

Tutorial 1 – Week 1

We'll be starting at the 10 minute mark

Agenda

1. TA Introductions
2. Logistics
3. Install Anaconda Navigator
4. Set up a Folder Structure for APS106
5. VSCode/Jupyter Notebook
6. UofT JupyterHub
7. Questions?

Introduction – TA



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(TUT0101, TUT0112)

Current studies: MEng Student, Dept. of MIE, U of T

Research/other interests: AI, Robotics, Optimization, Industry 4.0

Tutorial Logistics

- Tutorials are for your benefit – **no grading**
 - We will review previous weeks labs & lecture content
 - From Week 2, we will focus on **coding problems!**
- Be sure to **ask lots of questions** and have Python open.
We are here to help you!
- Questions outside of tutorial time?
 - Post to **Piazza** – all TAs/instructors and your peers can answer questions quickly
 - **Coffee Time** – drop-in hours for 1on1 help

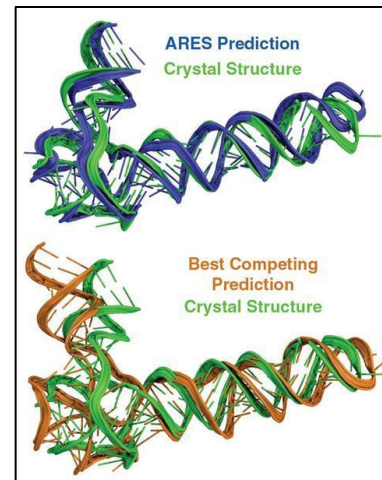
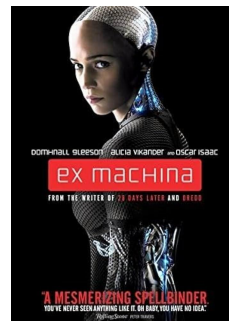
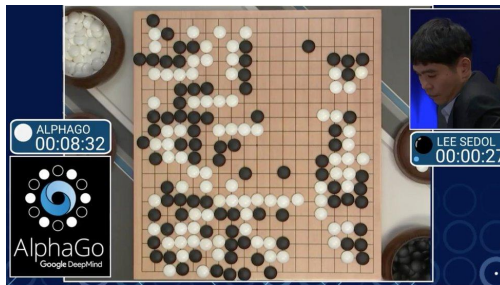
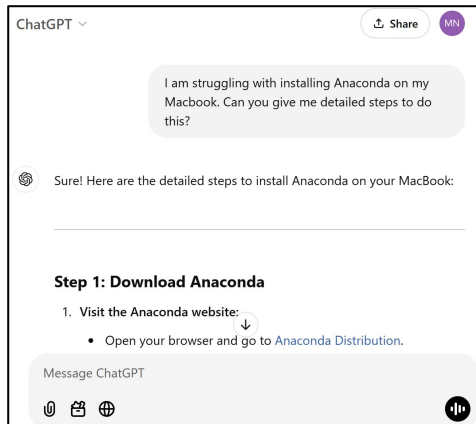
Online Tutorials/Office Hours Survey

- URL – <https://forms.office.com/r/4PZtA1hegg>



Why code?¹

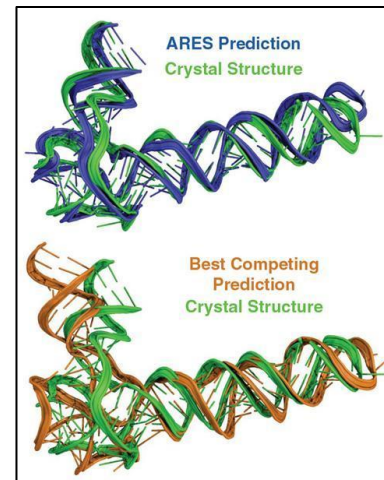
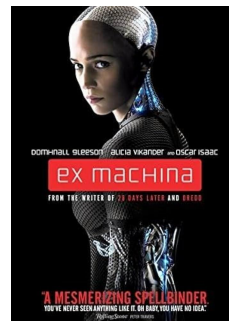
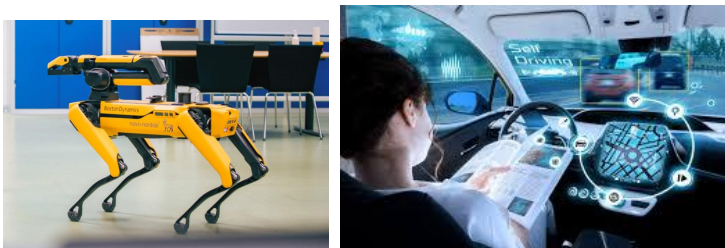
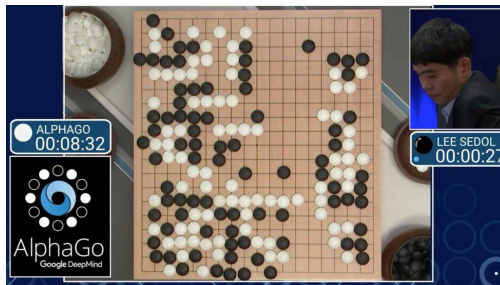
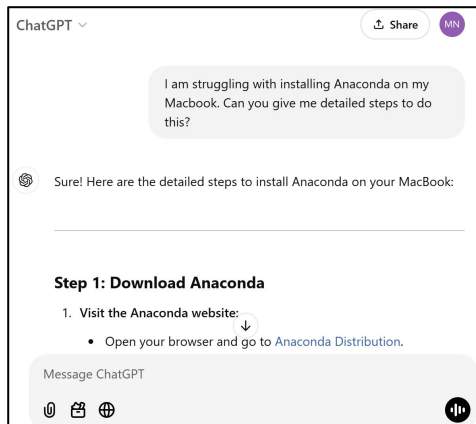
- Programming is awesome!
- Computers are everywhere, programming is a boundless opportunity
- Software engineering can be applied to almost any context in the world



Source: © Townshend et al, 2021 Science

Why code?²

- Regardless of background, coding is always an achievable skill
- Programming can be applied to almost any context in the world
- **NEVER THINK THAT YOU “CAN'T UNDERSTAND” CODING**



Source: © Townshend et al, 2021 Science



What would you want to ideally learn to program computers for?

slido



What would you want to ideally learn to program computers for?

