Getting Started with Python

A beginner course to Python

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Links

Tutorial Material on GitHub:

http://goo.gl/grrXQJ

Learning Outcomes

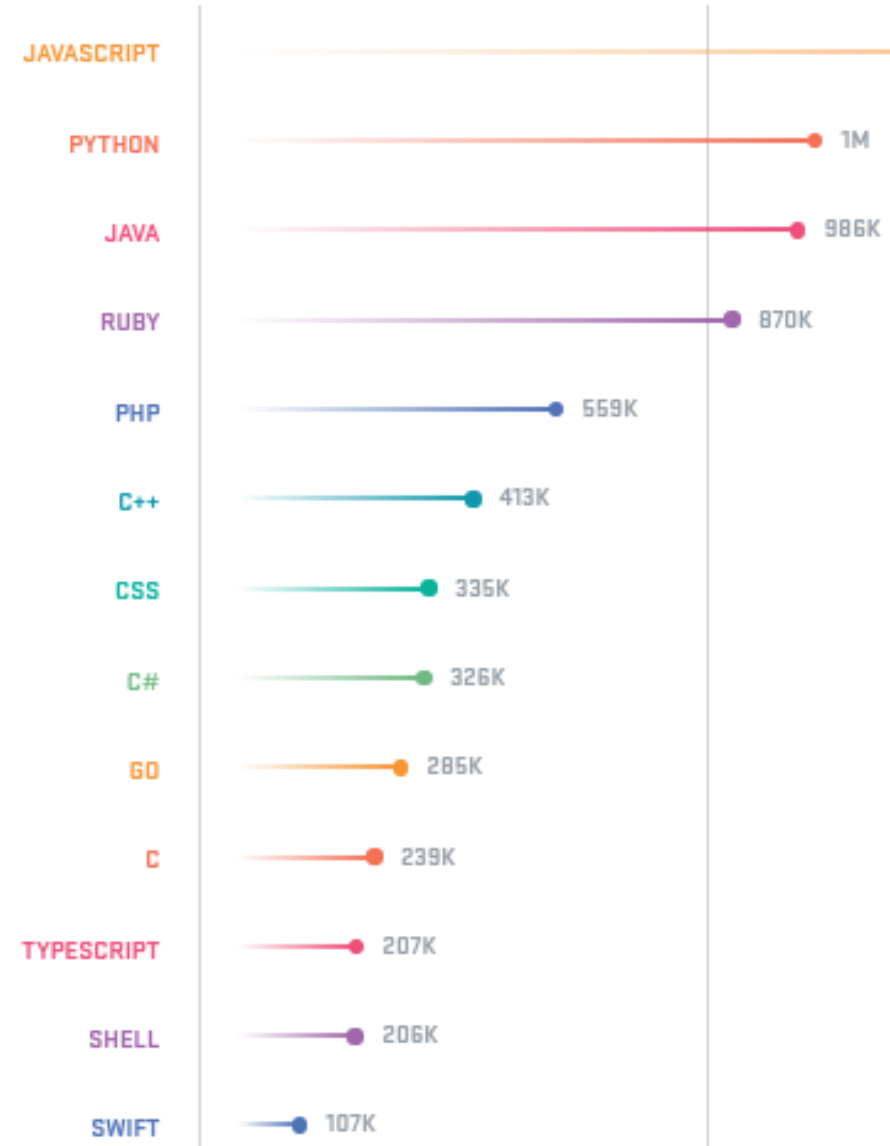
- Python as a programme language
- Python for different OS.
- Use Python in **Jupyter notebook.**
- **Familiar with different data structures.**
- **Make a loop with for and while.**
- **Defining functions.**
- **Reading files and plotting graphs.**
- **Object-oriented and Classes.**
- **Examples.**

What is Python?

Introduction to programming language and python

Why Python?

programming languages—but especially JavaScript.



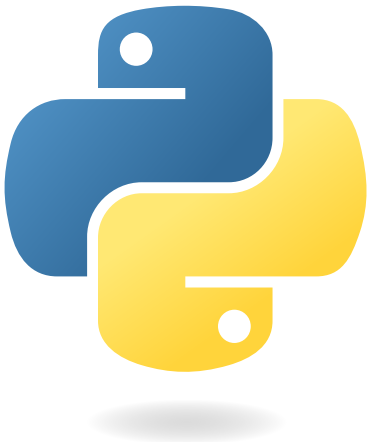
From GitHub statistics,

The fifteen most popular languages on GitHub by opened pull request

(https://octoverse.github.com/)

"Python replaced Java as the second-most popular language on GitHub, with 40 percent more pull requests opened this year than last."

What is Python?



