

# APS106



## 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



**Nazib Chowdhury**

(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/4PZtA1heqq>



# Why code?<sup>1</sup>

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

ChatGPT

I am struggling with installing Anaconda on my MacBook. Can you give me detailed steps to do this?

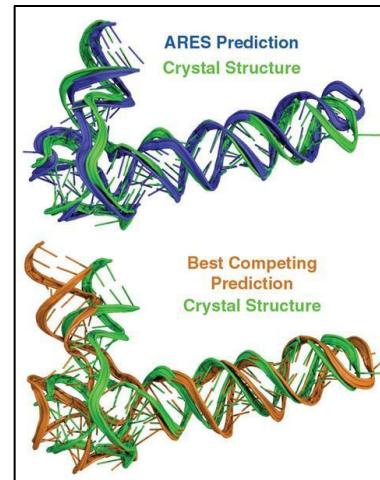
Sure! Here are the detailed steps to install Anaconda on your MacBook:

**Step 1: Download Anaconda**

1. Visit the Anaconda website:  
• Open your browser and go to [Anaconda Distribution](#).

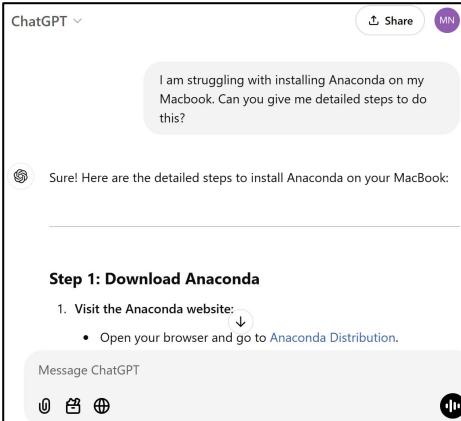
Message ChatGPT

0 1 0



# Why code?<sup>2</sup>

- 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



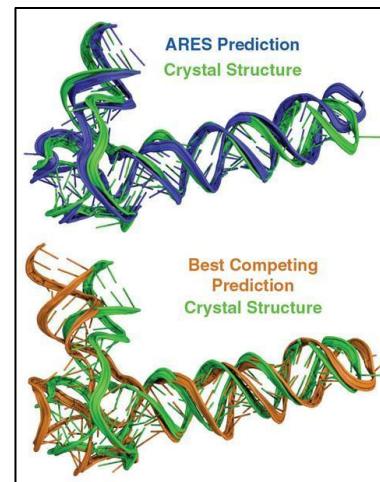
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Message ChatGPT



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?**

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



Coding experience?