① Click **Present with Slido** or install our [Chrome extension](#) to activate this poll while presenting.



Coding experience?

slido



Coding experience?

① Click **Present with Slido** or install our [Chrome extension](#) to activate this poll while presenting.

Install Anaconda Navigator

Anaconda

- Anaconda is a distribution of **Python** that includes tools and packages geared towards scientific computing (such as data science and machine learning)
- **Anaconda Navigator** is the graphical user interface (GUI) allowing users to install and manage their programming environment without command line (terminal) prompts



Install Anaconda

- You can install Anaconda from the following link:
 - <https://www.anaconda.com/download>

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Distribution

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Download Now

For installation assistance, refer to [Troubleshooting](#).

Download Anaconda Distribution or [Miniconda](#) by choosing the proper installer for your machine. Learn the difference from our [Documentation](#).



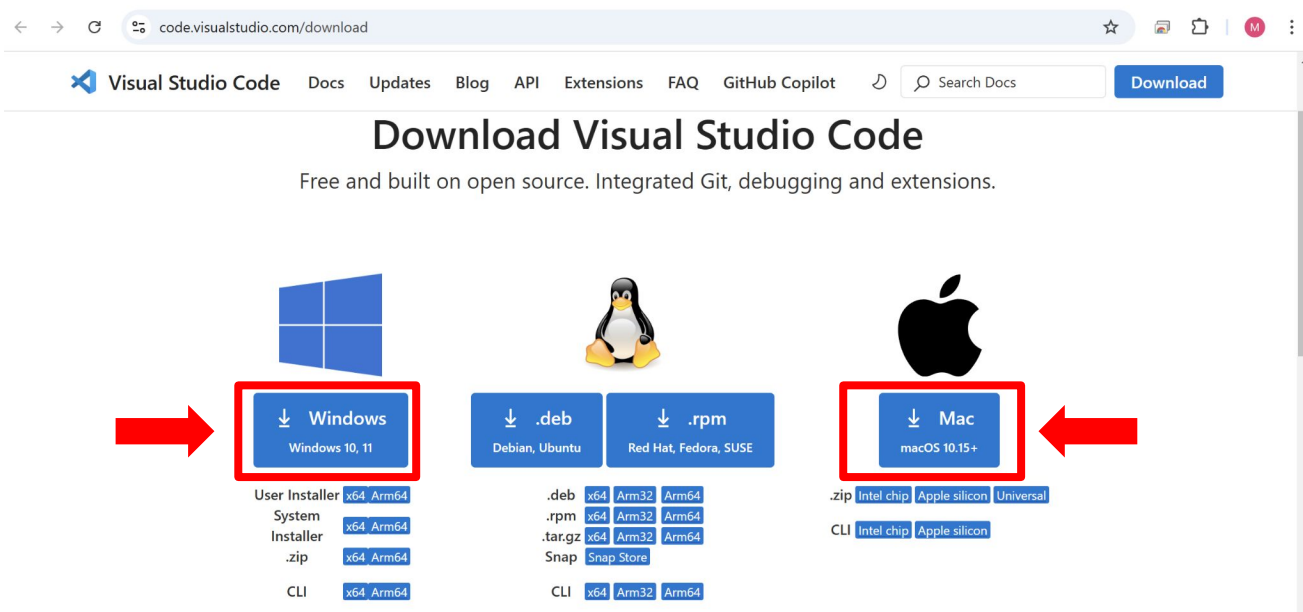
Anaconda Installers

 [Download](#)



Install VS Code¹

- You can install VS Code from the following link:
 - <https://code.visualstudio.com/download>

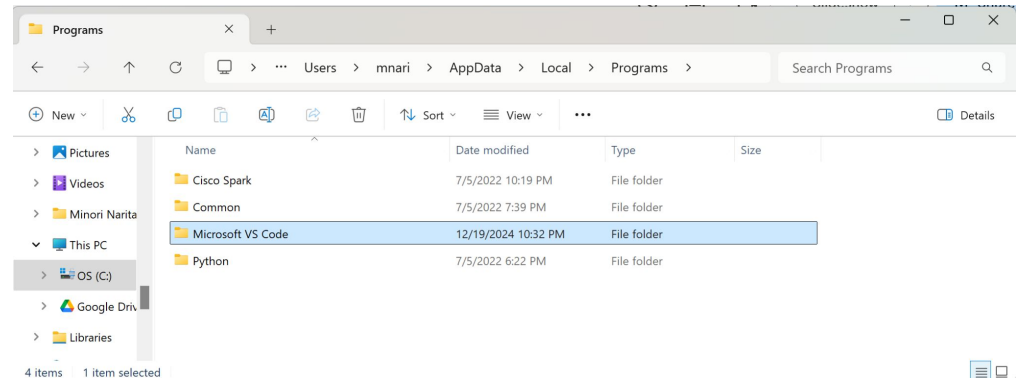


Install VS Code² (Windows)

