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Tools for Python developers

- Upon now, you used either python through terminal or some cloud service like Python anywhere (https://www.pythonanywhere.com/try-ipython/), or the respective jupyter notebooks for this class on Binder (https://mybinder.org/v2/gh/StephanRhode/py-algorithms-4-automotive-engineering/master).
- This chapter introduces an integrated development environment (Pycharm) and local interactive notebooks (Jupyter).

Pycharm

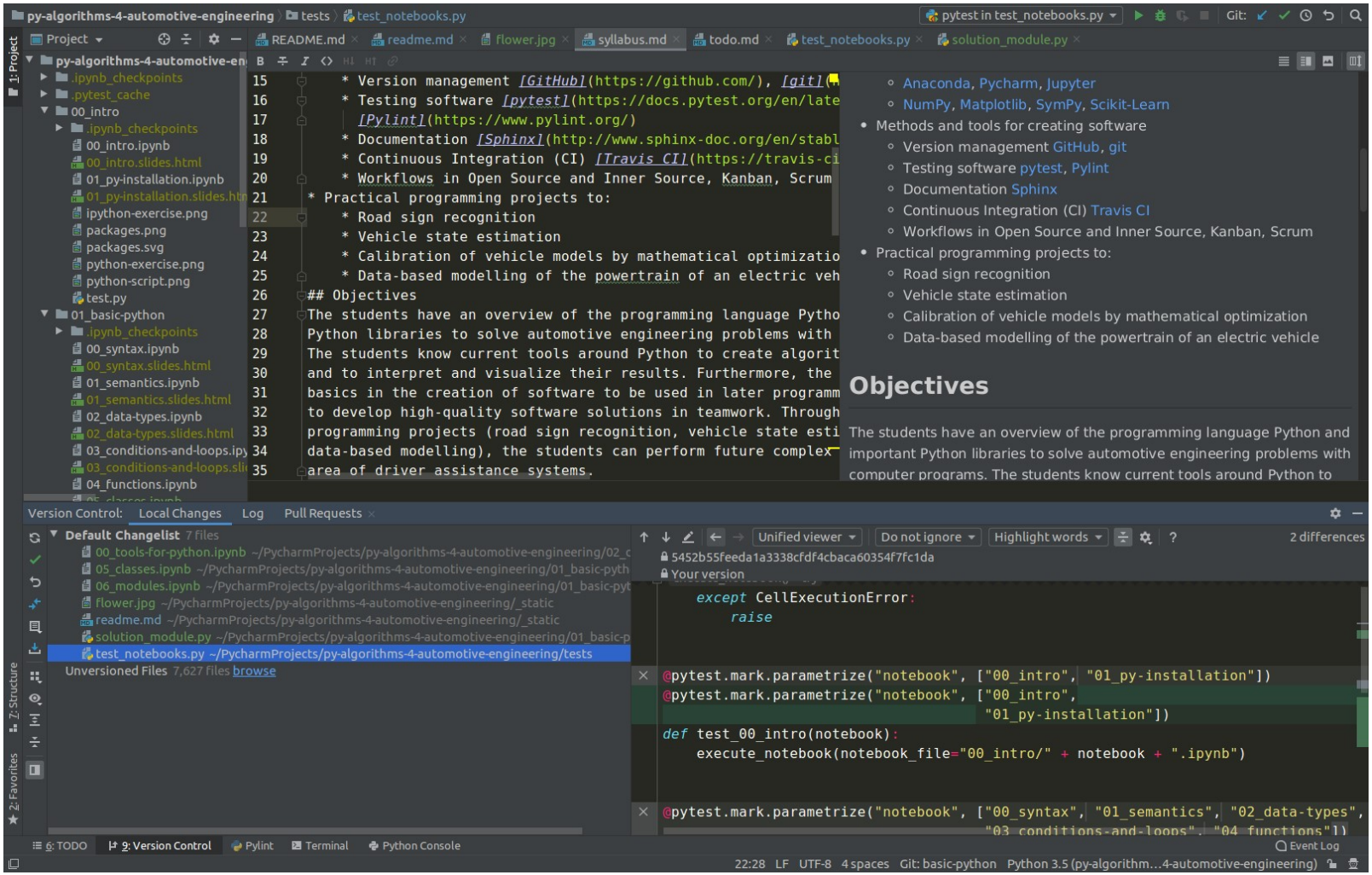
- Pycharm is one possible integrated development environment (IDE) for Python.
- An IDE is basically a program which supports all steps of software development like
    - Coding with code completion, static code analyses, templates,...
    - Testing
    - Debugging
    - Version control
    - Environment and package management
    - Code refactoring
    - Build chains,...
    - Please find here all features (https://www.jetbrains.com/pycharm/features/)

