Getting started with Python

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Python will be used for the Computer Vision class. The goal of this tutorial is to familiarize students with python and the libraries required for this class.

Contents:

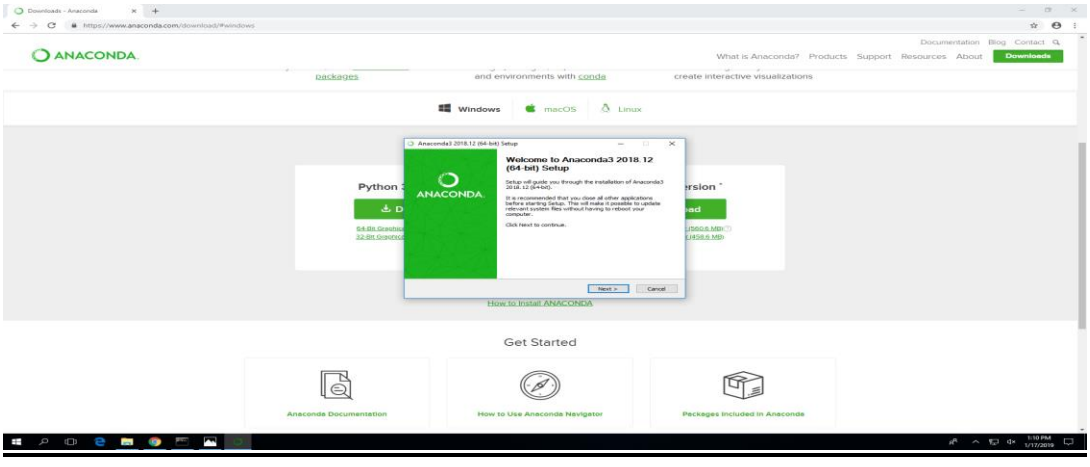
1. Setting up Python

The Computer Engineering cluster will be available to everyone in the class for projects. Python and the required libraries are already installed on the CE cluster. **Details on accessing the server will be provided in a separate document.**

The installation guidelines below are for students who want to work on a local machine.

How to install Python on a Local Machine

1. **Windows Installation**
   Download Anaconda Python 3.7 version (then we will downgrade to version 3.6)
   https://www.anaconda.com/download/#download



Skip Microsoft vs code installation

Click to select: Register Anaconda as my default python

Open Anaconda Prompt

** follow the instructions below inside the anaconda prompt terminal

- `conda create --name example_name_py36 python=3.6`
- `conda activate example_name_py36`
- `pip install pip-autoremove`
- `pip-autoremove jupyter -y`
- `conda install jupyter`
- `conda install nb_conda`
- `conda install ipykernel`
- `python -m ipykernel install --user --name current_kernel_name`
- `python -m pip install --user numpy scipy matplotlib`
- `python -m pip install --user pandas sympy nose opencv-python opencv-contrib-python`
- `python -m pip install --user scikit-image`

You can run python .py files in the environment you created or you can use the jupyter notebook environment which is already installed. To start jupyter type `jupyter notebook`

2. Ubuntu or Mac Installation

- `[ubuntu]!wget` https://repo.anaconda.com/archive/Anaconda3-2018.12-Linux-x86_64.sh
- `[Mac]curl -o` https://repo.continuum.io/archive/Anaconda3-2018.12-MacOSX-x86_64.sh
- `[ubuntu]!sha256sum Anaconda3-2018.12-Linux-x86_64.sh`
- `[ubuntu]bash Anaconda3-2018.12-Linux-x86_64.sh`
- `[Mac]!sha256sum Anaconda3-2018.12-Mac-x86_64.sh`
- `[Mac]bash Anaconda3-2018.12-Mac-x86_64.sh`
- ... Do you approve the license terms? [yes|no]
- Anaconda3 will now be installed into this location: /home/n/anaconda3
    - Press ENTER to confirm the location
    - Press CTRL-C to abort the installation
    - Or specify a different location below

  [/home/n/anaconda3] >>>

At this point, the installation will proceed. Note that the installation process takes some time.
Once the installation is complete, you'll receive the following output:
... installation finished. Do you wish the installer to prepend the Anaconda3 install location to PATH in your /home/n/.bashrc ? [yes|no]
[Yes] >>>

```
source ~/.bashrc
conda
```

- Caution :

  Anaconda may not be recognized by your system, it is very common bug. This happens because anaconda failed to write it's path to .bashrc. You need to manually point to the conda path.

- `export PATH=~/anaconda3/bin:$PATH`

  Edit bashrc manually and add the following line

- export PATH=$PATH:$HOME/anaconda/bin

  Once everything is installed, Run the following command

- `conda create -n name_of_env python=3.6.7 anaconda`
- `source activate name_of_env`

  Below command will launch jupyter notebook on local machine

- `ipython notebook`

  or

- `jupyter-notebook`

  Install Required Libraries

- `python -m pip install --user numpy scipy matplotlib ipython jupyter pandas sympy nose opencv-python opencv-contrib-python scikit-image`

2. <u>Selecting an Editor for python</u>

To learn about some popular editors, visit Python editors

** Important Note: On the server only nano or vim can be used to write the code. The server is a Linux based operating system.

We suggest using your favorite editor locally (I personally prefer jupyter notebook) to write and test code before transferring the code on the server, where you can use nano/vim.

These are some popular editors, but you are not limited to these choices:

1. Jupyter Notebook
   Can only be used on the local machine. It is not available on the CE server.
   Good for prototyping and debugging.

2. Nano or vim
   Command line editors available on Linux/server.

3. Notepad ++
   Available only for windows

4. Brackets
   Available on all platforms, but not on the server.

3. Introduction to Libraries for the course

1. Introduction to Python Basics
   Introduction to python syntax, loops, functions, classes.

2. Introduction to Numpy and Matplotlib tutorial
   Introduction to numpy and matplotlib, which are an alternative to Matlab.

3. Pandas
   Pandas is extensively used with Numpy and Matplotlib.
   For the tutorial on Pandas visit Pandas tutorial

4. Scikit-image
   Introductory tutorial on skimage could be found at Scikit-Image tutorial

5. OpenCV
   Introductory tutorial on OpenCV could be found at opencv tutorial

4. Project 0. Warmup Project (not part of the course grade)

Due: January 29, 2019

Objectives

The objectives of this project are:

Become familiar with Python, its libraries and related image processing functions.
Use Python for basic image processing operations.

1. Use OpenCV to do the following:

- Read an image
- Resize an image to half its size.
- Resize the original image two more times at different resolutions.
- Plot all 4 images (original and resized) using opencv functions strictly to subplot.
- Save all images

2. Create a python class named OpenCV_method which includes the steps of part 1 as the method.

3. Use skimage and numpy to do the following:

- Read an image
- Change the color space of the image to GRAY
- Plot the original image and the GRAY image using subplots.
- Change the color space of the image to HSV (Hue, Saturation, Value)
- Plot the original image and each of the HSV channels using subplots.
- Save all images

4. Create python class named skimage_method which includes the steps of part 3 as the method.

5. How do the saved images differ in format when using OpenCV and skimage?

Project Report:
A pdf version of the report, original images, and all code should be uploaded on mycourses by noon on the due date. You are encouraged to use latex on www.overleaf.com. Make sure you maintain the image aspect ratio when plotting. The report will be not graded for Project 0.

Submit by uploading on mycourses the project pdf, your code files (zipped), results (zipped) and latex project (zipped from overleaf)**.** Codes can be submitted as .py files or as .ipynb and HTML files.