Intro to Python for Data Science
Arusha Tech

Anthony FAUSTINE

August 2017

Outline

1 Introduction

2 Python

3 Data Science

4 Python Packages for Data Science

Learning goal

- Understand python programming language and different python libraries for data science.
- Explore Python language fundamentals, including basic syntax, variables, control flow, data structure and functions.
- Build Numpy arrays, and perform basic and some linear algebra calculations.
- Create and customize plots using matplotlib.

Presenter Bio

- PhD student at Nelson Mandela African Institution of Science and Technology,
- **Research :** Applied machine learning and signal processing for computational sustainability.
  - Develop probabilistic-deep learning algorithm (Hybrid HMM-DNN) for energy dis-aggregation problem.
- Co-founder Pythontz
- Assistant Lecturer (UDOM), Researcher (Vicres, Hakikidawa).

Pythontz

python™
Tanzania
We aim to create a vibrant and diverse python community in Tanzania

Pythontz

About Pythontz

- A postive peer learning community for interested Python users in Tanzania.

Vision

- To create a vibrant and diverse python community in Tanzania.

Mission

- To foster the application of python programming across industries, learning centers, schools and community in Tanzania.

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Introduction

What is Python ?

A very popular general-purpose programming language.

- Open source general-purpose language
- Dynamically semantics (rather than statically typed like Java or C/C++)
- Interpreted (rather than compiled like Java or C/C++)
- Object Oriented,

What can you use Python for ?

- Web development (Django)
- Web Scraping (Beautiful Soup)
- Scripting Language.
- Scientific programming and Numeric Computing.
- Automation and Embedded Sytstem.
- Desktop GUIs and 3D modelling.

But Why Python ?

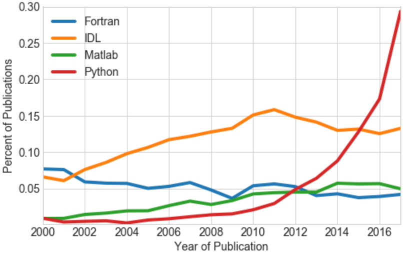

FIGURE – Jake VanderPlas PyCon 2017

- Python is a “teaching language”
- ....created to “bridge the gap between the shell and C
- “never intended. . . to be the primary language for programmers.”

Why is Python such an effective tool in science ?

1. Interoperability with Other Languages : You can use it in the shell on microtasks, or interactively, or in scripts, or build enterprise software with GUIs.
2. “Batteries Included” + Third-Party Modules : Python has built-in libraries and third-party liabraies for nearly everything.
3. Simplicity & Dynamic Nature : You can run your Python code on any architecture.
4. Open ethos well-fit to science : Easy to reproduce results with python
5. Python is the future of Machine Learning and AI.

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Why is Python such an effective tool for Data Science

1. Very rich scientific computing libraries
2. All DS tasks can be performed with Python :
   - accessing, collecting, cleaning, analysing, visualising data
   - modelling, evaluating models, integrating in prod, scaling

http ://slides.com/utstikkar/introtopython-pythonproglanguage#/3

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PYTHON 2 VS. PYTHON 3

- 2 major versions of Python in widespread use : Python 2.x and Python 3.x
- Some features in Python 3 are not backward compatible with Python 2
- Some Python 2 libraries have not been updated to work with Python 3
- Bottom-line : there is no wrong choice, as long as all the libraries you need are supported by the version you choose.
- In this workshop : Python3

Resource to learn Python

10 Resources to Get Started Learning Python

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What is Data science

`The future belongs to the companies and people that turn data into products. By Mike Loukides June 2, 2010`

Data science : deals with analyzing and manipulating data to derive insights and build data products.

- The end goal of DS ⇒ data product :

  Data product : any tool created with the help of data to make a more informed decision.

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Data science vs Machine learning

Machine learning : a set of algorithms that learn from data in order to make predictions or inference.

- Data Science is the real-world application of machine learning, with the goal of creating data products.

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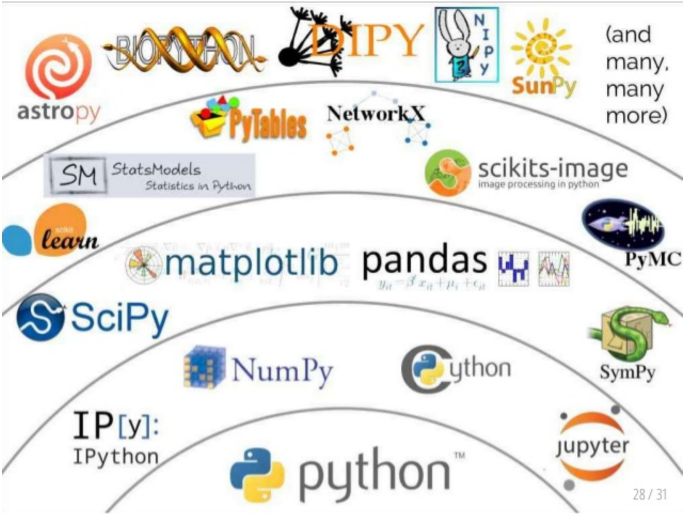
Python’s Scientific Stack



Jupyter

Jupyter : Open-source web application for interactive and exploratory computing.

