Introduction to Data Science Lab
Fall 2025
Lab 01 – Week 01

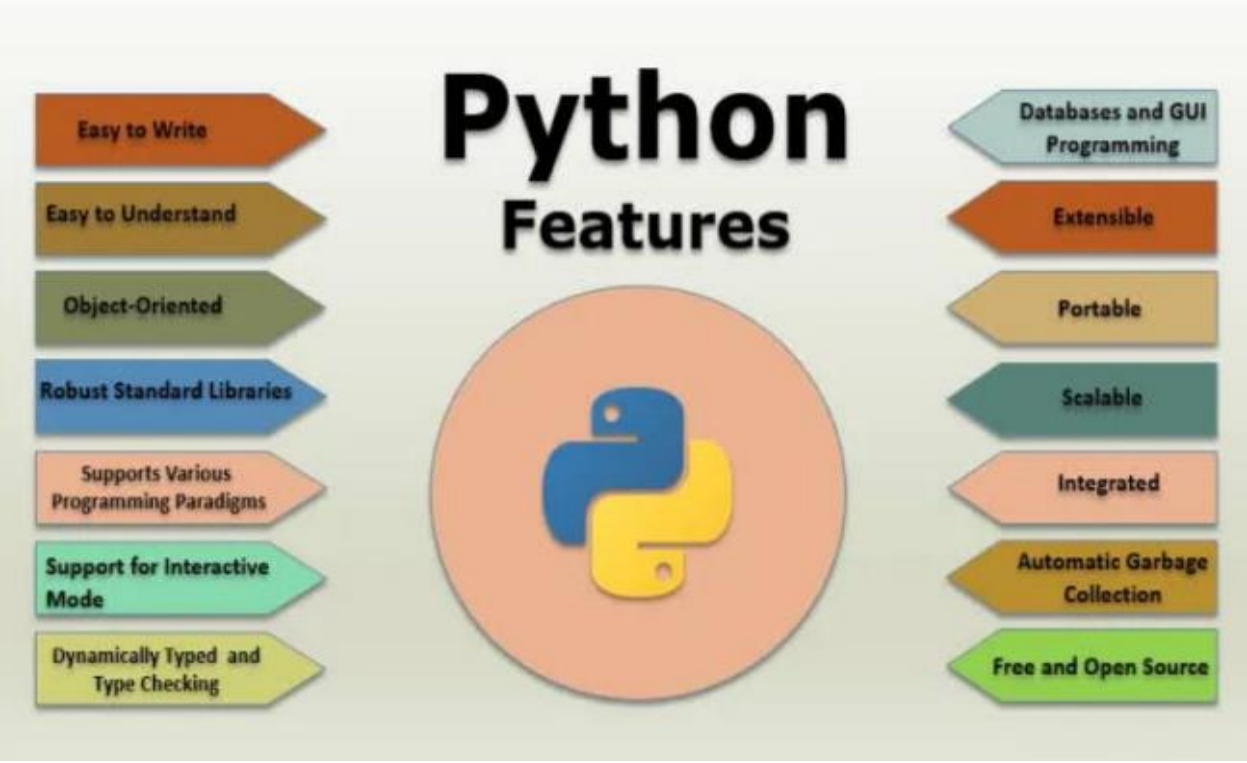
Basic Python Programming

Python Overview

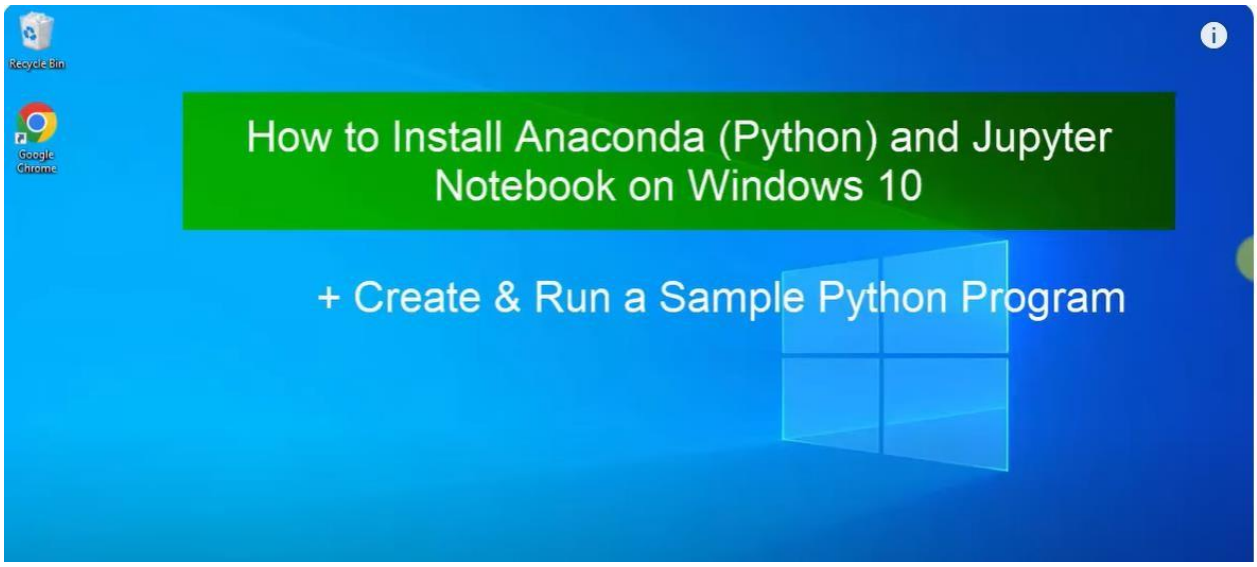
Python is a high-level, interpreted, and general-purpose programming language known for its simplicity and readability. It is dynamically typed, cross-platform, and supports both object-oriented and procedural programming. Python is widely used in web development, data science, artificial intelligence, automation, game development, and more due to its extensive libraries and frameworks like Django, Flask, Pandas, and TensorFlow. Its easy-to-understand syntax makes it beginner-friendly, while its power and versatility make it popular among professionals.

