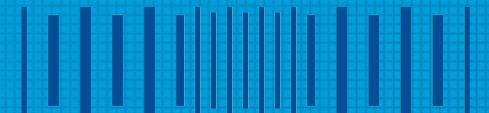


bit.ly/pystarters

**SWC PyStarters - Introduction to
scientific programming in Python.**

May 6th & 13th, 10am-4pm



Sainsbury Wellcome Centre

Schedule

- May 6th AM – Installing Python (Adam)
- May 6th PM – Introduction to Python (Steve)
- May 13th AM & PM– Advanced Python (Joaquin)
- May 13th PM– Wrap up & questions (Adam & Steve)

Structure

- Main zoom room for tutorial
- SWC slack (#pystarters) for questions
 - Zoom chat if you haven't got access yet
- TA will answer your question, or move to breakout room.

TAs:

- Steve, Joaquin & me (when not teaching)
- Federico Claudi, Spencer Wilson, & Lars Rollik

(For admin/zoom, otherwise non-programming questions, ask me)

Why learn Python?

Popularity

- Most popular language for data science ^a
- Fastest-growing major language ^a

Why learn Python?

Free and open source

- Unlike MATLAB, IGOR etc
- Saves your lab money
- More importantly, anyone can use your code (4.3M² open Python repositories on GitHub)

Why learn Python?

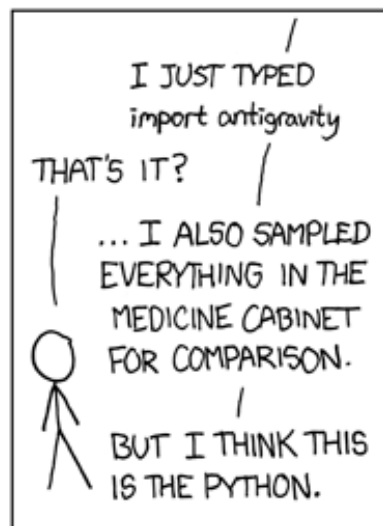
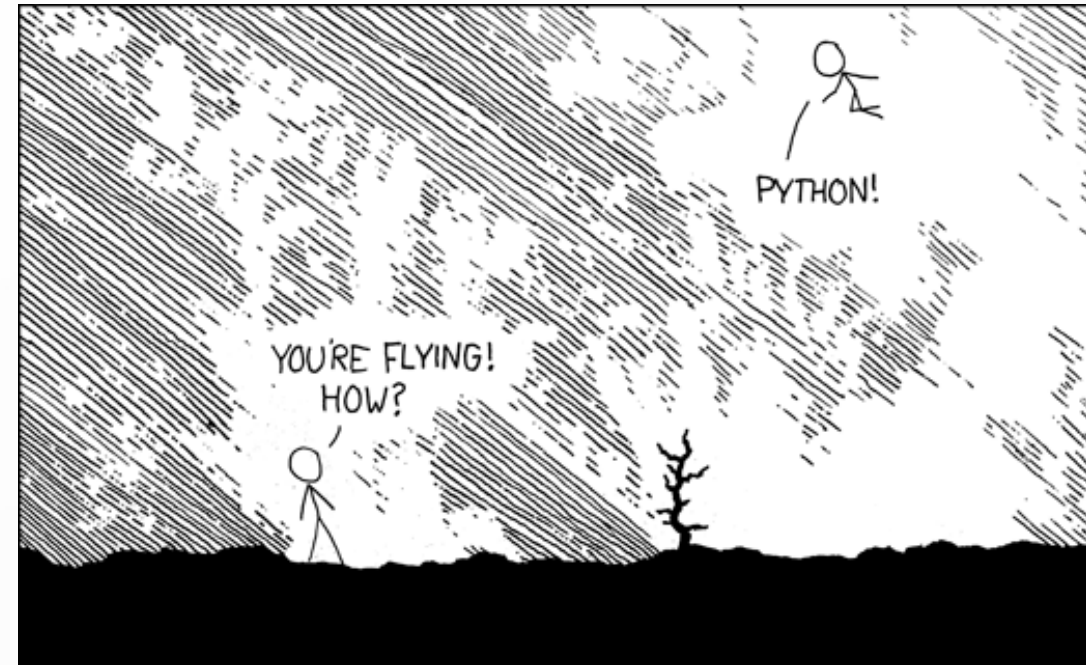
Versatility

- Not just data analysis / machine learning
 - Visualisation
 - Data acquisition
 - Web development
 - Etc etc ...

Why learn Python?

Packages for everything

- Numpy – numerical computing
- Scipy – scientific computing
- Scikit-image – image analysis
- TensorFlow – deep learning
- Matplotlib – plotting
- Etc etc ...