slido



# Coding experience?

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

# APS106



## Install Anaconda Navigator

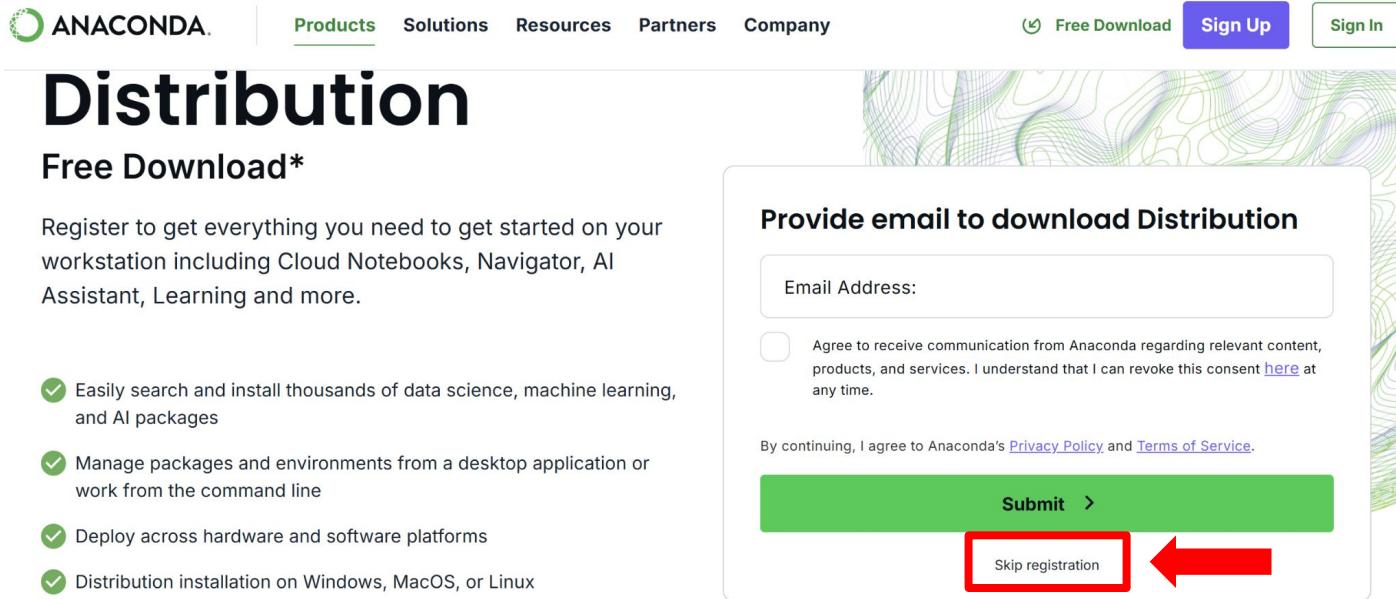
# Anaconda

- 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>



The screenshot shows the Anaconda website's distribution download page. At the top, there's a navigation bar with links for Products, Solutions, Resources, Partners, and Company. It also features a "Free Download" button, a purple "Sign Up" button, and a green "Sign In" button. Below the navigation, the word "Distribution" is prominently displayed in large, bold letters, followed by "Free Download\*". A descriptive text block encourages users to register for access to Cloud Notebooks, Navigator, AI Assistant, Learning, and more. To the right, a large rectangular form is titled "Provide email to download Distribution". It contains a text input field for "Email Address", a checkbox for accepting communication consent, and a "Submit" button at the bottom. A red arrow points to a "Skip registration" link located at the bottom right of the form.

ANACONDA Products Solutions Resources Partners Company

Free Download Sign Up Sign In

# Distribution

Free Download\*

Register to get everything you need to get started on your workstation including Cloud Notebooks, Navigator, AI Assistant, Learning and more.

- ✓ Easily search and install thousands of data science, machine learning, and AI packages
- ✓ Manage packages and environments from a desktop application or work from the command line
- ✓ Deploy across hardware and software platforms
- ✓ Distribution installation on Windows, MacOS, or Linux

Provide email to download Distribution

Email Address:

Agree to receive communication from Anaconda regarding relevant content, products, and services. I understand that I can revoke this consent [here](#) at any time.

By continuing, I agree to Anaconda's [Privacy Policy](#) and [Terms of Service](#).

Submit >

Skip registration

# Install Anaconda

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



## 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](#).

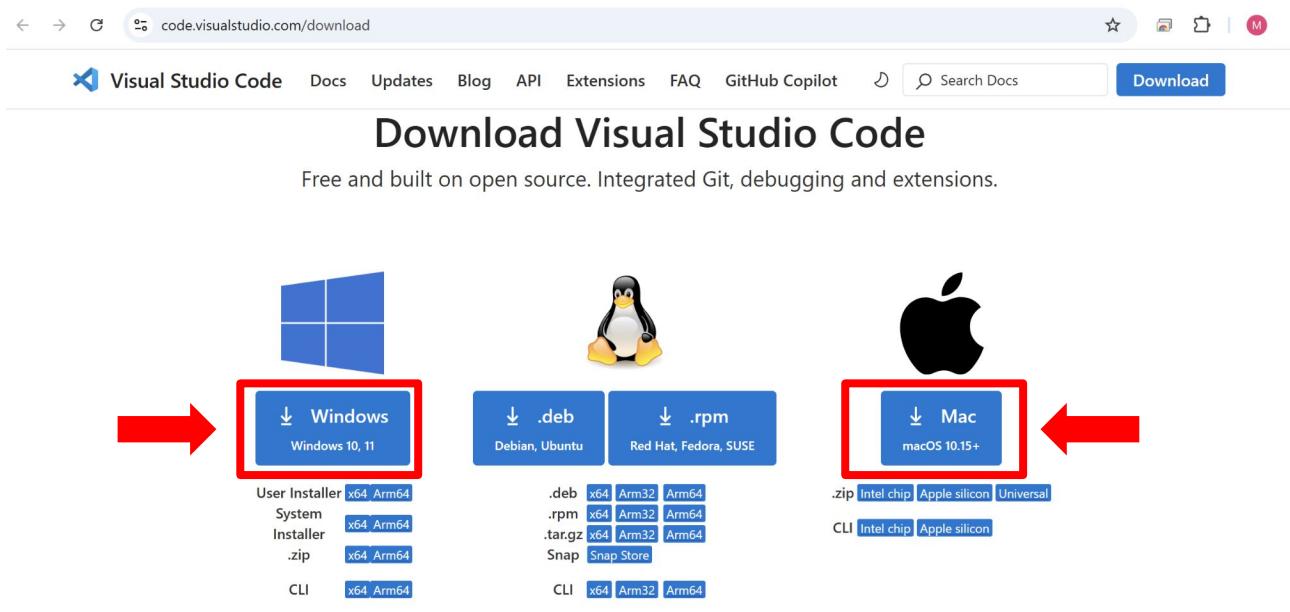


### Anaconda Installers



# Install VS Code<sup>1</sup>

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



The screenshot shows the Visual Studio Code download page. At the top, there's a navigation bar with links for Visual Studio Code, Docs, Updates, Blog, API, Extensions, FAQ, GitHub Copilot, a search bar, and a 'Download' button. The main heading is 'Download Visual Studio Code' with the subtext 'Free and built on open source. Integrated Git, debugging and extensions.' Below this, there are download links for different operating systems:

- Windows:** A large blue button with a downward arrow labeled 'Windows' and 'Windows 10, 11'. It is highlighted with a red box and has a red arrow pointing to it.
- .deb:** A blue button with a downward arrow labeled '.deb' and 'Debian, Ubuntu'.
- .rpm:** A blue button with a downward arrow labeled '.rpm' and 'Red Hat, Fedora, SUSE'.
- Mac:** A blue button with a downward arrow labeled 'Mac' and 'macOS 10.15+'. It is highlighted with a red box and has a red arrow pointing to it.