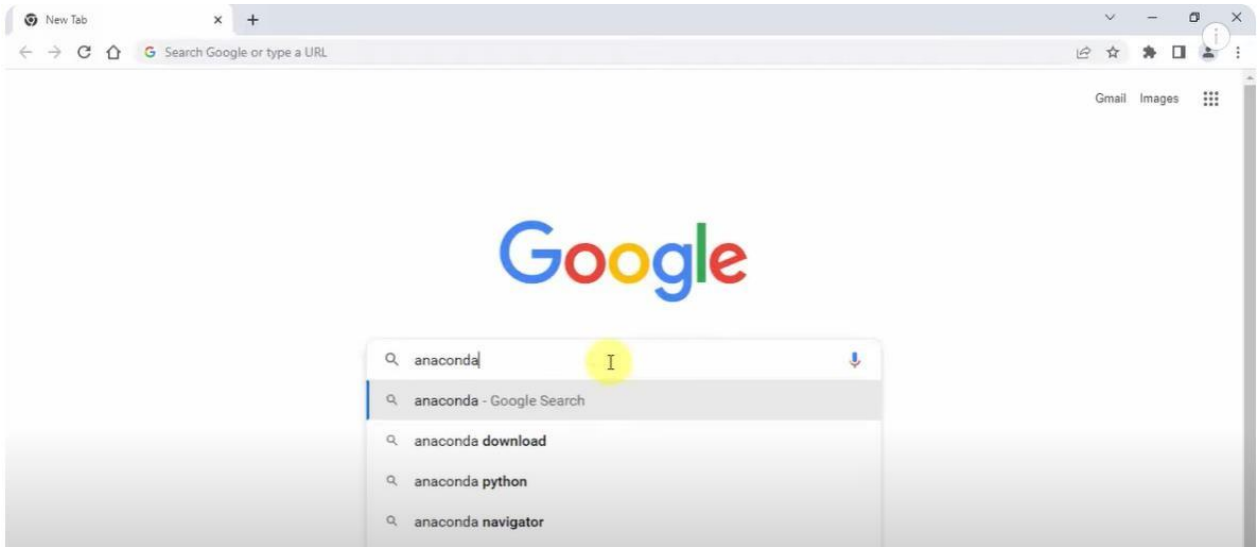
Python can be done in three ways:

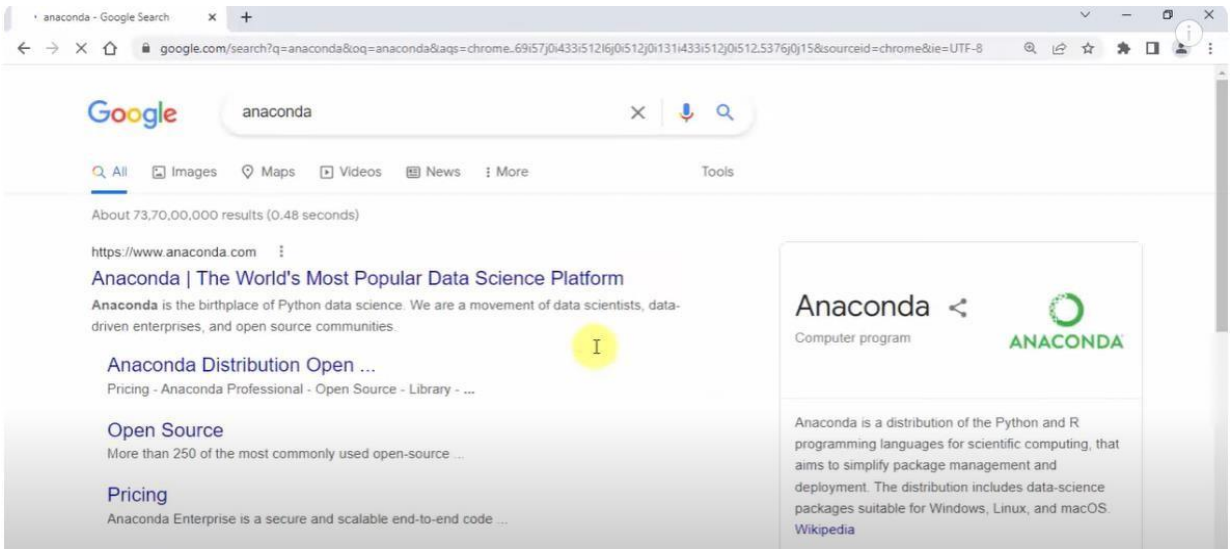
i. Immediate mode (Using Command Prompt)
ii. Script mode (using notepad and command prompt)
iii. IDE (Integrated Development Environment)
iv. For example: using Anaconda (Jupyter Notebook)

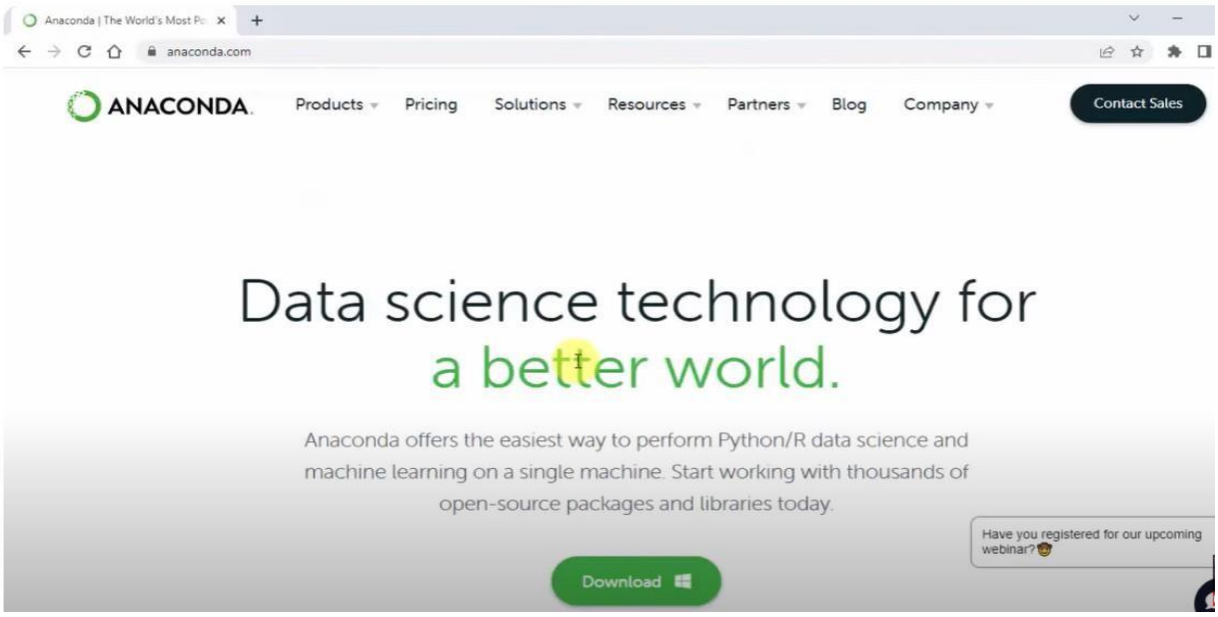


IDE Installation: Anaconda





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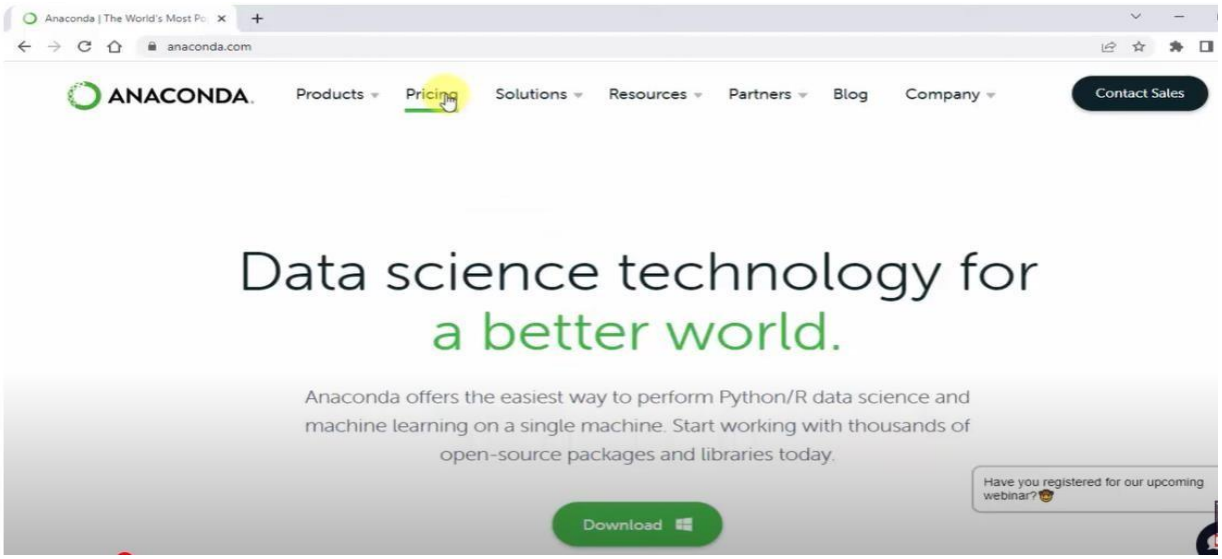