- Open the .exe file (e.g., VSCodeUserSetup-x64-1.96.2.exe) and install VS Code
- Go to Anaconda-Navigator → File → Preferences → Configure Navigator → Change the following lines of code

```
[home]
vscode_enable = True
[applications]
vscode_path = C:\Users\{USERNAME}\AppData\Local\Programs\Microsoft VS Code
```
- Restart Anaconda Navigator

(If you don't see AppData, click on
View → Show → Hidden items)



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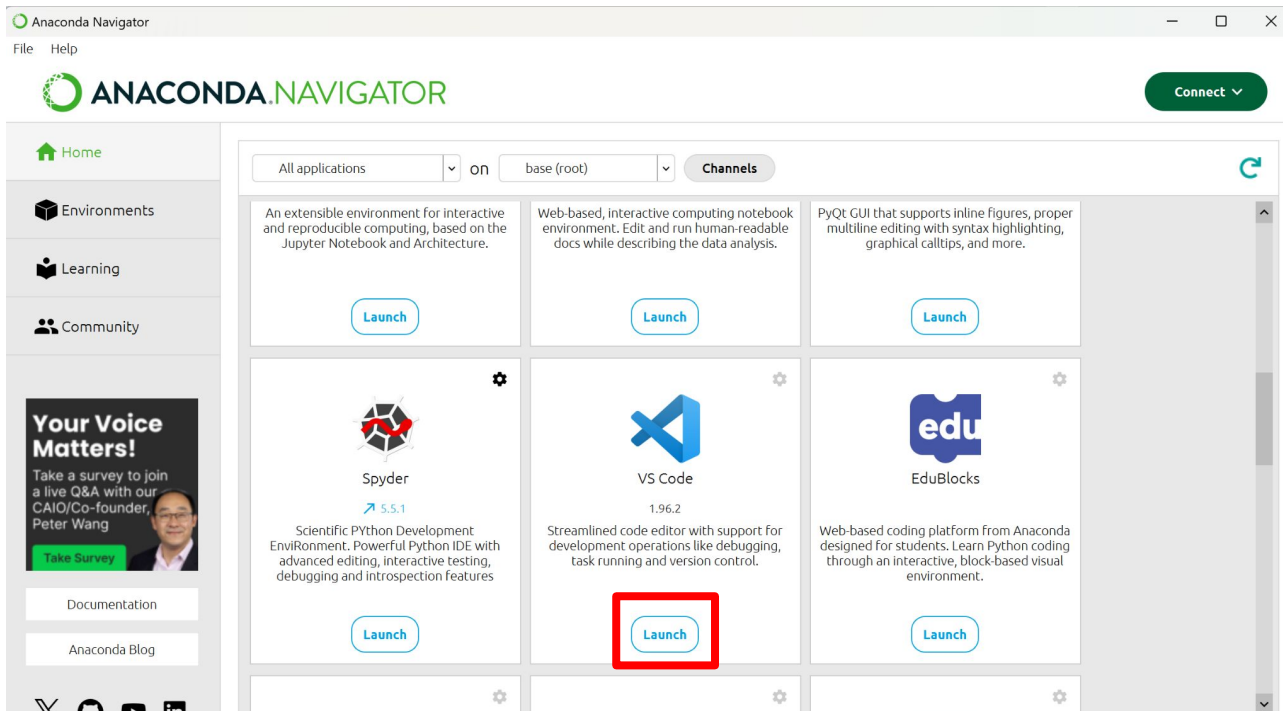
Microsoft VS Code might be under C:\Program Files (x86) – if so, `vscode_path` should be **C:\Program Files (x86)\Microsoft VS Code** instead

Install VS Code² (MacOS)

- If archive, extract the archive contents (e.g., VSCode-darwin-universal.zip).
- Drag **Visual Studio Code.app** to the **Applications** folder
- Double click the VS Code icon from the Applications folder
- Open **Anaconda Navigator** and see if you can find **VS Code** in **Home**. If not:
 - Open **Terminal** (from **Finder**, open the Applications/Utilities folder and double-click Terminal) and type in the following command and press Enter:
 - `conda config --set vscode /usr/local/bin/code`

Anaconda Navigator

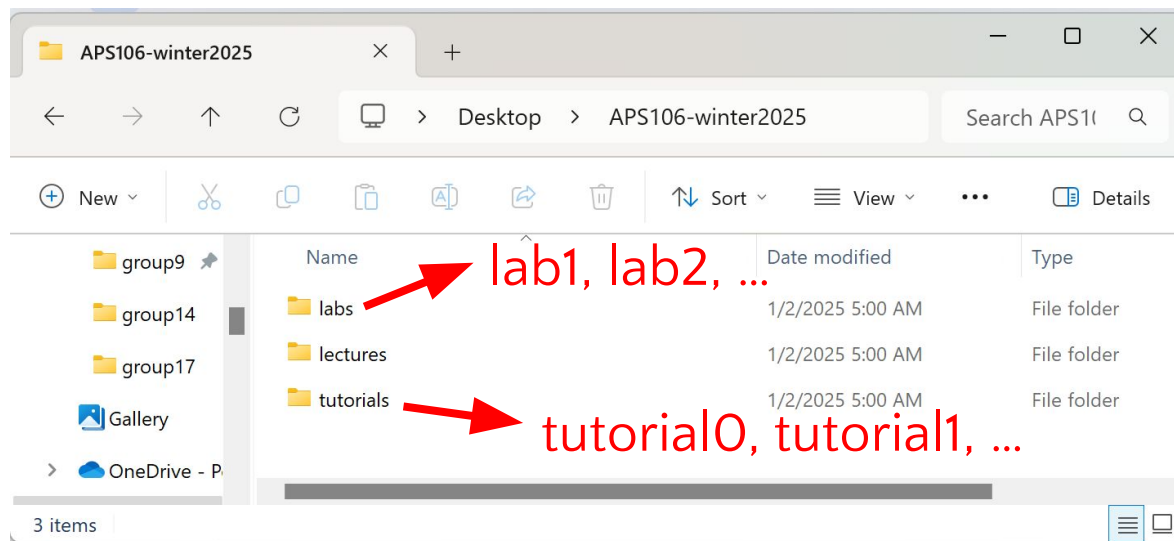
- We will be mainly using “**VS Code**” in this course. Let’s click on “Launch”!



