

#### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *sphinx: Python documentation generator*

#### Version Information

package-version.txt:

```
1.0.0b2
```

install-requires.txt:

```
sphinx-basic-ng
```

#### Equivalent System Packages

```
$ sudo pacman -S python-sphinx-basic-ng
```

```
$ conda install sphinx-basic-ng
```

```
$ sudo apt-get install sphinx-basic-ng
```

```
$ sudo yum install python-sphinx-basic-ng
```

```
$ sudo pkg install textproc/py-sphinx-basic-ng
```

```
$ sudo emerge dev-python/sphinx-basic-ng
```

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.389 sphinx\_copybutton: Add a copy button to each of your code cells.

### Description

Add a copy button to each of your code cells.

### License

MIT License

### Upstream Contact

<https://pypi.org/project/sphinx-copybutton/>

### Type

standard

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *sphinx: Python documentation generator*

### Version Information

package-version.txt:

```
0.5.2
```

install-requires.txt:

```
sphinx-copybutton
```

### Equivalent System Packages

```
$ apk add py3-sphinx-copybutton
```

```
$ sudo pacman -S python-sphinx-copybutton
```

```
$ conda install sphinx-copybutton
```

```
$ sudo yum install python-sphinx-copybutton
```

```
$ sudo pkg install textproc/py-sphinx-copybutton
```

```
$ sudo emerge dev-python/sphinx-copybutton
```

```
$ sudo xbps-install python3-sphinx-copybutton
```

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

### 6.1.390 `sphinx_inline_tabs`: Add inline tabbed content to your Sphinx documentation.

#### Description

Add inline tabbed content to your Sphinx documentation.

#### License

#### Upstream Contact

<https://pypi.org/project/sphinx-inline-tabs/>

#### Type

standard

#### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *sphinx: Python documentation generator*

#### Version Information

package-version.txt:

```
2023.4.21
```

install-requires.txt:

```
sphinx-inline-tabs
```

## Equivalent System Packages

(none known)

### 6.1.391 sphinxcontrib\_applehelp: Sphinx extension which outputs Apple help book

#### Description

Sphinx extension which outputs Apple help book

#### License

BSD

#### Type

standard

#### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

#### Version Information

package-version.txt:

```
1.0.8
```

install-requires.txt:

```
sphinxcontrib_applehelp >=1.0.2
```

## Equivalent System Packages

```
$ sudo pacman -S python-sphinxcontrib-applehelp
```

```
$ conda install sphinxcontrib-applehelp
```

```
$ sudo yum install python-sphinxcontrib-applehelp
```

```
$ sudo pkg install textproc/py-sphinxcontrib-applehelp
```

```
$ sudo emerge dev-python/sphinxcontrib-applehelp
```

```
$ sudo port install py-sphinxcontrib-applehelp
```

```
$ sudo zypper install python3\${PYTHON_MINOR}\-sphinxcontrib-applehelp
```

```
$ sudo xbps-install python3-sphinxcontrib-applehelp
```

See <https://repology.org/project/python:sphinxcontrib-applehelp/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

### 6.1.392 sphinxcontrib\_devhelp: Sphinx extension which outputs Devhelp documents

#### Description

Sphinx extension which outputs Devhelp documents

#### License

BSD

#### Type

standard

#### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

#### Version Information

package-version.txt:

```
1.0.6
```

install-requires.txt:

```
sphinxcontrib_devhelp >=1.0.2
```



## Equivalent System Packages

```
$ sudo pacman -S python-sphinxcontrib-devhelp
```

```
$ conda install sphinxcontrib-devhelp
```

```
$ sudo yum install python-sphinxcontrib-devhelp
```

```
$ sudo pkg install textproc/py-sphinxcontrib-devhelp
```

```
$ sudo emerge dev-python/sphinxcontrib-devhelp
```

```
$ sudo port install py-sphinxcontrib-devhelp
```

```
$ sudo zypper install python3\${PYTHON_MINOR}\-sphinxcontrib-devhelp
```

```
$ sudo xbps-install python3-sphinxcontrib-devhelp
```

See <https://repology.org/project/python:sphinxcontrib-devhelp/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.393 sphinxcontrib\_htmlhelp: Sphinx extension which outputs HTML help book

### Description

Sphinx extension which outputs HTML help book

### License

BSD

### Type

standard

### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`

### Version Information

package-version.txt:

```
2.0.5
```

install-requires.txt:

```
sphinxcontrib_htmlhelp >=1.0.3
```

### Equivalent System Packages

```
$ sudo pacman -S python-sphinxcontrib-htmlhelp
```

```
$ conda install sphinxcontrib-htmlhelp
```

```
$ sudo yum install python-sphinxcontrib-htmlhelp
```

```
$ sudo pkg install textproc/py-sphinxcontrib-htmlhelp
```

```
$ sudo emerge dev-python/sphinxcontrib-htmlhelp
```

```
$ sudo port install py-sphinxcontrib-htmlhelp
```

```
$ sudo zypper install python3\${PYTHON_MINOR}-sphinxcontrib-htmlhelp
```

```
$ sudo xbps-install python3-sphinxcontrib-htmlhelp
```

See <https://repology.org/project/python:sphinxcontrib-htmlhelp/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.394 sphinxcontrib\_jsmath: Sphinx extension which renders display math in HTML via JavaScript

### Description

Sphinx extension which renders display math in HTML via JavaScript

### License

BSD

## Upstream Contact

<https://pypi.org/project/sphinxcontrib-jsmath/>

## Type

standard

## Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

## Version Information

package-version.txt:

```
1.0.1
```

install-requires.txt:

```
sphinxcontrib_jsmath >=1.0.1
```

## Equivalent System Packages

```
$ sudo pacman -S python-sphinxcontrib-jsmath
```

```
$ conda install sphinxcontrib-jsmath
```

```
$ sudo yum install python-sphinxcontrib-jsmath
```

```
$ sudo pkg install textproc/py-sphinxcontrib-jsmath
```

```
$ sudo emerge dev-python/sphinxcontrib-jsmath
```

```
$ sudo port install py37-sphinxcontrib-jsmath
```

```
$ sudo zypper install python3\${PYTHON_MINOR}\-sphinxcontrib-jsmath
```

```
$ sudo xbps-install python3-sphinxcontrib-jsmath
```

See <https://repology.org/project/python:sphinxcontrib-jsmath/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.395 sphinxcontrib\_qthelp: Sphinx extension which outputs QtHelp documents

### Description

Sphinx extension which outputs QtHelp documents

### License

BSD

### Type

standard

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

### Version Information

package-version.txt:

```
1.0.7
```

install-requires.txt:

```
sphinxcontrib_qthelp >=1.0.3
```

### Equivalent System Packages

```
$ sudo pacman -S python-sphinxcontrib-qthelp
```

```
$ conda install sphinxcontrib-qthelp
```

```
$ sudo yum install python-sphinxcontrib-qthelp
```

```
$ sudo pkg install textproc/py-sphinxcontrib-qthelp
```

```
$ sudo emerge dev-python/sphinxcontrib-qthelp
```

```
$ sudo port install py-sphinxcontrib-qthelp
```

```
$ sudo zypper install python3\${PYTHON_MINOR}-sphinxcontrib-qthelp
```

```
$ sudo xbps-install python3-sphinxcontrib-qthelp
```