Downsides

Installation

- Not a single program to download
- Potentially complicated ecosystem (if used to e.g. MATLAB)
 - Python versions
 - Installing packages
 - Virtual environments

Installing Python

- Download miniconda installer (link on website)
- Install miniconda (varies with OS)

Windows

- Double click on installer
- Accept all defaults, BUT
- Check “**Add Anaconda to my PATH environment variable.**”

MacOS

- Double click on installer
- Accept all default options

Linux

- cd Downloads
- bash Miniconda3-latest-Linux-x86_64.sh
- Accept defaults
- Press enter to prepend miniconda to PATH (will be your default Python)

Conda environments

- Separate from each other (and system python)
- Allow for incompatible dependencies
- Reproducible workflows, share with:
 - Collaborators
 - Readers of your paper
 - Yourself (HPC etc.)

Creating an environment

- Open a terminal (anaconda prompt on Windows)
- `conda create -name pystarters python=3.9`
- Accept “y” for yes
- `conda activate pystarters`

You can make as many different environments as you like, but remember to “activate”

Installing packages

`pip install numpy`

Arrays & maths etc

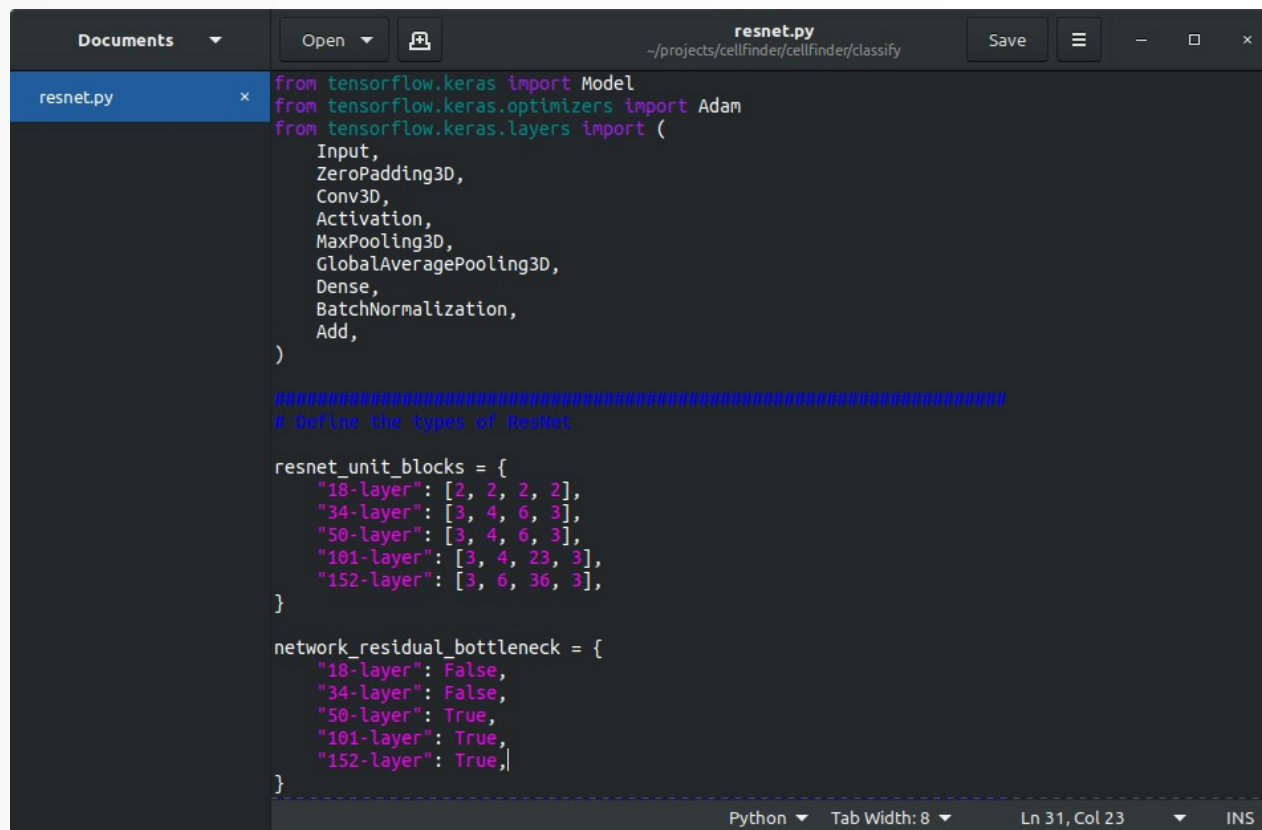


`pip install matplotlib`

Plotting



Editing files



```
Documents ▾ Open ▾ resnet.py Save
~/projects/cellfinder/cellfinder/classify

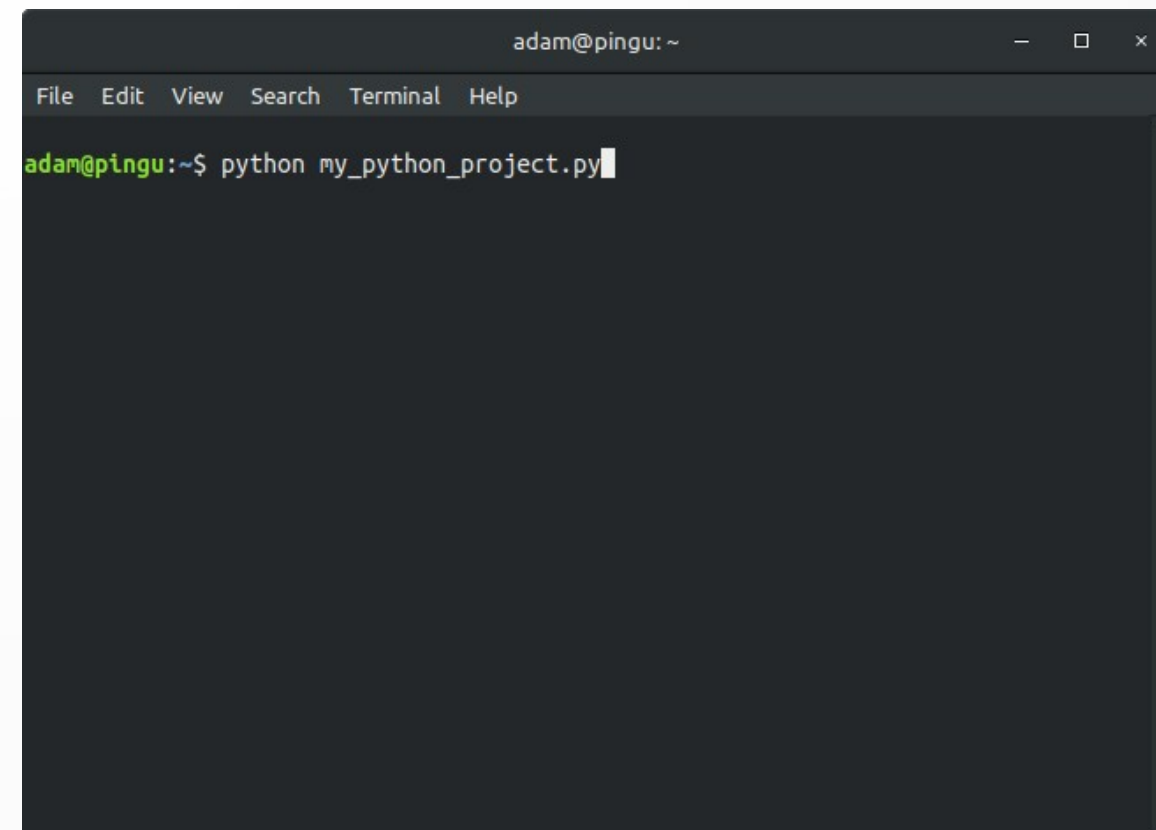
resnet.py ×
from tensorflow.keras import Model
from tensorflow.keras.optimizers import Adam
from tensorflow.keras.layers import (
    Input,
    ZeroPadding3D,
    Conv3D,
    Activation,
    MaxPooling3D,
    GlobalAveragePooling3D,
    Dense,
    BatchNormalization,
    Add,
)

#####
# Define the types of ResNet

resnet_unit_blocks = {
    "18-layer": [2, 2, 2, 2],
    "34-layer": [3, 4, 6, 3],
    "50-layer": [3, 4, 6, 3],
    "101-layer": [3, 4, 23, 3],
    "152-layer": [3, 6, 36, 3],
}

network_residual_bottleneck = {
    "18-layer": False,
    "34-layer": False,
    "50-layer": True,
    "101-layer": True,
    "152-layer": True,
}

Python ▾ Tab Width: 8 ▾ Ln 31, Col 23 ▾ INS
```



```
adam@pingu: ~
File Edit View Search Terminal Help

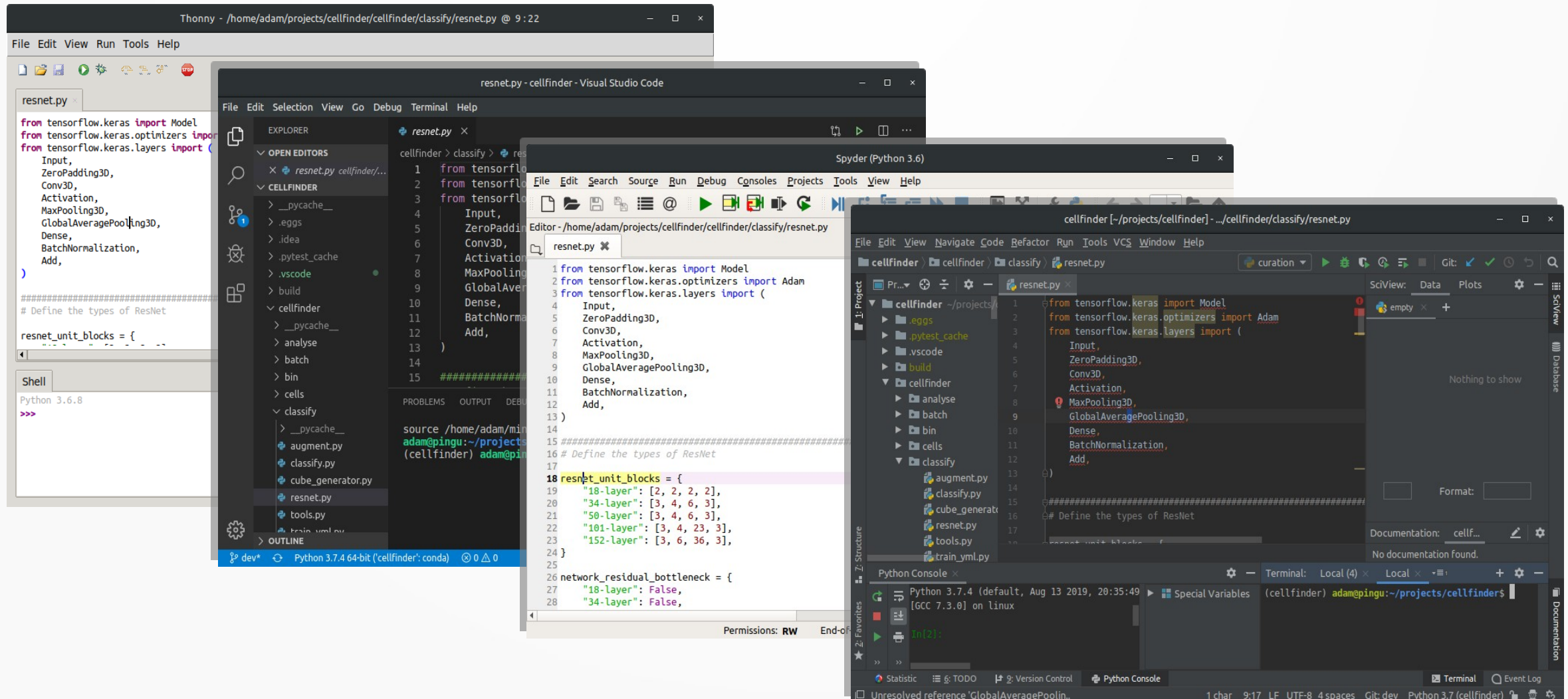
adam@pingu:~$ python my_python_project.py
```