Set up a Folder Structure for APS106

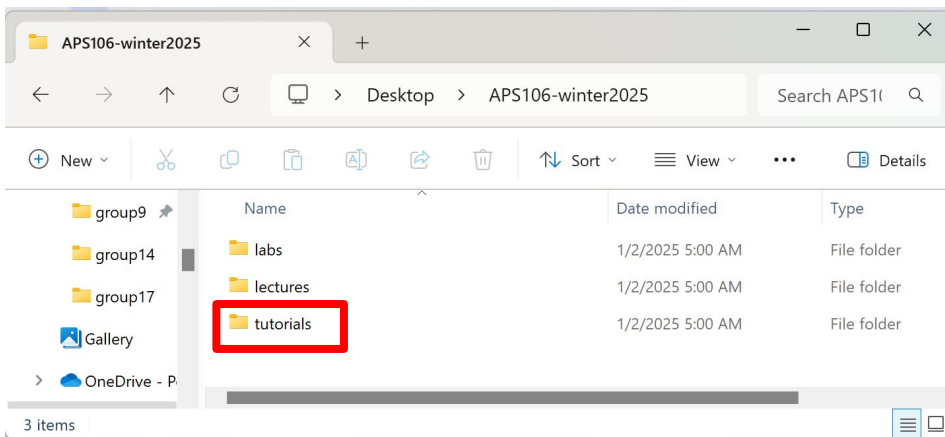
Stay Organized, Stay Efficient

- It's not a good idea to store all your files in the Downloads folder!
- Let's create a folder for APS106 (e.g., on Desktop) and organize your files there



Let's download files from Quercus!

- Go to Quercus → Modules → **Tutorial Homepage**
 - Click on **Tutorial 0 – Setting Up A Development Environment** in week1
 - Download “**tutorial0.zip**”
 - Unzip the zip file and move it in your folder for APS106



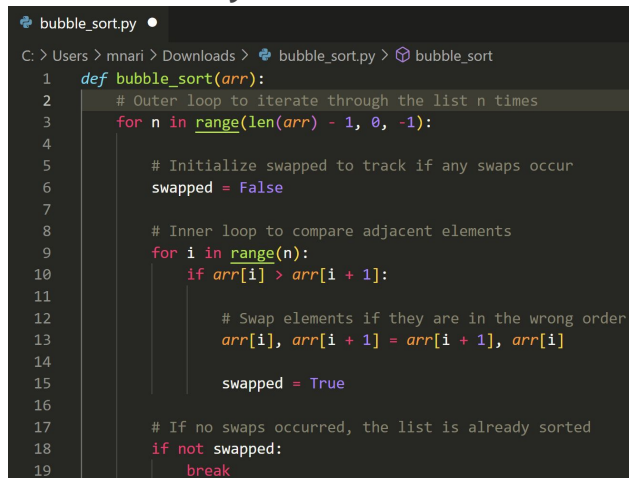
VSCode/Jupyter Notebook

VSCode is an IDE

- Integrated Development Environments (IDEs) are programs that provides tools and features to programmers in a unified environment
- IDEs often include:
 - **A code editor**
 - A place to type and edit code, usually with colour-coded syntax highlighting to improve readability
 - **Code compilers or interpreters**
 - Turns the readable Python code into something the machine can understand
 - **Debuggers**
 - Pause the code at pre-determined locations and go line-by-line through your code
- So IDEs basically contain **everything** you need to code!