See <https://repology.org/project/python:sphinxcontrib-qthelp/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.396 sphinxcontrib\_serializinghtml: Sphinx extension which outputs serialized HTML files

### Description

Sphinx extension which outputs serialized HTML files

### License

BSD

### Type

standard

### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`

### Version Information

package-version.txt:

```
1.1.10
```

install-requires.txt:

```
sphinxcontrib_serializinghtml >=1.1.5
```

### Equivalent System Packages

```
$ sudo pacman -S python-sphinxcontrib-serializinghtml
```

```
$ conda install sphinxcontrib-serializinghtml
```

```
$ sudo yum install python-sphinxcontrib-serializinghtml
```

```
$ sudo pkg install textproc/py-sphinxcontrib-serializinghtml
```

```
$ sudo emerge dev-python/sphinxcontrib-serializinghtml
```

```
$ sudo port install py-sphinxcontrib-serializinghtml
```

```
$ sudo zypper install python3\${PYTHON_MINOR}\-sphinxcontrib-serializinghtml
```

```
$ sudo xbps-install python3-sphinxcontrib-serializinghtml
```

See <https://repology.org/project/python:sphinxcontrib-serializinghtml/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

### 6.1.397 sphinxcontrib\_websupport: Sphinx API for Web apps

#### Description

sphinxcontrib-websupport provides a Python API to easily integrate Sphinx documentation into your Web application.

#### License

BSD

#### Type

standard

#### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *sphinxcontrib\_serializinghtml: Sphinx extension which outputs serialized HTML files*

#### Version Information

package-version.txt:

```
1.2.7
```

install-requires.txt:

```
sphinxcontrib_websupport >=1.2.1
```

## Equivalent System Packages

```
$ apk add py3-sphinxcontrib-websupport
```

```
$ sudo pacman -S python-sphinxcontrib-websupport
```

```
$ conda install sphinxcontrib-websupport
```

```
$ sudo apt-get install python3-sphinxcontrib.websupport
```

```
$ sudo yum install python-sphinxcontrib-websupport
```

```
$ sudo pkg install textproc/py-sphinxcontrib-websupport
```

```
$ sudo emerge dev-python/sphinxcontrib-websupport
```

```
$ sudo port install py-sphinxcontrib-websupport
```

```
$ sudo zypper install python3\${PYTHON_MINOR}-sphinxcontrib-websupport
```

See <https://repology.org/project/python:sphinxcontrib-websupport/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.398 sqlalchemy: A database abstraction library

### Description

Database Abstraction Library

### License

MIT

### Upstream Contact

<https://pypi.org/project/SQLAlchemy/>

### Type

optional

### Dependencies

### Version Information

requirements.txt:

```
sqlalchemy
```

### Equivalent System Packages

```
$ conda install sqlalchemy
```

```
$ sudo port install py-sqlalchemy
```

```
$ sudo zypper install python3\${PYTHON_MINOR}\-SQLAlchemy
```

```
$ sudo xbps-install python3-SQLAlchemy
```

See <https://repology.org/project/python:sqlalchemy/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.399 sqlite: An SQL database engine

### Description

SQLite is a software library that implements a self-contained, serverless, zero-configuration, transactional SQL database engine.

### License

Public Domain

### Upstream contact

- <https://www.sqlite.org>

### Dependencies

- readline



## Special Update/Build Instructions

- Use the autoconf version of sqlite.

## Type

standard

## Dependencies

- *readline*: Command line editing library

## Version Information

package-version.txt:

```
3.36.0
```

## Equivalent System Packages

```
$ apk add sqlite-dev
```

```
$ sudo pacman -S sqlite3
```

```
$ conda install sqlite
```

```
$ apt-cyg install libsqlite3-devel sqlite3
```

```
$ sudo apt-get install libsqlite3-dev sqlite3
```

```
$ sudo yum install sqlite-devel sqlite
```

```
$ sudo pkg install databases/sqlite3
```

```
$ sudo emerge dev-db/sqlite
```

```
$ brew install sqlite
```

```
$ sudo port install sqlite3
```

```
$ nix-env --install sqlite
```

```
$ sudo zypper install pkgconfig\(\sqlite3\)
```

```
$ sudo slackpkg install sqlite icu4c
```

```
$ sudo xbps-install sqlite-devel
```

See <https://repology.org/project/sqlite/versions>

If the system package is installed, `./configure` will check if it can be used.

### 6.1.400 **stack\_data**: Extract data from python stack frames and tracebacks for informative displays

#### Description

Extract data from python stack frames and tracebacks for informative displays

#### License

MIT

#### Upstream Contact

<https://pypi.org/project/stack-data/>

#### Type

standard

#### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *asttokens*: Annotate AST trees with source code positions
- *executing*: Get the currently executing AST node of a frame, and other information
- *pure\_eval*: Safely evaluate AST nodes without side effects

#### Version Information

package-version.txt:

```
0.6.3
```

install-requires.txt:

```
stack-data
```

## Equivalent System Packages

```
$ conda install stack_data
```

```
$ sudo emerge dev-python/stack-data
```

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

### 6.1.401 suitesparse: A suite of sparse matrix software

SuiteSparse is a collection of software to deal with sparse matrix. It is hosted at <http://faculty.cse.tamu.edu/davis/suitesparse.html>

This spkg does a minimal install of suitesparse disabling the following

- metis
- GraphBLAS (need cmake)
- Mongoose (need cmake)

An external metis package can be used but we just disable its use.

Patches:

- The first patch disable the building of package using cmake.
- The second patch make sure we use sage's blas/lapack on OS X. By default suitesparse discard any configurations to use the accelerate framework.

The building of metis is disabled by passing `MY_METIS_LIB=none` to make (any value would have done) We also configure cholmod so it doesn't require metis by passing `CHOLMOD_CONFIG=-DNPARTITION` to make.

Other configurations are self explanatory.

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### Type

standard

### Dependencies

- \$(BLAS)
- \$(MP\_LIBRARY)
- *gfortran: Fortran compiler from the GNU Compiler Collection*
- *mpfr: Multiple-precision floating-point computations with correct rounding*

### Version Information

package-version.txt:

```
5.10.1
```

### Equivalent System Packages

```
$ apk add suitesparse-dev
```

```
$ sudo pacman -S suitesparse
```

```
$ conda install suitesparse
```

```
$ apt-cyg install libsuitesparseconfig-devel
```

```
$ sudo apt-get install libsuitesparse-dev
```

```
$ sudo yum install suitesparse suitesparse-devel
```

```
$ sudo pkg install math/suitesparse
```

```
$ sudo emerge sci-libs/amd sci-libs/cholmod sci-libs/suitesparseconfig \
 sci-libs/umfpack
```

```
$ brew install suite-sparse
```

No package needed.

```
$ sudo zypper install suitesparse-devel
```



```
$ sudo xbps-install SuiteSparse-devel
```

See <https://repology.org/project/suitesparse/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.402 surf: Visualization of algebraic curves, algebraic surfaces and hyperplane sections of surfaces

### Description

surf is a tool to visualize some real algebraic geometry: plane algebraic curves, algebraic surfaces and hyperplane sections of surfaces. surf is script driven and has (optionally) a nifty GUI using the Gtk widget set.

