Awesome Python for Math People and Stuff

Part 2 - Numerical and Scientific programming

This session's Content

- Computation with Numpy & Scipy
- Plotting with Matplotlib
- Python-C API (ctypes)
- Other Examples & Questions

What is & What does Numpy do?

- Provides efficient array objects
- Provides essential numerical routines
  (Lin alg., FFTs, Random/Statistical,
  polynomials, sorting, etc.)
- Python-C API
  uses C-types; essentially, numpy arrays are
  the currency of exchange between your
  C/C++/Fortran code and Python.

What does Scipy do?

- Builds on top of Numpy, adds advanced functionality
  - ODE integration & Quadrature
  - Interpolation
  - Optimization
  - Special functions
  - Input/Output - Will read some common data formats - specifically, reads and writes MATLAB data files
  - Lin Alg - More advanced than Numpy, Includes sparse matrices & routines
  - Image & signal processing

Matplotlib

Advantages:

- Makes nice-looking plots
- Mimics MATLAB plotting functions where appropriate
- Very customizable

Disadvantages:

- Can be a pain to install and get working
- Can be slow
- More advanced functionality can be difficult to learn - go by examples.

Example Notes

- this link is a great starting point:
  - www.scipy.org/NumPy_for_Matlab_Users
- Index from Zero! (the one true way)
- Arrays vs. Matrices
- this link is great for figuring out how to do things in matplotlib: matplotlib.sourceforge.net/gallery.html