VSCode is an IDE

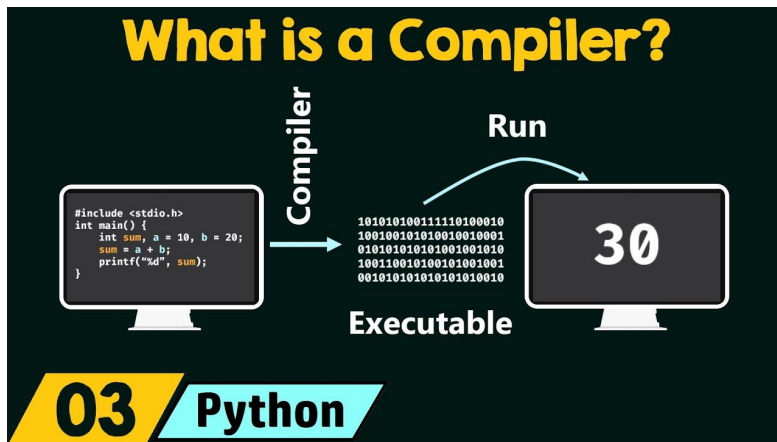
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```
bubble_sort.py •
C: > Users > mnari > Downloads > bubble_sort.py > bubble_sort
1  def bubble_sort(arr):
2      # Outer loop to iterate through the list n times
3      for n in range(len(arr) - 1, 0, -1):
4
5          # Initialize swapped to track if any swaps occur
6          swapped = False
7
8          # Inner loop to compare adjacent elements
9          for i in range(n):
10             if arr[i] > arr[i + 1]:
11
12                 # Swap elements if they are in the wrong order
13                 arr[i], arr[i + 1] = arr[i + 1], arr[i]
14
15                 swapped = True
16
17             # If no swaps occurred, the list is already sorted
18             if not swapped:
19                 break
```

VSCode is an IDE

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- IDEs often include:
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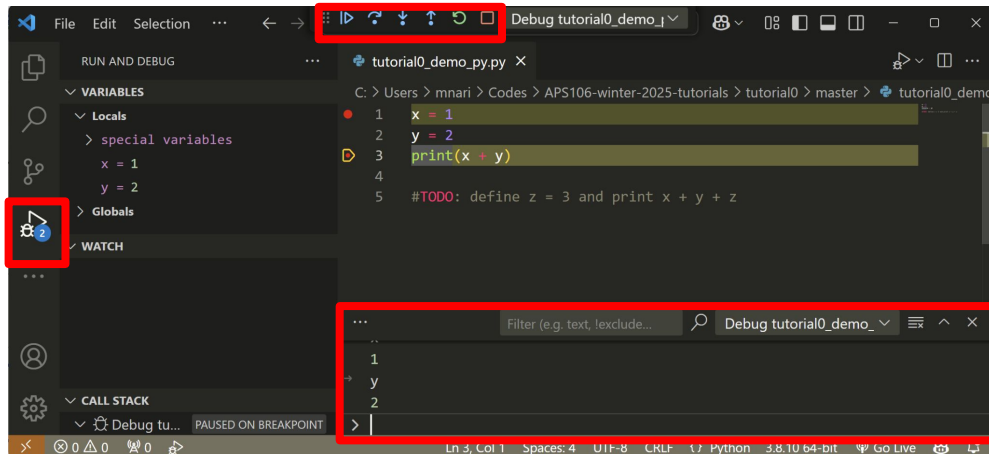