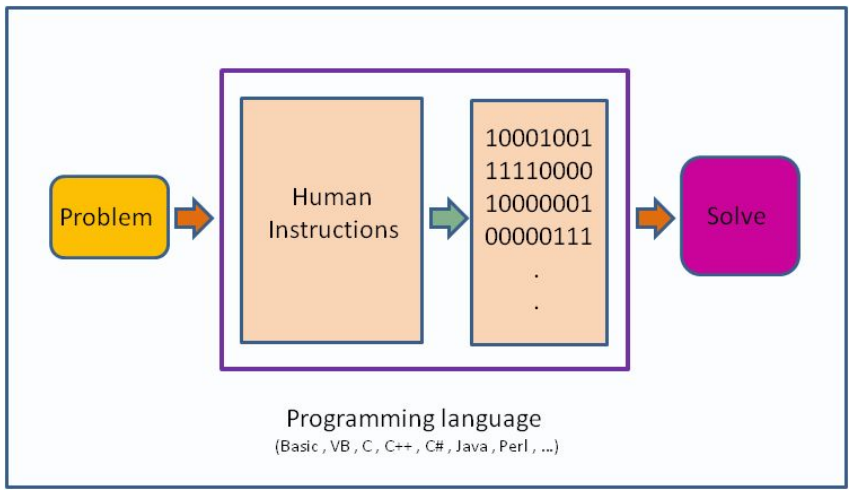
python™

- High-level programming language.
- Object-oriented, interpreted, interactive.
- Easy write, easy read.
- Dynamic variables & memory management.

What does a program do?

Sequences of instructions that tell the computer to solve your problem.

- Like cooking.
- A program is a receipt.
- You prepare raw food, seasoning, etc. (Input)
- If you follow the receipt, you will get a good food (hopefully).



Why Python? Lots of packages!

- Coding and debugging is a tough task.
- Spend less time debugging, Code more!
- Lots of packages written in Python for speed deployment!

How can I get python?

Install python on your system.

Python distributions

- Anaconda (Recommended! For Windows, MacOS and Linux)
  - `https://www.anaconda.com/download/`
- Official Site (Windows, MacOS, Linux)
  - `https://www.python.org/downloads/`

Python version, 2 vs 3

Python 2 vs Python 3:

- Python 2 still has a huge number of users.
- Officially, they suggest people to use python 3
- Python 3 is the future, it reduces nasty way to
- code.
- But there stills a lot of well-written package for
- python 2.
- So, learn both is the best option, you can use any
- of it, but keep it consistent.
- Learn to use `__future__` package in python2.

Installing Python with Anaconda

- Windows
  - http://ryan-leung.github.io/PHYS4650_Python_Tutorial/installing-on-windows.html
- MacOS
  - http://ryan-leung.github.io/PHYS4650_Python_Tutorial/installing-on-macos.html
- Linux:
  - http://ryan-leung.github.io/PHYS4650_Python_Tutorial/installing-on-linux.html

Install Python in Linux (Not from Anaconda)

Linux: Usually pre-installed, or get it from repository:

- Fedora: `sudo dnf install python`
- Ubuntu: `sudo apt-get install python`

MacOS: Usually pre-installed in new version.

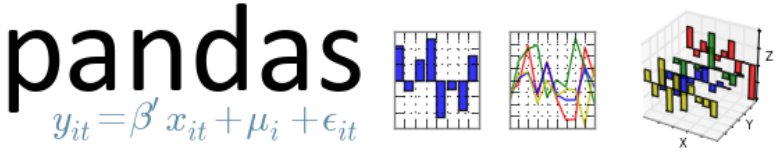
Installing package in Python

How can we install package we need.

What are python packages (or library)

Packages for numerical calculations

1. For symbolic maths
   1.1 sympy
2. For numerical
   2.1 numpy
   2.2 scipy
3. For data science
   3.1 pandas



Packages for data visualing/plotting

matplotlib All-round, major plotting in Python.

aplpy High quality FITS image plotting program.

yt Large data / volumetric data visualising.

bokeh interactive plots in html & javascript.

conda, package management system for Anaconda

- Anaconda distribution have their own package management system.
- To use `conda`, one should have open a proper Anaconda Python setup as the instruction.
- And the `conda` command in terminal is working (any terminal in MacOS/Linux; “Anaconda prompt“ in MS Windows Start menu.)

To search/install packages:

- `conda search xxxxxx`
- `conda install xxxxxx`
- `Other commands:`
- http://conda.pydata.org/docs/_downloads/conda-cheatsheet.pdf

`pip`, a package management system for python

To search/install packages:

- Search package : `pip search xxxxxx`
- Install package : `pip install xxxxxx`
- Upgrade package : `pip install --upgrade xxxxxx`
- Uninstall package : `pip uninstall xxxxxx`
- Install wheel package : `pip install xxxxxx.whl`

Virtual Environment

`virtualenv` is a tool to create isolated Python environments. Simply open your terminal and type:

- `virtualenv ENV`, where `ENV` is a directory to place the new virtual environment.
- To use : `source ENV/bin/activate`
- To end and deactivate the session : `source deactivate`
- Example:
  - `virtualenv ~/newpython/`, which create a "newpython" directory under your home directory.
  - `source ~/newpython/bin/activate`.

Create virtual Python environment in conda

conda has its own version to create a separated Python environment.

