Scipy

Overview

- Tools for math, science, and engineering
- Makes heavy use of Numpy - some overlap

integrate **ndimage**

interpolate **optimize**

io **stats**

Optimization - scipy.optimize

- function minimization
- least-squares regression
- root-finding

Optimization - scipy.optimize

- Fitting a line to data:
  - Define the functional form of your model as a Python function
  - Feed in to leastsq() with data
  - ??
  - Profit

Optimization - scipy.optimize

- Fitting a line to data is easy:

```
from scipy.optimize import leastsq

def error_function(p, x, y, sigma_y):
    m,b = p
    return (y - m*x - b) / sigma_y

fit_p, ier = leastsq(error_function,
                     x0=[1.,0.],
                     args=(x, y, sigma_y))
```

Integration - scipy.integrate

- Similar to leastsq() - define Python function for the expression you want to integrate
- Pass in to integration function of your choice

Interpolation - scipy.interpolate

- I have measurements of a function at:
  - x = 0, 1, 2, 3
- I want to know values at:
  - x = 0.5, 1.5, 2.5, 3.5

scipy.ndimage

- Utilities for manipulating image data
  - filters (e.g., gaussian blur)
  - transforms (e.g., rotation)