Below each download section, there are smaller links for User Installer, System Installer, .zip, CLI, and various file formats (.deb, .rpm, .tar.gz, Snap) and architectures (x64, Arm32, Arm64, Intel chip, Apple silicon, Universal).

# Install VS Code<sup>2</sup> (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]

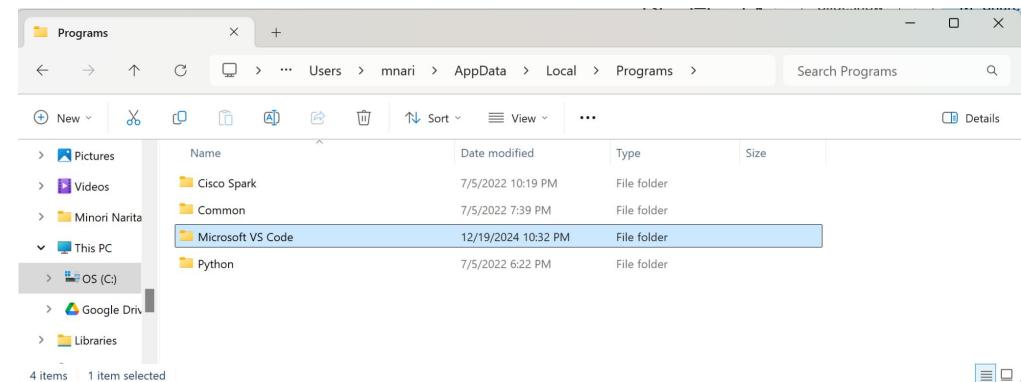
**vscode\_enable = True**

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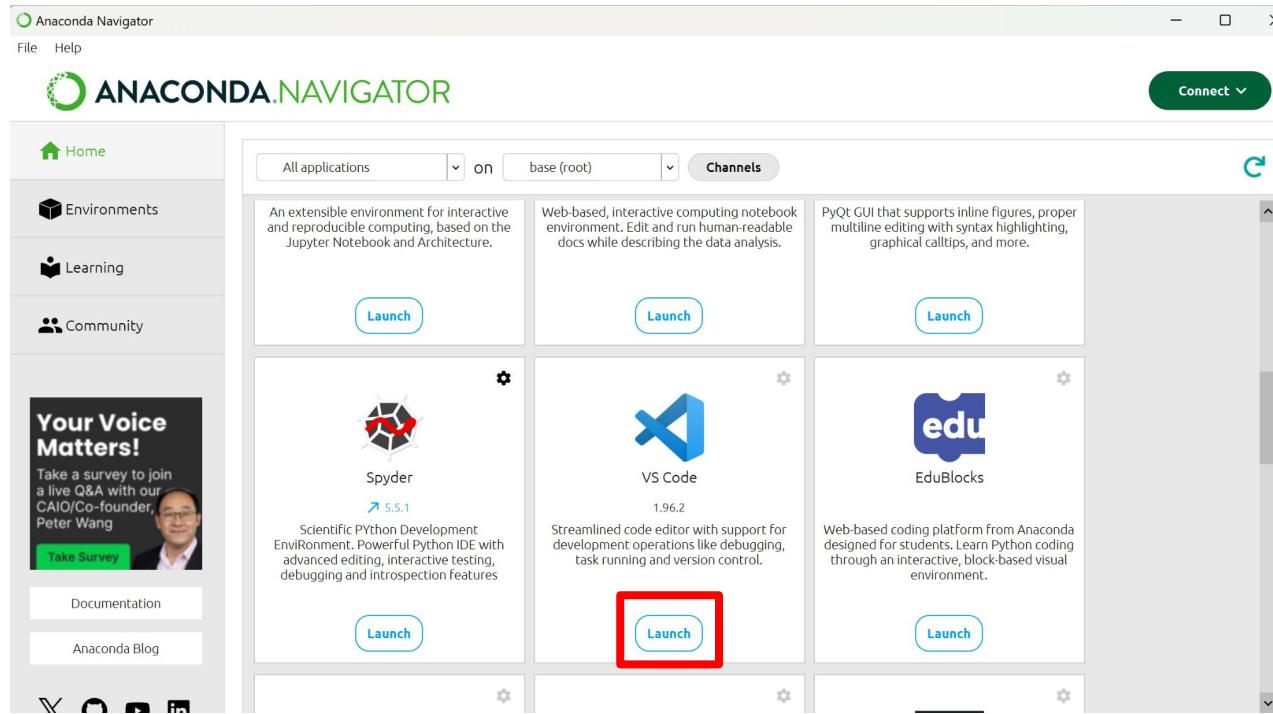
Microsoft VS Code might be under C:\Program  
Files (x86) – if so, vscode\_path should be  
**C:\Program Files (x86)\Microsoft VS Code**  
instead