- To create : `conda create -n yourenvname python=x.x anaconda`
- Example :
  - `conda create -n py3 python=3.6 anaconda` to create a Python 3 environment even you are using Python 2.
  - `conda create -n py2 python=2.7 anaconda` , vice versa.
- To use : `source activate yourenvname`
- To end and deactivate the session : `source deactivate`

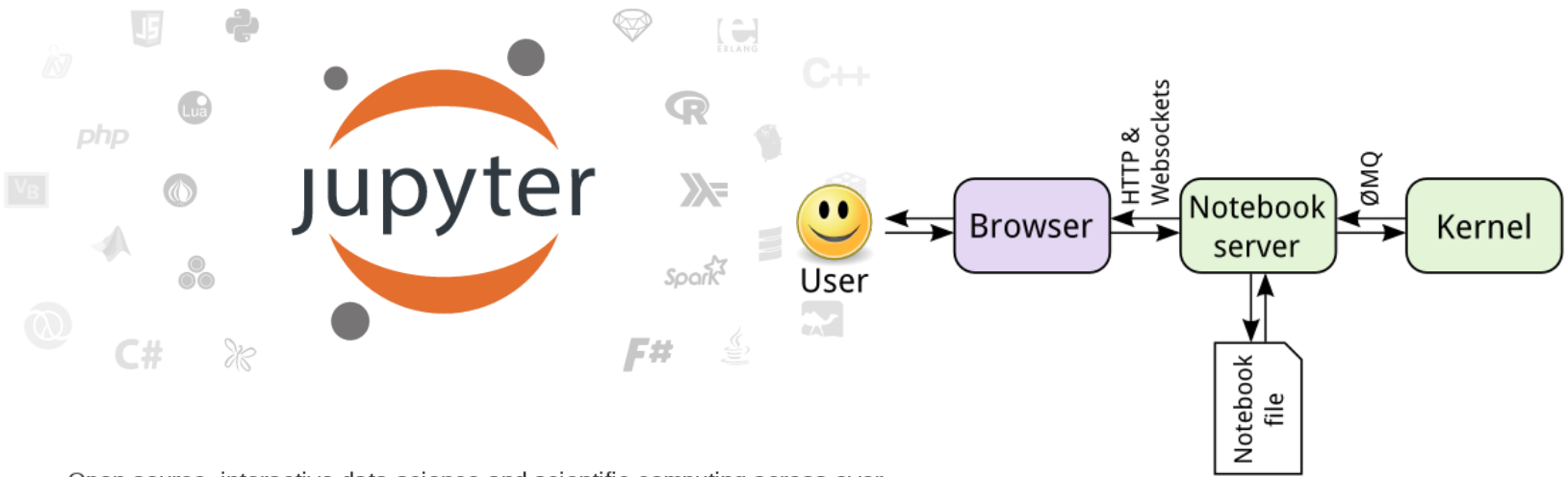
Running Python in computer

How can we launch python.

Jupyter Notebook

You may want to run a Jupyter notebook when:

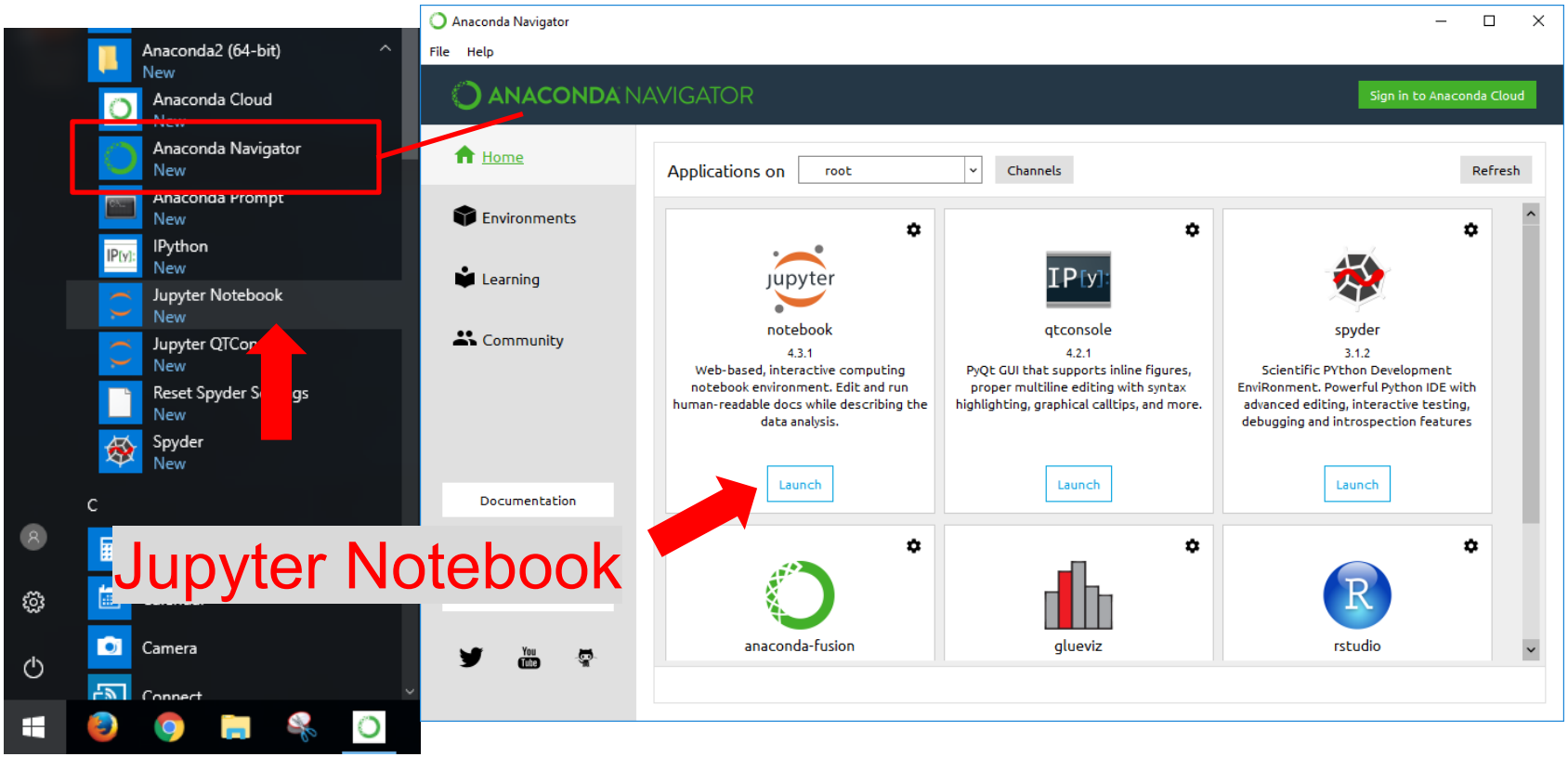
- You want to try out a new experiment or analysis with an existing Jupyter notebook from someone.
- You want to develop an algorithm that run on a large software.
- You have only ten minutes to download a data, plot a graph and send the email to your supervisor in a neat format.