This is used by the Singular Jupyter kernel to produce 3D plots.

### License

GPL version 2 or later

### Upstream Contact

<http://surf.sourceforge.net> (although the project is essentially dead)

### Dependencies

- cups (optional)
- GNU flex Version 2.5 or higher
- GTK+ Version 1.2.0 or higher (optional)
- POSIX Threads
- GNU MP(gmp) Version 2 or higher
- lib-tiff
- lib-jpeg
- zlib
- ps2pdf (optional)

This package is “experimental” because not all of these dependencies are packaged with Sage.

### Type

experimental

### Dependencies

- \$(MP\_LIBRARY)

### Version Information

package-version.txt:

```
1.0.6-gcc6
```

### Equivalent System Packages

```
$ sudo zypper install surf
```

See <https://repology.org/project/surf-alggeo/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.403 `surface_dynamics`: dynamics on surfaces (measured foliations, interval exchange transformation, Teichmüller flow, etc)

### Description

Dynamics on surfaces.

### License

GPLv2+

### Upstream Contact

[https://gitlab.com/videlec/surface\\_dynamics](https://gitlab.com/videlec/surface_dynamics) <https://pypi.org/project/surface-dynamics/>

### Type

optional

## Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- `$(SAGERUNTIME)`
- *cysignals: Interrupt and signal handling for Cython*
- *pplpy: Python interface to the Parma Polyhedra Library*

## Version Information

requirements.txt:

```
surface_dynamics
```

## Equivalent System Packages

See <https://repology.org/project/python:surface-dynamics/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.404 symengine: A C++ symbolic manipulation library

### Description

SymEngine is a standalone fast C++ symbolic manipulation library.

### License

BSD 3-clause

### Upstream Contact

<https://github.com/symengine/symengine>

### Type

optional

### Dependencies

- `$(MP_LIBRARY)`
- *cmake*: A cross-platform build system generator
- *ecm*: Elliptic curve method for integer factorization
- *flint*: Fast Library for Number Theory
- *mpc*: Arithmetic of complex numbers with arbitrarily high precision and correct rounding
- *mpfr*: Multiple-precision floating-point computations with correct rounding

### Version Information

package-version.txt:

```
0.11.2
```

### Equivalent System Packages

```
$ sudo pacman -S symengine
```

```
$ conda install symengine
```

```
$ sudo pkg install math/symengine
```

```
$ sudo emerge sci-libs/symengine
```

```
$ brew install symengine
```

```
$ sudo port install symengine
```

```
$ nix-env --install symengine
```

```
$ sudo zypper install symengine
```

See <https://repology.org/project/symengine/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.405 symengine\_py: Python wrappers for SymEngine

### Description

Python wrappers for SymEngine

## License

symengine.py is MIT licensed and uses several LGPL, BSD-3 and MIT licensed libraries

## Upstream Contact

<https://github.com/symengine/symengine.py>

## Type

optional

## Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *cmake: A cross-platform build system generator*
- *cython: C-Extensions for Python, an optimizing static compiler*
- *symengine: A C++ symbolic manipulation library*

## Version Information

package-version.txt:

```
0.11.0
```

install-requires.txt:

```
symengine.py >= 0.6.1
```

## Equivalent System Packages

```
$ sudo pacman -S python-symengine
```

```
$ conda install python-symengine
```

```
$ sudo pkg install math/py-symengine
```

```
$ sudo emerge dev-python/symengine
```

See <https://repology.org/project/python:symengine/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.406 **symmetrica**: Library for representation theory

### Description

Symmetrica is a Collection of C routines for representation theory.

It is a program developed by Lehrstuhl Mathematik II of the University of Bayreuth. It has routines to handle the following topics:

- ordinary representation theory of the symmetric group and related groups (2/11/04)
- ordinary representation theory of the classical groups
- modular representation theory of the symmetric group
- projective representation theory of the symmetric group
- combinatorics of tableaux
- symmetric functions and polynomials (7/22/04)
- commutative and non commutative Schubert polynomials
- operations of finite groups.
- ordinary representation theory of Hecke algebras of type  $A_n$

For more details check <http://www.algorithm.uni-bayreuth.de/en/research/SYMMETRICA>

Updated package on <https://gitlab.com/sagemath/symmetrica/-/releases> with changes to modernize the source and the build system.

### License

Public Domain (see the above web site)

### Upstream Contact

- (passed away in 2013) Axel Kohnert - see <http://www.mathe2.uni-bayreuth.de/axel/>

### Type

standard

### Dependencies

- *xz*: General-purpose data compression software

## Version Information

package-version.txt:

```
3.0.1
```

## Equivalent System Packages

```
$ sudo pacman -S symmetrica
```

```
$ conda install symmetrica
```

```
$ sudo apt-get install libsymmetrica2-dev
```

```
$ sudo yum install symmetrica-devel
```

```
$ sudo pkg install math/symmetrica
```

```
$ sudo emerge sci-libs/symmetrica
```

```
$ nix-env --install symmetrica
```

```
$ sudo xbps-install symmetrica-devel
```

See <https://repology.org/project/symmetrica/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.407 sympow: Computes special values of symmetric power elliptic curve L-functions

### Description

SYMPOW is a package to compute special values of symmetric power elliptic curve L-functions. It can compute up to about 64 digits of precision.

### License

- See the file `src/COPYING`

### Upstream Contact

SYMPOW does not appear to be maintained any longer. Mark Watkins, the package author, now works at Magma. Previous (possibly still usable) email is [watkins@maths.usyd.edu.au](mailto:watkins@maths.usyd.edu.au)

New upstream: <https://gitlab.com/rezozzer/forks/sympow>

### Dependencies

- GNU patch

### Special Update/Build Instructions

- Some of the code is very dubious, and it is anyone's guess really what the compiler does with it. For example, the following line exists in `src/eulerfactors.c`:

```
if ((HECKE) && (d==1)) return hecke_good(p,ap,m,v);
```

But since `hecke_good` is defined as returning void, it's hard to know exactly how this code behaves. I would not be surprised by any bugs that might show up. I (David Kirkby) would personally not trust this code much at all.

- This is a difficult package to maintain. A github issue (#9758) has been opened to implement Watkins-Delaunay's algorithm for computing modular degrees in Sage. Once implemented, it should be possible to remove this package.
- The package is configured such that the data files are in a directory below where 'sympow' is installed. If Sage is installed globally, then it will be impossible to create the data files without being root. This has been fixed in the Gentoo Linux distribution. Some information from Christopher can be seen on [github issue #9703](#). This package will generate binary versions of all shipped datafiles, so these will work. However, creating totally new datafiles from scratch will not work.