# Install VS Code<sup>2</sup> (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”!



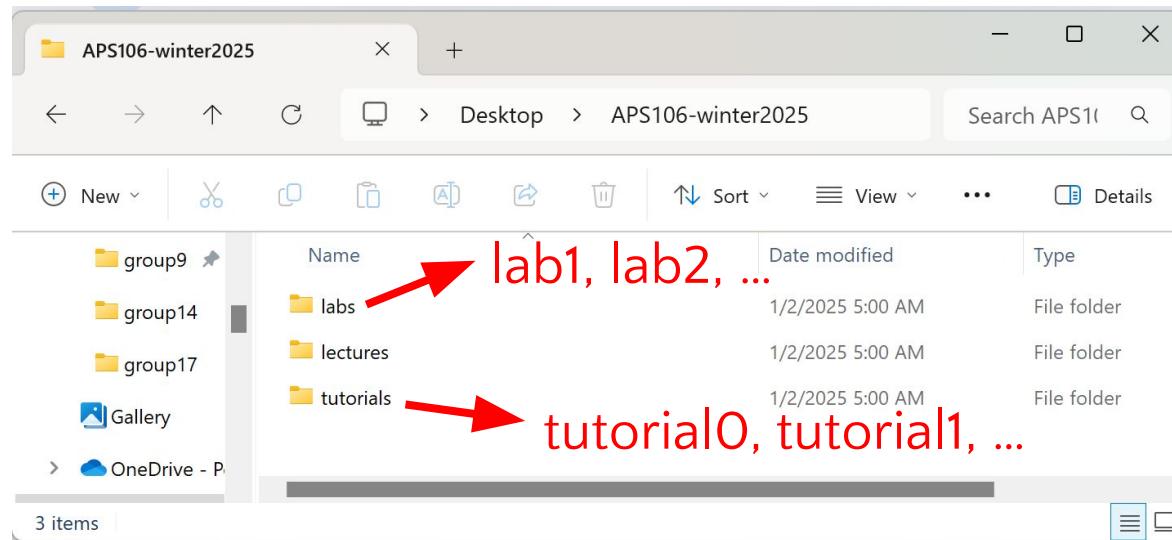
# APS106



## Set up a Folder Structure for APS106

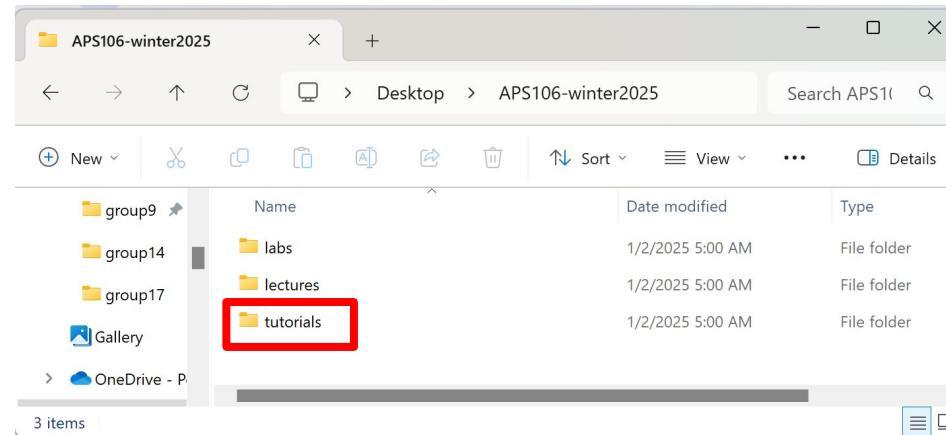
# Stay Organized, Stay Efficient

- 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



# APS106



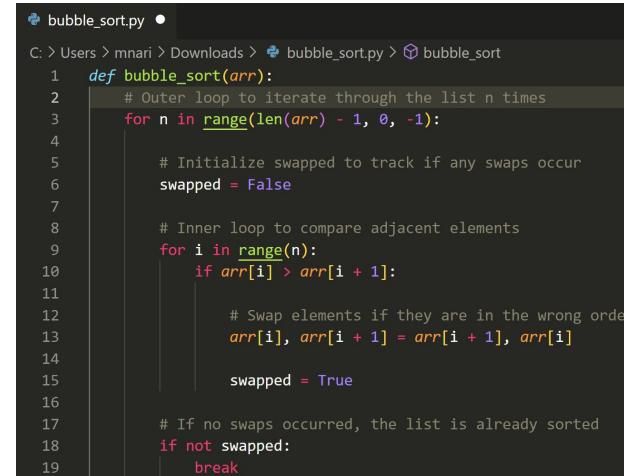
## VSCode/Jupyter Notebook

# 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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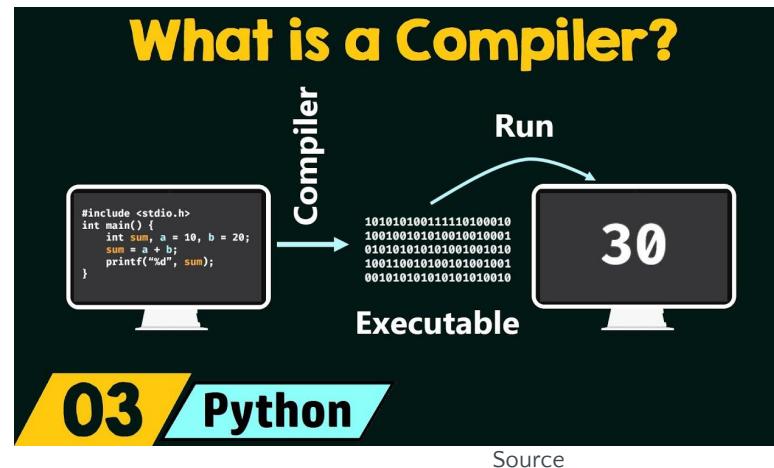


