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SymPy

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COMP8440 – FOSSD

A Symbolic Algebra Library Built In Python



About SymPy



Australian
National
University

- ▶ A Python library for symbolic mathematics.
- ▶ Aims to become a full-featured **Computer Algebra System** (CAS) in the future.
- ▶ SymPy is easy to use and install. Works with Python 2.5 or newer version (Linux, Windows, Mac OS X etc.)
- ▶ Common features include –
 - ▶ Functions (exp, log, sin)
 - ▶ Integration
 - ▶ Differentiation
 - ▶ Complex Numbers
- ▶ Various projects using SymPy – Sage, MathPix, PyDy, IKFast etc.

```
>>> math.sqrt(8)  
2.82842712475
```



```
>>> sympy.sqrt(8)  
2*sqrt(2)
```



Features – What Sets It Apart?

- ▶ Free & Open Source (as opposed to many leading CAS). Licensed under the liberal New BSD.
- ▶ Developed in Python, rather than inventing a new language.
- ▶ Lightweight Library.
- ▶ Can be used as a library, interactive Python environment or an API.

```
latex(Integral(cos(x)**2, (x, 0, pi)))
```

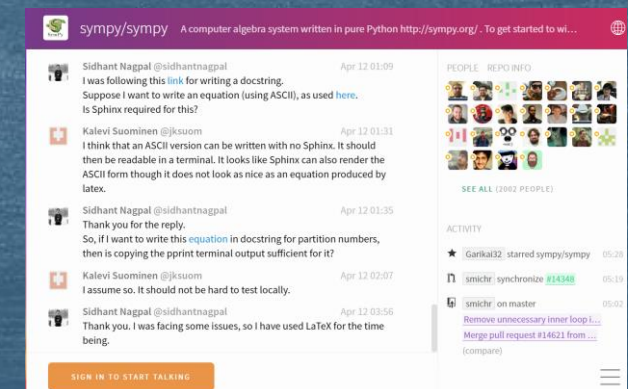
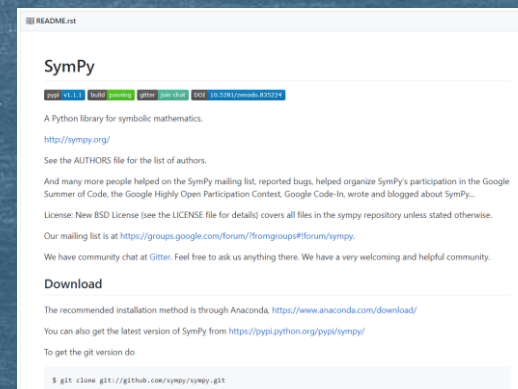
$$\int_0^{\pi} \cos^2(x) dx$$

```
>>>
>>> from sympy import *
>>> x = symbols('x')
>>> a = Integral(cos(x)*exp(x), x)
>>> Eq(a, a.doit())
Eq(Integral(exp(x)*cos(x), x), exp(x)*sin(x)/2 + exp(x)*cos(x)/2)
>>>
```



Web Presence

- ▶ GitHub Repository - <https://github.com/sympy/sympy>
- ▶ Official Website - <http://sympy.org/>
- ▶ Wikis – Intro To Computing - <https://github.com/sympy/sympy/wiki/Introduction-to-contributing>
- ▶ Gitter Chat
- ▶ Google Mailing List






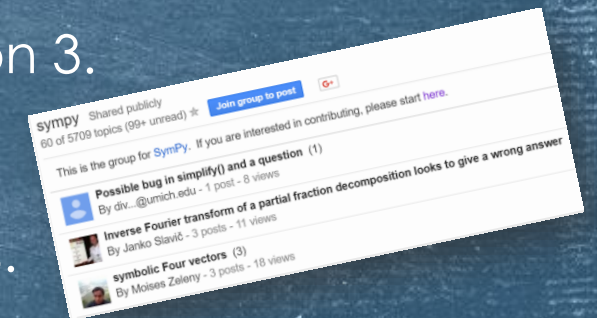
History

- ▶ Started by **Ondřej Čertík** in **2005**.
- ▶ He was doing Bachelors and wanted a Python library that could do what Mathematica does.
- ▶ Project accelerated in 2007, when SymPy started participating in **Google Summer of Code(GSoC)**.
- ▶ In 2011, **Aaron Meurer** (from GSoC fame) took over as the lead developer.
- ▶ Current Status –
 - ▶ 655 Contributors on GitHub (Source: GitHub)
 - ▶ ~ 31, 800 commits and 57 releases (Source: GitHub)
 - ▶ 328, 000 lines of code (over 100, 000 lines of tests) (Source: Open Hub, Wikipedia)



Development & Contributing

- ▶ All people who have contributed at least 1 patch to the project, are considered a part of the development team.
- ▶ No core Development Team. **Aaron Meurer** is the current lead developer
- ▶ Big financial & infrastructural support comes through **GSoC**. 
- ▶ Spacing, Naming and Documentation follow strict standards & guidelines.
- ▶ Any submitted code needs to run in both Python 2 & Python 3.
- ▶ Instructions and guidelines for posting patches.
- ▶ Use **Google Groups** & **Mailing List** for submission of patches.
- ▶ Lots of documentation – **Wiki** (487 pages), **README**, **Manuals**, **cheatsheets**