VSCoDe is an IDE

- Integrated Development Environments (IDEs) are programs that provides tools and features to programmers in a unified environment
- IDEs often include:
 - **Debuggers**
 - Pause the code at pre-determined locations and go line-by-line through your code

Continue, step over, step in/out, restart, stop

Run and Debug



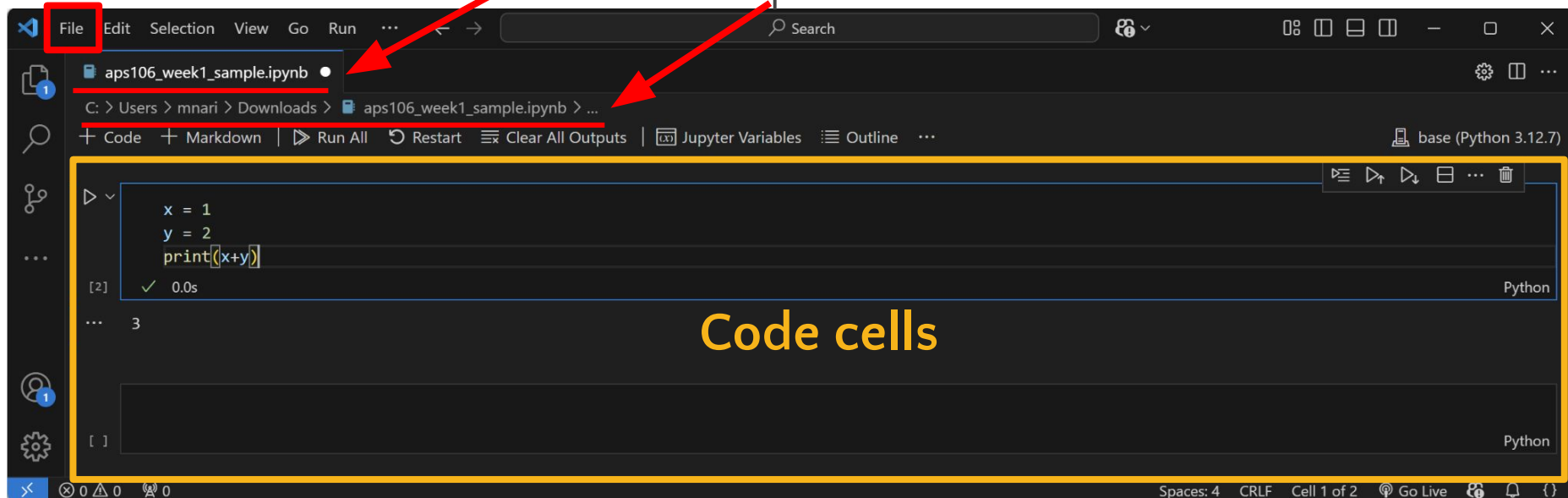
Debug console

VS Code (Jupyter Notebook)

Open/Save files

Filename

File path

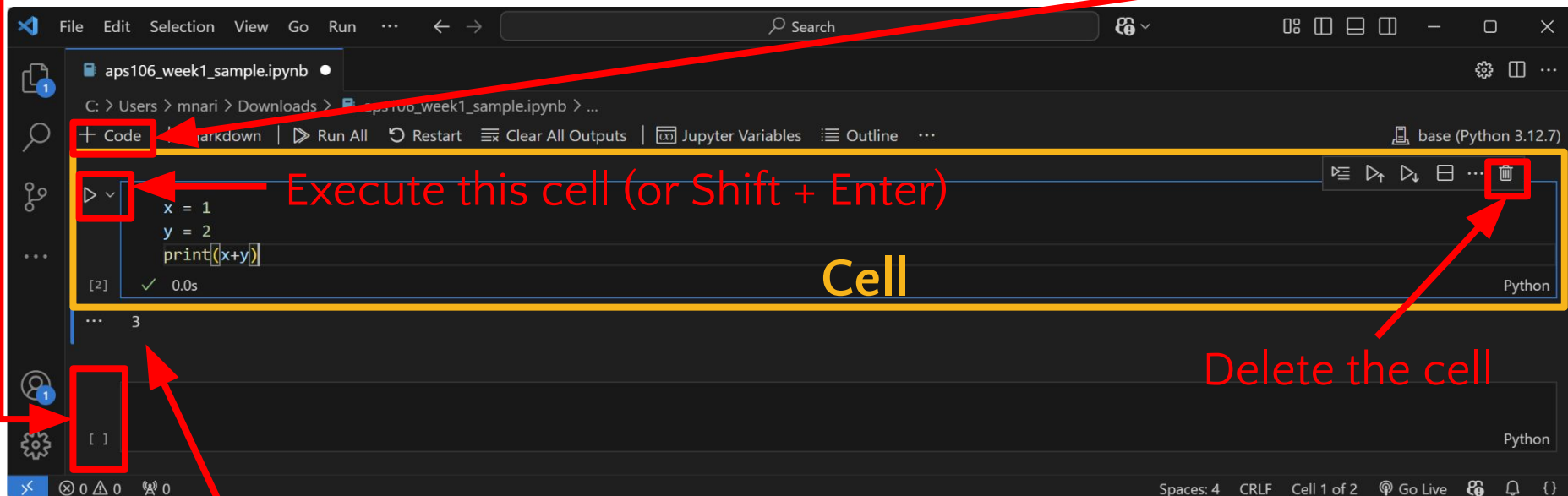


VS Code (Jupyter Notebook)

(drag&drop or Alt + ↑ / Alt + ↓)

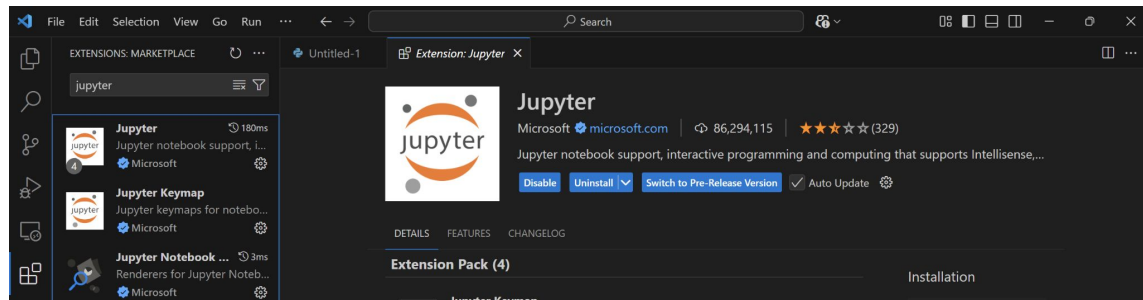
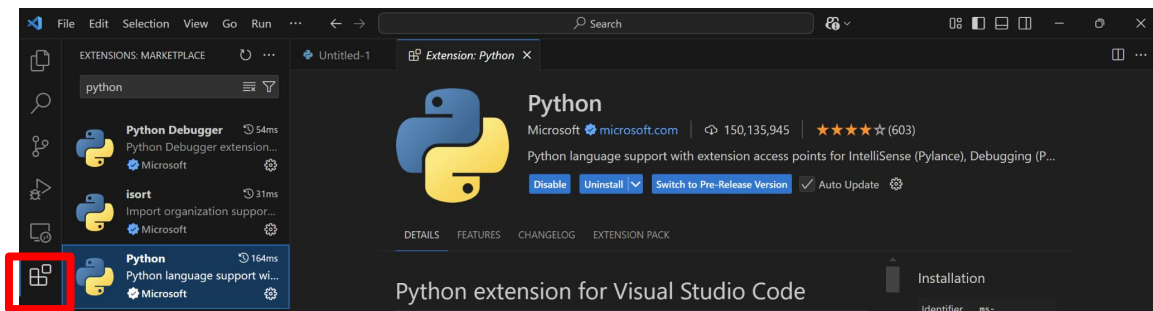
Move up/down the cell

Create a new cell under the current one



VS Code (Jupyter Notebook)

- Make sure you have “Python” and “Jupyter” extensions installed!

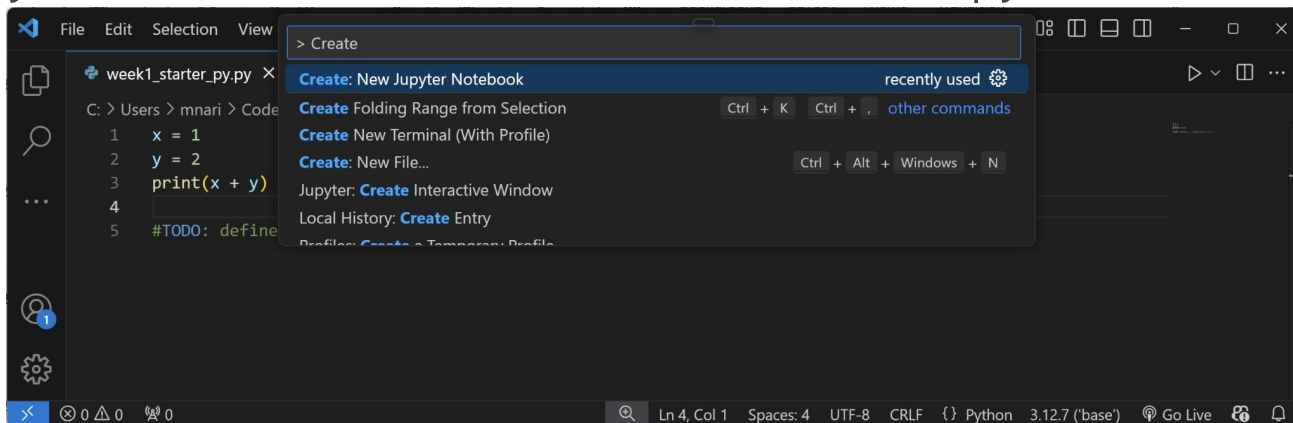


Let's practice!¹

- Let's open **tutorial0_demo_jupyter.ipynb**, write our first program, and save it!
