SCIPY

CS 010

Design and Implementation of Solutions to Computational Problems

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EXTENDING PYTHON

MODULES EXTEND PYTHON

• Numpy

• Scipy
  • a collection of math algorithms and functions that extend python
  • high-level commands and classes for
    • manipulating data
    • visualizing data
  • (like Matlab, R, or Octave)

see scipy.org
INTRODUCTION TO SCIPY

SCIPY IS A COLLECTION OF MODULES

• built on numpy and matplotlib
• but those are separate required modules

```
import numpy as np
import matplotlib as mpl
import matplotlib.pyplot as plt
```
INSTALL SCIPY

INSTALLED SCIPY

$ pip3 install scipy
Collecting scipy
  Downlaoding scipy-0.18.1-cp35-cp35m-macosx_10_6_intel.macosx_10_9_intel.
macosx_10_9_x86_64.macosx_10_10_intel.macosx_10_10_x86_64.whl (21.0MB)
  100% |████████████████████████████████| 21.0MB 51kB/s
Requirement already satisfied: numpy>=1.7.1 in /Library/Frameworks/Python.
framework/Versions/3.5/lib/python3.5/site-packages (from scipy)
Installing collected packages: scipy
Successfully installed scipy-0.18.1
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• cluster
  • clustering algorithms
  • unsupervised machine learning algorithms
  • Clustering algorithms are useful in information theory, target detection, communications, compression, and other areas. The vq module only supports vector quantization and the k-means algorithms.
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• constants
  • Physical and mathematical constants
    • speed of light
    • proton mass
    • gravitational constant
    • etc.

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- fftpack
  - Fast Fourier Transforms
    - converts raw amplitudes into spectral graphs
    - aka, stereo equalizer

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• integrate

• Integration and ordinary differential equation solvers
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- interpolate
- Interpolation and smoothing splines
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• io
  • modules to read and write files of many different formats
    • wav
    • arff files
    • matlab files

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- linalg
  - Linear algebra functions
    - matrix algebra
    - matrix inversion
    - eigenvalues
    - matrix decompositions

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• ndimage
  • N-dimensional image processing

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• odr
  • Orthogonal distance regression
• optimize
  • Optimization and root-finding routines
• signal
  • signal processing
• sparse
  • sparse matrix manipulation

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- **spatial**
  - Spatial data structures and algorithms
- **special**
  - Bessel functions, polynomials, ellipsoid
- **stats**
  - This module contains a large number of probability distributions as well as a growing library of statistical functions

see scipy.org
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- weave
- C/C++ integration
CASE STUDY

SOUND FREQUENCIES

• First create your input audio
• Then read in your sound file in python
• Then convert it to frequencies using FFT
• Then plot it
CASE STUDY

ANIMATE SOUND FREQUENCIES

see scipy.org