

# APS106



## Tutorial 0 - 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



**Amirhossein Babaei Ravandi**

(TUT06, TUT09)

**Current studies:** Postdoctoral Fellow

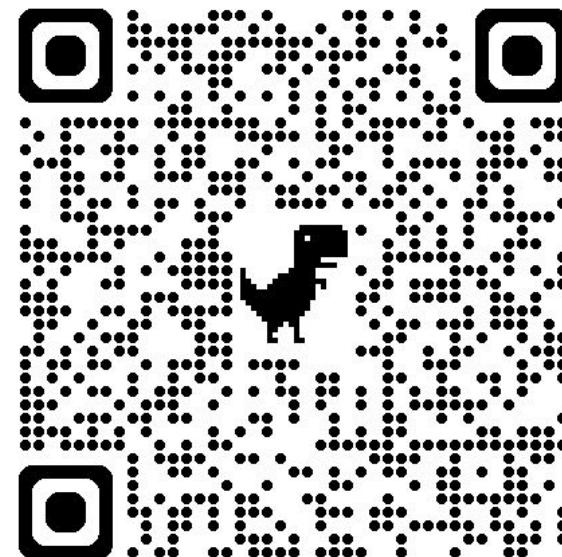
**Research/other interests:** Agentic AI – Data Management / Violin, Camping

# 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

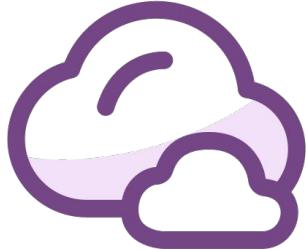
# Online Tutorials/Office Hours Survey

- URL - <https://forms.gle/s8VTXuMrVezatbQU7>





What is one boring task in your life you wish  
a robot could do for you?



# What is one boring task in your life you wish a robot could do for you?

# 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?

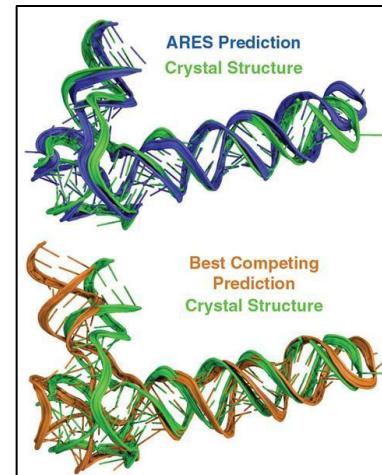
Sure! Here are the detailed steps to install Anaconda on your MacBook:

**Step 1: Download Anaconda**

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

Message ChatGPT

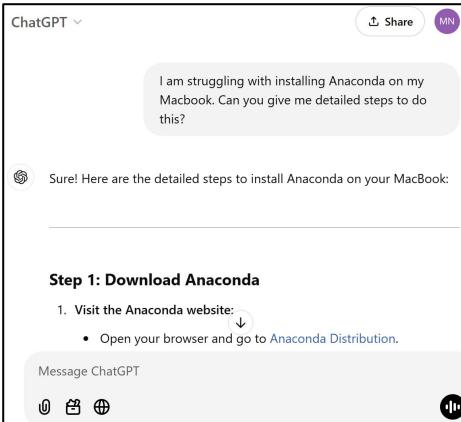
0 1 0



Source: © Townshend et al, 2021 Science

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

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



ChatGPT

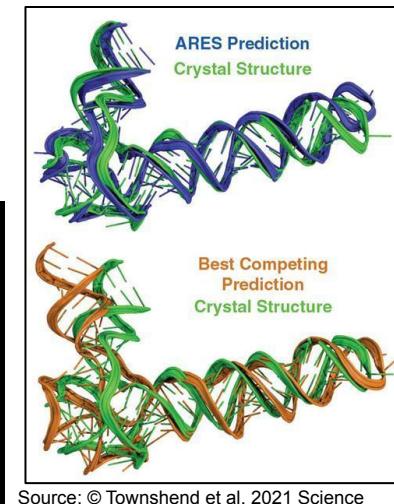
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Message ChatGPT



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

- ***"Coding is the closest thing we have to a superpower!"*** – Drew Houston, Dropbox Co-founder
  - Coding empowers you to solve real-world problems creatively.
  - Code is the driving force behind technological innovations.
  - Coding opens doors to a plethora of career opportunities.
  - Every line of code is a step towards building solutions that make a difference.



- Images Created by DALL-E, an AI Image Generation Model developed by OpenAI

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

- Real-World Examples
- Ever wondered how Netflix suggests movies you might like?
- Coding and algorithms enable early disease detection, enhance diagnostic accuracy, and save lives.
- Virtual Reality (VR) and Augmented Reality (AR) experiences are crafted through intricate code, with gaming, simulation, and immersive experiences depending on the skills of programmers.