Open source, interactive data science and scientific computing across over

Open Jupyter in Windows

Open your Start menu, goes to Anaconda Folder, Click the Jupyter Notebook shortcut (Recommended). Or start the Anaconda Navigator and Launch



Open Jupyter in Linux/MacOS

Type: `jupyter notebook`

```
# yanyan @ vela in ~/workspace [12:37:07]
$ jupyter notebook
```

jupyter notebook

```
# yanyan @ vela in ~/workspace [12:37:07]
$ jupyter notebook
[I 12:38:14.082 NotebookApp] Serving notebooks from local directory: /home/yanya
n/workspace
[I 12:38:14.082 NotebookApp] 0 active kernels
[I 12:38:14.082 NotebookApp] The Jupyter Notebook is running at: http://localhos
t:8888/?token=40a1e1aa7783bb15e5178ec870a0f8bb07470e94d0a02da0
[I 12:38:14.082 NotebookApp] Use Control-C to stop this server and shut down all
 kernels (twice to skip confirmation).
[C 12:38:14.083 NotebookApp]

    Copy/paste this URL into your browser when you connect for the first time,
    to login with a token:
        http://localhost:8888/?token=40a1e1aa7783bb15e5178ec870a0f8bb07470e94d0a
02da0
Gtk-Message: Failed to load module "pk-gtk-module"
Created new window in existing browser session.
[I 12:38:15.159 NotebookApp] Accepting one-time-token-authenticated connection f
rom ::1
```

Hands-on Session 1

- Python Syntax
- Python Intrinsic Data Type
- Python Data Structures
- Python Conditionals And Loops
- Python Functions And Class

Hands-on Session 2

- Python plotting with `matplotlib`
- Python plotting with `Astropy`
- Python data analysis with `Pandas`
- Problem solving

Running Python without Jupyter

For large softare, a python script is much better.

Python interpreter

For Linux / OSX, type `python` in terminal. For windows, open `Anaconda` folder in Start menu.

Running a python script (In Linux and Mac)

Simply type `python xxxx.py` in the terminal.

You can also type `PATH_TO_SCRIPT.py` if you get the following done:

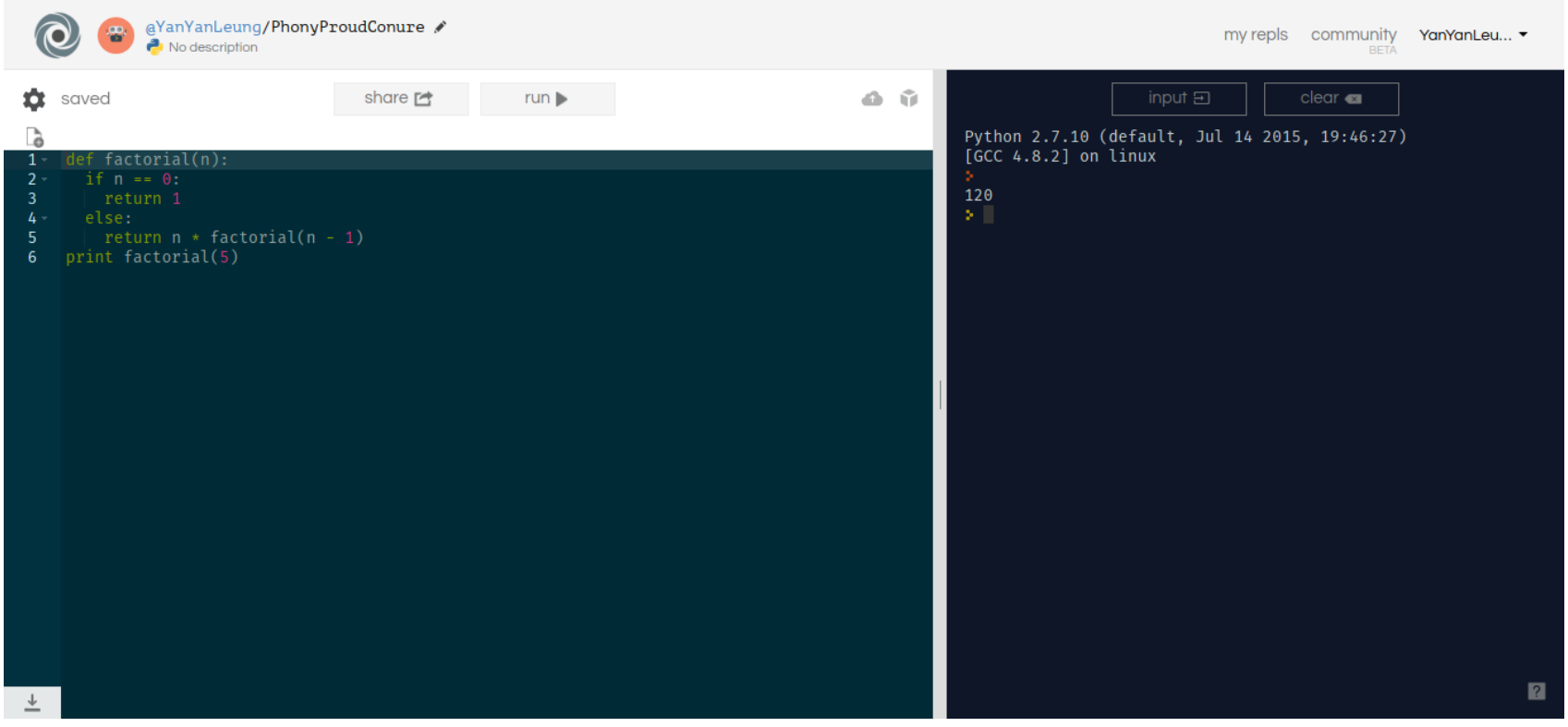
- Add it to the first line of your script:
- `#!/usr/bin/env python` (MacOS might be different)
- You must then make the script executable, using the following command:
- `chmod +x YOUR_SCRIPT.py`