### Type

standard

### Dependencies

- *pari: Computer algebra system for fast computations in number theory*

### Version Information

package-version.txt:

2.023.6



## Equivalent System Packages

```
$ sudo pacman -S sympow
```

```
$ conda install sympow
```

```
$ sudo apt-get install sympow
```

```
$ sudo yum install sympow
```

```
$ sudo emerge sci-mathematics/sympow
```

```
$ nix-env --install sympow
```

```
$ sudo zypper install sympow
```

```
$ sudo xbps-install sympow
```

See <https://repology.org/project/sympow/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.408 sympy: Python library for symbolic mathematics

### Description

SymPy is a Python library for symbolic mathematics. It aims to become a full-featured computer algebra system (CAS) while keeping the code as simple as possible in order to be comprehensible and easily extensible. SymPy is written entirely in Python and does not require any external libraries, except optionally for plotting support.

### Website

<https://sympy.org/>

### License

New BSD: <http://www.opensource.org/licenses/bsd-license.php>

### Upstream Contact

sympy mailinglist: <http://groups.google.com/group/sympy>

### Dependencies

- Python 2.5 or later

### Special Update/Build Instructions

- A simple script can be used to ease the updating of the SPKG. See the README.

### Type

standard

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *mpmath: Pure Python library for multiprecision floating-point arithmetic*

### Version Information

package-version.txt:

```
1.12
```

install-requires.txt:

```
sympy >=1.6, <2.0
```

### Equivalent System Packages

```
$ sudo pacman -S python-sympy
```

```
$ conda install sympy
```

```
$ sudo apt-get install python3-sympy
```

```
$ sudo yum install python-sympy
```

```
$ sudo emerge dev-python/sympy
```

```
$ sudo port install py-sympy
```

```
$ sudo zypper install python3\${PYTHON_MINOR}-sympy
```

```
$ sudo xbps-install python3-sympy
```

See <https://repology.org/project/python:sympy/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.409 tachyon: A ray tracing system

### Description

Tachyon is a raytracer developed by John E. Stone. Tachyon supports the typical ray tracer features, most of the common geometric primitives, shading and texturing modes, etc. It also supports less common features such as HDR image output, ambient occlusion lighting, and support for various triangle mesh and volumetric texture formats beneficial for molecular visualization (e.g. rendering VMD scenes).

Currently not all of Tachyon's functionality is exported by the Sage interface.

### License

Copyright (c) 1994-2010 John E. Stone All rights reserved.

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3. The name of the author may not be used to endorse or promote products derived from this software without specific prior written permission.

### Upstream Contact

- <http://jedi.ks.uiuc.edu/~johns/raytracer/>
- <http://www.photonlimited.com/~johns/raytracer/>
- John Stone <[johns@ks.uiuc.edu](mailto:johns@ks.uiuc.edu)>

### Dependencies

This spkg depends on:

- libpng

### Special Update/Build Instructions

- Delete the scenes directory, which has lots of cool examples.
- Delete the msvc directory, which is also large and not used within Sage.
- The CVS subdirectories are currently (almost) empty, but should otherwise be deleted.
- The upstream files had strange permissions, i.e. some source files were executable, while almost all files weren't world-readable.
- There's seems to be some crap like `tachyon.html.tar.gz` and a few `.#*` files I haven't [yet] deleted, since they're not that large.
- TODO: Check whether building multi-threaded versions on MacOS X meanwhile works. (This was said to fail with an old beta.)
- TODO: Use `patch` instead of copying over pre-patched files.
- TODO: [Optionally] also install some of the documentation.
- TODO: I doubt the CFLAGS set for AIX and HP-UX won't get overridden by the created Makefile, but that's a minor issue. -leif

### Type

standard

### Dependencies

- *libpng: Bitmap image support*

### Version Information

package-version.txt:

```
0.98.9.p7
```

### Equivalent System Packages

```
$ sudo pacman -S tachyon
```

```
$ conda install tachyon
```

```
$ sudo apt-get install tachyon
```

```
$ sudo yum install tachyon tachyon-devel
```

```
$ sudo pkg install graphics/tachyon
```

```
$ sudo emerge media-gfx/tachyon
```

```
$ nix-env --install tachyon
```

```
$ sudo zypper install tachyon
```

```
$ sudo xbps-install tachyon
```

See <https://repology.org/project/tachyon/versions>, <https://repology.org/project/tachyon-opengl/versions>

If the system package is installed, `./configure` will check if it can be used.

### 6.1.410 tdlb: Algorithms for computing tree decompositions

#### Description

Providing algorithms concerning treedecompositions

website: <https://github.com/freetdi/tdlib>

#### License

GNU General Public License v2

#### SPKG Maintainers

Lukas Larisch ([lukas.larisch@kaust.edu.sa](mailto:lukas.larisch@kaust.edu.sa))

#### Upstream Contact

- Lukas Larisch ([lukas.larisch@kaust.edu.sa](mailto:lukas.larisch@kaust.edu.sa))
- git-repo: <https://github.com/freetdi/tdlib>

#### Dependencies

- None

#### Type

optional

### Dependencies

### Version Information

package-version.txt:

```
0.3.1.p0
```

### Equivalent System Packages

```
$ sudo pacman -S tdlib
```

See <https://repology.org/project/python:tdlib/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.411 terminado: Tornado websocket backend for the term.js Javascript terminal emulator library

### Description

This is a Tornado websocket backend for the term.js Javascript terminal emulator library.

It evolved out of pyxterm, which was part of GraphTerm (as lineterm.py), v0.57.0 (2014-07-18), and ultimately derived from the public-domain Ajaxterm code, v0.11 (2008-11-13) (also on Github as part of QWeb).

### Type

standard

### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *hatchling: Modern, extensible Python build backend*
- *ptyprocess: Python interaction with subprocesses in a pseudoterminal*
- *tornado: Python web framework and asynchronous networking library*

## Version Information

package-version.txt:

```
0.17.1
```

install-requires.txt:

```
terminado >=0.8.3
```

## Equivalent System Packages

```
$ conda install terminado
```

```
$ sudo emerge dev-python/terminado
```

```
$ sudo port install py-terminado
```

```
$ sudo xbps-install python3-terminado
```

See <https://repology.org/project/terminado/versions>, <https://repology.org/project/python:terminado/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.412 texlive: A comprehensive TeX system

### Description

TeX Live is an easy way to get up and running with the TeX document production system. It provides a comprehensive TeX system with binaries for most flavors of Unix, including GNU/Linux, and also Windows. It includes all the major TeX-related programs, macro packages, and fonts that are free software, including support for many languages around the world.

This package installs all texlive packages required to build Sage. If necessary, texlive itself is installed.

### License

Various FSF-approved free software licenses. See <https://www.tug.org/texlive/copying.html> for details.

### Upstream Contact

Home page: <https://www.tug.org/texlive>

### Dependencies

- python

### Special Update/Build Instructions

This package requires internet access to download texlive packages for the TeX mirrors.