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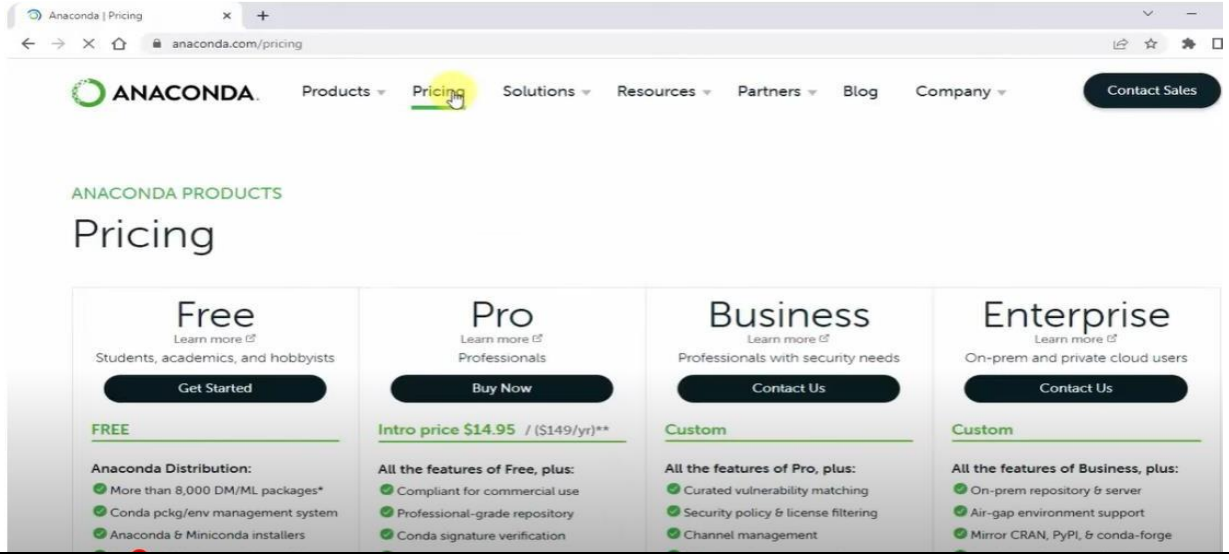
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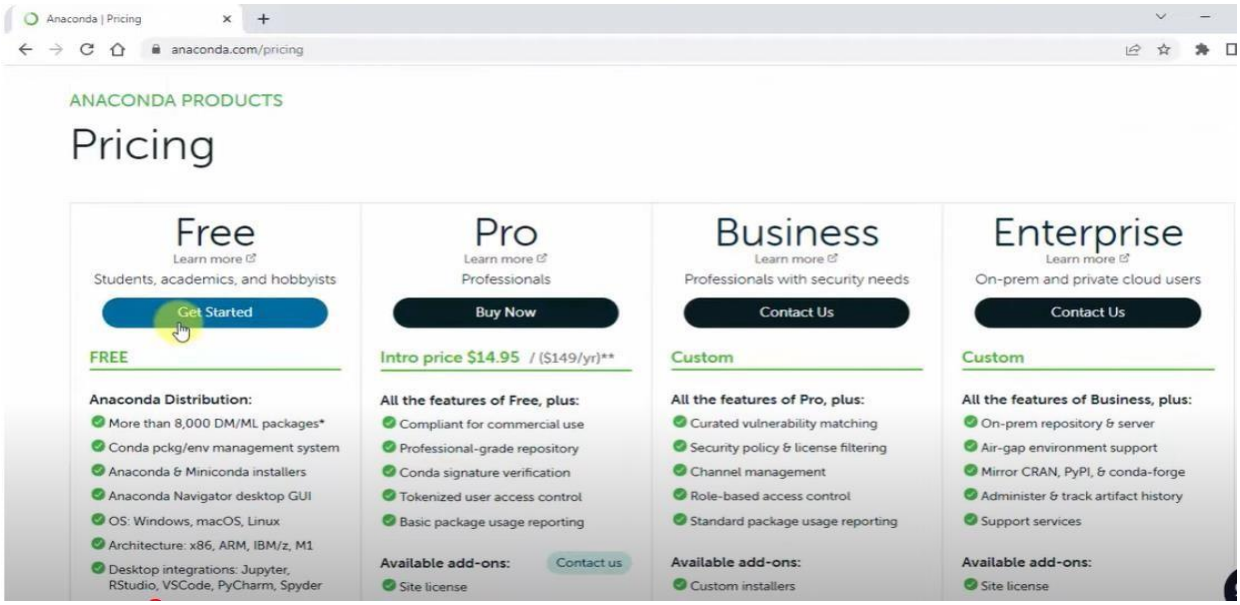
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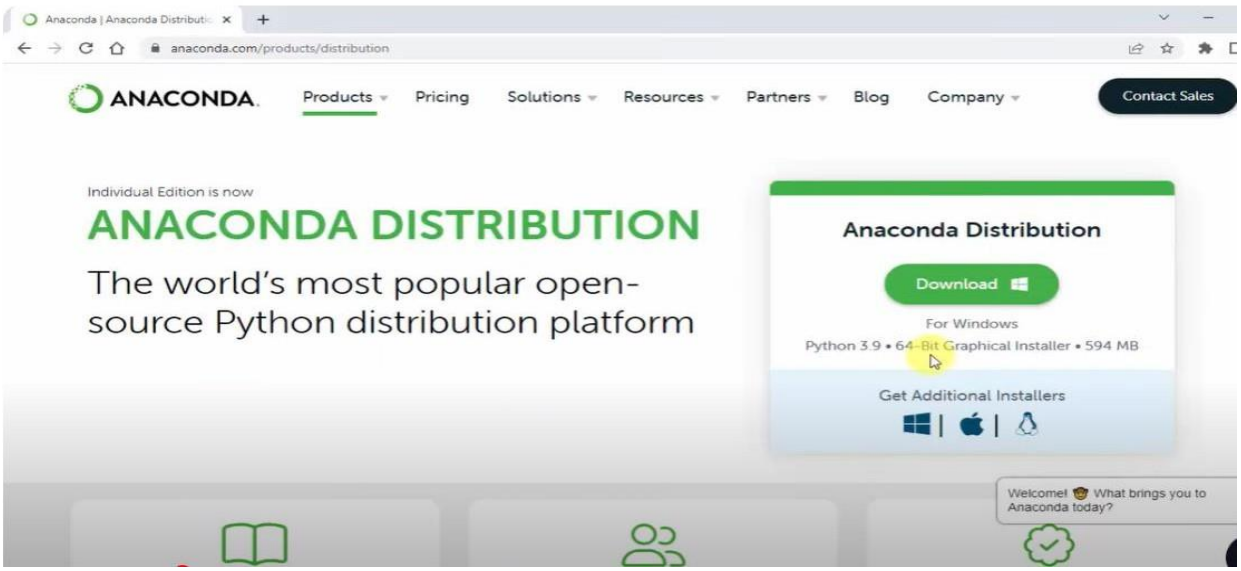
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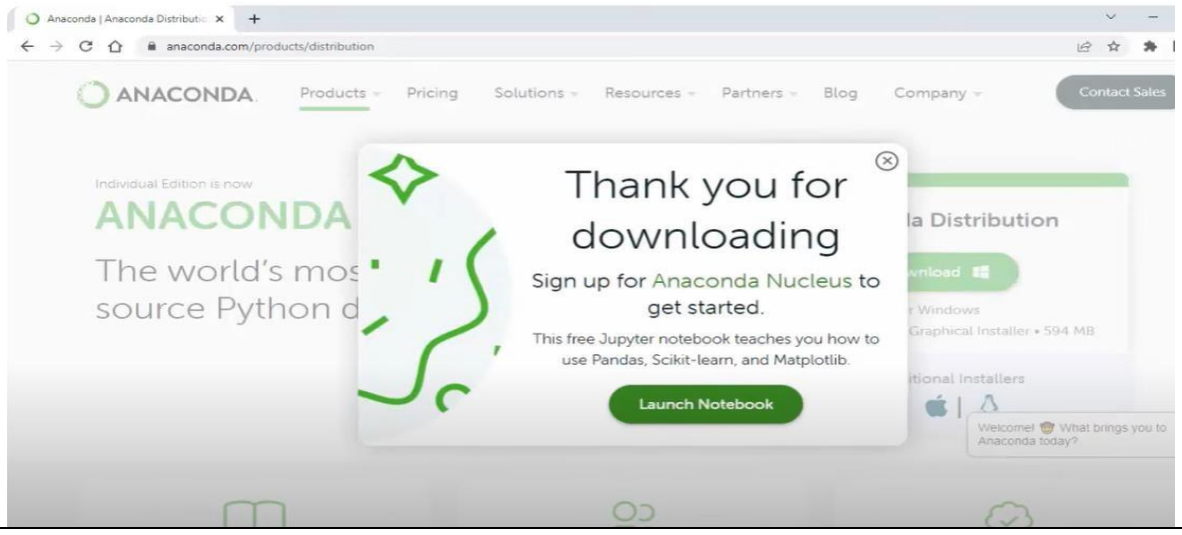
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Sign up for Anaconda Nucleus to get started.
This free Jupyter notebook teaches you how to use Pandas, Scikit-learn, and Matplotlib.