A screenshot of the Visual Studio Code (VSCode) interface. The title bar shows the file name "bubble\_sort.py". The code editor displays a Python script for performing bubble sort on a list. The code uses color-coded syntax highlighting where keywords like "def", "for", and "if" are in blue, and variable names like "arr" and "n" are in purple. The script defines a function "bubble\_sort" that iterates over the list multiple times, comparing adjacent elements and swapping them if they are in the wrong order. It continues until no swaps occur, indicating the list is sorted.

```
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

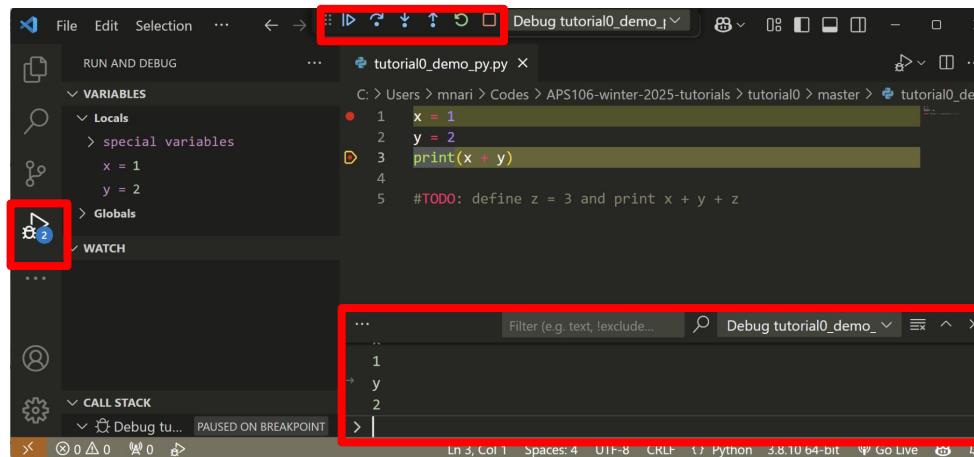
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# VSCODE is an IDE

- 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



The screenshot shows the VS Code interface with the following elements highlighted:

- Run and Debug view:** Located on the left, it shows a tree view of variables. A red box highlights the "Run and Debug" icon (a play button with a gear).
- Top toolbar:** A red box highlights the toolbar icons, which include symbols for file operations, search, and run/debug.
- Code editor:** Shows a Python script named "tutorial0\_demo\_py.py" with the following code:

```
1 x = 1
2 y = 2
3 print(x + y)
4
5 #TODO: define z = 3 and print x + y + z
```

A red box highlights the status bar at the bottom of the code editor.
- Debug console:** Located at the bottom right, it displays the output of the current session:

```
1
y
2
> |
```

A red box highlights the status bar at the bottom of the debug console.

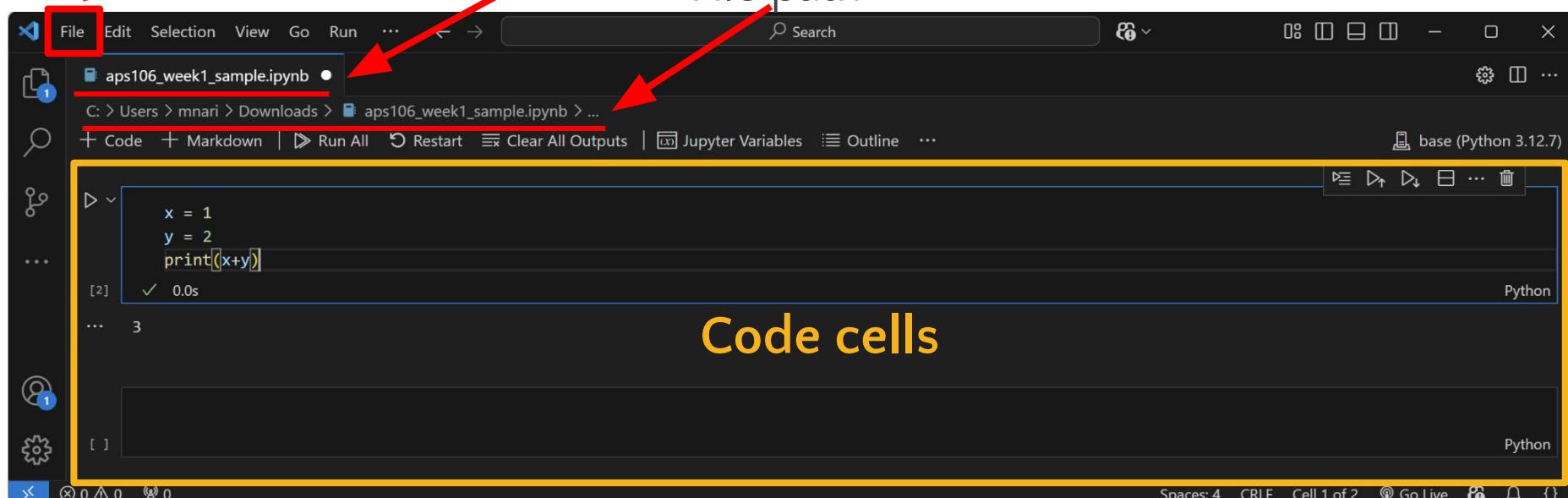
Debug console

# VS Code (Jupyter Notebook)

Open/Save files

Filename

File path

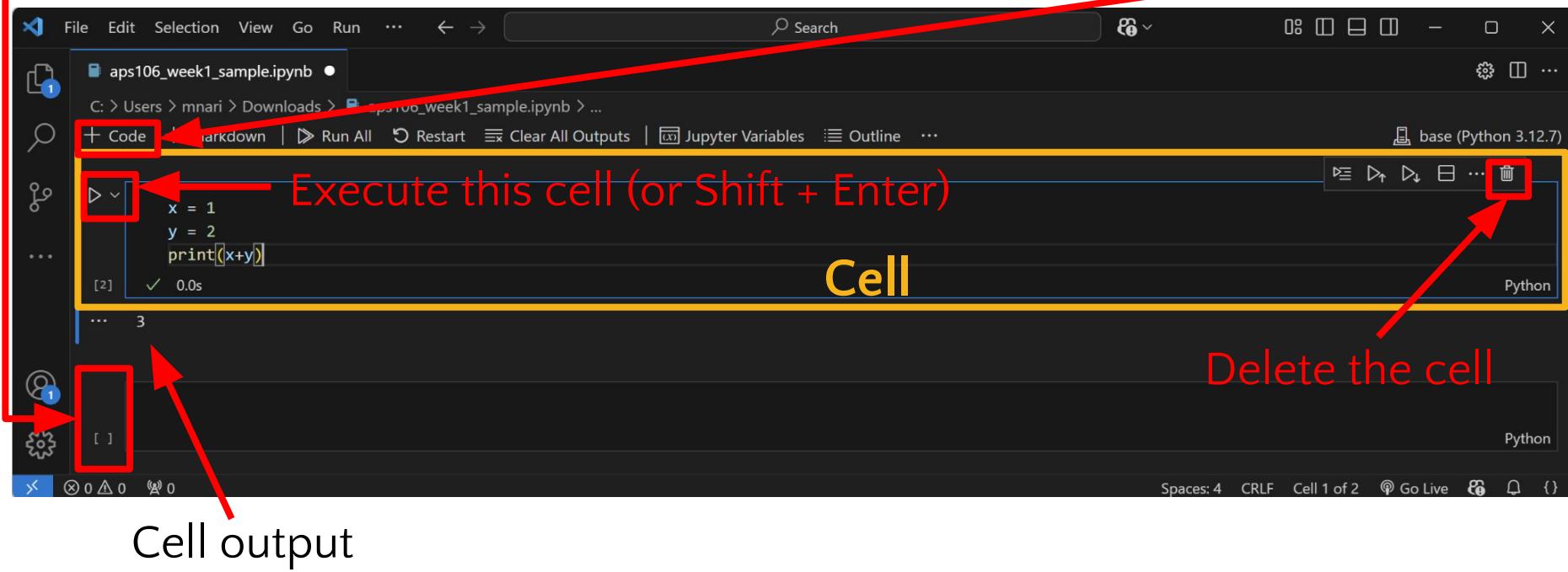


# VS Code (Jupyter Notebook)

(drag&drop or Alt + ↑ /Alt + ↓ )

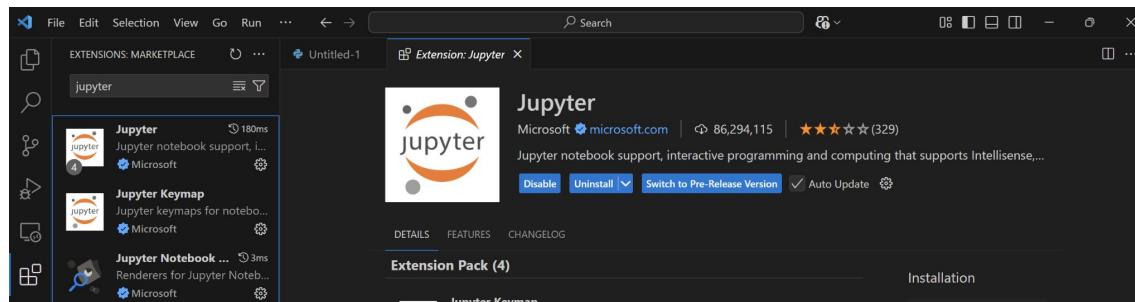
Move up/down the cell

Create a new cell under the current one



# VS Code (Jupyter Notebook)

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



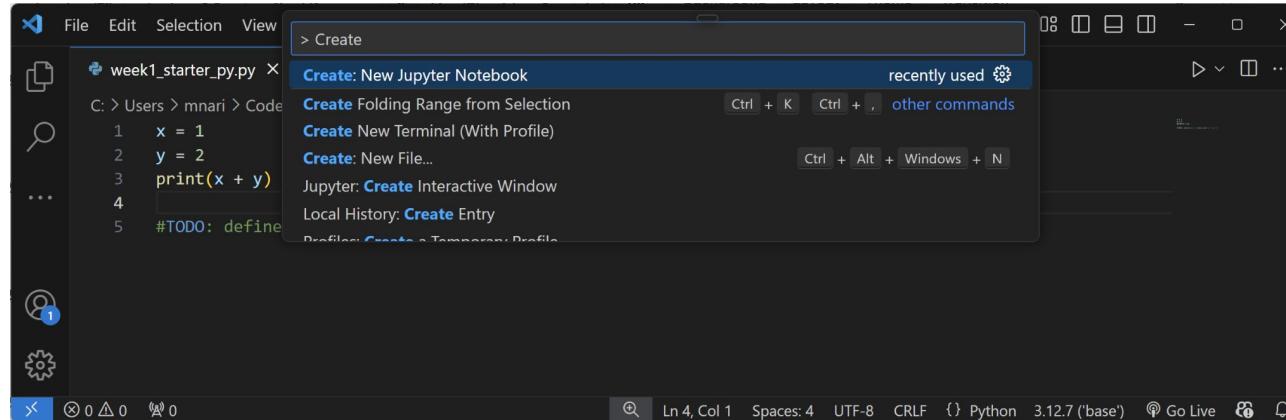
# Let's practice!<sup>1</sup>

- 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