### Type

optional

### Dependencies

### Version Information

### Equivalent System Packages

```
$ apk add texlive
```

```
$ sudo pacman -S texlive-core texlive-latexextra texlive-langjapanese \
texlive-langcyrillic
```

```
$ apt-cyg install texlive
```

```
$ sudo apt-get install texlive-latex-extra texlive-xetex latexmk dvipng \
tex-gyre texlive-fonts-recommended texlive-lang-cyrillic \
texlive-lang-english texlive-lang-european texlive-lang-french \
texlive-lang-german texlive-lang-italian texlive-lang-japanese \
texlive-lang-polish texlive-lang-portuguese texlive-lang-spanish
```

```
$ sudo yum install latexmk texlive texlive-collection-latexextra \
texlive-collection-langcyrillic texlive-collection-langeuropean \
texlive-collection-langfrench texlive-collection-langgerman \
texlive-collection-langitalian texlive-collection-langjapanese \
texlive-collection-langpolish texlive-collection-langportuguese \
texlive-collection-langspanish
```

```
$ sudo emerge dev-tex/latexmk app-text/texlive app-text/dvipng \
dev-texlive/texlive-langcjk dev-texlive/texlive-langcyrillic \
dev-texlive/texlive-langenglish dev-texlive/texlive-langeuropean \
dev-texlive/texlive-langfrench dev-texlive/texlive-langgerman \
dev-texlive/texlive-langitalian dev-texlive/texlive-langjapanese \
dev-texlive/texlive-langportuguese \
dev-texlive/texlive-langspanish dev-texlive/texlive-latexextra \
dev-texlive/texlive-latexrecommended \
dev-texlive/texlive-mathscience
```

```
$ sudo port install texlive
```



```
$ sudo zypper install texlive
```

```
$ sudo slackpkg install texlive
```

```
$ sudo xbps-install texlive
```

See <https://repology.org/project/texlive/versions>

If the system package is installed, `./configure` will check if it can be used.

### 6.1.413 texlive\_luatex: LuaTeX packages

#### Description

Packages for LuaTeX, a TeX engine using Lua as an embedded scripting and extension language, with native support for Unicode, OpenType/TrueType fonts, and both PDF and DVI output.

The purpose of this dummy package is to associate system package lists with it.

#### License

GNU General Public License version 2.0 (GPLv2)

#### Upstream Contact

<https://www.luatex.org/>

#### Type

optional

#### Dependencies

- *texlive: A comprehensive TeX system*

#### Version Information

#### Equivalent System Packages

```
$ apk add texlive-luatex
```

```
$ sudo pacman -S texlive-collection-luatex
```

```
$ apt-cyg install texlive
```

```
$ sudo apt-get install texlive-luatex
```

```
$ sudo yum install texlive-luatex
```

```
$ sudo emerge dev-texlive/texlive-luatex
```

```
$ sudo port install texlive-luatex
```

```
$ sudo zypper install texlive-luatex
```

See <https://repology.org/project/texlive-luatex/versions>

If the system package is installed, `./configure` will check if it can be used.

### 6.1.414 texttable: Python module for creating simple ASCII tables

#### Description

Python module for creating simple ASCII tables

#### License

MIT License (MIT)

#### Upstream Contact

<https://github.com/foutaise/texttable/>

#### Dependencies

- python

#### Special Update/Build Instructions

#### Type

optional

#### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

## Version Information

package-version.txt:

```
1.7.0
```

install-requires.txt:

```
texttable >=1.6.3
```

## Equivalent System Packages

```
$ sudo pacman -S python-texttable
```

```
$ conda install texttable
```

```
$ sudo apt-get install python3-texttable
```

```
$ sudo yum install python-texttable
```

```
$ sudo emerge dev-python/texttable
```

```
$ sudo port install py-texttable
```

```
$ sudo zypper install python3\${PYTHON_MINOR}-texttable
```

```
$ sudo xbps-install python3-texttable
```

See <https://repology.org/project/texttable/versions>, <https://repology.org/project/python:texttable/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.415 threejs: JavaScript library to display 3D graphics in the browser

### Description

Three.js is a JavaScript library to display 3D graphics in the browser.

### License

MIT License

### Upstream Contact

Home page: <http://threejs.org>

### Dependencies

None.

### Special Update/Build Instructions

None.

### Type

standard

### Dependencies

#### Version Information

package-version.txt:

```
r122.p0
```

### Equivalent System Packages

```
$ conda install threejs-sage=122.*
```

See <https://repology.org/project/threejs/versions>, <https://repology.org/project/threejs-sage/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.416 tides: Integration of ODEs

### Description

TIDES is a library for integration of ODEs with high precision.

## License

GPLv3+

## Upstream Contact

- Marcos Rodriguez ([marcos@unizar.es](mailto:marcos@unizar.es))

## Dependencies

- gcc
- mpfr
- gmp

## Special Update/Build Instructions

minc\_tides.patch changes the size of the name of the temporal files, so there is no problem in systems that use long names. Also solves a bug in the inverse function.

## Type

optional

## Dependencies

- \$(MP\_LIBRARY)
- *mpfr: Multiple-precision floating-point computations with correct rounding*

## Version Information

package-version.txt:

2.0.p0

## Equivalent System Packages

See <https://repology.org/project/tides/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.417 tinycss2: A tiny CSS parser

### Description

A tiny CSS parser

### License

### Upstream Contact

<https://pypi.org/project/tinycss2/>

### Type

standard

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *webencodings: Character encoding aliases for legacy web content*

### Version Information

package-version.txt:

```
1.2.1
```

install-requires.txt:

```
tinycss2
```

### Equivalent System Packages

```
$ apk add py3-tinycss2
```

```
$ sudo pacman -S python-tinycss2
```

```
$ conda install tinycss2
```

```
$ sudo apt-get install python3-tinycss2
```

```
$ sudo yum install python-tinycss2
```

```
$ sudo pkg install textproc/py-tinycss2
```

```
$ sudo emerge dev-python/tinycss2
```

```
$ sudo port install py-tinycss2
```

```
$ sudo zypper install python-tinycss2
```

```
$ sudo xbps-install python3-tinycss2
```

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.418 tomli: A lil' TOML parser

### Description

A lil' TOML parser

### License

### Upstream Contact

<https://pypi.org/project/tomli/>

### Type

standard

### Dependencies

- `$(PYTHON)`
- *pip: Tool for installing and managing Python packages*

### Version Information

package-version.txt:

```
2.0.1
```

install-requires.txt:

```
tomli
```

### Equivalent System Packages

```
$ conda install tomli
```

```
$ sudo emerge dev-python/tomli
```

```
$ sudo xbps-install python3-tomli
```

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

### 6.1.419 topcom: Compute triangulations of point configurations and oriented matroids

#### Description

TOPCOM is a collection of clients to compute Triangulations Of Point Configurations and Oriented Matroids, resp.

The algorithms use only combinatorial data of the point configuration as is given by its oriented matroid. Some basic commands for computing and manipulating oriented matroids can also be accessed by the user.

It was very much inspired by the maple program PUNTOS, which was written by Jesus de Loera. TOPCOM is entirely written in C++, so there is a significant speed up compared to PUNTOS.