- Steps:
 1. Launch VS Code through Anaconda Navigator
 2. File -> Open File -> Go to the APS106 folder and select **tutorial0_demo_jupyter.ipynb**
 3. In the first code cell, write
print("Hello World!")
 4. Execute the cell (if asked, select "base (Python 3.12.7)")
 5. File -> Save as -> save it as **"tutorial0_demo_jupyter.ipynb"**

Create a new Jupyter Notebook

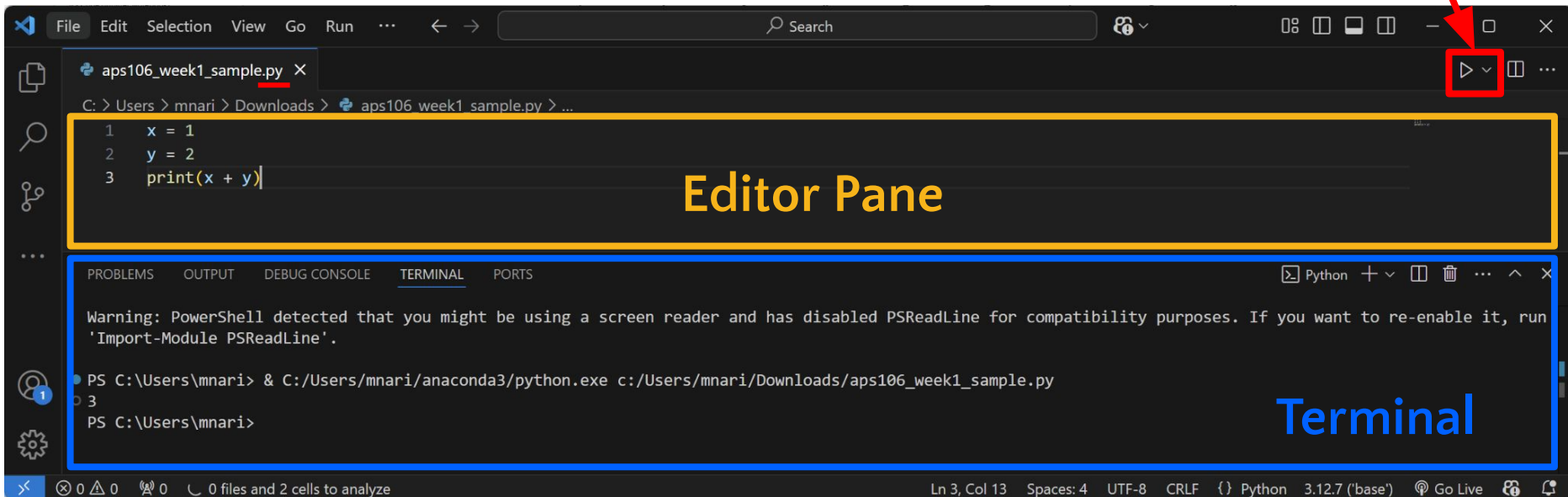
- You can create a new notebook on VS Code too!
- Steps:
 1. Launch VS Code through Anaconda Navigator
 2. In the command palette (“Search” on top), type in “> **create new jupyter notebook**” and select “Create: New Jupyter Notebook”



VS Code (Python script)

- When you open a `.py` file, an editor with a different layout appears

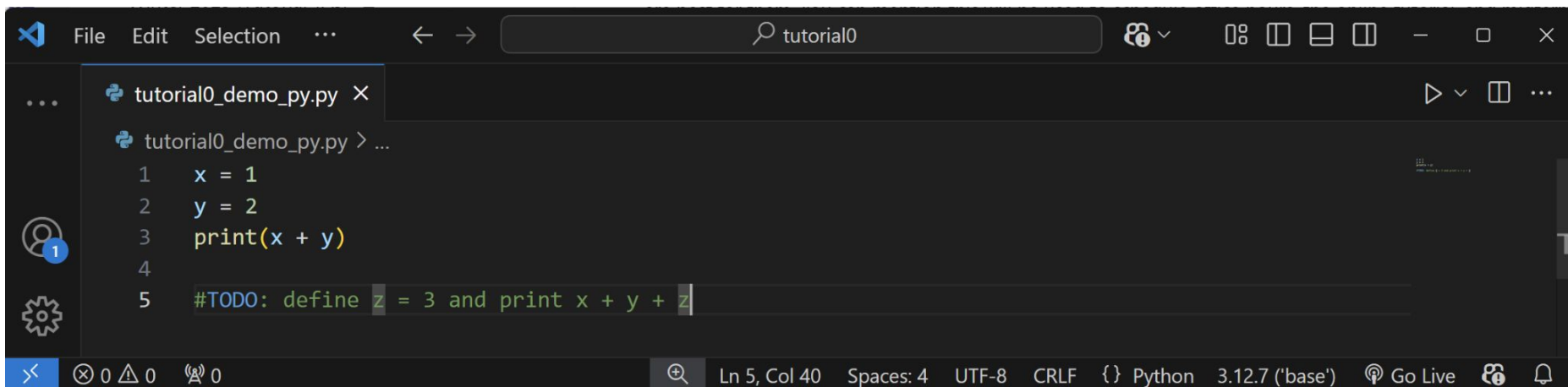
Execute the Python script



Coding on VS Code

Let's practice!²

- Let's open **tutorial0_demo_py.py** in VS Code, modify the code based on the instruction, and run it!