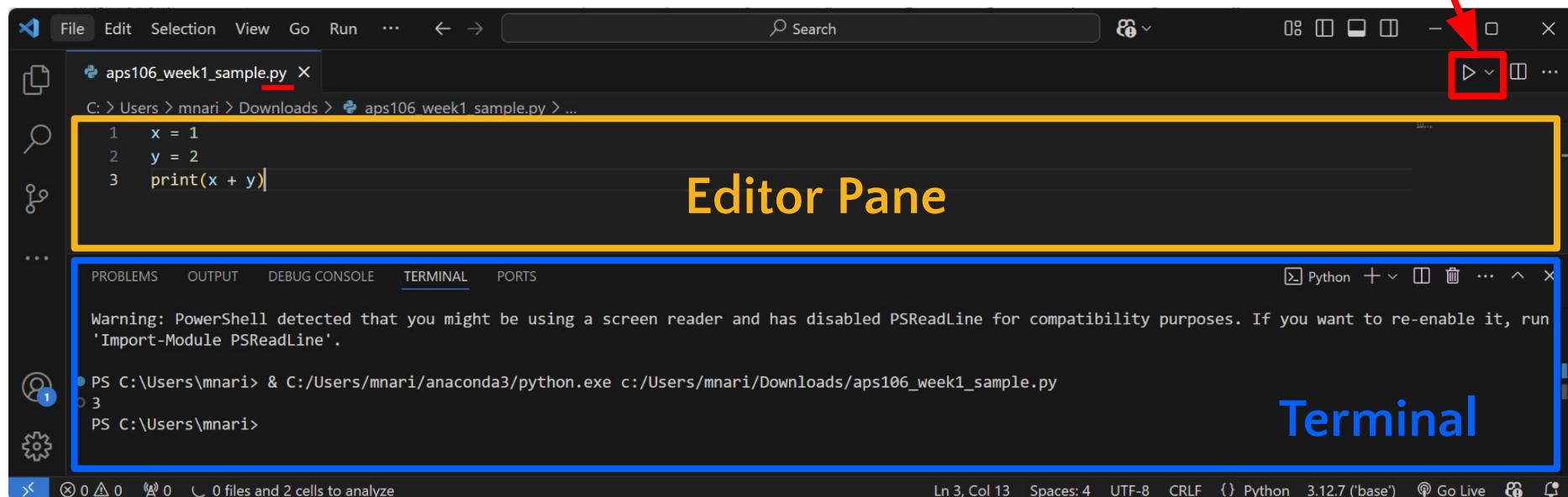
- You can create a new notebook on VS Code too!
- Steps:
  1. Launch VS Code through Anaconda Navigator
  2. In the command palette (“Search” on top), type in “> **create new jupyter notebook**” and select “Create: New Jupyter Notebook”



# VS Code (Python script)

Execute the Python script

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



The screenshot shows the VS Code interface with a Python script file open. The top bar includes File, Edit, Selection, View, Go, Run, and a search bar. The main area is divided into two panes: the **Editor Pane** (highlighted with a yellow border) containing the code:

```
1 x = 1
2 y = 2
3 print(x + y)
```

and the **Terminal** (highlighted with a blue border) showing the output of running the script:

```
PS C:\Users\mnari> & C:/Users/mnari/anaconda3/python.exe c:/Users/mnari/Downloads/aps106_week1_sample.py
3
PS C:\Users\mnari>
```

Annotations include a red arrow pointing to the `Run` button in the top bar, and a yellow box highlighting the Editor Pane.

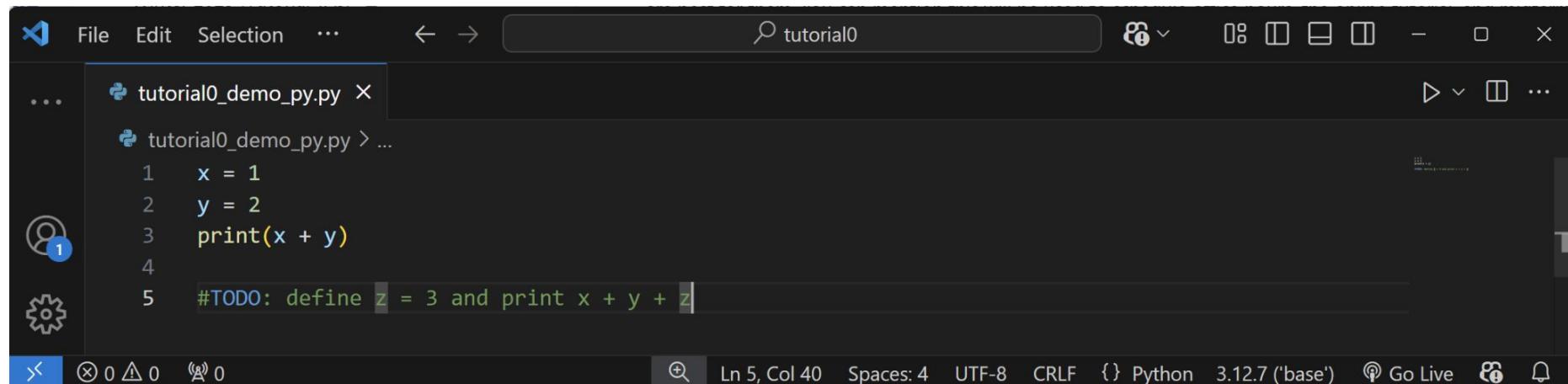
# APS106



## Coding on VS Code

# Let's practice!<sup>2</sup>

- 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



## 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
- 

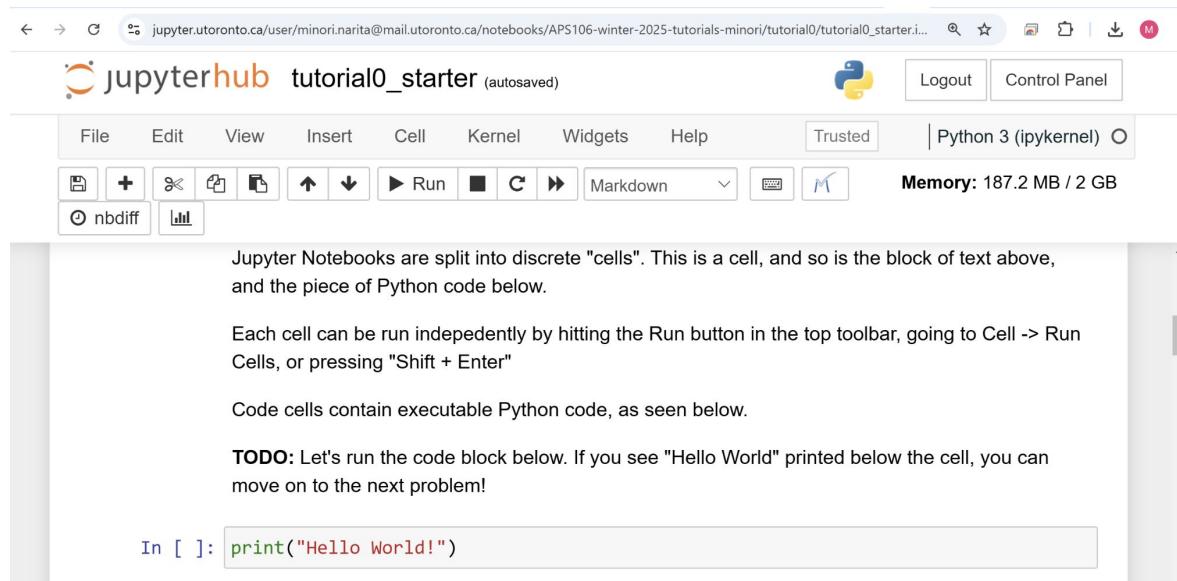
## Tutorial 0 - Setting Up A Development Environment

### Content

Section	TA	Links
TUT0101	Nazib Chowdhury	<a href="#">JupyterHub Starter Link</a> <a href="#">JupyterHub Complete Link</a> 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**



The screenshot shows a Jupyter Notebook interface with the following details:

- Title Bar:** jupyter.utoronto.ca/user/minori.narita@mail.utoronto.ca/notebooks/APS106-winter-2025-tutorials-minori/tutorial0/tutorial0\_starter.ipynb
- User Information:** Logout, Control Panel
- Toolbar:** File, Edit, View, Insert, Cell, Kernel, Widgets, Help, Trusted, Python 3 (ipykernel)
- Cell Buttons:** Run, Cell, Kernel, Widgets, Help, Trusted, Python 3 (ipykernel)
- Memory Status:** Memory: 187.2 MB / 2 GB
- Notebook Content:**
  - A text cell explaining that Jupyter Notebooks are split into discrete "cells".
  - An instruction on how to run a cell.
  - A statement about code cells containing executable Python code.
  - A **TODO** item asking to run a code block and move on if successful.
- In-Cell Input:** 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!**