- Other popular choices next to Pycharm are Visual Studio Code (https://code.visualstudio.com/), and Spyder (https://www.spyder-ide.org/). Just try which one is best for you.
- There is a free community edition of Pycharm link to installer (https://www.jetbrains.com/pycharm/download).
- And as Pycharm is a professional software, there is much video recorded training material (https://www.jetbrains.com/pycharm/learning-center/).

Pycharm introduction video

Please find here a video which presents Pycharm features (https://www.youtube.com/watch?v=BPC-bGdBSM8).

A small Pycharm live demo



Exercise: First steps in Pycharm (15 minutes)

Please complete the following tasks:

- Install Pycharm from https://www.jetbrains.com/pycharm/download (https://www.jetbrains.com/pycharm/download)
- Create a new project
- Create an environment (pip, conda)
- Add this Python code as file

```
def my_hello():
    print("Hello world")
```

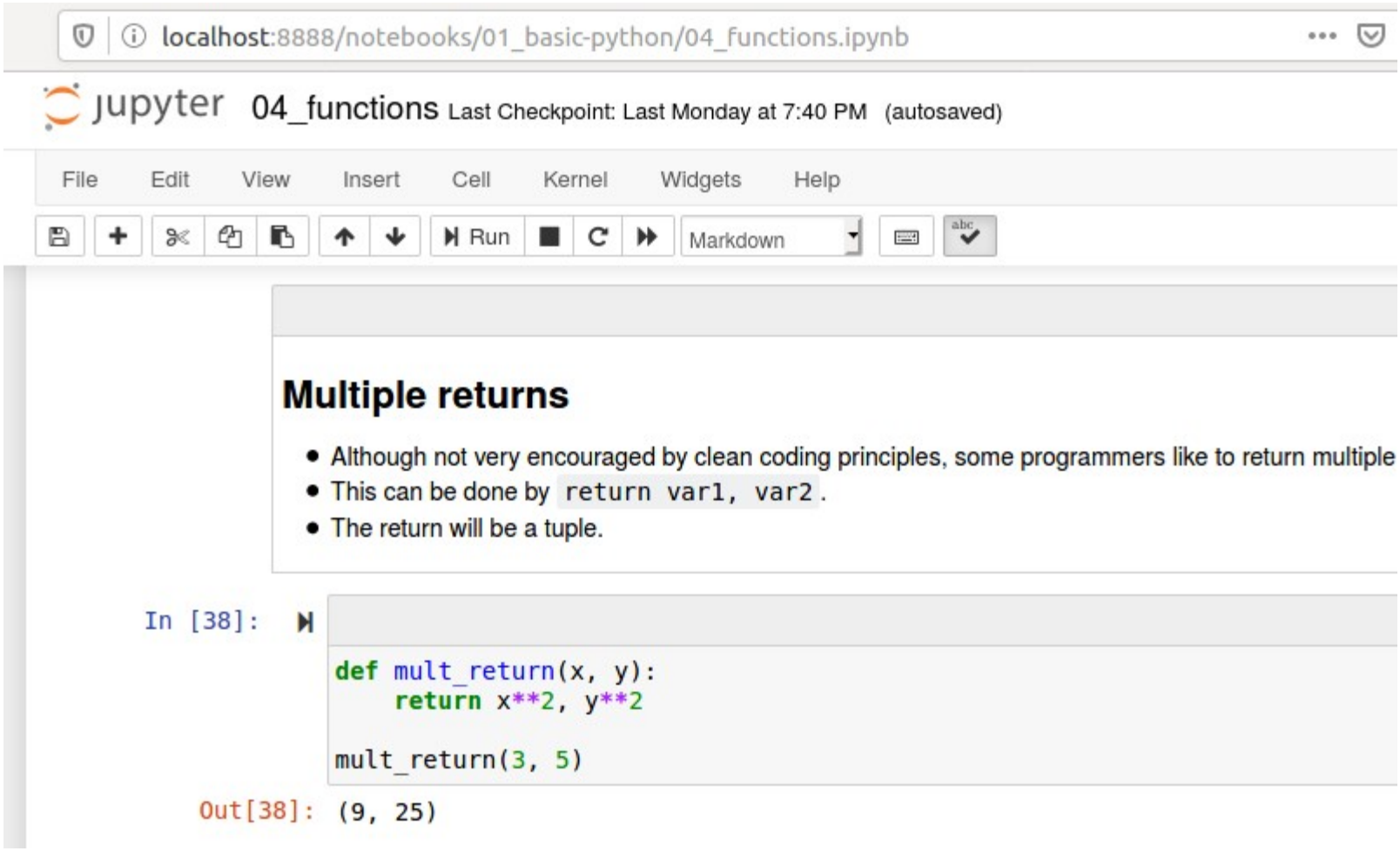
- Execute this file in Pycharm

Jupyter

- Jupyter is an interactive programming environment, where you can combine programming, presentation of results, and explanation with text and equations in one web page.
- Hence Jupyter is a way to communicate scientific computing like it is done since ages. Leonardo da Vinci used Notebooks as well!
- Jupyter works with Python kernel, as well as with Julia, R, Rubi, Matlab.
- Relatively recent, [Jupyter Lab (https://jupyterlab.readthedocs.io/en/stable/)](https://jupyterlab.readthedocs.io/en/stable/) was released, which is the successor of Jupyter.
- Note the entire course material is written in Jupyter. It is very convenient :)

Jupyter installation

- Jupyter is a package. Hence, just type `conda install jupyter` to extend your environment.
- You can also try Jupyter in the cloud here [https://jupyter.org/try (https://jupyter.org/try)](https://jupyter.org/try).
- The command to start the Jupyter notebook server is `jupyter notebook`.



Some Jupyter commands

- There is edit mode and navigation mode. You can switch between them with `enter` and `esc`.
- `shift + enter` runs a cell and selects the next cell below.
- If you use functions, you can use auto completion with `tab` or read the doc string with `shift + tab`.