Launch Notebook
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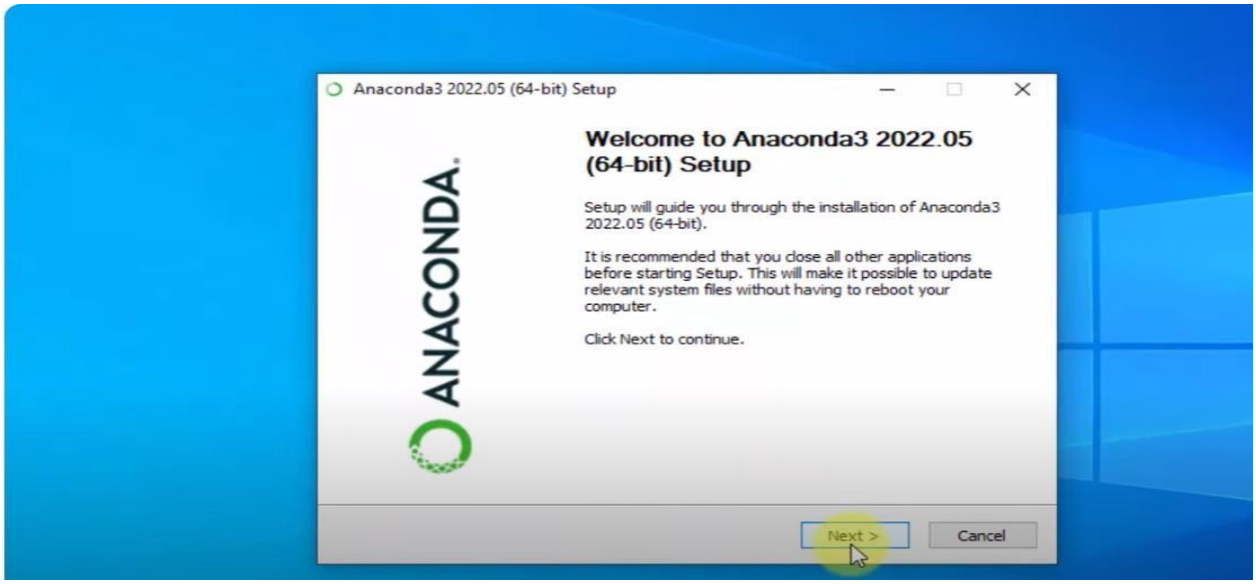
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Welcome to Anaconda3 2022.05 (64-bit) Setup
Setup will guide you through the installation of Anaconda3 2022.05 (64-bit).
It is recommended that you close all other applications before starting Setup. This will make it possible to update relevant system files without having to reboot your computer.
Click Next to continue.
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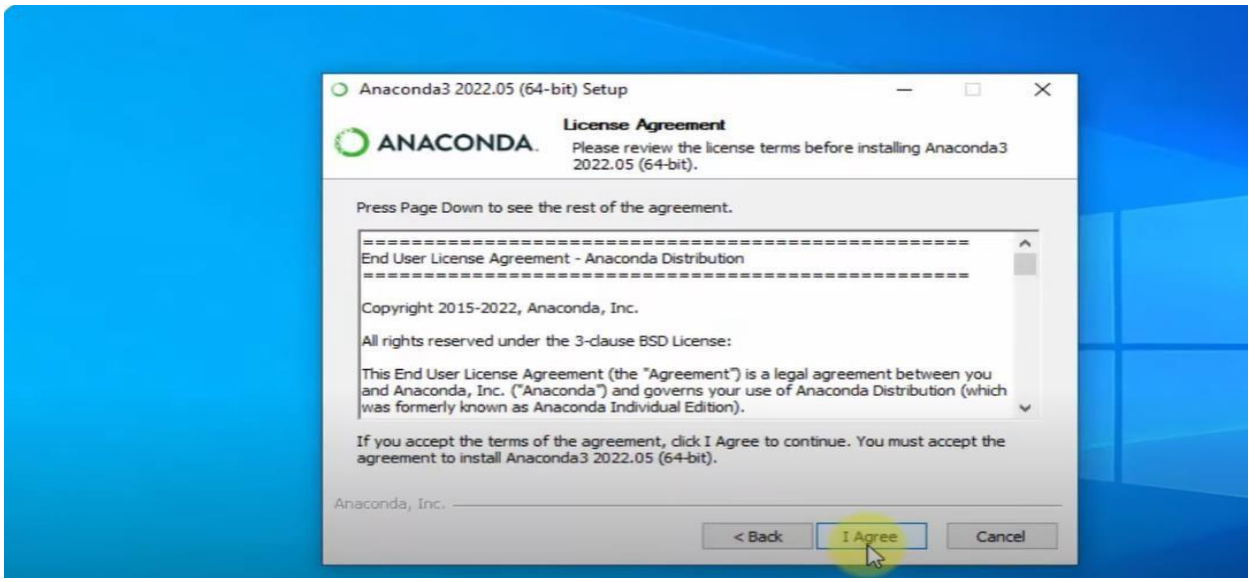
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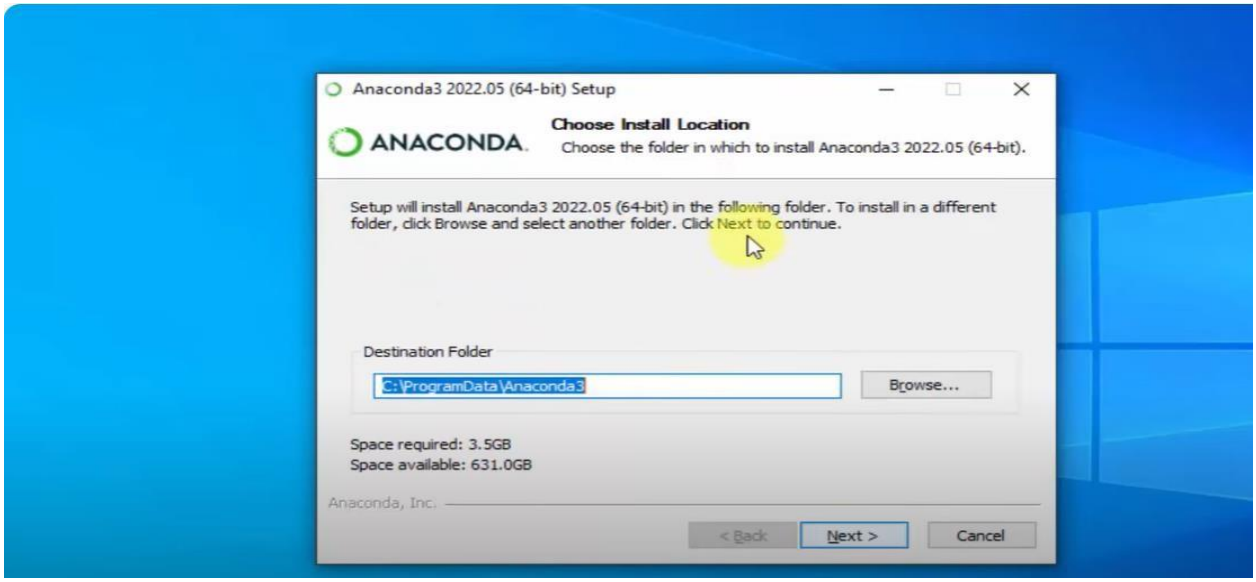
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Choose Install Location
Choose the folder in which to install Anaconda3 2022.05 (64-bit).
Setup will install Anaconda3 2022.05 (64-bit) in the following folder. To install in a different folder, click Browse and select another folder. Click Next to continue.
Destination Folder
C:\ProgramData\Anaconda3
Browse...