AI-generated (DALL-E)



Source



Source

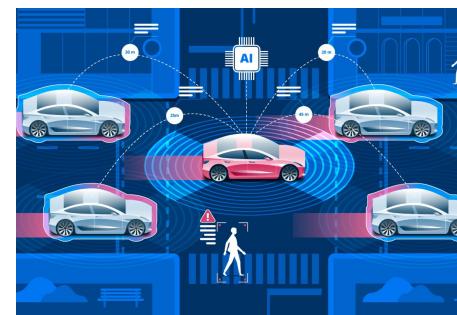


# Why code?<sup>2</sup>

- Space agencies, such as NASA, heavily depend on coding for space exploration missions (spacecraft navigation, data analysis, etc.).
- Autonomous vehicles use image recognition for safe navigation, as cameras capture real-time surroundings and algorithms identify objects, pedestrians, and other vehicles on the road.
- Regardless of background, coding is always an achievable skill
- NEVER THINK THAT YOU “CAN’T UNDERSTAND” CODING



Source



Source

*“Programming isn’t about what you know; it’s about what you can figure out.” - Chris Pine, Learn to Program*



What would you want to ideally  
learn how to do with computers?

slido



**What would you want to  
ideally learn how to do with  
computers?**

- ⓘ 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.

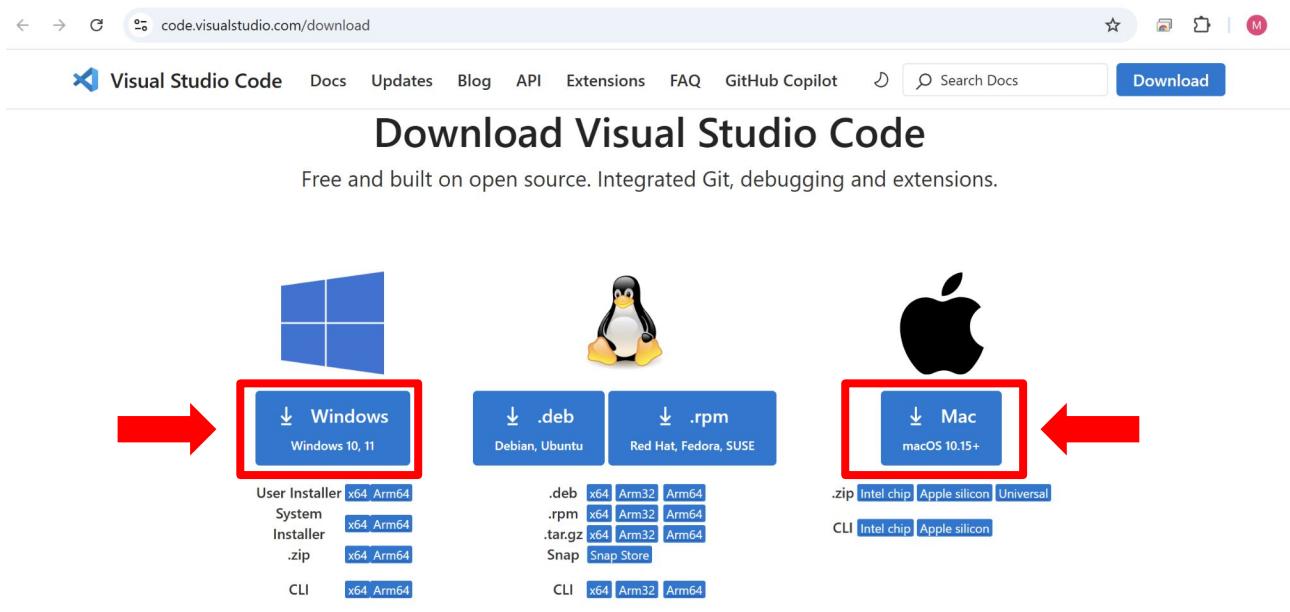
# APS106



## Install VS Code

# 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 main download section, there are smaller links for alternative formats like User Installer, System Installer, .zip, CLI, and various package formats (.deb, .rpm, .tar.gz, Snap) along with their supported architectures (x64, Arm64, etc.).

# Install VS Code<sup>2</sup> (Windows)

- Open the .exe file and install VS Code
- **Important:** Accept all default settings.

