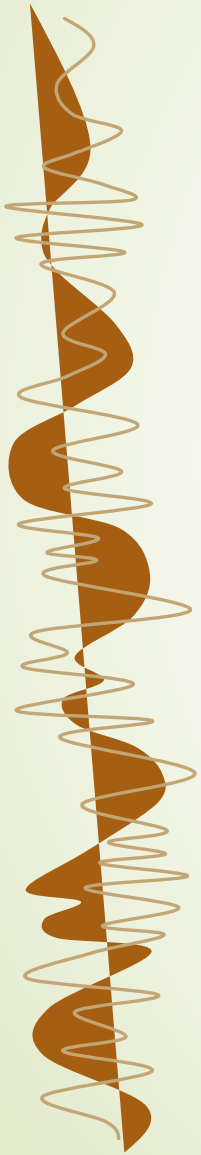


Lab1 - Python

Introduction

What is Python

- https://www.python.org/
  - Python is a programming language that lets you work more quickly and integrate your systems more effectively.
  - You can learn to use Python and see almost immediate gains in productivity and lower maintenance costs.
- https://www.python.org/about/gettingstarted/
  - Installing (multiplatform)
  - Learning
  - Frequently Asked Questions

What is Python

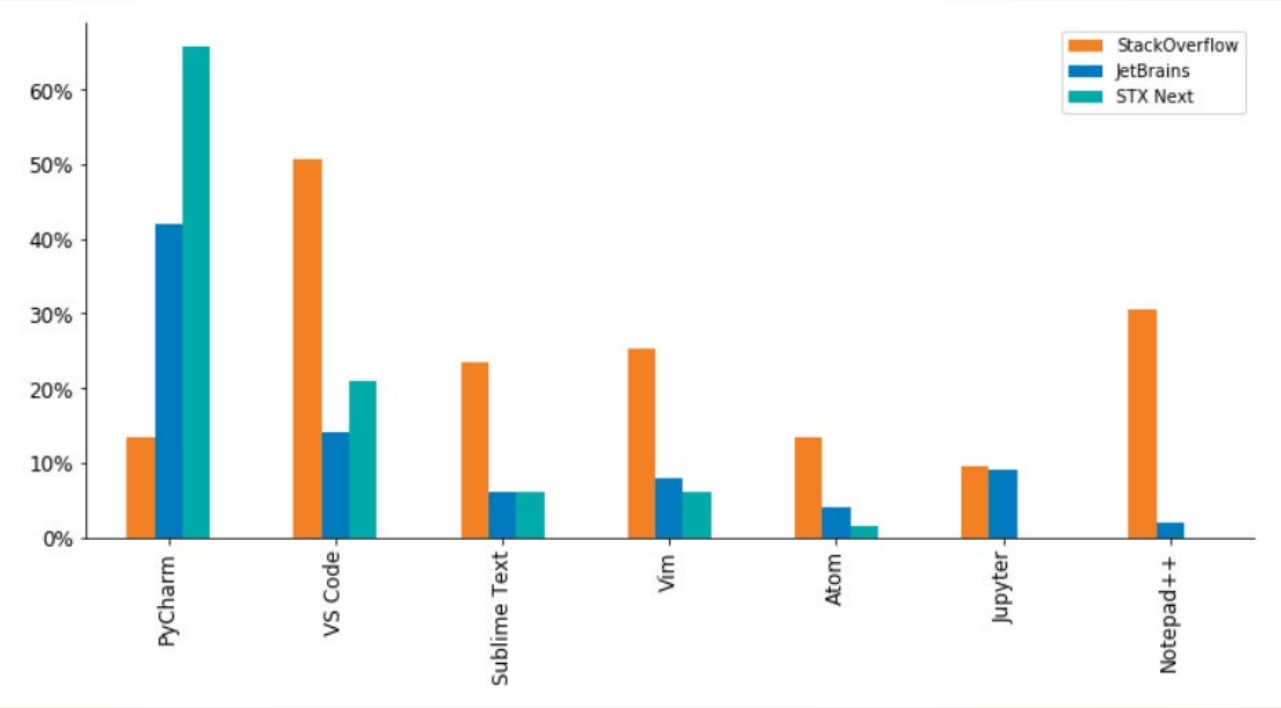
- High level programming language
  - Interpreted
  - object-oriented
  - with dynamic semantics.
- Its high-level built in data structures, combined with dynamic typing and dynamic binding, make it very attractive for Rapid Application Development
- Python's simple, easy to learn syntax emphasizes readability and therefore reduces the cost of program maintenance.
- Python supports modules and packages, which encourages program modularity and code reuse.
- The Python interpreter and the extensive standard library are available in source or binary form without charge for all major platforms, and can be freely distributed.