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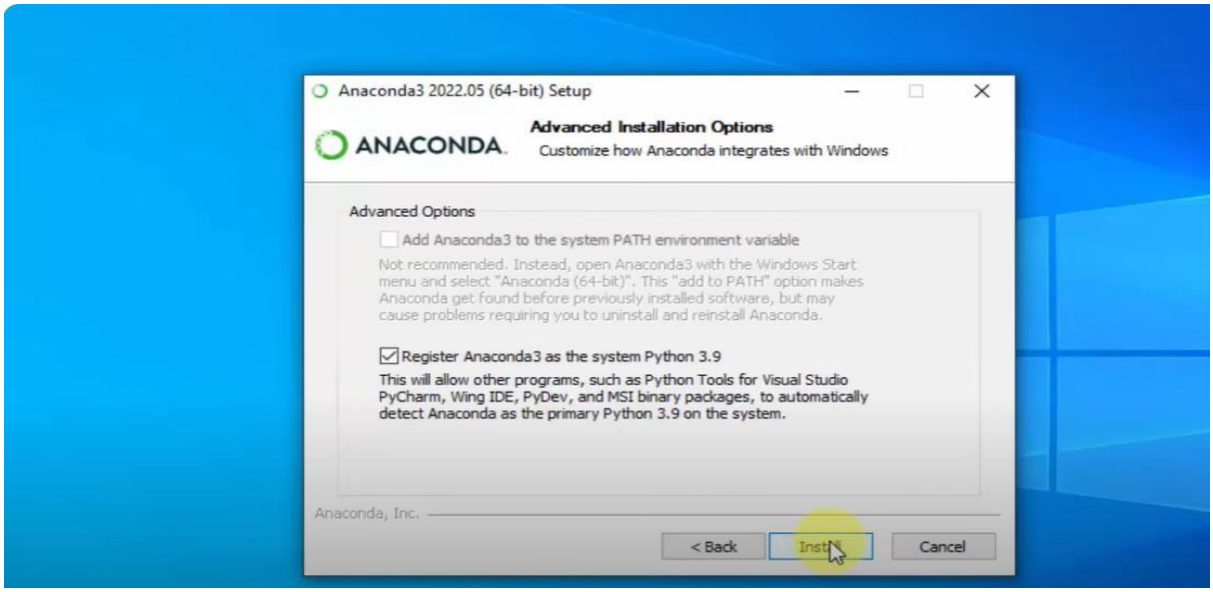
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Advanced Installation Options
Customize how Anaconda integrates with Windows
Advanced Options
Add Anaconda3 to the system PATH environment variable
Not recommended. Instead, open Anaconda3 with the Windows Start menu and select "Anaconda (64-bit)". This "add to PATH" option makes Anaconda get found before previously installed software, but may cause problems requiring you to uninstall and reinstall Anaconda.
Register Anaconda3 as the system Python 3.9
This will allow other programs, such as Python Tools for Visual Studio PyCharm, Wing IDE, PyDev, and MSI binary packages, to automatically detect Anaconda as the primary Python 3.9 on the system.
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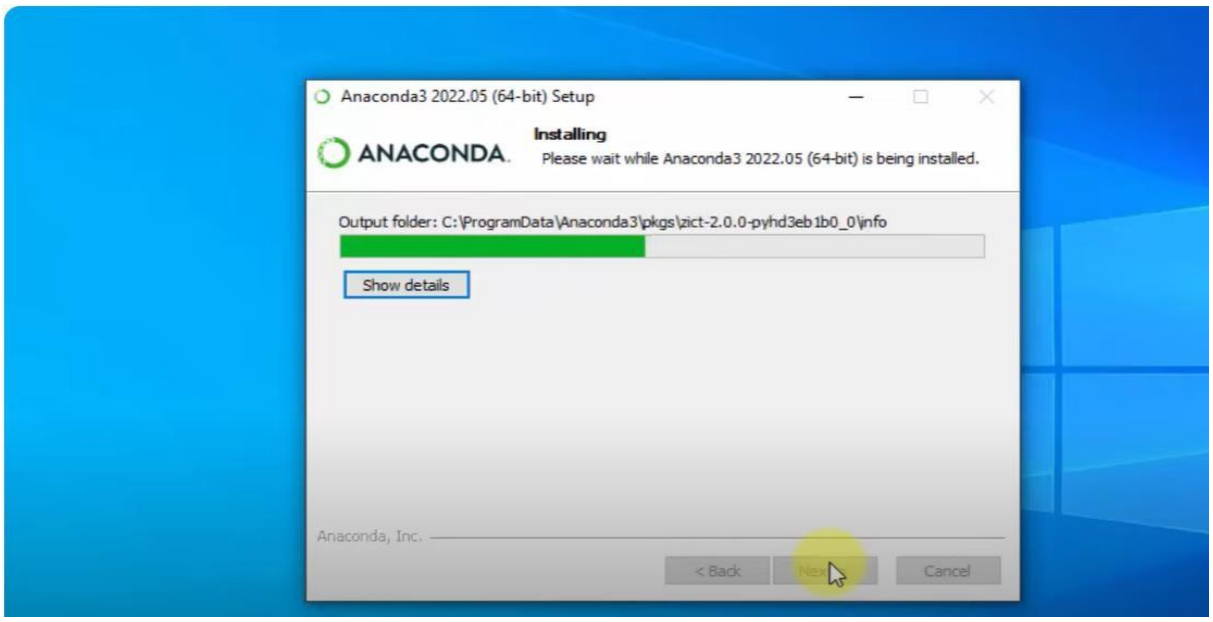
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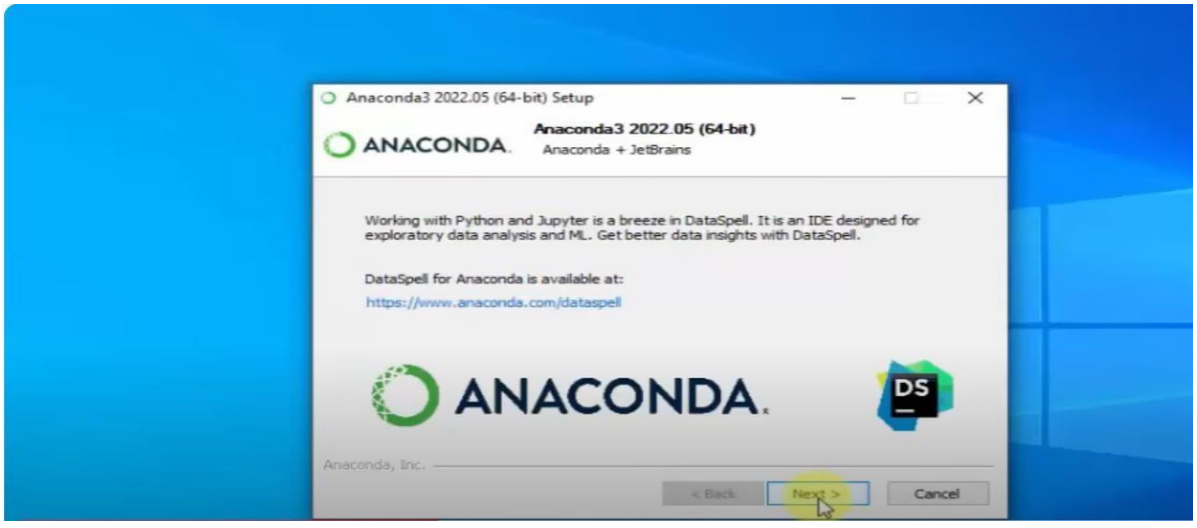
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Anaconda3 2022.05 (64-bit) Setup
Completing Anaconda3 2022.05 (64-bit) Setup
Thank you for installing Anaconda Distribution.
Here are some helpful tips and resources to get you started. We recommend you bookmark these links so you can refer back to them later.