# 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

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# APS106



## Install Anaconda Navigator

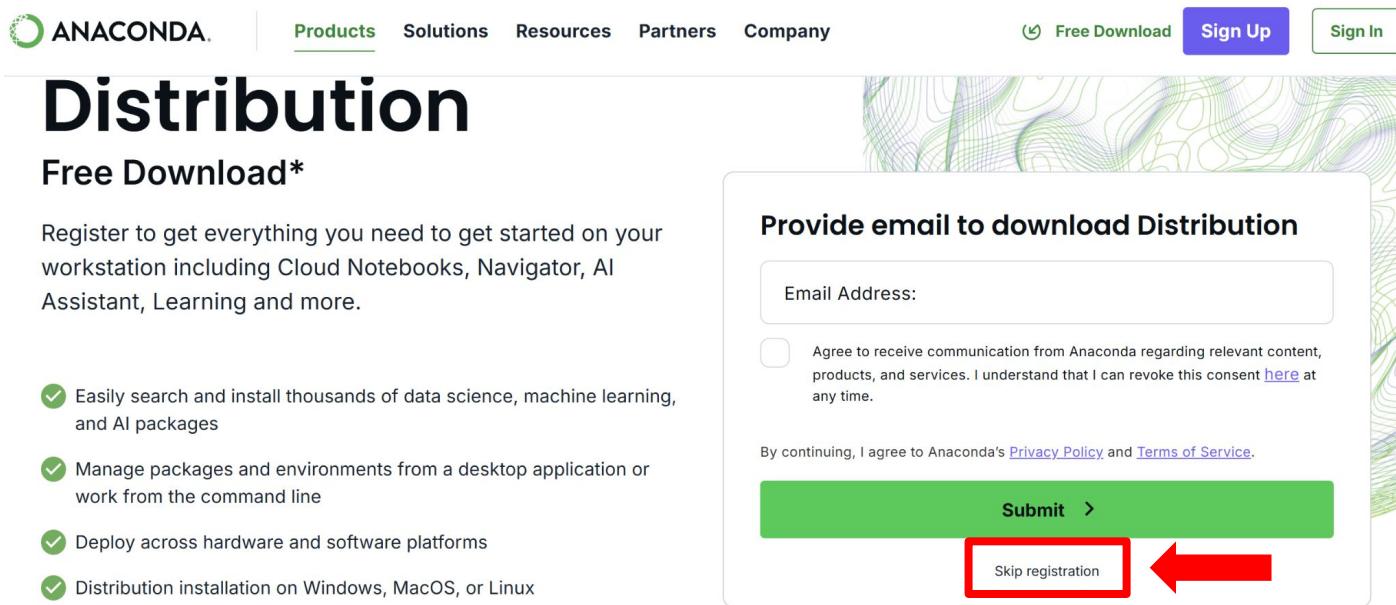
# Anaconda

- 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](#).



