# Python for X-Informatics – SciPy I

## Overview

Scipy is a powerful python package built on top of numpy. It has a number of algorithms pertaining to different fields like calculus, stats, signal processing, image processing, etc.

## List of Scipy Packages

The documentation to the all the packages in scipy can be found online at
http://docs.scipy.org/doc/scipy/reference/

### Clustering package (scipy.cluster)

This package provides the methods to perform clustering using the k-means algorithm.

### Constants (scipy.constants)

This package provides all of the mathematical constants (eg: Pi($\pi$) )

### Discrete Fourier transforms (scipy.fftpack)

Provides methods to perform fourier transforms. These are popularly used in the fields of Image Processing and Signal Processing.

### Integration and ODEs (scipy.integrate)

This package provides methods for performing integration.

### Interpolation (scipy.interpolate)

This package provides classes and methods to perform interpolation. Interpolation is finding values(missing) between a known range of values.

### Input and output (scipy.io)

Provides Methods to save, load data and perform other I/O operations

### Linear algebra (scipy.linalg)

This package provides methods to perform various linear algebra operations.

### Miscellaneous routines (scipy.misc)

This package provides a number of general purpose tools. These include methods for reading images, finding factorials, etc

### Multi-dimensional image processing (scipy.ndimage)

Provides a number of methods to perform image processing.

### Orthogonal distance regression (scipy.odr)

Orthogonal distance regression is a technique used for prediction

### Optimization and root finding (scipy.optimize)

This package provides methods to find optimum parameters(minimum or maximum) for a given function.
 It also has methods find roots for a given function.

### Signal processing (scipy.signal)

This package provides methods for signal processing.

### Sparse matrices (scipy.sparse)

Sparse matrices are matrices where a large number of elements are 0. This package provides ways to deal with such matrices

### Sparse linear algebra (scipy.sparse.linalg)

This package provides methods to perform linear algebra operations on matrices assuming them to be sparse matrices.

### Compressed Sparse Graph Routines (scipy.sparse.csgraph)

These are graph based methods for processing sparse graphs.

### Spatial algorithms and data structures (scipy.spatial)

This package contains methods to works with spatial data.

### Special functions (scipy.special)

This package provides a number of special functions(eg: Bessel function). We will be looking at the ndtri() function int eh later stages of the course.

### Statistical functions (scipy.stats)

These include functions from the field of statistics(example computing the probability density function, etc.)

### Statistical functions for masked arrays (scipy.stats.mstats)

This is similar to the statistical functions except that it works on masked arrays. Masked arrays are a data structure provided in numpy to represent arrays with missing values.

### C/C++ integration (scipy.weave)

It is used to write code so that it can interact with C or C++ languages