#### License

GPL v2

#### Upstream Contact

```
Prof. Dr. Jörg Rambau <Joerg.Rambau@uni-bayreuth.de>
Lehrstuhl für Wirtschaftsmathematik
Raum FAN-D.1.29 (Sekretariat: FAN-D.1.30)
Universität Bayreuth
D-95440 Bayreuth
Germany
Tel: +49-921-55-7350, Fax: +49-921-55-7352
http://www.rambau.wm.uni-bayreuth.de
```

#### Dependencies

- gmp, libcdd



## Special Update/Build Instructions

See `spkg-src`

## Type

optional

## Dependencies

- *cddlib*: Double description method for polyhedral representation conversion

## Version Information

package-version.txt:

```
1.1.2
```

## Equivalent System Packages

See <https://repology.org/project/topcom/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.420 tornado: Python web framework and asynchronous networking library

### Description

Python web framework and asynchronous networking library

### License

Apache License

### Upstream Contact

Home page: <http://www.tornadoweb.org>

### Dependencies

Python

### Type

standard

### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *certifi: Python package for providing Mozilla's CA Bundle*

### Version Information

package-version.txt:

```
6.4
```

install-requires.txt:

```
tornado >=6.0.4
```

### Equivalent System Packages

```
$ conda install tornado
```

```
$ sudo emerge www-servers/tornado
```

```
$ sudo port install py-tornado
```

```
$ sudo zypper install python3\${PYTHON_MINOR}-tornado
```

```
$ sudo xbps-install python3-tornado
```

See <https://repology.org/project/python:tornado/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.421 tox: tox is a generic virtualenv management and test command line tool

### Description

tox is a generic virtualenv management and test command line tool

### License

MIT

### Upstream Contact

<https://pypi.org/project/tox/>

### Type

standard

### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *cachetools: Extensible memoizing collections and decorators*
- *chardet: Universal encoding detector for Python 3*
- *colorama: Cross-platform colored terminal text.*
- *filelock: A platform independent file lock*
- *packaging: Core utilities for Python packages*
- *platformdirs: A small Python module for determining appropriate platform-specific dirs, e.g. a "user data dir".*
- *pluggy: plugin and hook calling mechanisms for python*
- *pyproject\_api: API to interact with the python pyproject.toml based projects*
- *tomli: A lil' TOML parser*
- *virtualenv: Virtual Python Environment builder*

### Version Information

package-version.txt:

```
4.11.1
```

install-requires.txt:

```
see spkg-configure.m4
tox >= 4.2.7
```

### Equivalent System Packages

```
$ sudo pacman -S python-tox
```

```
$ conda install tox
```

```
$ sudo apt-get install tox
```

```
$ sudo yum install tox
```

```
$ sudo pkg install tox
```

```
$ sudo emerge dev-python/tox
```

```
$ brew install tox
```

```
$ sudo port install py-tox
```

```
$ sudo slackpkg install tox
```

```
$ sudo xbps-install tox
```

See <https://repology.org/project/python:tox/versions>

If the system package is installed, `./configure` will check if it can be used.

### 6.1.422 traitlets: Traitlets Python configuration system

#### Description

Traitlets Python configuration system

#### License

BSD

#### Upstream Contact

<https://pypi.org/project/traitlets/>

## Type

standard

## Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *hatchling: Modern, extensible Python build backend*
- *ipython\_genutils: Vestigial utilities from IPython*

## Version Information

package-version.txt:

```
5.14.0
```

install-requires.txt:

```
traitlets >=4.3.3
```

## Equivalent System Packages

```
$ conda install traitlets
```

```
$ sudo emerge dev-python/traitlets
```

```
$ sudo port install py-traitlets
```

```
$ sudo zypper install python3\${PYTHON_MINOR}-traitlets
```

```
$ sudo xbps-install python3-traitlets
```

See <https://repology.org/project/traitlets/versions>, <https://repology.org/project/python:traitlets/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.423 trove\_classifiers: Canonical source for classifiers on PyPI (pypi.org).

### Description

Canonical source for classifiers on PyPI (pypi.org).

### License

### Upstream Contact

<https://pypi.org/project/trove-classifiers/>

### Type

standard

### Dependencies

- `$(PYTHON)`
- *calver: Setuptools extension for CalVer package versions*
- *pip: Tool for installing and managing Python packages*

### Version Information

package-version.txt:

```
2023.11.29
```

install-requires.txt:

```
trove-classifiers
```

### Equivalent System Packages

```
$ apk add py3-trove-classifiers
```

```
$ sudo pacman -S python-trove-classifiers
```

```
$ sudo yum install python-trove-classifiers
```

```
$ sudo pkg install devel/py-trove-classifiers
```

```
$ sudo emerge dev-python/trove-classifiers
```

```
$ sudo port install py-trove-classifiers
```

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

### 6.1.424 types\_python\_dateutil: Typing stubs for python-dateutil

#### Description

Typing stubs for python-dateutil

#### License

Apache-2.0 license

#### Upstream Contact

<https://pypi.org/project/types-python-dateutil/>

#### Type

standard

#### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

#### Version Information

package-version.txt:

```
2.8.19.14
```

install-requires.txt:

```
types-python-dateutil
```

#### Equivalent System Packages

(none known)

### 6.1.425 typing\_extensions: Backported and Experimental Type Hints for Python 3.8+

#### Description

Backported and Experimental Type Hints for Python 3.8+

### License

PSF

### Upstream Contact

<https://pypi.org/project/typing-extensions/>

### Type

standard

### Dependencies

- `$(PYTHON)`
- *pip: Tool for installing and managing Python packages*

### Version Information

package-version.txt:

```
4.8.0
```

install-requires.txt:

```
According to https://github.com/python/typing_extensions/blob/main/CHANGELOG.md,
version 4.4.0 adds another Python 3.11 typing backport
typing_extensions >= 4.4.0; python_version<"3.11"
```

### Equivalent System Packages

```
$ sudo pacman -S python-typing_extensions
```

```
$ conda install typing_extensions
```

```
$ sudo apt-get install python3-typing-extensions
```

```
$ sudo yum install python-typing-extensions
```

```
$ sudo pkg install devel/py-typing-extensions
```

```
$ sudo emerge dev-python/typing-extensions
```

```
$ sudo zypper install python3\${PYTHON_MINOR}-typing_extensions
```

```
$ sudo xbps-install python3-typing_extensions
```

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.