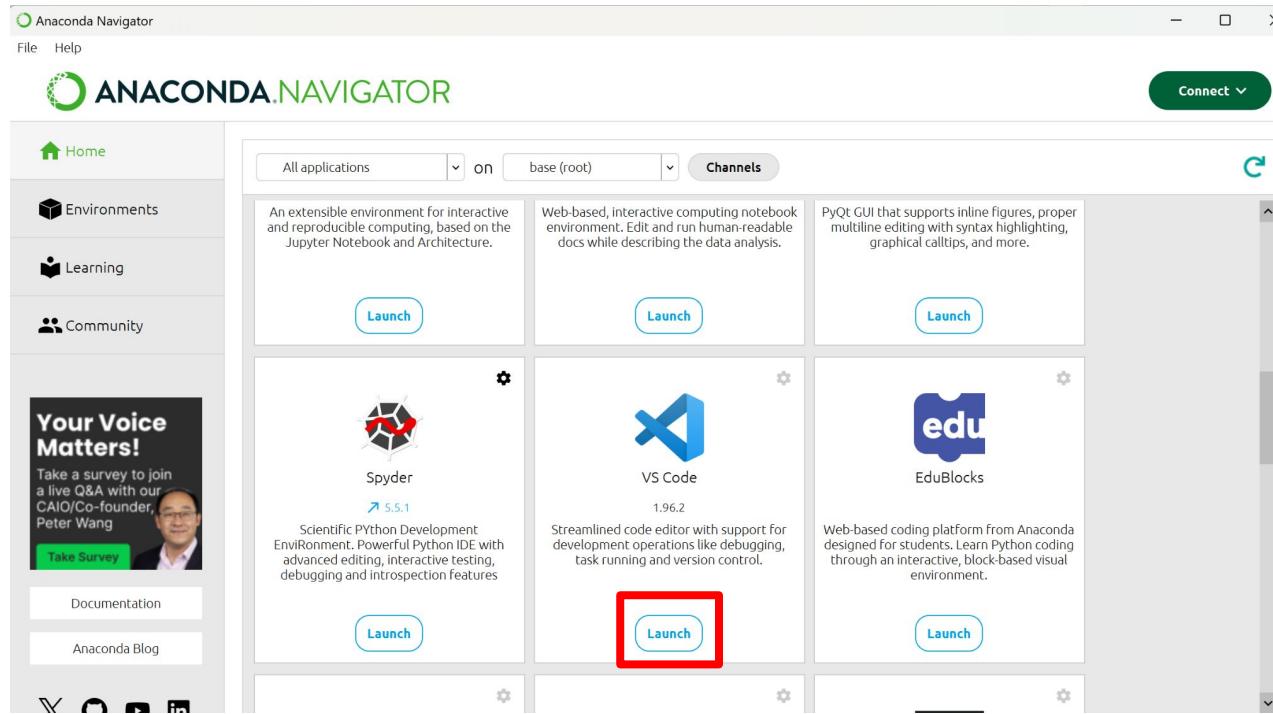
### Anaconda Installers

 Download



# Anaconda Navigator

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



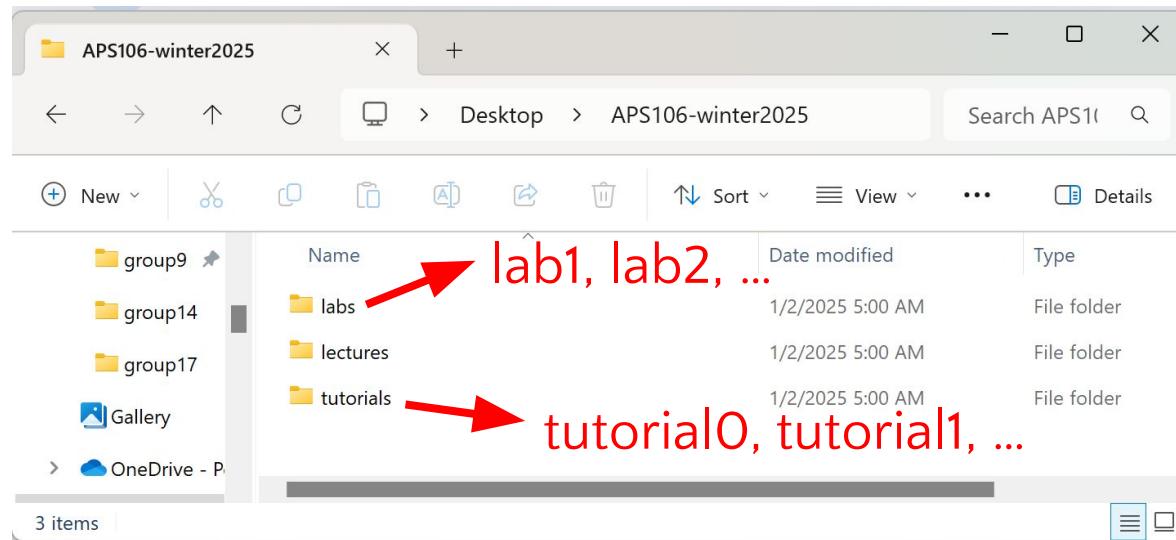
# APS106



## Set up a Folder Structure for APS106

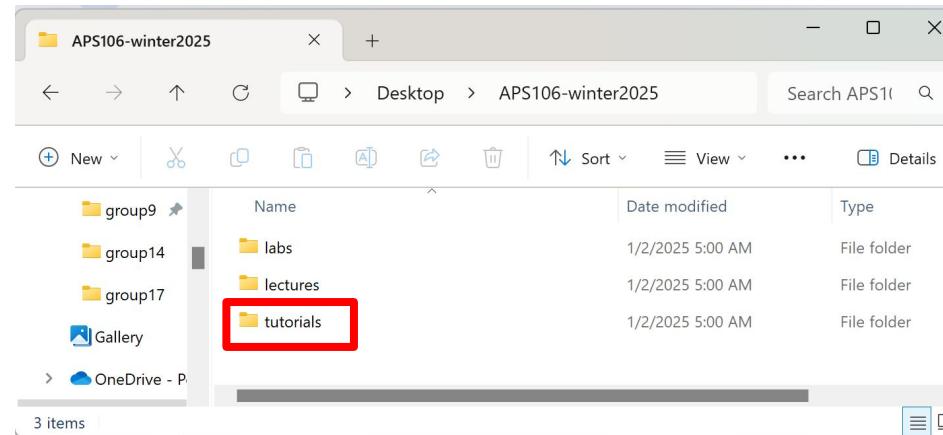
# Stay Organized, Stay Efficient

- 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



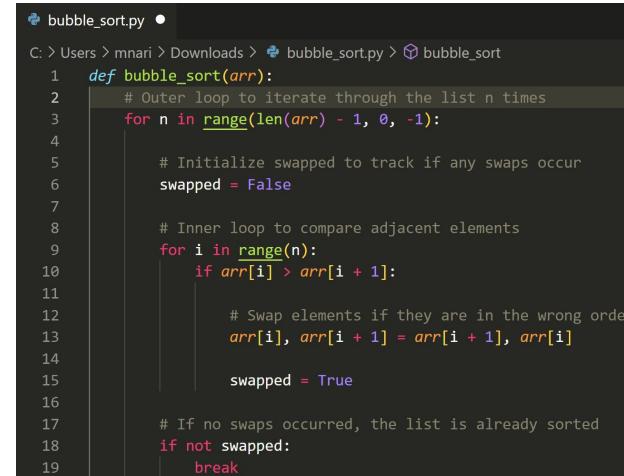
## VSCode/Jupyter Notebook

# VSCode is an IDE

- Integrated Development Environments (IDEs) are programs that provides tools and features to programmers in a unified environment. Think of them as "smart" text editors specifically designed for writing code
- 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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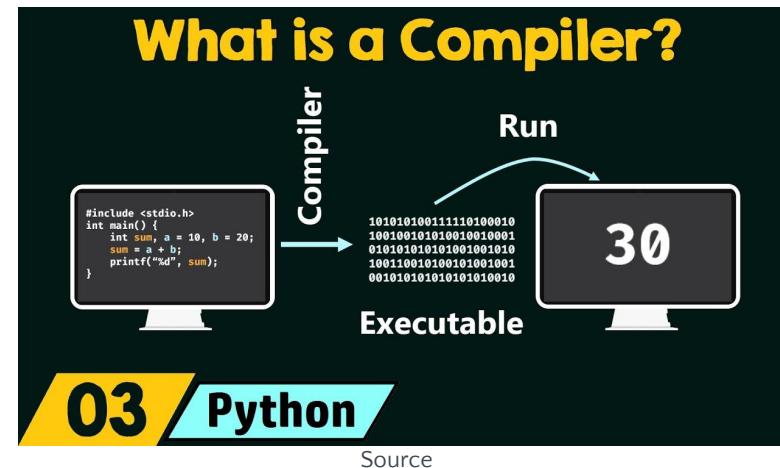