What is Python

- Python is developed under an OSI-approved open source license, making it freely usable and distributable, even for commercial use. Python's license is administered by the Python Software Foundation.

IDE for Python

- https://www.stxnext.com/blog/best-python-ides-code-editors/



Libraries

- Numpy
- Scipy
- Scikit-learn
- Keras
- PyTorch
- Pandas
- Matplotlib
- More info here https://www.mygreatlearning.com/blog/open-source-python-libraries/

OpenCV

- OpenCV (Open Source Computer Vision Library: http://opencv.org) is an open-source library that includes several hundreds of computer vision algorithms.

- https://docs.opencv.org/4.x/d6/d00/tutorial_py_root.html

What is OpenCV

- Open Source Computer Vision Library
- Library of programming functions aimed at real-time computer vision
- Developed by Intel, and now supported by Willow Garage and Itseez
- Free for use under the open source BSD license
- Cross-platform

Purposes

- Initially an Intel Research initiative to advance CPU-intensive applications (1999)
- The goals of the project were:
  - Advance vision research by providing not only open but also optimized code for basic vision infrastructure
  - Common infrastructure that developers could build on
  - Portable, performance-optimized code available for free

Applications

- 2D and 3D feature toolkits
- Augmented reality
- Egomotion estimation
- Facial recognition system
- Gesture recognition
- Human–computer interaction (HCI)
- Mobile robotics
- Motion tracking
- Motion understanding
- Object detection
- Segmentation and recognition
- Stereo vision: depth perception from 2 cameras
- Structure from motion (SFM)

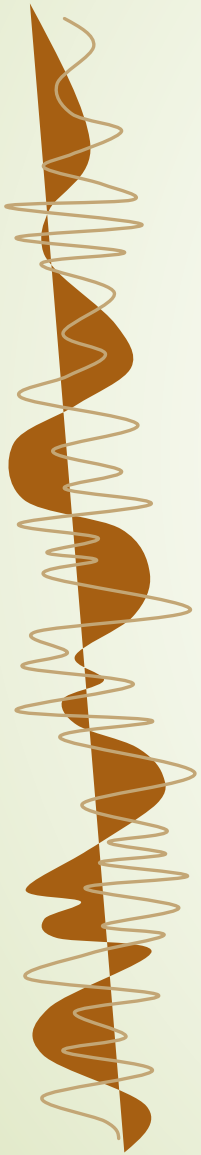
Machine Learning

- Boosting
- Decision tree learning
- Gradient boosting trees
- Expectation-maximization algorithm
- k-nearest neighbor algorithm
- Naive Bayes classifier
- Artificial neural networks
- Random forest
- Support vector machine (SVM)

Why Using OpenCV

- Many functions (>500)
- Efficient implementations
- De-facto standard
- Free to use
- Source code
- Quick bug-fixes
- Platform independent
- Rapid prototyping with Python

Programming Languages



- Originally in C, since 2.0 also C++
- Existing bindings in Java and Python
- Wrappers in other languages such as C#, Perl, Ch, Haskell and Ruby

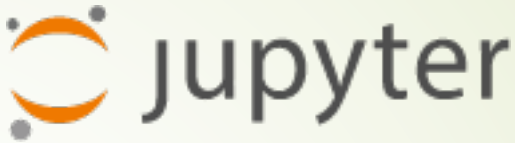
Platforms

- OpenCV runs on many desktop platforms:
  - Windows, macOS, Linux, FreeBSD, OpenBSD
- OpenCV also runs on mobile platforms:
  - Android, iOS
- See: https://opencv.org/releases/

OpenCV Installation

- Windows: https://docs.opencv.org/4.6.0/d3/d52/tutorial_windows_install.html
- Mac: https://docs.opencv.org/4.6.0/d0/db2/tutorial_macos_install.html
  - Check also the "brew install" version
- Linux (Ubuntu): https://docs.opencv.org/4.6.0/d7/d9f/tutorial_linux_install.htm
  - Check also the "apt install" version

Jupyter notebook



- The Jupyter Notebook is the original web application for creating and sharing computational documents. It offers a simple, streamlined, document-centric experience.
- https://jupyter.org/
- Install the classic Jupyter Notebook with:
  - *pip install notebook*
  - To run the notebook:
  - *jupyter notebook*