NumPy

Snapshot for SciPy 2018

What Is NumPy?

NumPy is the fundamental package needed for scientific computing with Python. It provides:

- A powerful N-dimensional array object
- Tools for integrating C/C++ and Fortran code
- Useful linear algebra, Fourier transform, and random number capabilities

More information may be found at

- Website (including documentation): https://www.numpy.org
- Mailing list: https://mail.python.org/mailman/listinfo/numpy-discussion
- Source: https://github.com/numpy/numpy

The NumPy Release Cycle

NumPy has an effective release cycle of about six months. Each release is followed by three to five bug fix micro releases as needed. The last three minor releases are:

- NumPy 1.13.0 -- 2017-06-07
- NumPy 1.14.0 -- 2018-03-12
- NumPy 1.15.0rc1 -- 2018-06-21

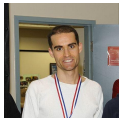
There have been proposals for a faster release cycle, but they never seem to work out.

NumPy Highlights From Last Three Releases

There have been many bug fixes and improvements to NumPy over the last year. Some of the notable highlights have been:

- Operations like a + b + c will reuse temporaries on some platforms,
- Inplace operations check if inputs overlap outputs and create temporaries
- The text io functions now handle files with any Python supported encoding.
- There are major improvements to printing of NumPy arrays and scalars.
- The new __array_ufunc__ attribute allows overriding ufuncs.
- The new np.block function for creating blocked arrays.
- The np.einsum function uses BLAS when possible
- NumPy switched to pytest for testing.

Current Status

- Tyler Reddy and Matti Picus are now working full-time at BIDS on NumPy
-  
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- Rough Draft Roadmap to complement the NEP process (link may change before scipy)
    - Birds of a feather session *tomorrow* to continue discussion

Future Plans - 1

There are several Numpy Enhancement Proposals currently in play, they may be viewed online at http://www.numpy.org/neps/. Four that are of general interest are:

- NEP-0014: The NumPy 1.16 release will be the last to support Python 2.7. That release will be maintained through the end of 2019.
- NEP-0018: Support for an __array_function__ attribute to facilitate overriding a larger class of numpy functions than allowed by __array_ufunc__.
- NEP-0019: Support for new random number generators and algorithms. This will require dropping the guarantee on repeatable random number streams, but the old routines will be maintained for backward compatibility.
- NEP-0021: Advanced indexing syntax

Future Plans -2

Depends on how community roadmap solidifies, but will probably include items such as:

- [yes] Extensible user-defined dtypes
- [expand] Code coverage in tests
- [yes] Standardize missing values
- [maybe, probably not?] Typing stubs for type annotation systems
- [maybe, low priority?] Speedups, or at least establish baseline benchmarks

Getting involved

Help us grow the community, both in absolute numbers and to make it more diverse. Please reach out if you see a way to get more people involved:

- Educational materials & outreach
- Employer-sponsored time to work on NumPy
- Adopt a feature: masked arrays, c-api refcount documentation, configuration reporting for bug reports, switch out linalg backends, ...

Tomorrow: Birds of a Feather planning session
Saturday / Sunday: Sprint