A screenshot of the Visual Studio Code (VSCode) interface. The title bar shows the file name "bubble\_sort.py". The code editor displays a Python script for performing bubble sort on a list. The code uses color-coded syntax highlighting where keywords like "def", "for", and "if" are in blue, and variable 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

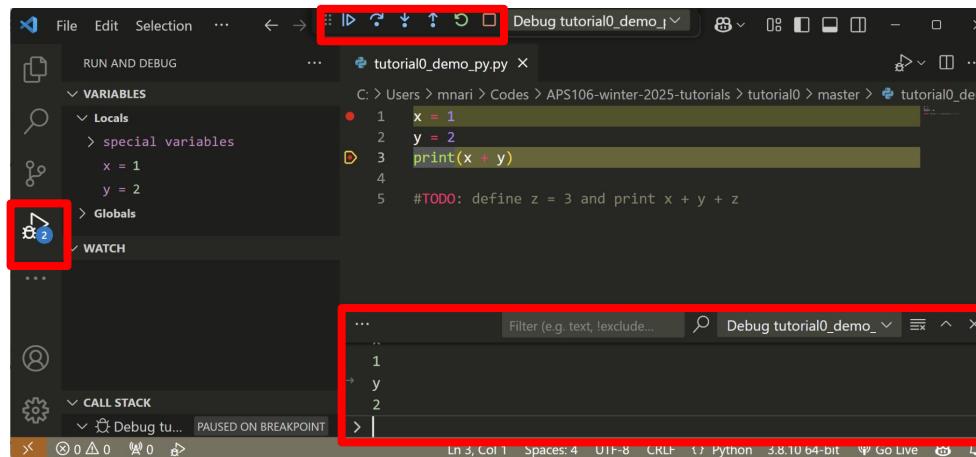
- Integrated Development Environments (IDEs) are programs that provides tools and features to programmers in a unified environment
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  - **Code compilers or interpreters**
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# VSCODE is an IDE

- 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 (left sidebar):** Shows variables (Locals and Globals), a call stack, and a debug toolbar icon (highlighted with a red box). The toolbar includes icons for run, stop, step over, step in, and step out.
- Code editor:** Displays a Python script named `tutorial0_demo.py.py`. The code contains:

```
1 x = 1
2 y = 2
3 print(x + y)
4
5 #TODO: define z = 3 and print x + y + z
```
- Breakpoints:** A red dot indicates a breakpoint at line 1.
- Debug console (bottom right):** Shows the output of the current session, including variable values `x`, `y`, and `z`.
- Status bar:** Shows file path, line, column, and encoding information.