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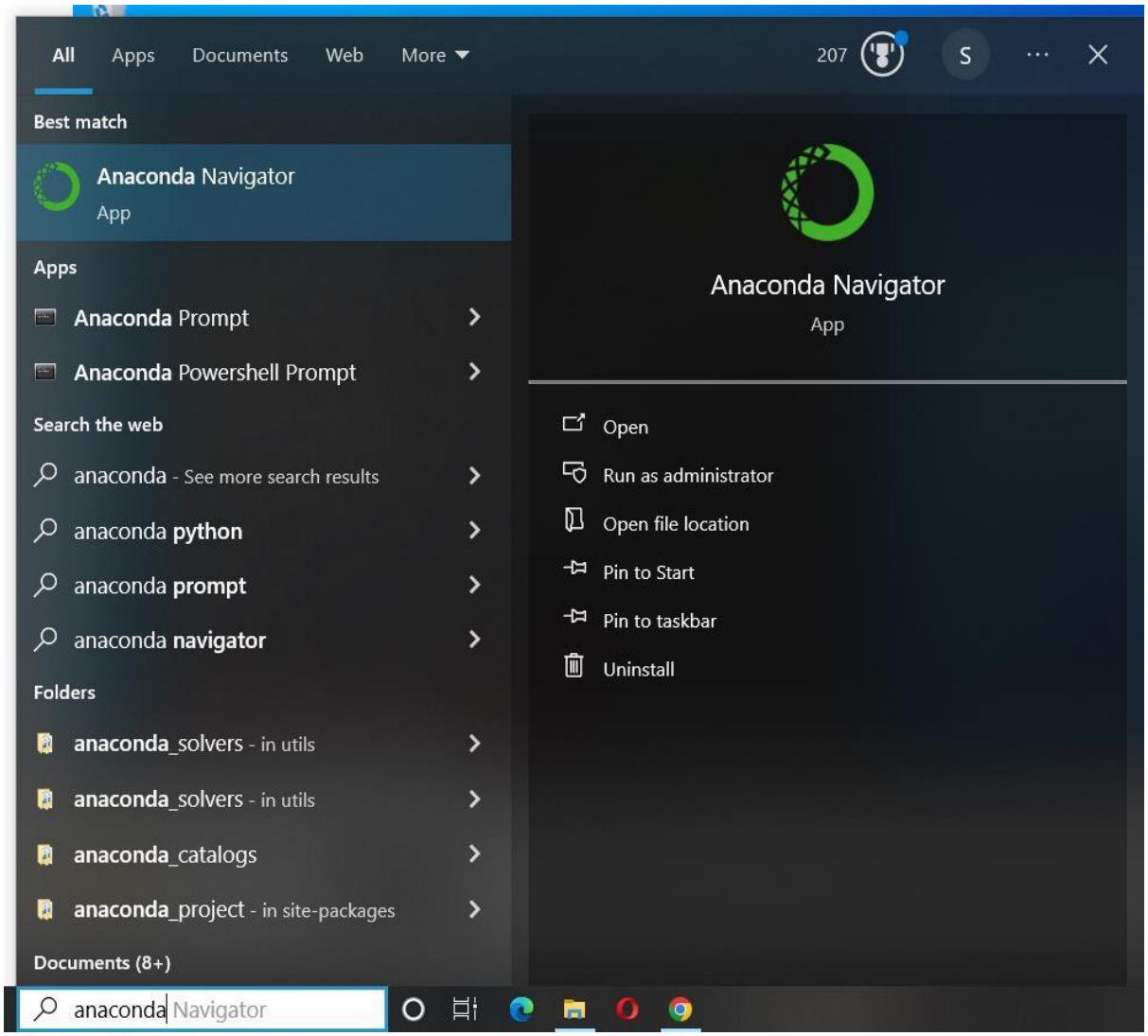
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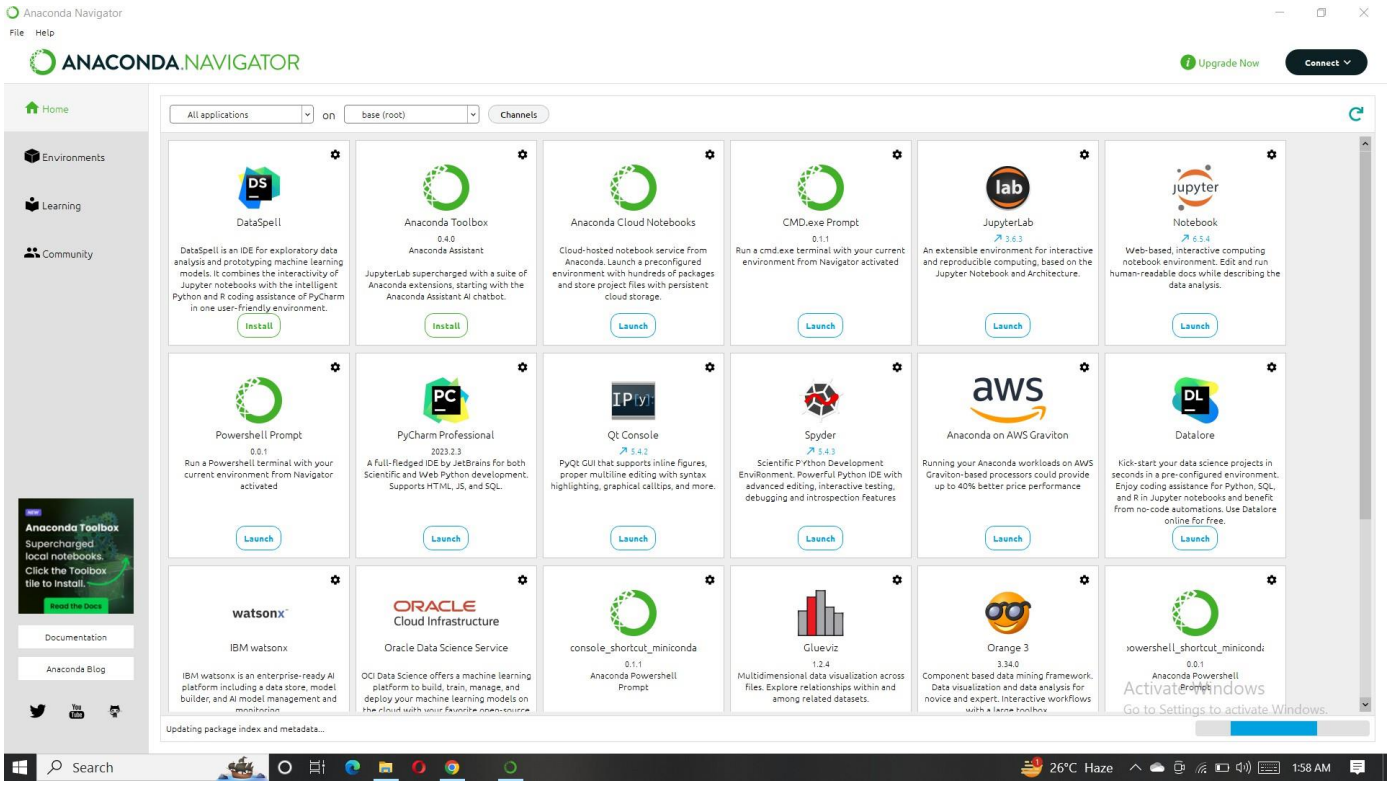
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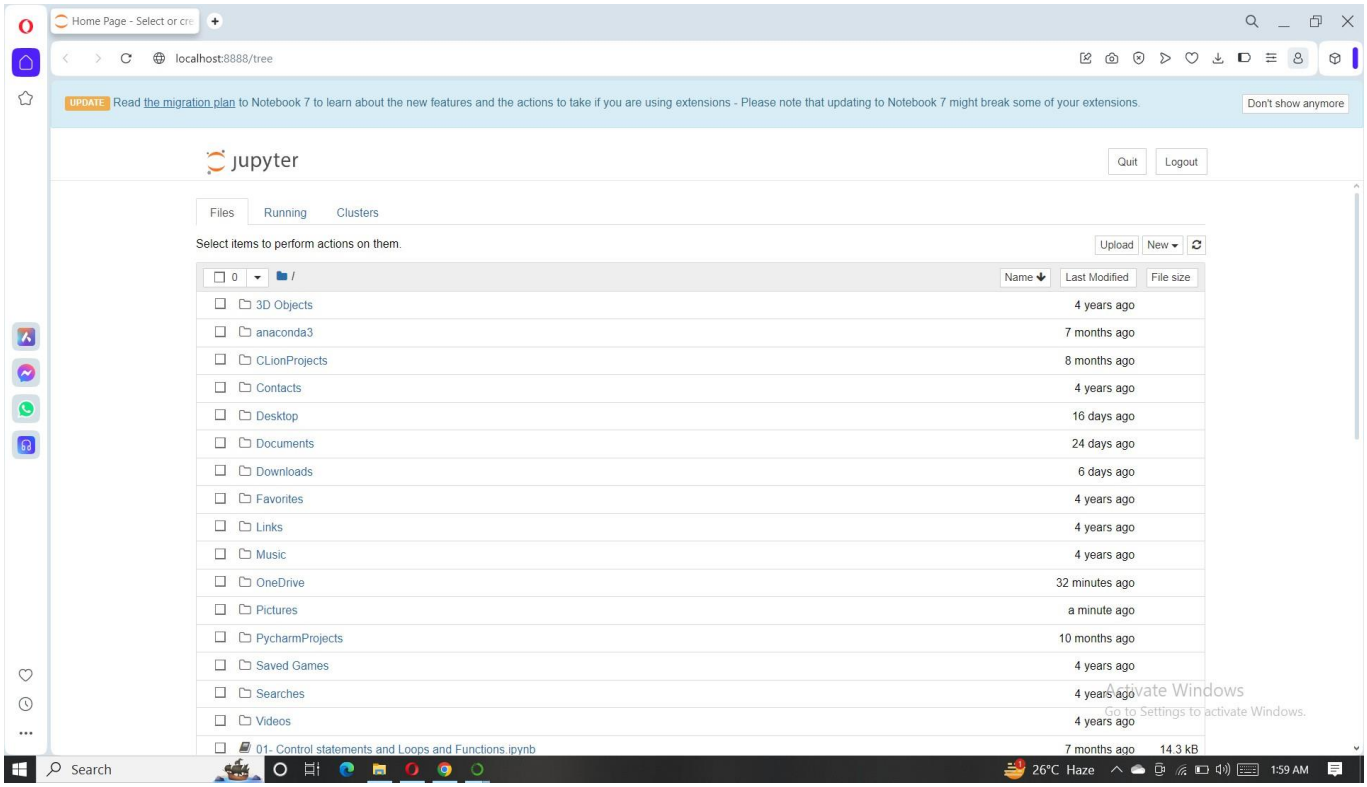
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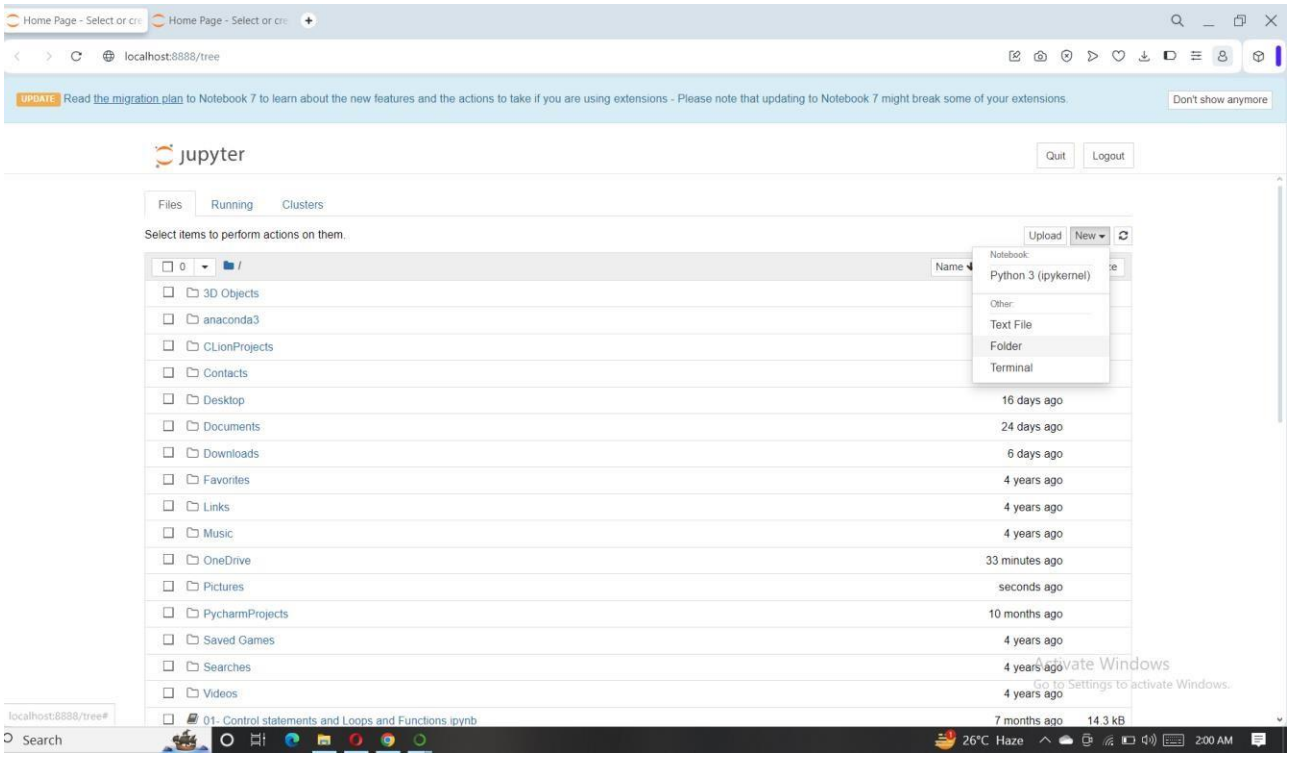