Tools for learning Python

How to strengthen your Python programming skills.

Online Platforms

Here are some online Python platform that are quite good indeed.



repl.it (https://repl.it/)

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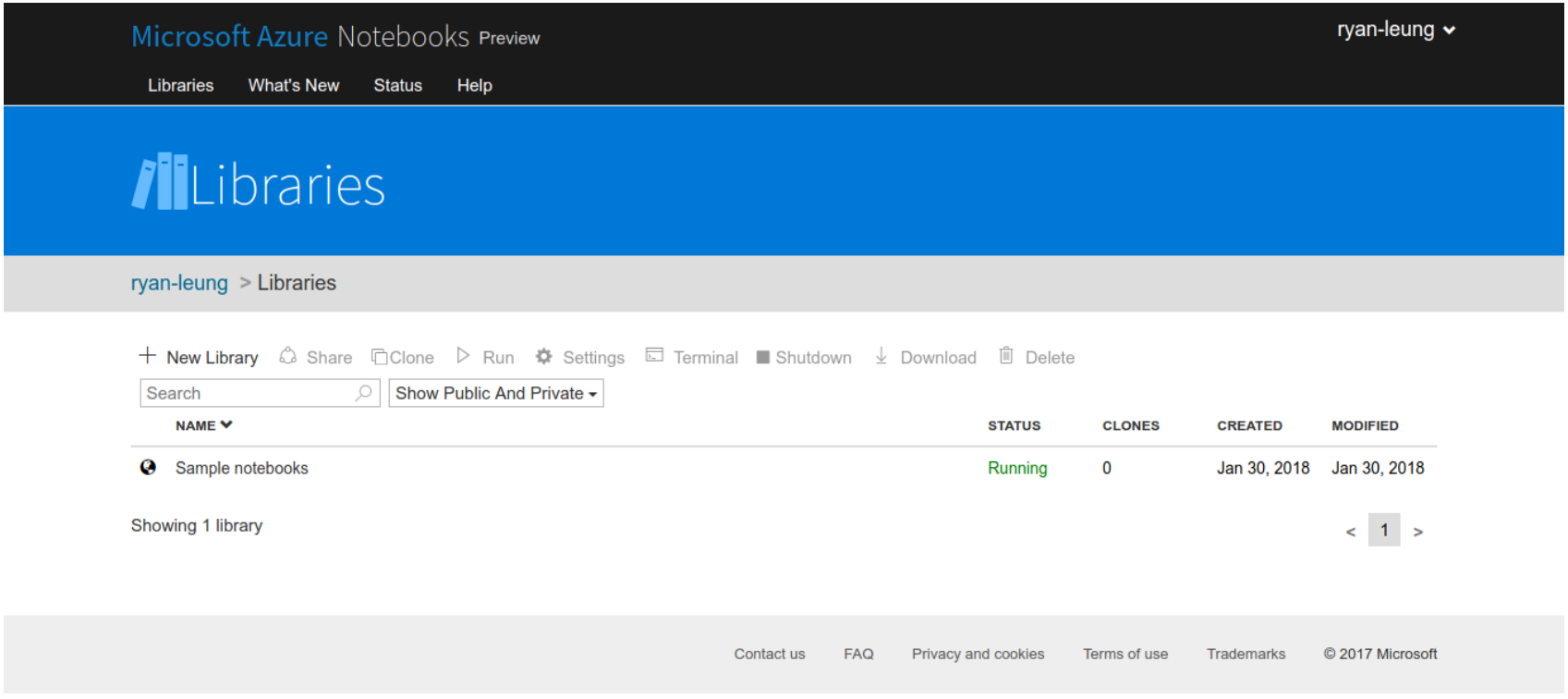

Microsoft Azure Notebooks (https://notebooks.azure.com/)