Run and Debug

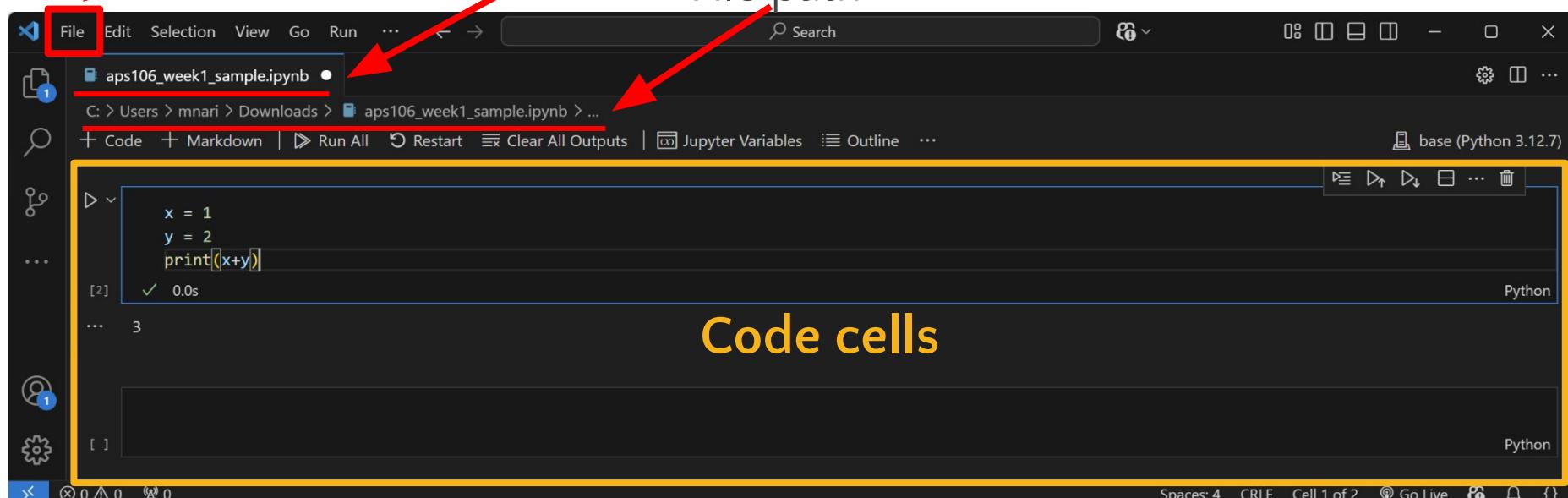
Debug console

# VS Code (Jupyter Notebook)

Open/Save files

Filename

File path

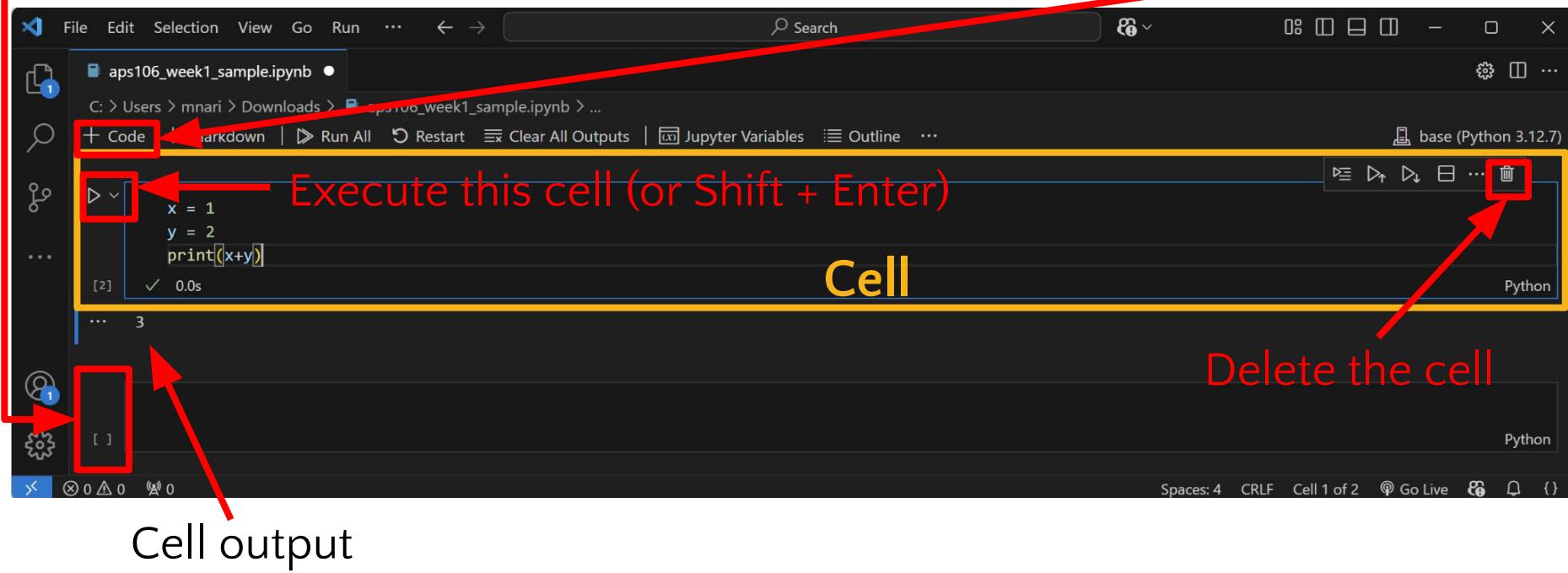


# VS Code (Jupyter Notebook)

(drag&drop or Alt + ↑ /Alt + ↓ )