IDEs (Integrated Development Environments)

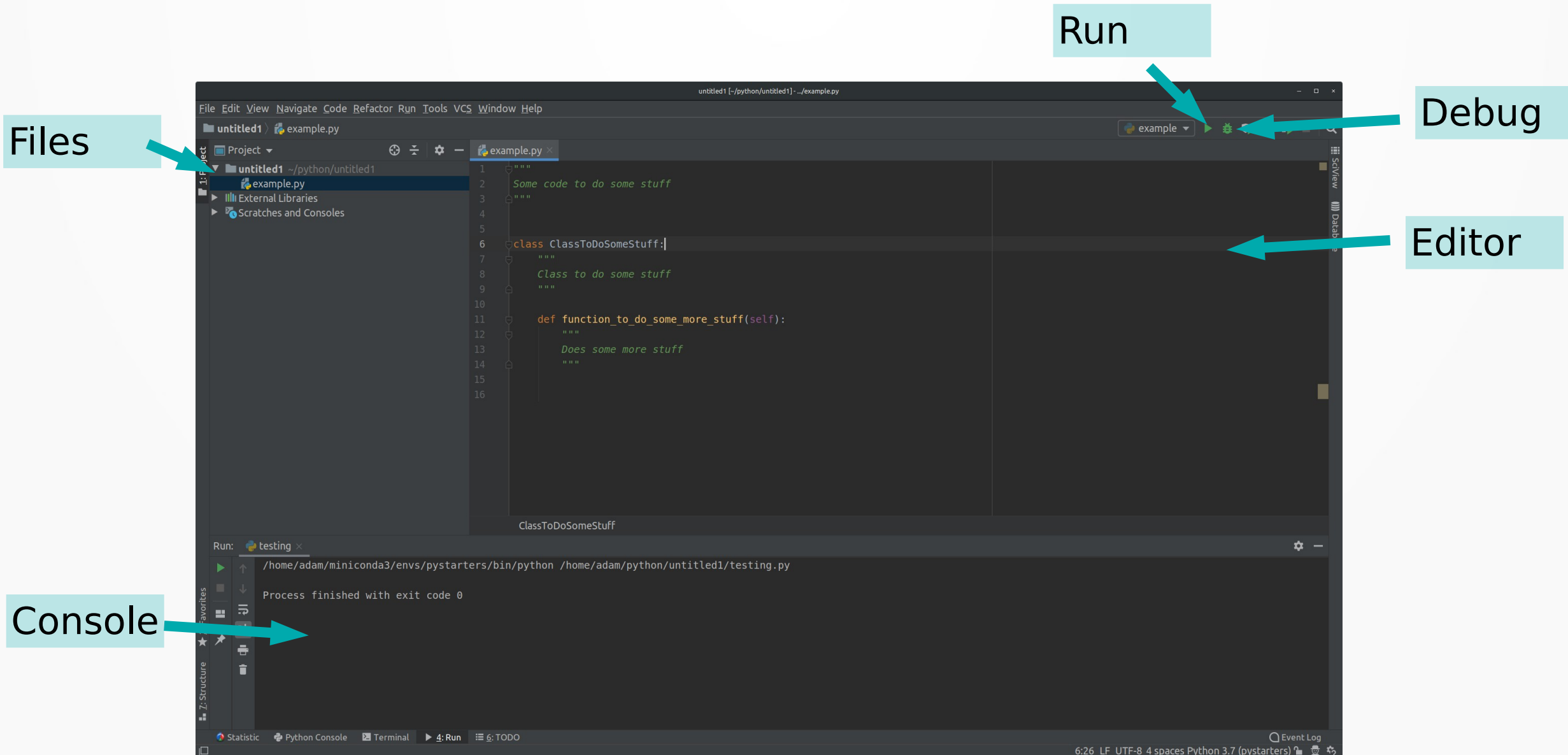
- Friendly to beginners, and used by most developers ^a
- Edit, organise and run your code in one program
- Configure once for each project.
- But ... can be unnecessarily complicated

