



Initial Setup

Lab-session 0

Computer Vision and Image Processing

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Working on your computer

Requirements



These slides will teach you how to configure and install the required libraries in your computer. Requirements:

- Windows or Linux-Ubuntu (macOS and other Linux distributions are not in this guide but they should work too.)
- Internet connection

We will install:

- Python 3.5.x
- Pip
- Python-Libraries: OpenCV, Matplotlib, Numpy
- Jupyter Notebook

Step 1: Installing Python 3.5.x

Two main versions of Python: Python 2.x and Python 3.x are available.

The two version have several features in common, but they are not fully compatible: a Python 2.x program may not work in Python 3.x and vice versa.

Installing on Windows:

- Download the Python3.5.x release from:
<https://www.python.org/downloads/>
- Run the installer. **Remind to Add Python to PATH**



Installing on Ubuntu:

- Ubuntu already comes with Python installed. If you want to update it to the latest version open your terminal and run:
`sudo apt-get install --upgrade python3`

IMPORTANT: After python 3.7.x, OpenCV is only available on Pip in version $> 3.4.8.x$. Thus, you need to install previous version of python ($\leq 3.7.x$) to run the notebooks.

Step 2: Installing pip

PIP is a recursive acronym that stands for “PIP Installs Packages”. It’s a command-line utility that allows you to install, reinstall, or uninstall Python packages with a simple command: **pip**

Installing on Windows:

- Download the get-pip.py installer script from here: <https://bootstrap.pypa.io/get-pip.py>
Right-click on the link and select Save As and save it to any location.
- Open the Command Prompt (better **Windows PowerShell**) and navigate to the folder containing the get-pip.py file (`cd path_to_folder`).
- Run the following command: **`python get-pip.py`**

Installing on Ubuntu:

- Open your terminal and run the following:
`sudo apt-get install python3-pip`
- **[Optional] Virtual Environment** if having conflicts with system libraries:
 - 1- Install virtual-env:
`sudo pip3 install virtualenv`
 - 2 - Create virtual environment:
`virtualenv -p /usr/bin/python3
“name-for-your-virtual-environment”`
 - 3-Activate it (every new terminal):
`source “path-to-your-virtual-environment/bin/activate”`

Step 3: Install Python Libraries with pip



Installing on every OS:

Open your terminal (Windows PowerShell for Windows) and run the following commands:

- Install numpy (For array operations) :

pip3 install numpy

- Install matplotlib (For plotting and visualization)

pip3 install matplotlib

- Install OpenCV (Computer Vision Library):

pip3 install opencv-python==3.4.2.16

pip3 install opencv-contrib-python == 3.4.2.16

Step 4: Install and run Jupyter Notebook



The Jupyter Notebook is an open-source web application that allows you to create and share documents that contain live code, equations, visualizations and narrative text. It is useful to explain how to code and to visualize interactively the results of an algorithm or code.

Installing on every OS:

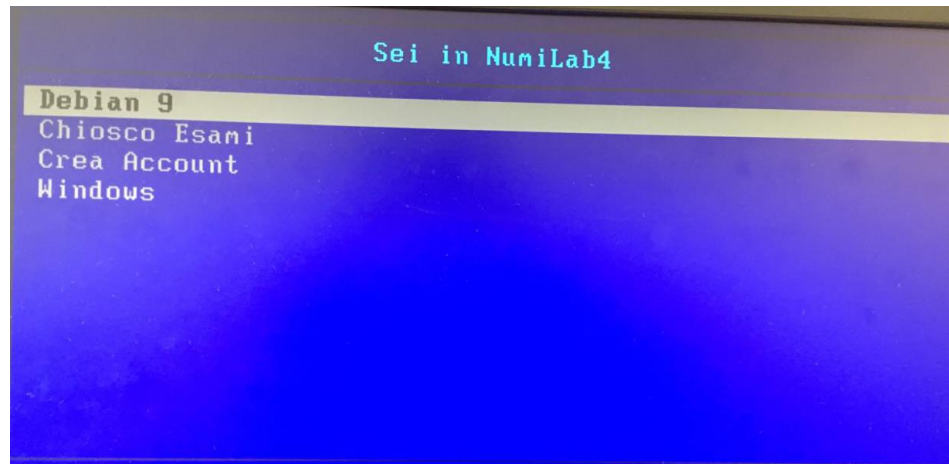
- Open your terminal and run:

pip3 install jupyter



Working on Lab Computer

Working on Lab computer



All the packages you need are already installed. If it is your first time in lab, perform the following steps:

1. Create your account
2. Login into **Debian 9** (only Linux will be supported in lab PCs) with username and password
3. run **startx** in the terminal to run the GUI



After Initial Setup

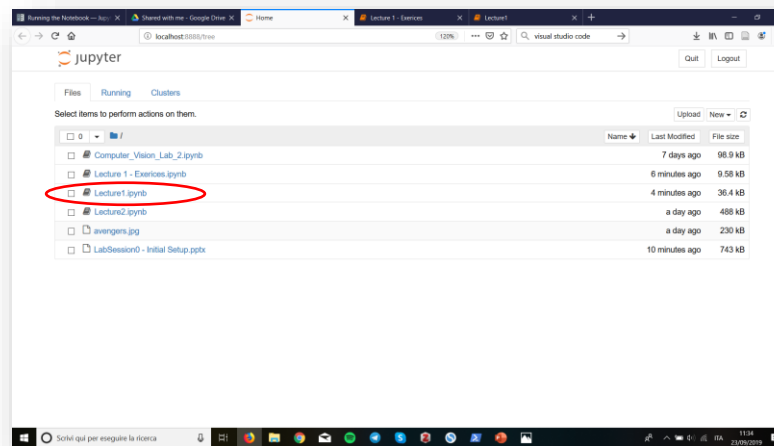
Jupyter Notebook: An overview

Run Jupyter Notebook:

Navigate to the folder containing the lab-session notebooks and **launch** the notebook server in a terminal (**do not close it!**) with the following command:

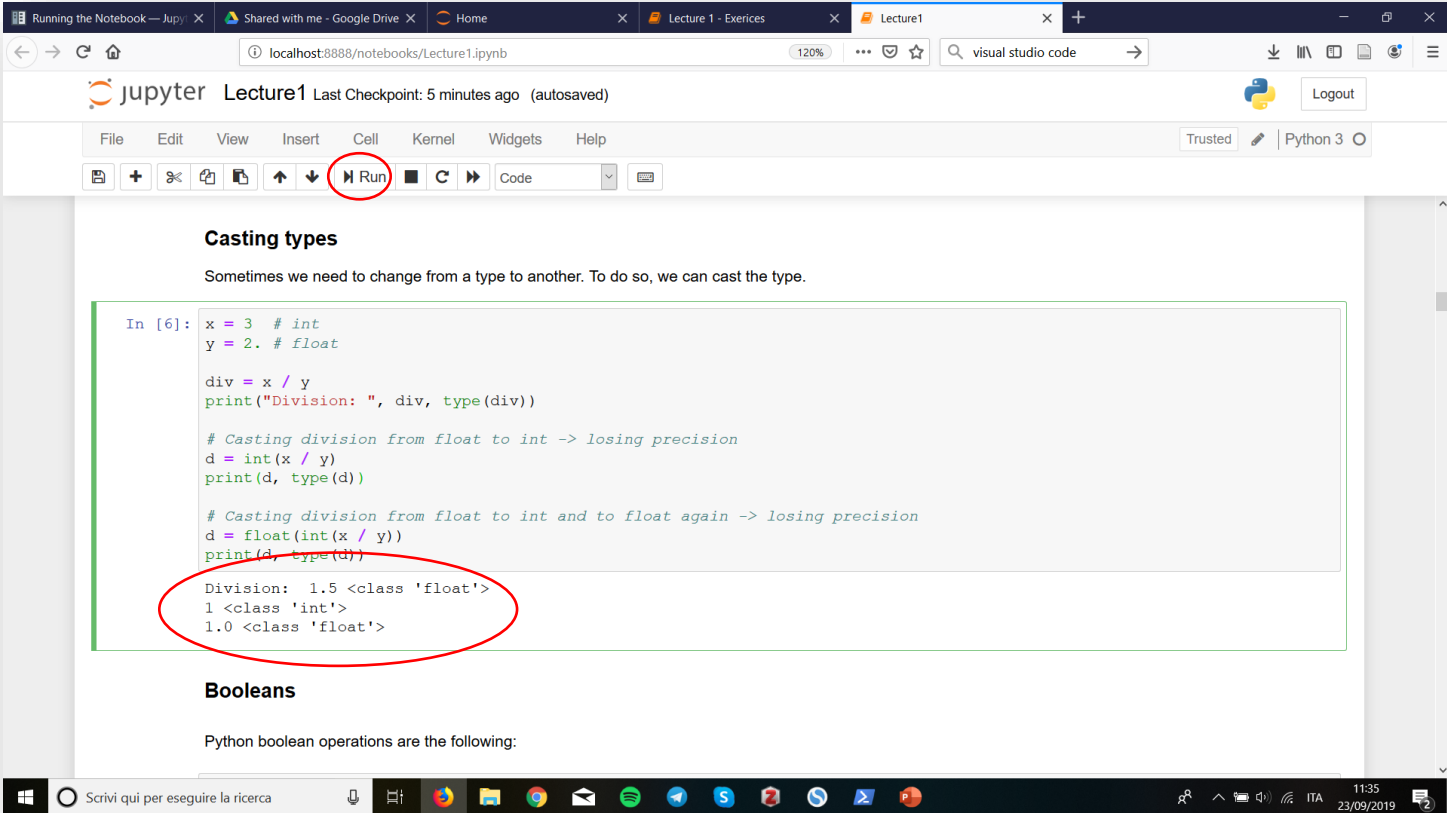
jupyter notebook --ip 127.0.0.1

You should see the notebook open in your browser. If this is not the case, just point your browser to the URL printed on the terminal (default: **http://localhost:8888**)



Notebook dashboard. Navigate to your notebook (.ipynb file) and open it

Jupyter Notebook: An overview



The screenshot shows a Jupyter Notebook interface in a web browser. The browser tabs include 'Running the Notebook - Jupyter', 'Shared with me - Google Drive', 'Home', 'Lecture 1 - Exercises', and 'Lecture1'. The address bar shows 'localhost:8888/notebooks/Lecture1.ipynb'. The Jupyter interface has a menu bar with 'File', 'Edit', 'View', 'Insert', 'Cell', 'Kernel', 'Widgets', and 'Help'. Below the menu bar is a toolbar with icons for file operations, a 'Run' button (circled in red), and a 'Code' dropdown. The notebook content is titled 'Lecture1' and shows the last checkpoint was 5 minutes ago (autosaved). The code cell contains the following Python code:

```
In [6]: x = 3 # int
        y = 2. # float

        div = x / y
        print("Division: ", div, type(div))

        # Casting division from float to int -> losing precision
        d = int(x / y)
        print(d, type(d))

        # Casting division from float to int and to float again -> losing precision
        d = float(int(x / y))
        print(d, type(d))
```

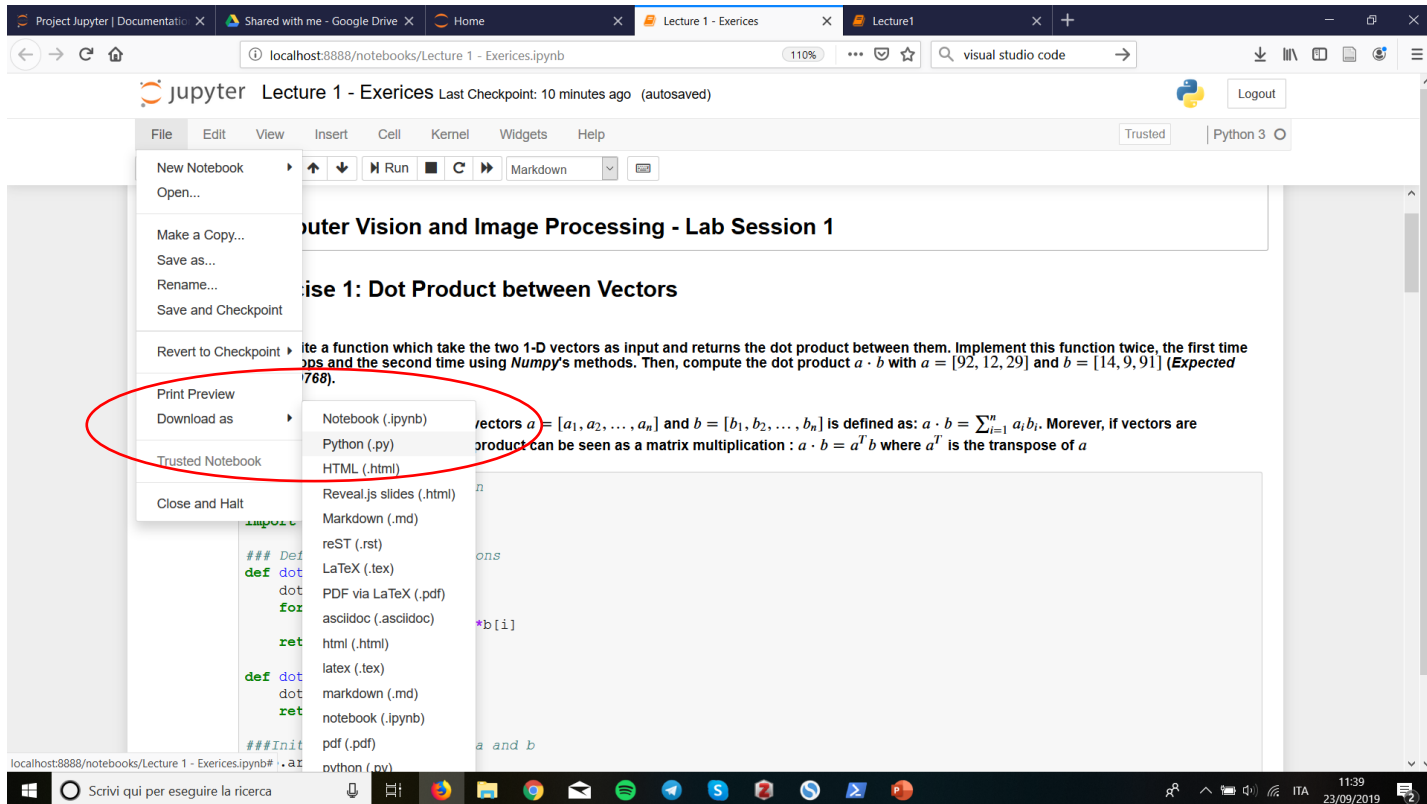
The output of the code is:

```
Division: 1.5 <class 'float'>
1 <class 'int'>
1.0 <class 'float'>
```