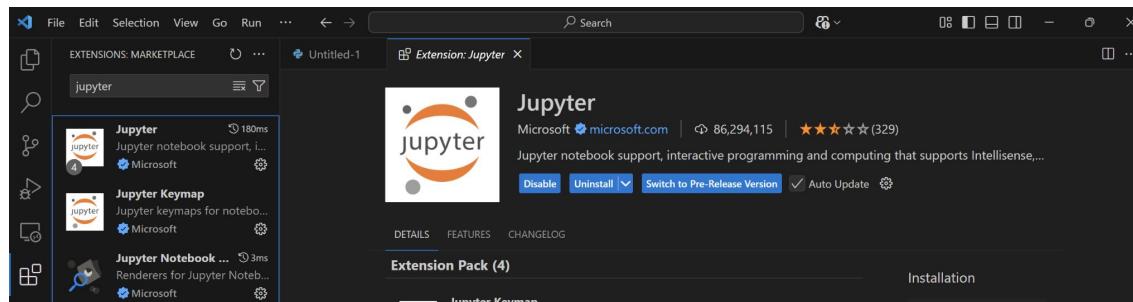
Move up/down the cell

Create a new cell under the current one



# VS Code (Jupyter Notebook)

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



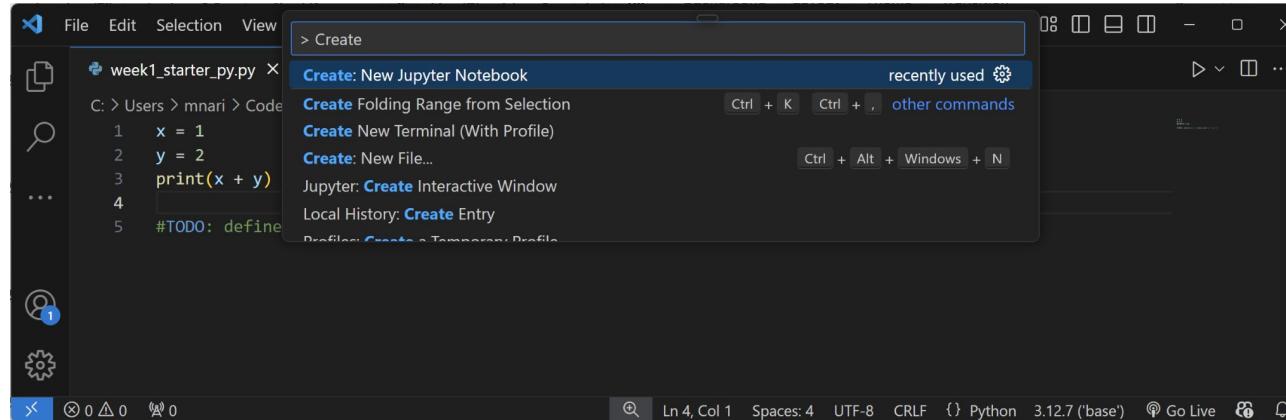
# Let's practice!<sup>1</sup>

- 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

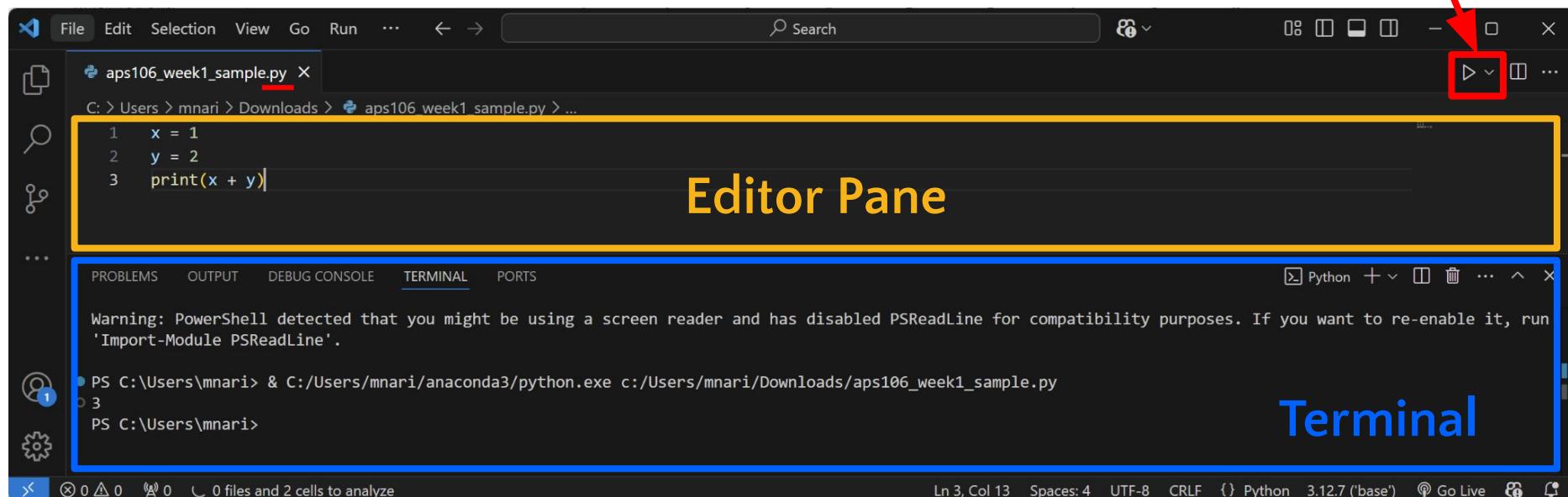
- You can create a new notebook on VS Code too!
- Steps:
  1. Launch VS Code through Anaconda Navigator
  2. In the command palette (“Search” on top), type in “> **create new jupyter notebook**” and select “Create: New Jupyter Notebook”



# 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** pane (highlighted with a blue border) showing the output of running the script:

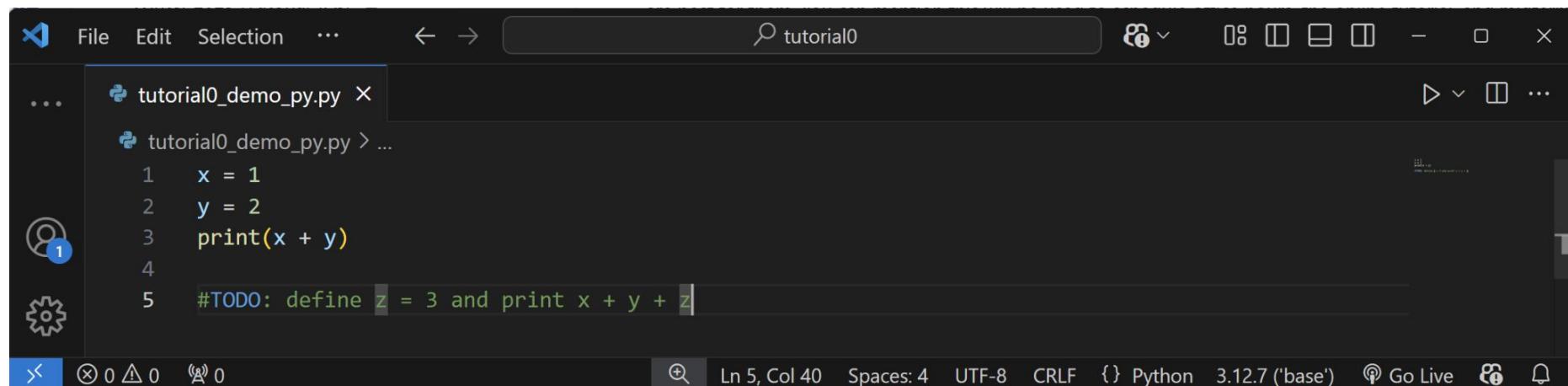
```
Warning: PowerShell detected that you might be using a screen reader and has disabled PSReadLine for compatibility purposes. If you want to re-enable it, run 'Import-Module PSReadLine'.
```