## 6.1.426 tzdata: Provider of IANA time zone data

### Description

Provider of IANA time zone data

### License

Apache-2.0

### Upstream Contact

<https://pypi.org/project/tzdata/>

### Type

standard

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

### Version Information

package-version.txt:

```
2023.3
```

install-requires.txt:

```
tzdata
```

### Equivalent System Packages

```
$ conda install tzdata
```

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.427 tzlocal: Python timezone information for the local timezone

### Description

tzinfo object for the local timezone

### Type

standard

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)
- *pytz\_deprecation\_shim: Shims to make deprecation of pytz easier*

### Version Information

package-version.txt:

```
5.0.1
```

install-requires.txt:

```
tzlocal >=2.1
```

### Equivalent System Packages

```
$ sudo pacman -S python-tzlocal
```

```
$ conda install tzlocal
```

```
$ sudo apt-get install python3-tzlocal
```

```
$ sudo yum install python-tzlocal
```

```
$ sudo pkg install devel/py-tzlocal
```

```
$ sudo emerge dev-python/tzlocal
```

```
$ sudo port install py-tzlocal
```

```
$ sudo zypper install python3\${PYTHON_MINOR}-tzlocal
```

```
$ sudo xbps-install python3-tzlocal
```

See <https://repology.org/project/tzlocal/versions>, <https://repology.org/project/python:tzlocal/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.428 uri\_template: RFC 6570 URI Template Processor

### Description

RFC 6570 URI Template Processor

### License

MIT License

### Upstream Contact

<https://pypi.org/project/uri-template/>

### Type

standard

### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`

### Version Information

package-version.txt:

```
1.3.0
```

install-requires.txt:

```
uri-template
```

### Equivalent System Packages

(none known)

## 6.1.429 urllib3: HTTP library with thread-safe connection pooling, file post, and more.

### Description

HTTP library with thread-safe connection pooling, file post, and more.

### License

MIT

### Upstream Contact

<https://pypi.org/project/urllib3/>

### Type

standard

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

### Version Information

package-version.txt:

```
2.1.0
```

install-requires.txt:

```
urllib3
```

### Equivalent System Packages

```
$ sudo pacman -S python-urllib3
```

```
$ conda install urllib3
```

```
$ sudo apt-get install python3-urllib3
```

```
$ sudo yum install python-urllib3
```

```
$ sudo pkg install net/py-urllib3
```

```
$ sudo emerge dev-python/urllib3
```

```
$ sudo zypper install python3\${PYTHON_MINOR}\-urllib3
```

```
$ sudo xbps-install python3-urllib3
```

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

### 6.1.430 valgrind: Memory error detector, call graph generator, runtime profiler

#### Description

This is an optional spkg. It supports Linux on x86, x86-64, ppc, ppc64 and ARM as well as Darwin (Mac OS X 10.5 and 10.6) on x86 and x86-64.

Valgrind is an instrumentation framework for building dynamic analysis tools. There are Valgrind tools that can automatically detect many memory management and threading bugs, and profile your programs in detail. You can also use Valgrind to build new tools.

The Valgrind distribution currently includes six production-quality tools: a memory error detector, two thread error detectors, a cache and branch-prediction profiler, a call-graph generating cache and branch-prediction profiler, and a heap profiler. It also includes three experimental tools: a heap/stack/global array overrun detector, a second heap profiler that examines how heap blocks are used, and a SimPoint basic block vector generator. It runs on the following platforms: X86/Linux, AMD64/Linux, ARM/Linux, PPC32/Linux, PPC64/Linux, S390X/Linux, ARM/Android (2.3.x), X86/Darwin and AMD64/Darwin (Mac OS X 10.6 and 10.7).

#### License

Valgrind is Open Source / Free Software, and is freely available under the GNU General Public License, version 2.

#### Upstream Contact

- <http://www.valgrind.org/>
- valgrind-user, valgrind-devel mailing lists

#### Dependencies

- None

### Special Build Instructions

- To build on OS X, you need to use Apple's compiler. FSF GCC is unsupported.

### Patches

- None.

### Type

experimental

### Dependencies

### Version Information

package-version.txt:

```
3.14.0
```

### Equivalent System Packages

```
$ apk add valgrind
```

```
$ brew install valgrind
```

```
$ sudo port install valgrind
```

```
$ sudo zypper install valgrind
```

```
$ sudo xbps-install valgrind
```

See <https://repology.org/project/valgrind/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see [github issue #27330](#) for more information.

## 6.1.431 virtualenv: Virtual Python Environment builder

### Description

Virtual Python Environment builder

## License

MIT

## Upstream Contact

<https://pypi.org/project/virtualenv/>

## Type

standard

## Dependencies

- `$(PYTHON)`
- *distlib: Distribution utilities*
- *filelock: A platform independent file lock*
- *pip: Tool for installing and managing Python packages*
- *platformdirs: A small Python module for determining appropriate platform-specific dirs, e.g. a “user data dir”.*

## Version Information

package-version.txt:

```
20.25.0
```

install-requires.txt:

```
virtualenv
```

## Equivalent System Packages

```
$ conda install virtualenv
```

```
$ sudo xbps-install python3-virtualenv
```

If the system package is installed, `./configure` will check if it can be used.

## 6.1.432 wcwidth: Measures the displayed width of unicode strings in a terminal

### Description

Measures the displayed width of unicode strings in a terminal

### License

MIT

### Upstream Contact

<https://pypi.org/project/wcwidth/>

### Type

standard

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

### Version Information

package-version.txt:

```
0.2.12
```

install-requires.txt:

```
wcwidth >=0.1.7
```

### Equivalent System Packages

```
$ conda install wcwidth
```

```
$ sudo emerge dev-python/wcwidth
```

```
$ sudo port install py-wcwidth
```

```
$ sudo zypper install python3\${PYTHON_MINOR}-wcwidth
```

```
$ sudo xbps-install python3-wcwidth
```

See <https://repology.org/project/wcwidth/versions>, <https://repology.org/project/python:wcwidth/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.



### 6.1.433 webcolors: A library for working with the color formats defined by HTML and CSS.

#### Description

A library for working with the color formats defined by HTML and CSS.

#### License

BSD-3-Clause

#### Upstream Contact

<https://pypi.org/project/webcolors/>

#### Type

standard

#### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

#### Version Information

package-version.txt:

```
1.13
```

install-requires.txt:

```
webcolors
```

#### Equivalent System Packages

(none known)

### 6.1.434 webencodings: Character encoding aliases for legacy web content

#### Description

Character encoding aliases for legacy web content.

### License

BSD License

### Upstream Contact

Home Page: <https://github.com/gsnedders/python-webencodings>

### Dependencies

Python

### Type

standard

### Dependencies

- \$(PYTHON)
- \$(PYTHON\_TOOLCHAIN)

### Version Information

package-version.txt:

```
0.5.1
```

install-requires.txt:

```
webencodings >=0.5.1
```

### Equivalent System Packages

```
$ sudo pacman -S python-webencodings
```

```
$ conda install webencodings
```

```
$ sudo apt-get install python3-webencodings
```

```
$ sudo yum install python-webencodings
```

```
$ sudo emerge dev-python/webencodings
```

```
$ sudo port install py-webencodings
```

```
$ sudo zypper install python3\${PYTHON_MINOR}-webencodings
```

```
$ sudo xbps-install python3-webencodings
```

See <https://repology.org/project/python:webencodings/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

### 6.1.435 websocket\_client: WebSocket client for Python with low level API options

#### Description

WebSocket client for Python with low level API options

#### License

Apache-2.0

#### Upstream Contact

<https://pypi.org/project/websocket-client/>

#### Type

standard

#### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`

#### Version Information

package-version.txt:

```
1.6.4
```

install-requires.txt:

```
websocket-client
```

## Equivalent System Packages

(none known)

