Introduction to Python

Scientific Computing with Python

2nd December 2016

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- Today is a small selection.
- Today: numpy, matplotlib, (no sympy - sorry)
- Missed out: Pandas, SciPy, PyGSL, ScientificPython, GmPy. . .
- Please **read the docs!**

Introduction to numpy

- What is it?

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- numpy is written in C and so is as fast as e.g. matlab.
- Designed for ease of use with matlab - similar functions and can accept .mat files.

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- Arrays have a shape field that returns a vector of dimensions.

```
import numpy as np
x = np.random.rand(3) # x is 1d array
print x.shape # 3
```

ndarray

- Many similar functions to matlab.

```
import numpy as np
x = np.random.rand(3) # shape is 3
y = np.eye((3,3)) # identity matrix
z = np.zeros((4,4,4)) # note two sets of brackets
```

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- Demo!

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- e.g. slicing - slightly nicer syntax for numpy

```
import numpy as np
x = np.arange(6).reshape(4,4)
y = x[3,:] # y is 4th row of x
```

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- A lot of basic stats is built in: mean, standard deviation etc.
- Example: linear regression

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- Makes things very simple!
- Line plots, scatter plots, histograms, contour plots, 3d plots etc.

Basic idea

- There is always a 'current figure' and 'current plot'.
- You build up the plot as you go before using .show() or . savefig ("filename").