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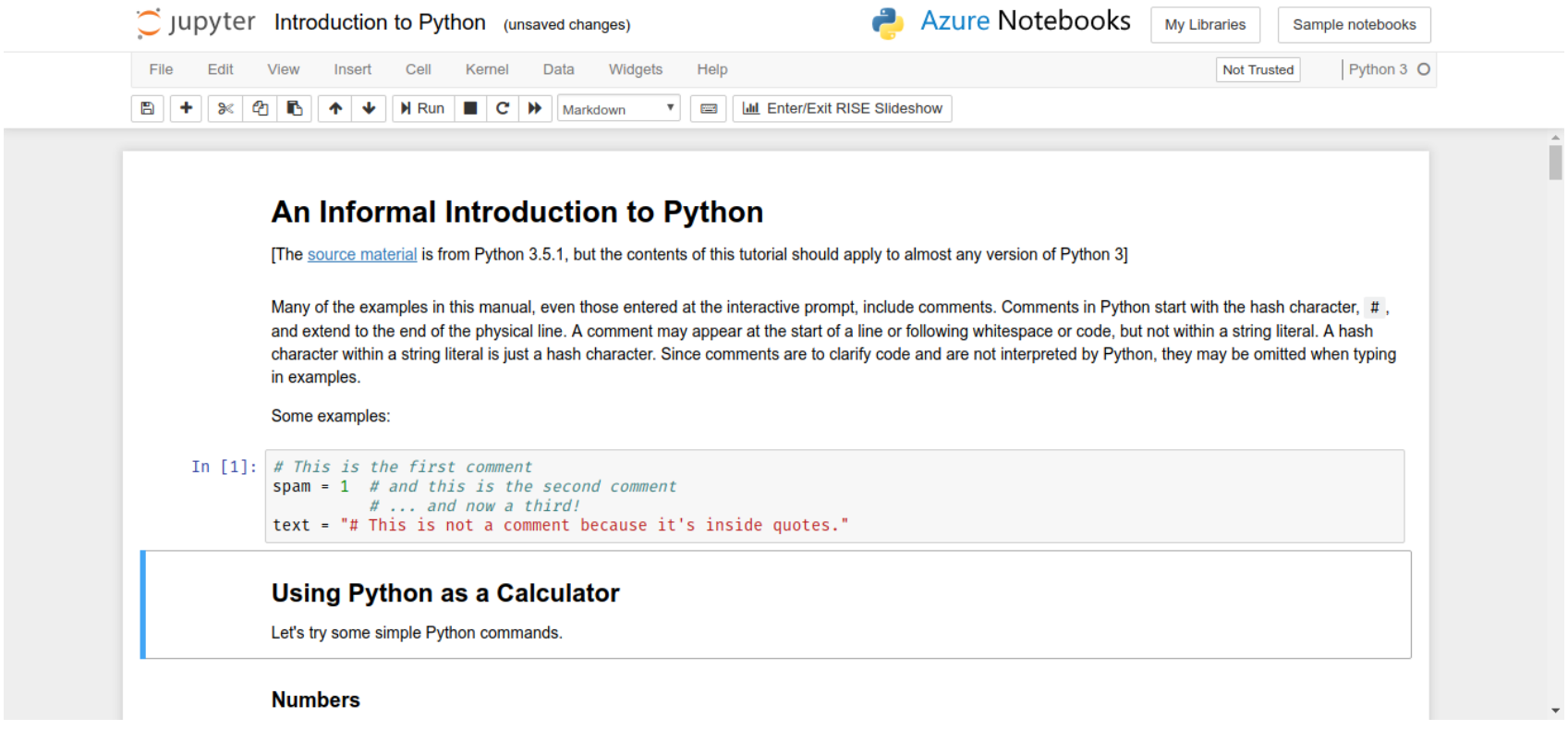

Microsoft Azure Notebooks (https://notebooks.azure.com/)

Online Judge

An online judge is an online system to test programs in programming contests. They can also be used to practice your programming skills.

- Their system can compile and execute code.
- They provide some pre-constructed data.
- Your submitted code will test against those data.
- Some online judge rank the user answers against other users for comparison.