### 6.1.436 wheel: A built-package format for Python

#### Description

A built-package format for Python

#### License

MIT

#### Upstream Contact

<https://pypi.org/project/wheel/>

#### Type

standard

#### Dependencies

- `$(PYTHON)`
- *pip: Tool for installing and managing Python packages*

#### Version Information

package-version.txt:

```
0.42.0
```

install-requires.txt:

```
https://github.com/sagemath/sage/issues/31050 - version constraint for macOS Big Sur support
wheel >=0.36.2
```

## Equivalent System Packages

```
$ sudo pacman -S python-wheel
```

```
$ conda install wheel
```

```
$ sudo apt-get install python3-wheel
```

```
$ sudo yum install python-wheel
```

```
$ sudo emerge dev-python/wheel
```

```
$ sudo port install py-wheel
```

```
$ sudo zypper install python3\${PYTHON_MINOR}-wheel
```

```
$ sudo xbps-install python3-wheel
```

See <https://repology.org/project/wheel/versions>, <https://repology.org/project/python:wheel/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.437 widgetsnbextension: Jupyter interactive widgets for Jupyter Notebook

### Description

Jupyter interactive widgets for Jupyter Notebook

### License

BSD 3-Clause License

### Upstream Contact

<https://pypi.org/project/widgetsnbextension/>

### Type

standard

### Dependencies

- `$(PYTHON)`
- `$(PYTHON_TOOLCHAIN)`
- *jupyter\_core*: Jupyter core package

### Version Information

package-version.txt:

```
4.0.9
```

install-requires.txt:

```
widgetsnbextension
```

### Equivalent System Packages

```
$ sudo pacman -S jupyter-widgetsnbextension
```

```
$ conda install widgetsnbextension
```

```
$ sudo yum install python-widgetsnbextension
```

```
$ sudo pkg install devel/py-widgetsnbextension
```

```
$ sudo emerge dev-python/widgetsnbextension
```

```
$ sudo port install py-widgetsnbextension
```

```
$ sudo zypper install jupyter-widgetsnbextension
```

```
$ sudo xbps-install python3-jupyter_widgetsnbextension
```

See <https://repology.org/project/python:widgetsnbextension/versions>, <https://repology.org/project/jupyter-widgetsnbextension/versions>, <https://repology.org/project/python:jupyter-widgetsnbextension/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.438 xindy: a general-purpose index processor

### Description

This dummy package represents xindy: xindy was developed after an impasse had been encountered in the attempt to complete internationalisation of makeindex. Xindy can be used to process indexes for documents marked up using (L)A<sub>T</sub>E<sub>X</sub>, Nroff family and SGML-based languages. Xindy is highly configurable, both in markup terms and in terms of the collating order of the text being processed.

We do not have an SPKG for it. The purpose of this dummy package is to associate system package lists with it.

**License**

GNU General Public License version 2.0 (GPLv2)

**Upstream Contact**

<http://www.xindy.org/>

**Type**

optional

**Dependencies****Version Information****Equivalent System Packages**

```
$ sudo apt-get install xindy
```

```
$ sudo port install xindy
```

```
$ sudo zypper install xindy
```

See <https://repology.org/project/xindy/versions>

If the system package is installed, `./configure` will check if it can be used.

**6.1.439 xz: General-purpose data compression software****Description**

XZ Utils is free general-purpose data compression software with a high compression ratio.

**License**

Some parts public domain, other parts GNU LGPLv2.1, GNU GPLv2, or GNU GPLv3.

**Upstream Contact**

<http://tukaani.org/xz/>

### Dependencies

#### Type

standard

### Dependencies

#### Version Information

package-version.txt:

```
5.2.5
```

### Equivalent System Packages

```
$ apk add xz
```

```
$ conda install xz
```

```
$ apt-cyg install xz
```

```
$ sudo apt-get install xz-utils
```

```
$ sudo yum install xz
```

```
$ brew install xz
```

```
$ sudo port install xz
```

```
$ sudo zypper install xz
```

```
$ sudo slackpkg install xz
```

```
$ sudo xbps-install xz
```

See <https://repology.org/project/xz/versions>

If the system package is installed, `./configure` will check if it can be used.

## 6.1.440 zeromq: A modern networking library

### Description

A modern networking library. Also known as 0mq or zmq. The same API is provided by <http://www.crossroads.io>, though we currently use the <http://www.zeromq.org> implementation.



## License

LGPLv3+

## Upstream Contact

<http://www.zeromq.org>

## Dependencies

A working compiler.

## Special Update/Build Instructions

N/A

## Type

standard

## Dependencies

## Version Information

package-version.txt:

```
4.3.5
```

## Equivalent System Packages

```
$ apk add zeromq-dev
```

```
$ sudo pacman -S zeromq
```

```
$ conda install zeromq
```

```
$ apt-cyg install libzmq-devel
```

```
$ sudo apt-get install libzmq3-dev
```

```
$ sudo yum install zeromq zeromq-devel
```

```
$ sudo pkg install net/libzmq4
```

```
$ sudo emerge net-libs/zeromq
```

```
$ brew install zeromq
```

No package needed.

```
$ sudo zypper install pkgconfig\ (libzmq\)
```

```
$ sudo xbps-install zeromq-devel
```

See <https://repology.org/project/zeromq/versions>

If the system package is installed, `./configure` will check if it can be used.

### 6.1.441 zipp: A pathlib-compatible zipfile object wrapper

#### Description

A pathlib-compatible Zipfile object wrapper. A backport of the Path object.

#### License

MIT License

#### Upstream Contact

Home page: <https://github.com/jaraco/zipp>

#### Dependencies

Python, Setuptools

#### Type

standard

#### Dependencies

- `$(PYTHON)`
- *pip: Tool for installing and managing Python packages*

## Version Information

package-version.txt:

```
3.17.0
```

install-requires.txt:

```
zipp >=0.5.2
```

## Equivalent System Packages

```
$ conda install zipp
```

```
$ sudo emerge dev-python/zipp
```

```
$ sudo port install py-zipp
```

```
$ sudo xbps-install python3-zipp
```

See <https://repology.org/project/python:zipp/versions>

If the system package is installed and if the (experimental) option `--enable-system-site-packages` is passed to `./configure`, then `./configure` will check if the system package can be used.

## 6.1.442 zlib: Data compression library

### Description

Massively Spiffy Yet Delicately Unobtrusive Compression Library (Also Free, Not to Mention Unencumbered by Patents)

### License

- Modified BSD.

### Upstream Contact

- <http://www.zlib.net/>

### Type

standard

### Dependencies

### Version Information

package-version.txt:

```
1.2.11.p0
```

### Equivalent System Packages

```
$ apk add zlib-dev
```

```
$ conda install zlib
```

```
$ apt-cyg install zlib-devel
```

```
$ sudo apt-get install libz-dev
```

```
$ sudo yum install zlib-devel
```

```
$ brew install zlib
```

```
$ sudo port install zlib
```

```
$ sudo zypper install pkgconfig\zlib\
```

```
$ sudo slackpkg install zlib
```

```
$ sudo xbps-install zlib-devel
```

See <https://repology.org/project/zlib/versions>

If the system package is installed, `./configure` will check if it can be used.

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