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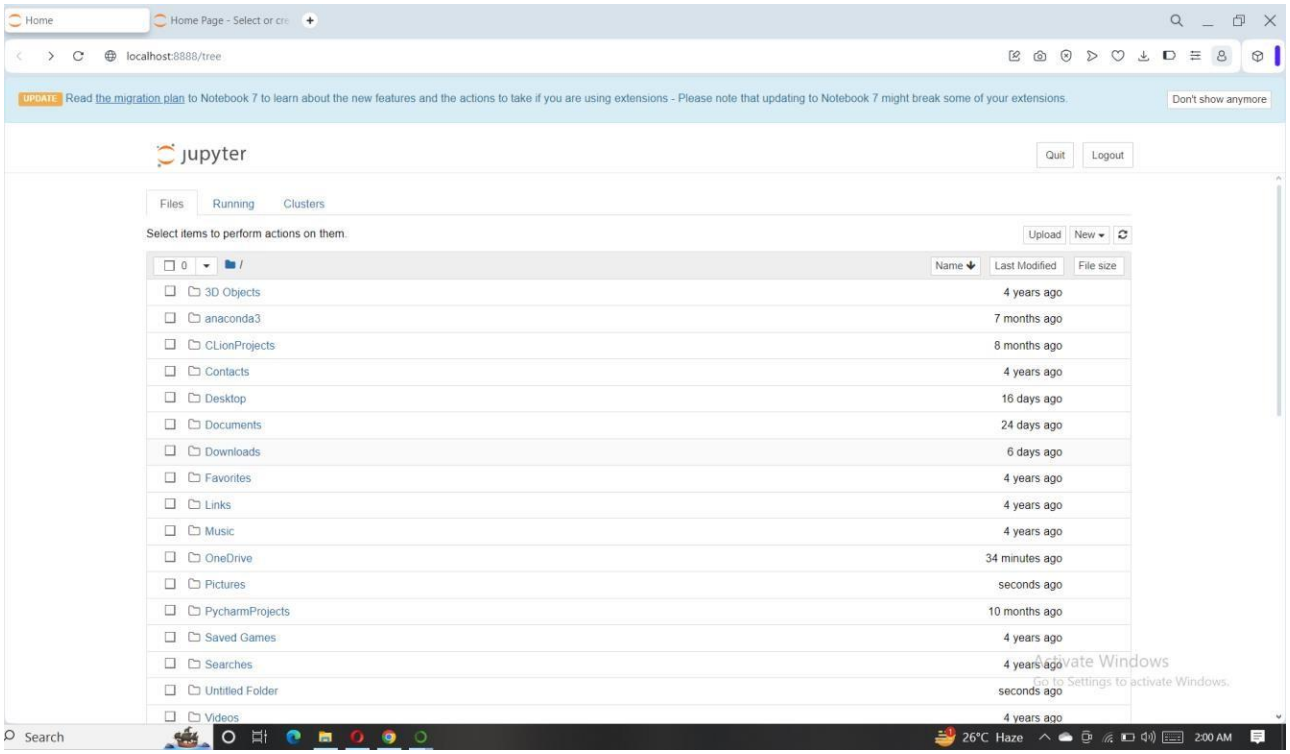
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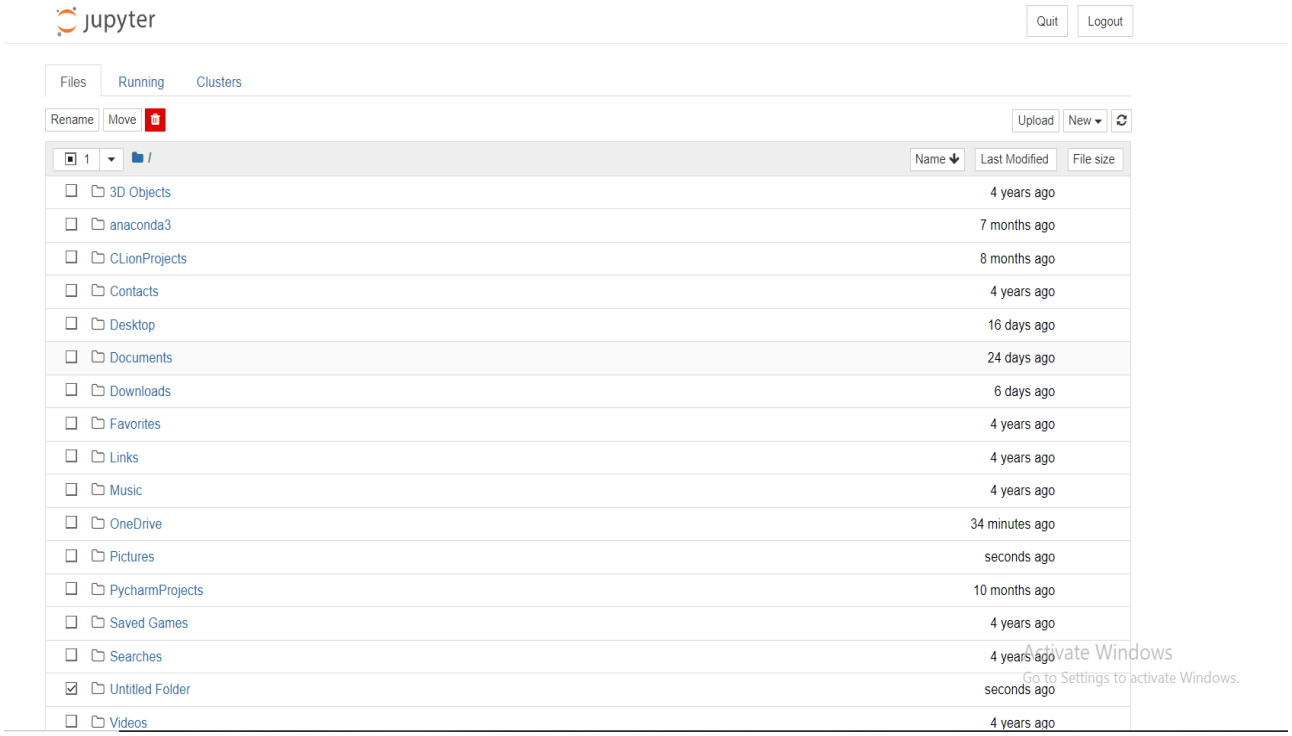
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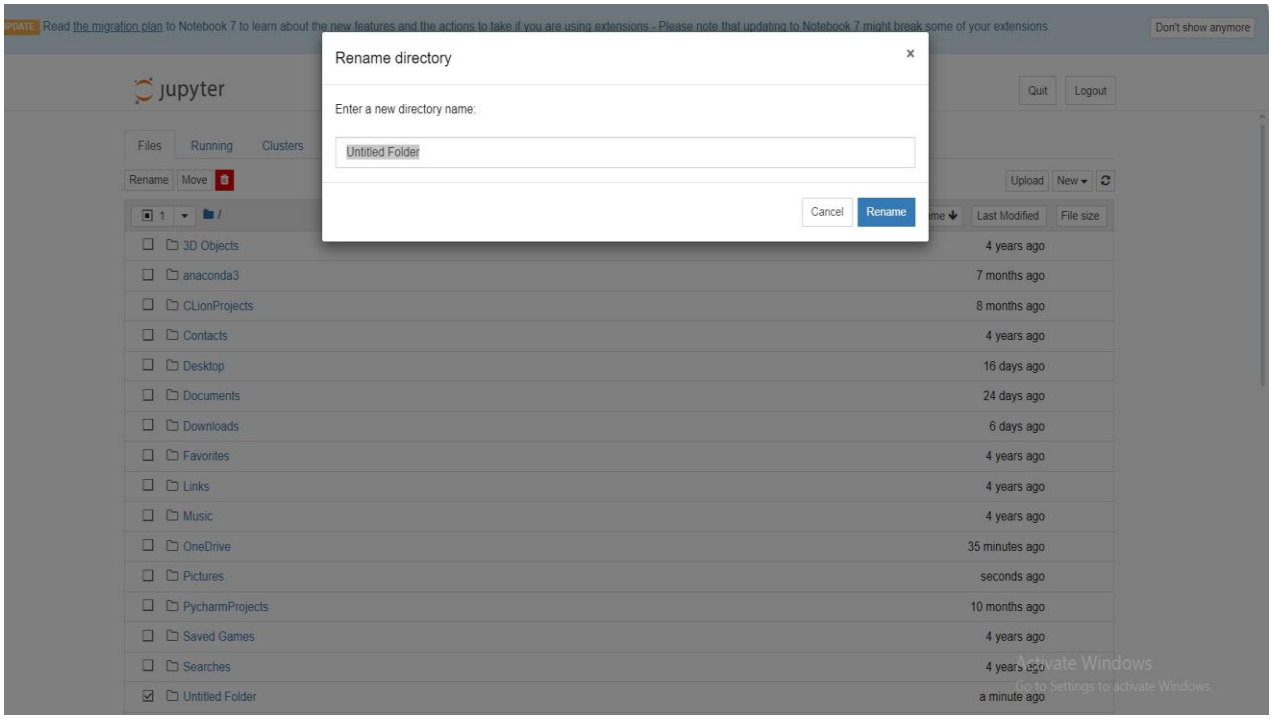
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CLionProjects 8 months ago