IDEs

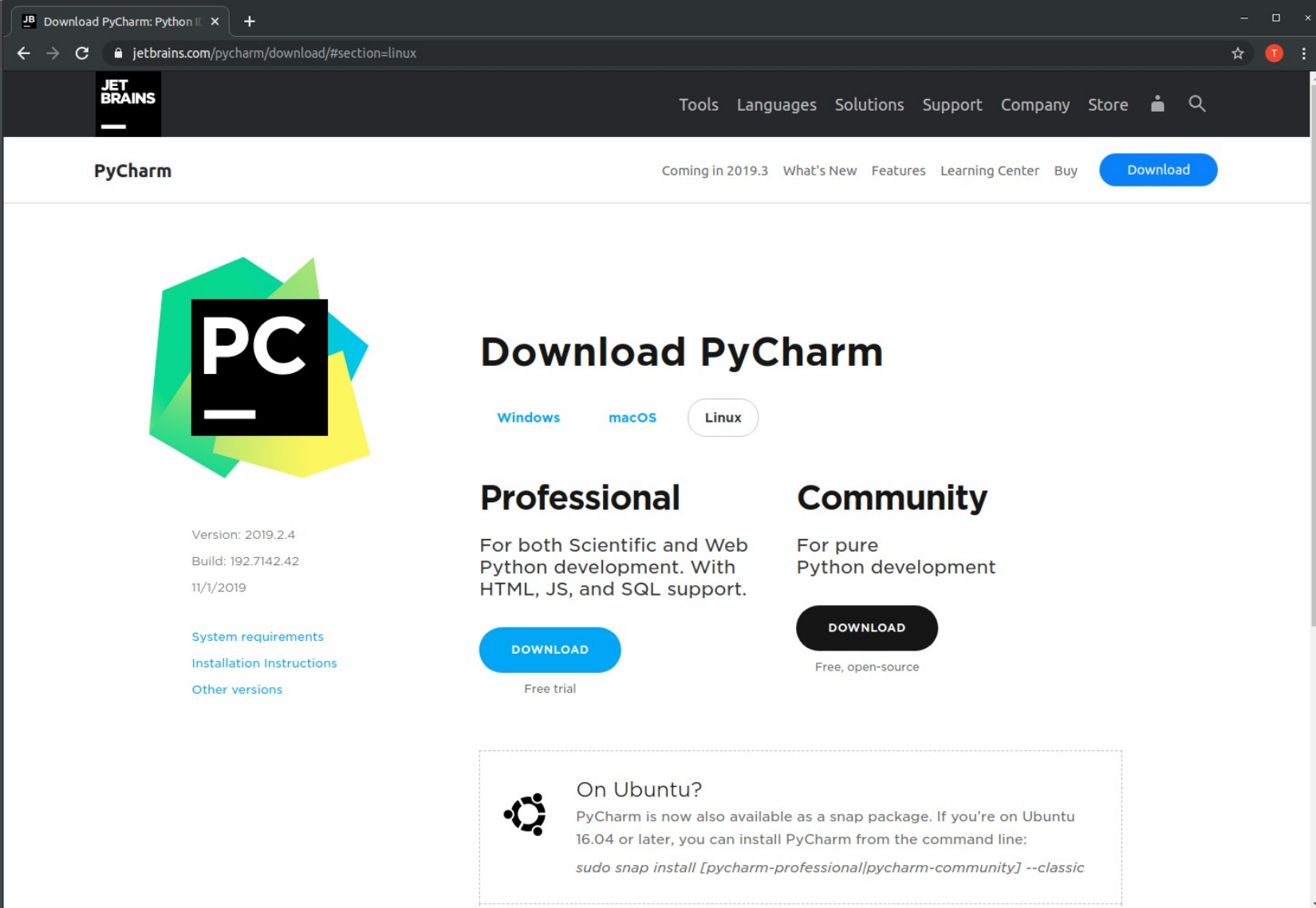
Everyone has a preference (but essentially all the same).