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

The bottom status bar indicates 0 files and 2 cells to analyze, and the terminal settings are set to Python 3.12.7 ('base'). A red arrow points to the 'Run' button in the top right of the Editor pane.

# 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 ⚙

# 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!**

# APS106



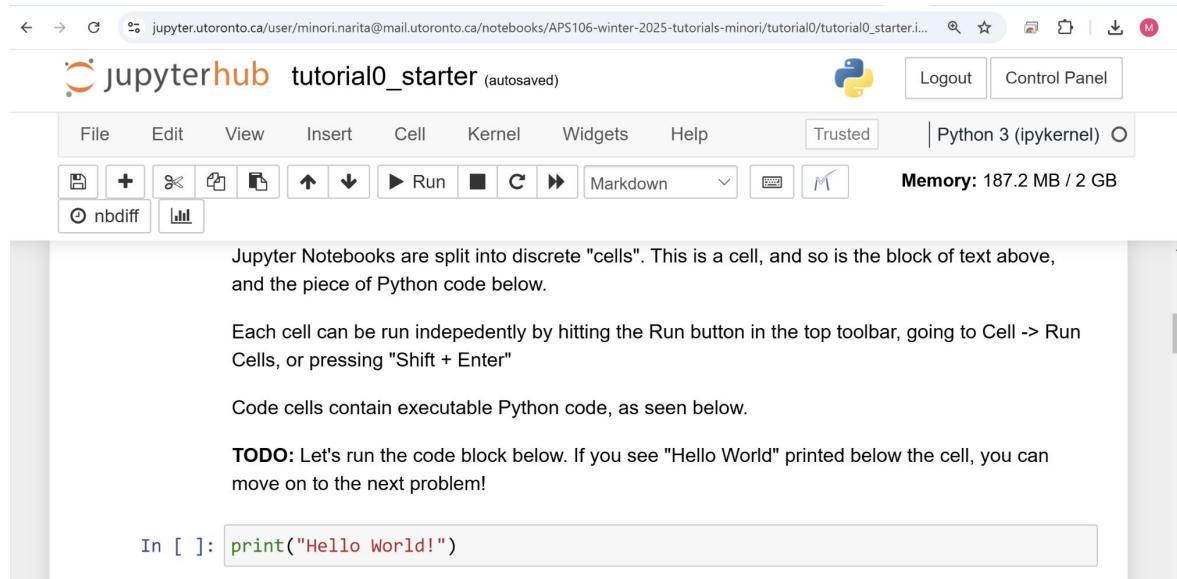
## UofT JupyterHub

# 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!

# 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!")

# Troubleshooting

Reference: If VS Code does not appear in Anaconda.

# 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]

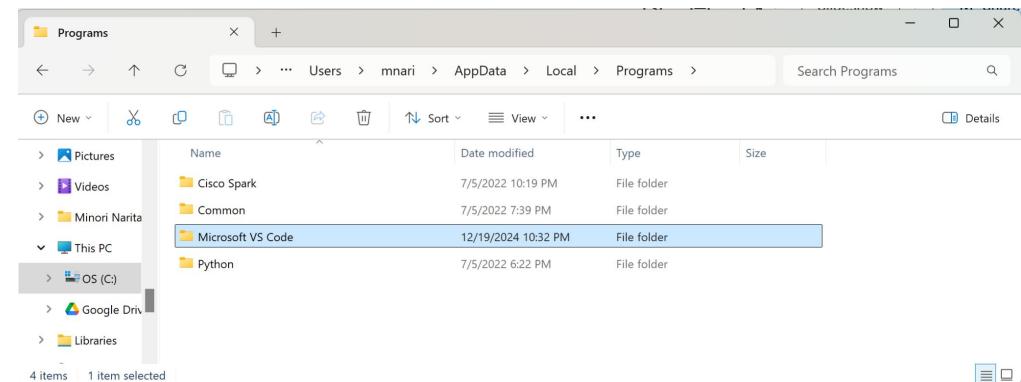
**vscode\_enable = True**

[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)



# Install VS Code<sup>2</sup> (Windows)

- Open the .exe file (e.g., VSCodeUserSetup-x64-1.96.2.exe) and install VS Code
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**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)

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**