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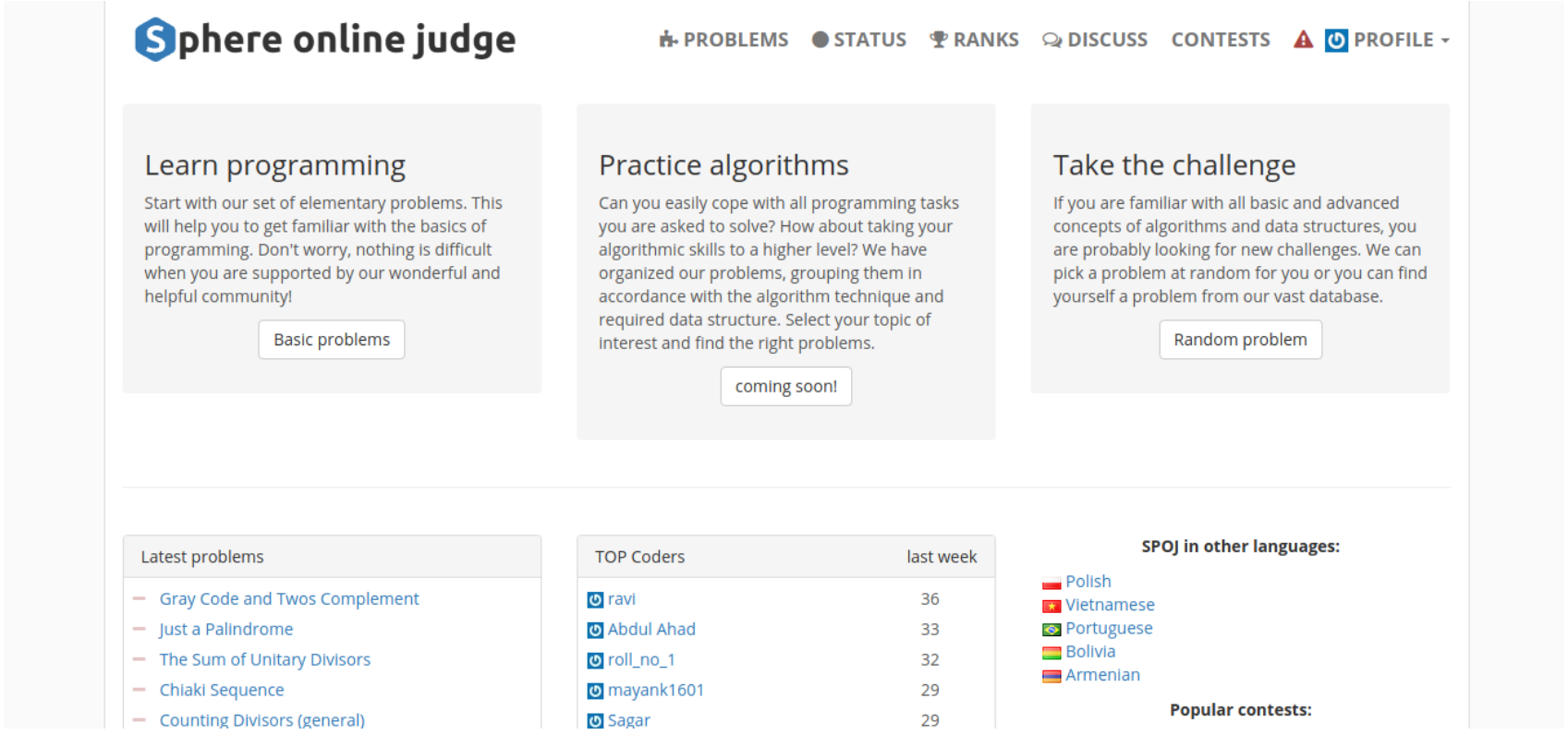
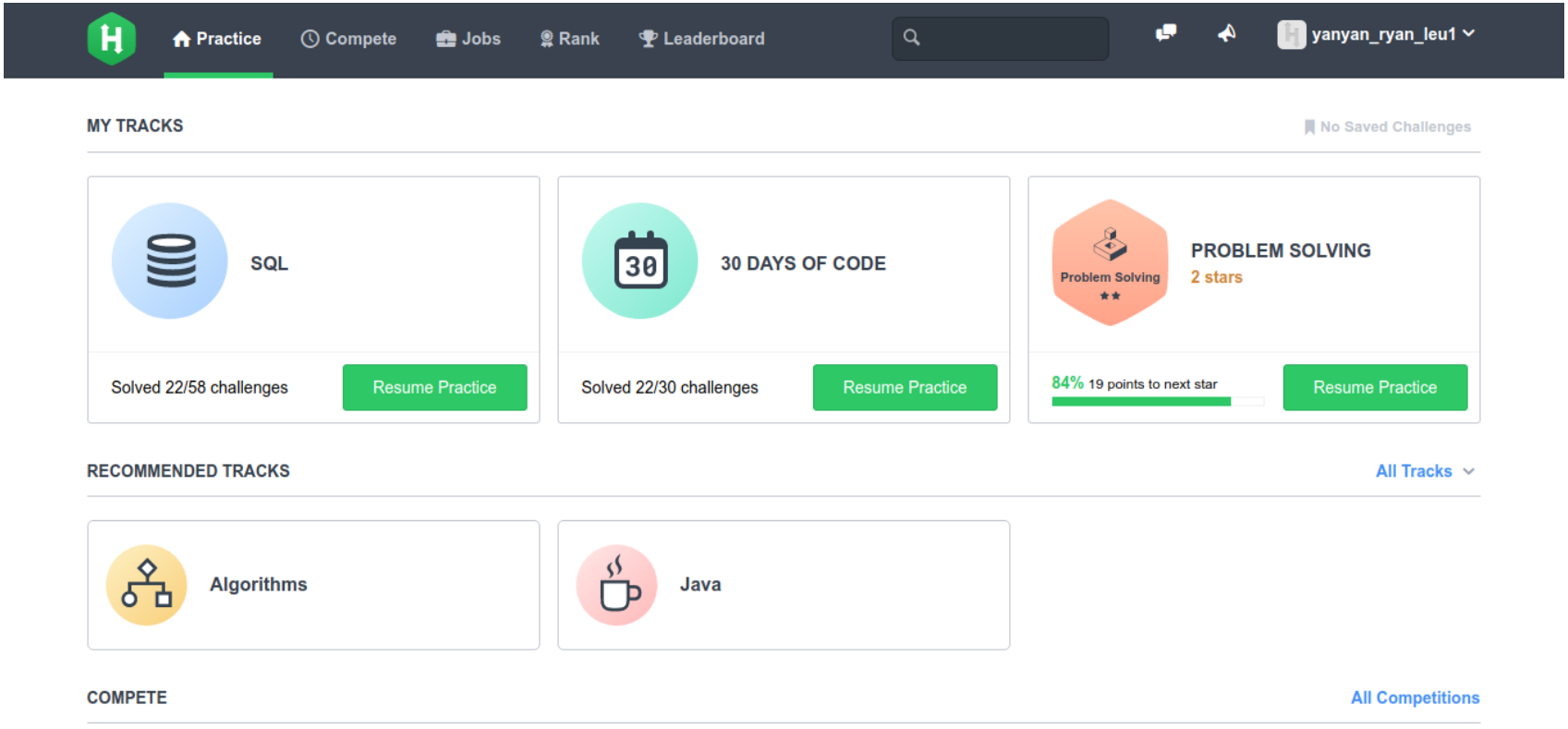
- Sphere Online Judge (SPOJ) http://www.spoj.com/
- HackerRank https://www.hackerrank.com/
- CodeAcademy https://www.codecademy.com/
- Aizu Online Judge (AOJ) http://judge.u-aizu.ac.jp/onlinejudge/index.jsp