PyCharm



Download



The screenshot shows the JetBrains PyCharm download page in a web browser. The browser's address bar shows the URL `jetbrains.com/pycharm/download/#section=linux`. The page features the JetBrains logo and a navigation menu with links to Tools, Languages, Solutions, Support, Company, and Store. The main heading is "PyCharm", followed by a "Download" button. Below this, the PyCharm logo is displayed, along with version information: "Version: 2019.2.4", "Build: 192.7142.42", and "11/1/2019". Links for "System requirements", "Installation Instructions", and "Other versions" are provided. The page is divided into two columns for "Professional" and "Community" editions. The "Professional" column includes a "DOWNLOAD" button and a "Free trial" link. The "Community" column includes a "DOWNLOAD" button and a "Free, open-source" link. At the bottom, a section titled "On Ubuntu?" provides instructions for installing PyCharm as a snap package on Ubuntu 16.04 or later, including the command `sudo snap install [pycharm-professional|pycharm-community] --classic`.

Download PyCharm: Python II x


jetbrains.com/pycharm/download/#section=linux

JETBRAINS

Tools Languages Solutions Support Company Store

PyCharm

Coming in 2019.3 What's New Features Learning Center Buy [Download](#)



Version: 2019.2.4
Build: 192.7142.42
11/1/2019

[System requirements](#)
[Installation Instructions](#)
[Other versions](#)

Download PyCharm

[Windows](#) [macOS](#) [Linux](#)

Professional

For both Scientific and Web Python development. With HTML, JS, and SQL support.

[DOWNLOAD](#)

Free trial

Community

For pure Python development

[DOWNLOAD](#)

Free, open-source

On Ubuntu?

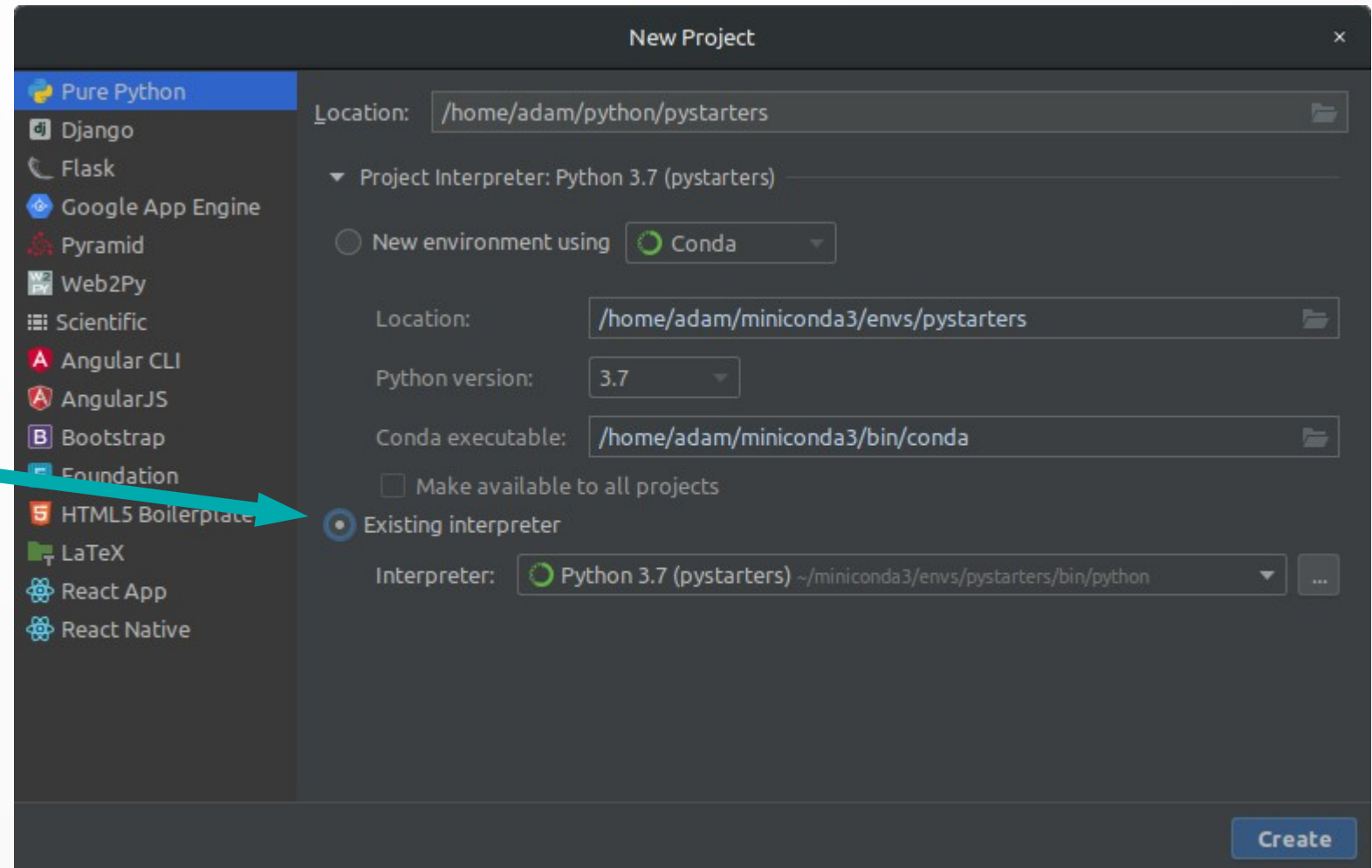
PyCharm is now also available as a snap package. If you're on Ubuntu 16.04 or later, you can install PyCharm from the command line:

```
sudo snap install [pycharm-professional|pycharm-community] --classic
```