Releases

- ▶ Releases were managed through `code.google.com` till 2013
- ▶ Now moved to GitHub Repository

| Release | 0.7.3 | 0.7.4 | 0.7.5 | 0.7.6 | 1.0 | 1.1 | 1.1.1 |
|---------|----------|----------|----------|----------|----------|----------|----------|
| Date | Jul 2013 | Dec 2013 | Feb 2014 | Nov 2014 | Mar 2016 | Jul 2017 | Jul 2017 |

- ▶ Latest Stable Release – SymPy 1.1.1 (July 2017)
- ▶ Released on git, tarballs (.tgz) and as Anaconda or PyPi libraries.
- ▶ **Hard Dependency** – mpmath | **Optional** – matplotlib, gmpy, Pyglet



Licensing

► Licensed under the **New BSD License**.

```
Copyright (c) 2006-2018 SymPy Development Team
```

```
All rights reserved.
```

```
Redistribution and use in source and binary forms, with or without  
modification, are permitted provided that the following conditions are met:
```

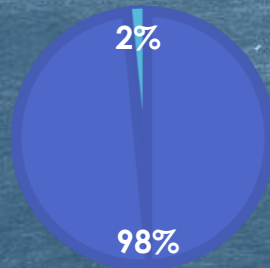
- a. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
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- c. Neither the name of SymPy nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.

► Covers all files in the SymPy repository unless stated otherwise.

Some Stats

LANGUAGES BREAK-UP

Python
XSLT

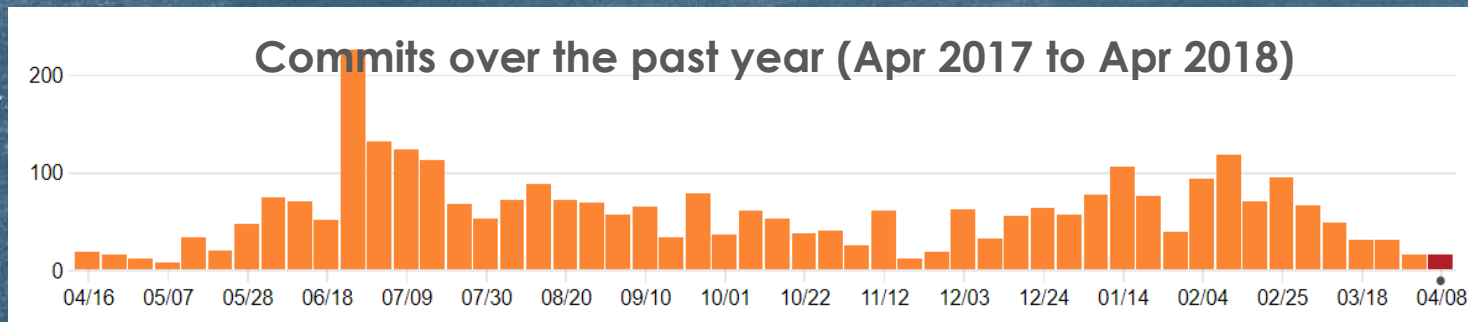


31,820 commits

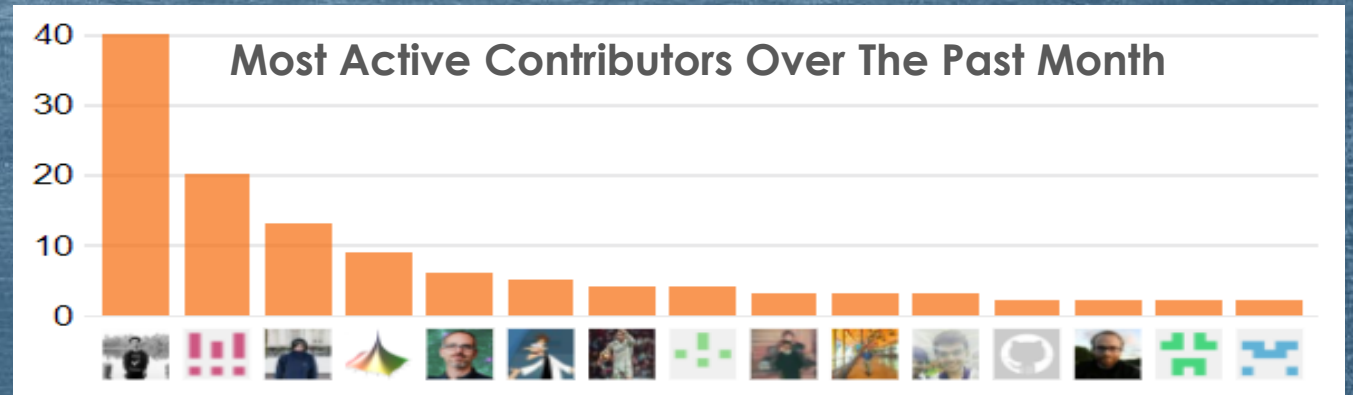
2,737 Open
5,029 Closed

7 branches

- Pure Python Library (98.5% purity)



- Pretty Active Development



OVER THE PAST 1 MONTH –

- ✓ 64 Active PRs
- ✓ 46 Merged PRs
- ✓ 87 Active Issues
- ✓ 32 Closed Issues
- ✓ 121 Commits to Master
- ✓ 4791 Additions & 524 Deletions



Future

- ▶ Aims to be fully functional CAS.
- ▶ Aims to be an independent library for Python, without any dependencies.
- ▶ Make things run faster
 - ▶ **SymEngine** - A library built purely in C++ but has wrappers for other languages including Python. Bound to make things faster.
- ▶ Implement more algorithms to compute more things.
- ▶ Encourage people to use SymPy for other applications.

Thanks!

Questions & Discussions

are most welcome...