Online Judge



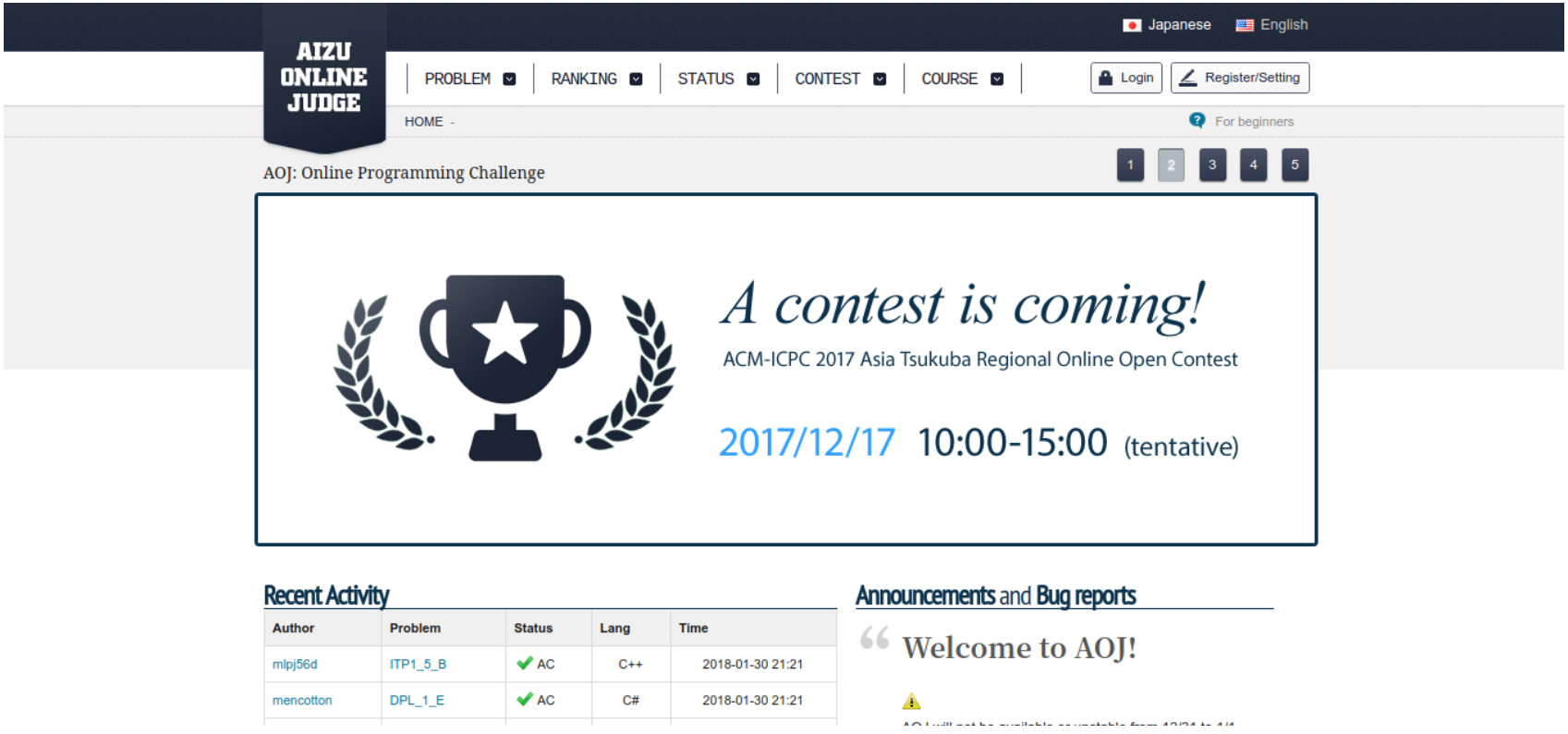
Sphere Online Judge (SPOJ) (http://www.spoj.com/)

Online Judge



HackerRank (https://www.hackerrank.com/)

Online Judge



Aizu Online Judge (AOJ)
(http://judge.u-aizu.ac.jp/onlinejudge/index.jsp)

THE END