```
File Edit Selection ... tutorial0
```

```
... tutorial0_demo_py.py X
```

```
... tutorial0_demo_py.py > ...
```

```
1 x = 1
```

```
2 y = 2
```

```
3 print(x + y)
```

```
4
```

```
5 #TODO: define z = 3 and print x + y + z
```

Ln 5, Col 40 Spaces: 4 UTF-8 CRLF {} Python 3.12.7 ('base') Go Live

APS106



UNIVERSITY OF
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UofT JupyterHub

Let's Begin Coding!!!

What is UofT JupyterHub?

- Access at <https://jupyter.utoronto.ca/>
- Cloud-based Jupyter Notebook service that allows us to run Jupyter Notebooks (.ipynb files) directly from a web browser
 - Don't need to install anything
- Linked to your UofT account, all lecture notes are stored as a copy in JupyterHub!

What is UofT JupyterHub?

- Access at <https://jupyter.utoronto.ca/>
- Go to Quercus

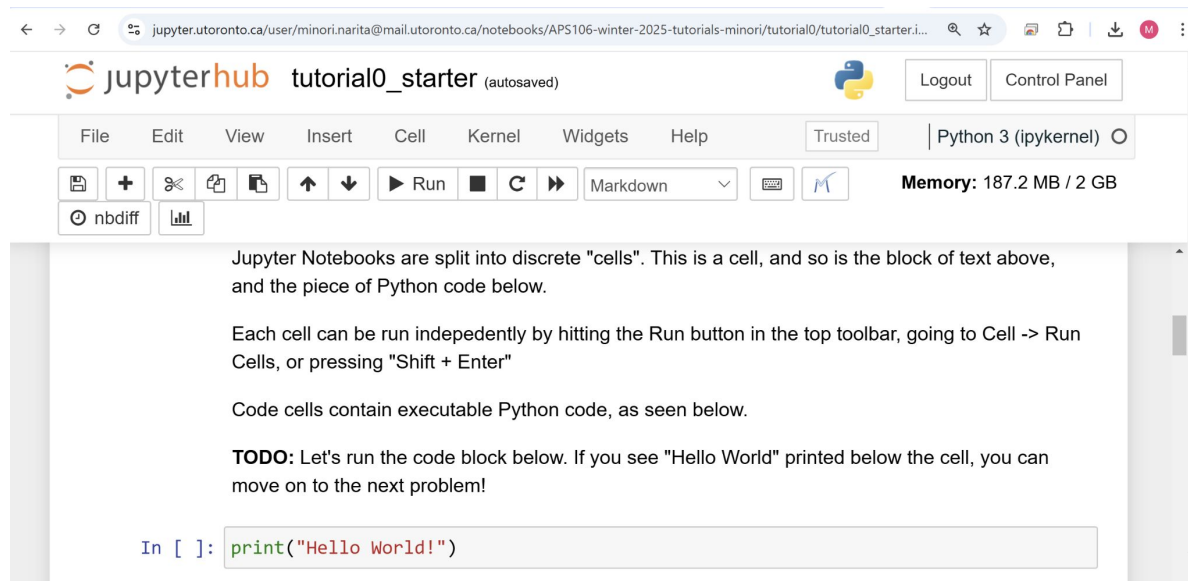
Tutorial 0 - Setting Up A Development Environment

Content

Section	TA	Links
TUT0101	Nazib Chowdhury	JupyterHub Starter Link JupyterHub Complete Link tutorial0.zip

Let's try UofT JupyterHub!

- Go to **Tutorial Homepage** in APS106 Modules on Quercus
 - Click on **Tutorial 0 – Setting Up A Development Environment** in week1
 - Click on **JupyterHub Starter Link**



Jupyter Notebooks are split into discrete "cells". This is a cell, and so is the block of text above, and the piece of Python code below.

Each cell can be run independently by hitting the Run button in the top toolbar, going to Cell -> Run Cells, or pressing "Shift + Enter"

Code cells contain executable Python code, as seen below.

TODO: Let's run the code block below. If you see "Hello World" printed below the cell, you can move on to the next problem!

```
In [ ]: print("Hello World!")
```


We'll switch from .ipynb to .py files later

- Jupyter Notebooks (.ipynb) are interactive and beginner-friendly
- Python scripts (.py) are **the standard format** for Python programs and are suited for building and running **larger projects**
- We'll switch to .py files in **lab5!**