- Many more keyboard shortcuts are on top of Jupyter panel in the keyboard icon.
- Add to this, there are some so called magic commands, which start with `%`. Quite common is for instance `%matplotlib notebook`, which embeds plots.

Jupyter tutorial

- There are tons of Jupyter tutorials in the web. Just google for it and try some. One compact and precise tutorial is on tutorialspoint for instance.
- https://www.tutorialspoint.com/jupyter/index.htm (https://www.tutorialspoint.com/jupyter/index.htm)

Exercise: Jupyter (10 minutes)

Here the task:

- Activate your local Python environment and install jupyter with `conda install jupyter`.
- Open the notebook server with `jupyter notebook` command.
- Create a new notebook and try some Python code there.
- Add text in markdown cells.

Jupyter extensions

There are many extensions for Jupyter notebooks like

- table of contents bar,
- variable inspector,
- spell checkers,
- auto code style checks,... available in [jupyter-contrib-nbextensions (https://jupyter-contrib-nbextensions.readthedocs.io/en/latest/index.html)](https://jupyter-contrib-nbextensions.readthedocs.io/en/latest/index.html).

With these extensions, Jupyter becomes a very powerful interactive development environment.

Please find here a screen shot of Jupyter with table of contents and variable inspector extension.

jupyter 02_data-types Last Checkpoint: a minute ago (unsaved changes)

File Edit View Insert Cell Kernel Navigate Widgets Help

Run Code

Contents

Variable Inspector ↻[-][x]

X	Name	Type	Size	Value
x	a	float	24	0.1
x	b	float	24	0.2
x	my_string	str	63	Say some

1.2.3 Fixed precision of floating point numbers

- Remember that numbers are actually stored in binary form in computers.
- The precision of floating point numbers is always limited, due to fixed number
- This drawback of floating point numbers is not Python specific, it will also occ

In [5]:

```
# let's look a bit deeper in floats
a = 0.1
b = 0.2
# print a with 21 digits
print("{0:.21f}".format(a))
print("{0:.21f}".format(b))
```

```
0.100000000000000005551
0.200000000000000011102
```

In [6]:

```
# Hence, tests like this will fail
0.1 + 0.2 == 0.3
```

Out[6]: False