The output is circled in red. Below the code cell, the notebook shows the title 'Booleans' and the text 'Python boolean operations are the following:'.

Run single code instruction and see the result interactively!

Export python .py from notebook file



You can download all the code cells of a notebook as a single **.py file**. After that, you can run it as a standard Python script.

Working from home: IDE and terminal



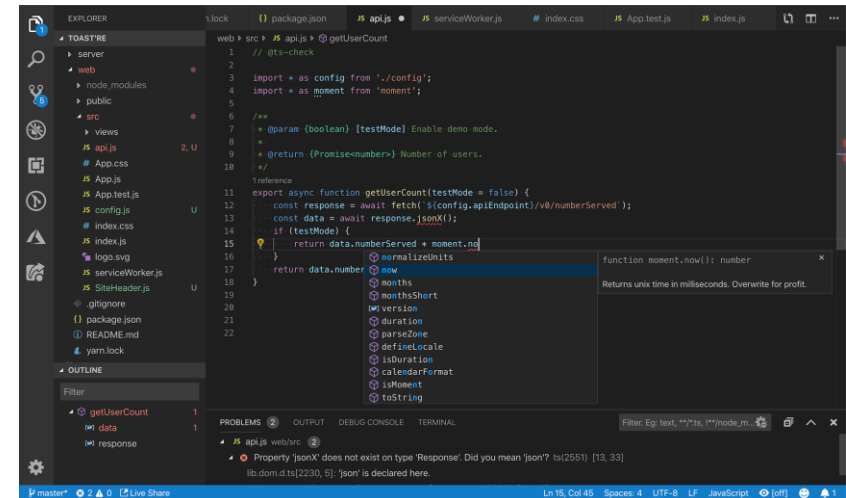
When you work with python you typically do not program directly on Jupyter Notebook but it is common to use a Source Code Editor such as

Visual Studio Code:

<https://code.visualstudio.com/>

or **Pycharm:**

<https://www.jetbrains.com/pycharm/>



Visual Studio Code

When you finish writing your script, navigate in your terminal to your script folder and run:

python my_script.py

References

- Python3 documentation:

<https://docs.python.org/3/c-api/index.html>

- Jupyter documentation:

<https://jupyter.readthedocs.io/en/latest/>

- Numpy documentation:

<https://docs.scipy.org/doc/numpy/reference/index.html>

- Matplotlib documentation:

<https://matplotlib.org/3.1.1/api/index.html>

- OpenCV documentation:

https://docs.opencv.org/trunk/d6/d00/tutorial_py_root.html