SymPy Tutorial

Symbolic computation with Python using SymPy

Amit Kumar

Delhi Technological University | Github: @aktech | Twitter: @iaktech

What is SymPy?

- open source Python library for symbolic mathematics.
- aims to become a full-featured computer algebra system.
- while keeping the code as simple as possible in order to be comprehensible and easily extensible.
- written entirely in Python and does not require any external libraries.

What is Symbolic Computation?

It’s a scientific area that refers to the study and development of algorithms and software for manipulating **mathematical expressions** and other **mathematical objects**.

Why SymPy?

- Standalone
- Full featured
- BSD licensed
- Embraces Python
- Usable as a library

Outline

- Goal
- History
- Features
- Statistics
- Future Plans
- Tutorial

Goal

Provide a symbolic manipulation library in Python.

History

- Ondřej Čertík started the project in 2006.
- Lot of work was done in Google Summer of Code 2007.
- Participated in every GSoC for last 9 years.
- Aaron Meurer took over as a lead developer on Jan 4, 2011.

Features

- Core Capabilities
  - Basic Arithmetic (+,-,*,/)
  - Simplification (Trigonometric, Polynomials)
  - Expansion (of Polynomial)
  - Function (trigonometric, hyperbolic, special functions, etc)
  - Substitution
- Polynomials
- Calculus
- Solving Equations

Features (Contd..)

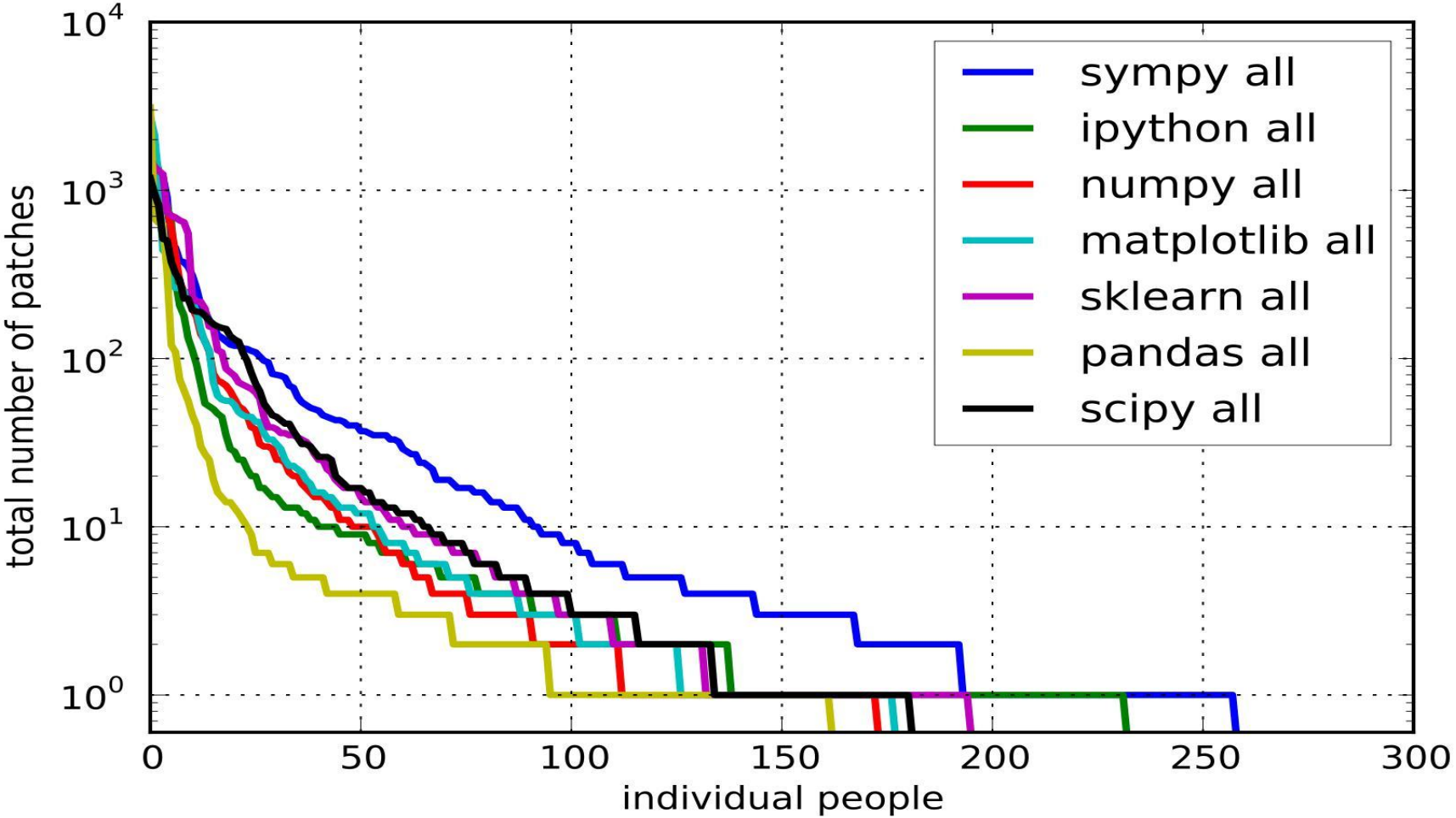
- Matrices
- Geometry (2D, 3D)
- Plotting (Matplotlib support)
- Parsing (Conversion from Python to SymPy objects)
- Printing (pretty print, LaTeX, ..)
- Physics (Mechanics, Optics, ..)
- Statistics

Features (Contd..)

and a lot more...

Statistics

- Over 400 Contributors
- Almost Half a million lines of code & Documentation
- 2500+ Stargazers on github repository
- 1200+ forks
- 200+ watchers
- 20,000+ Monthly downloads on PyPi
- 250+ Open Pull requests
- 51 releases (Latest: SymPy 0.7.6.1)


10^4
10^3
10^2
10^1
10^0
total number of patches
0
50
100
150
200
250
300
individual people
sympy all
ipython all
numpy all
matplotlib all
sklearn all
pandas all
scipy all

Future Plans

- Make things faster.
- Implement more algorithms.
- Encourage more people to use and contribute to SymPy.
- Full List of things to be implemented: https://github.com/sympy/sympy/wiki/GSoC-2015-Ideas

Tutorial

Let’s begin!

Courtesy: Most of material is taken from “Aaron Meurer, Jason Moore, Matthew Rocklin”s presentation of SciPy 2014