New project

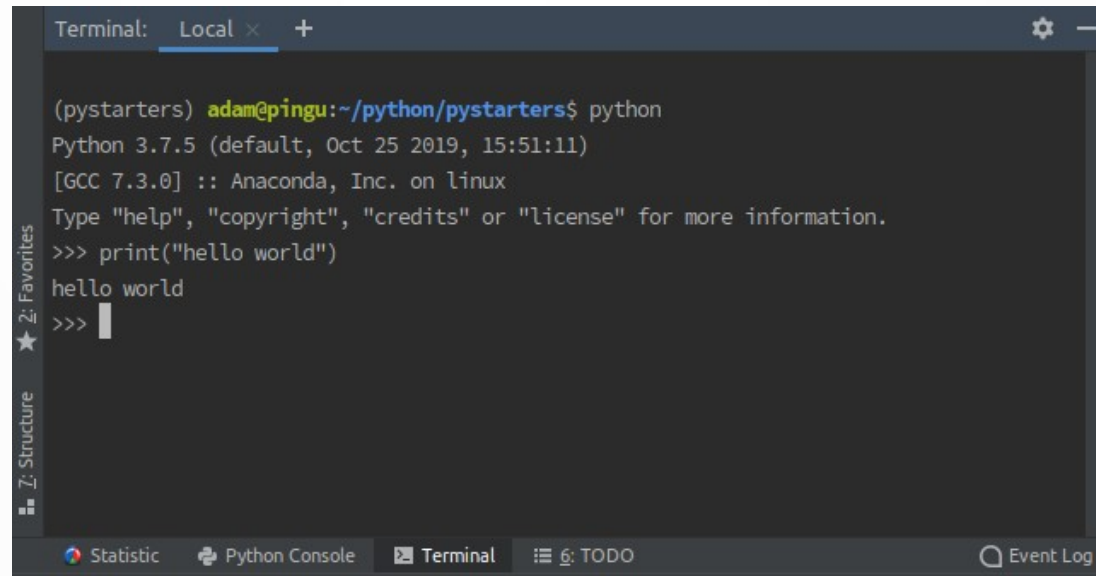
File → New Project

Important to set
interpreter



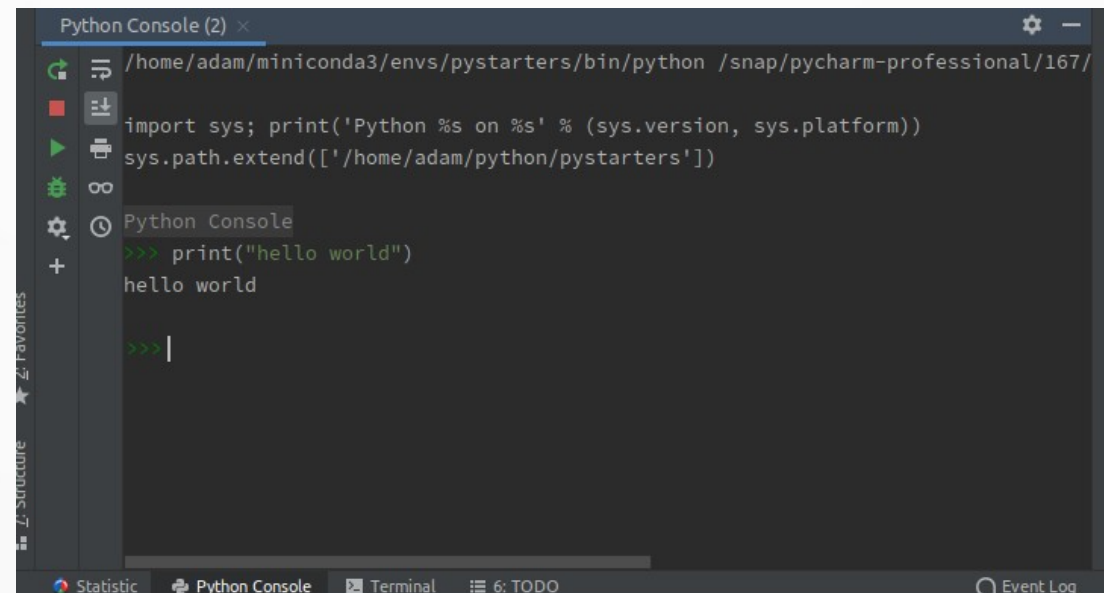
Hello world

Terminal



```
Terminal: Local x +
(pystarters) adam@pingu:~/python/pystarters$ python
Python 3.7.5 (default, Oct 25 2019, 15:51:11)
[GCC 7.3.0] :: Anaconda, Inc. on linux
Type "help", "copyright", "credits" or "license" for more information.
>>> print("hello world")
hello world
>>> 
```