- Allows to create and share documents that contain live code, equations, visualizations and explanatory text.

- It is a platform for Data Science at scale.
- Covers all the life-cycle of scientific ideas :ideas to publications.
- Demo

Numpy and Sci-py

Numpy : the fundamental Python package for scientific computing.

- Provide high-performance vector, matrix and higher-dimensional data structures.
- Offers Matlab-ish capabilities within Python.

Sci-py : Collections of high level mathematical operations

- linear algebra.
- Optimization
- Integration etc.

statsmodels

statsmodels : statistical modelling toolbox

Matplotlib

Matplotlib is an excellent 2D and 3D graphics library for generating scientific figures.

- It provides both a very quick way to visualize data from Python and publication-quality figures in many formats.

Other data visualization packages : Seaborn and Bokeh.

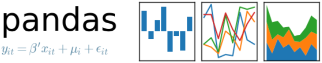
Other Python Library for Visualization

87.62
88.905
56
Ba
Barium
137.327
71
Lu
1.0
10.0
100.0
Pd
Tc
Ag
Cd

Pandas

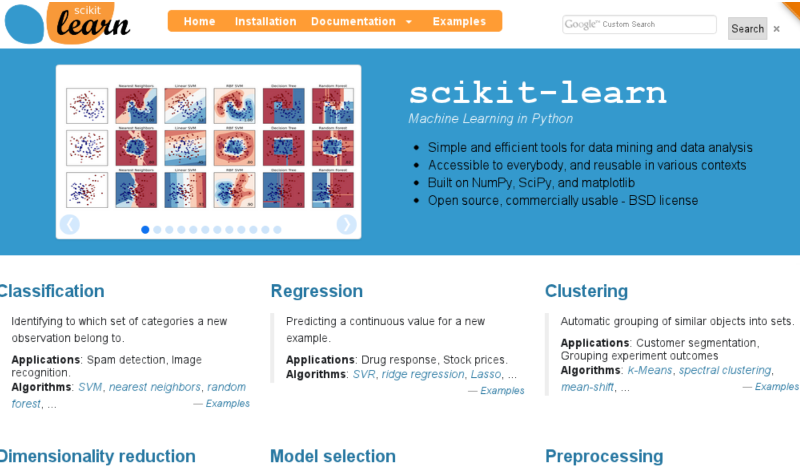
Panda : a python package providing fast, flexible, and expressive data structures for data analysis.

- A fundamental high-level building block for doing practical, real world data analysis in Python.
- Designed to work with relational or labeled data or both.



Scikit-Learn for ML

Scikit-Learn (sklearn) is Python's premier general-purpose machine learning library.



scikit-learn

Machine Learning in Python

- Simple and efficient tools for data mining and data analysis
- Accessible to everybody, and reusable in various contexts
- Built on NumPy, SciPy, and matplotlib
- Open source, commercially usable - BSD license

Classification

Identifying to which set of categories a new observation belong to.

Applications: Spam detection, Image recognition.
Algorithms: *SVM*, *nearest neighbors*, *random forest*, ... — *Examples*

Regression

Predicting a continuous value for a new example.

Applications: Drug response, Stock prices.
Algorithms: *SVR*, *ridge regression*, *Lasso*, ... — *Examples*

Clustering

Automatic grouping of similar objects into sets.

Applications: Customer segmentation, Grouping experiment outcomes
Algorithms: *k-Means*, *spectral clustering*, *mean-shift*, ... — *Examples*

Dimensionality reduction

Model selection

Preprocessing

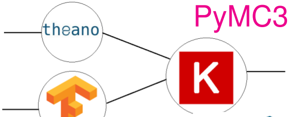
Python ML and AI libraries

Tensorflow

Theano

Pytorch

Keras



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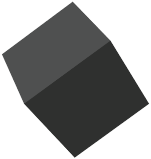
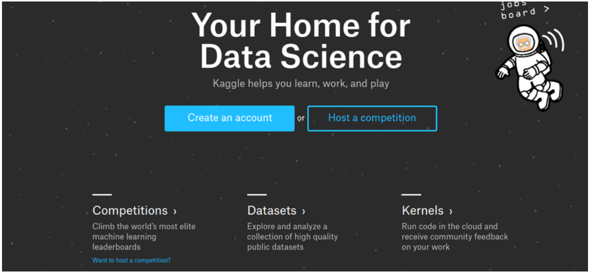


PyMC3

NLTK

Data Science Platform

Kaggle : helps you learn, work, and play.



Your Home for Data Science

Kaggle helps you learn, work, and play

Competitions ›
Climb the world's most elite machine learning leaderboards
Want to host a competition?

Datasets ›
Explore and analyze a collection of high quality public datasets

Kernels ›
Run code in the cloud and receive community feedback on your work

Data set :

- Academic Torrents
- UCI Machine learning repository

THANK YOU

Practical Session

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