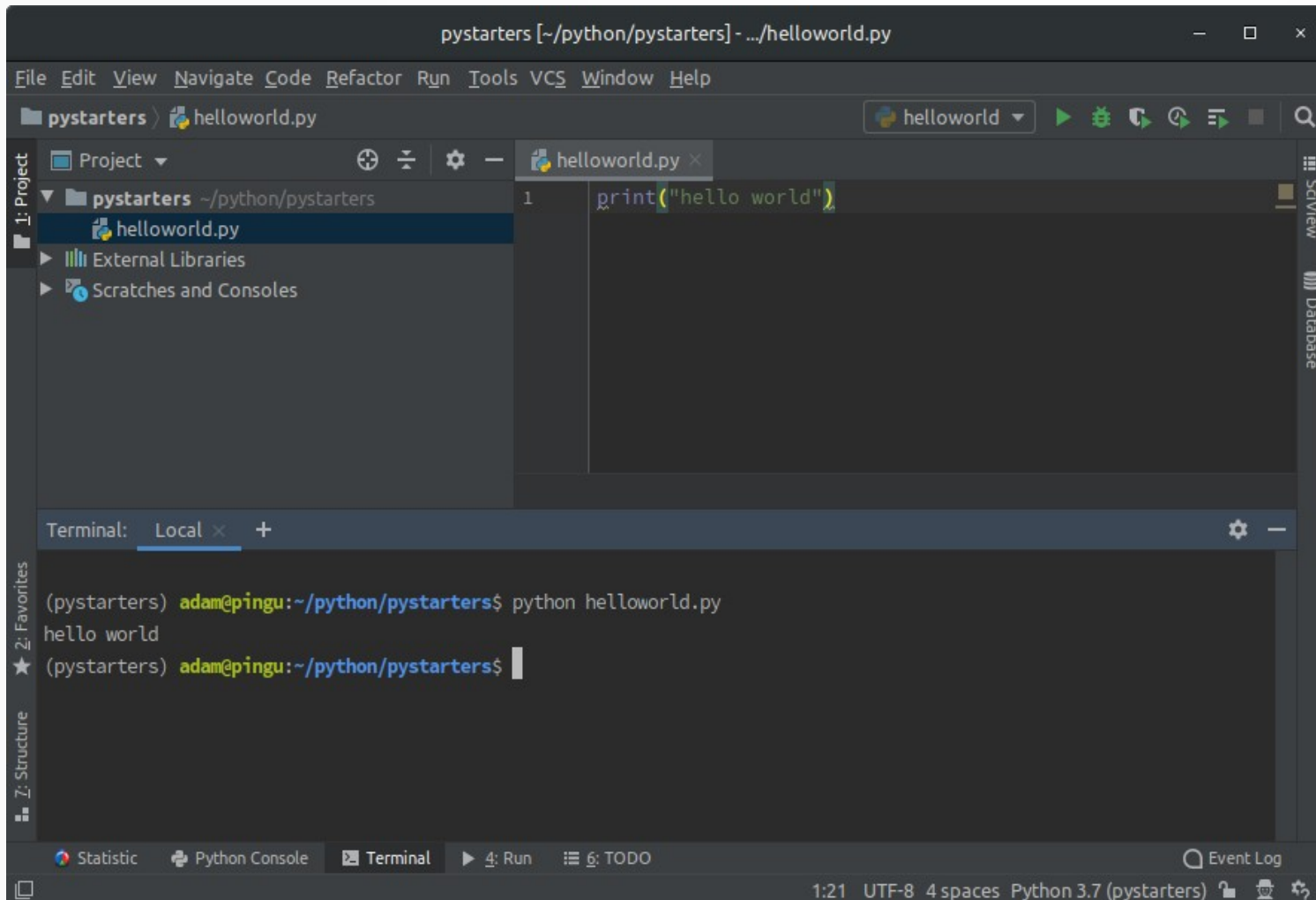
Python console



```
Python Console (2) x
/home/adam/miniconda3/envs/pystarters/bin/python /snap/pycharm-professional/167/
import sys; print('Python %s on %s' % (sys.version, sys.platform))
sys.path.extend(['/home/adam/python/pystarters'])
Python Console
>>> print("hello world")
hello world
>>> 
```

Hello world

File → New file → “helloworld.py”



Terminal:
`python helloworld.py`

Or:
Right click →
Run 'helloworld'