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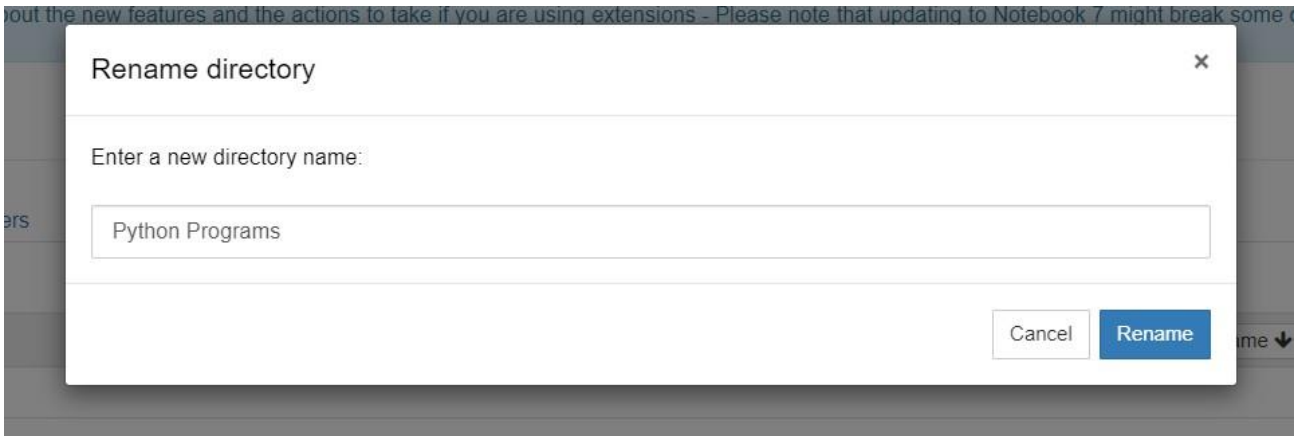
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Python Programs
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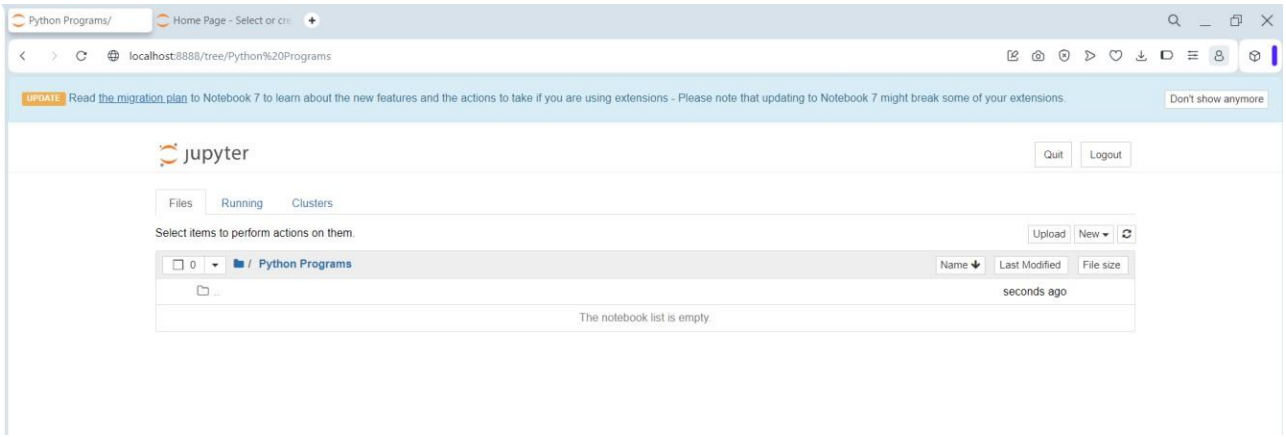
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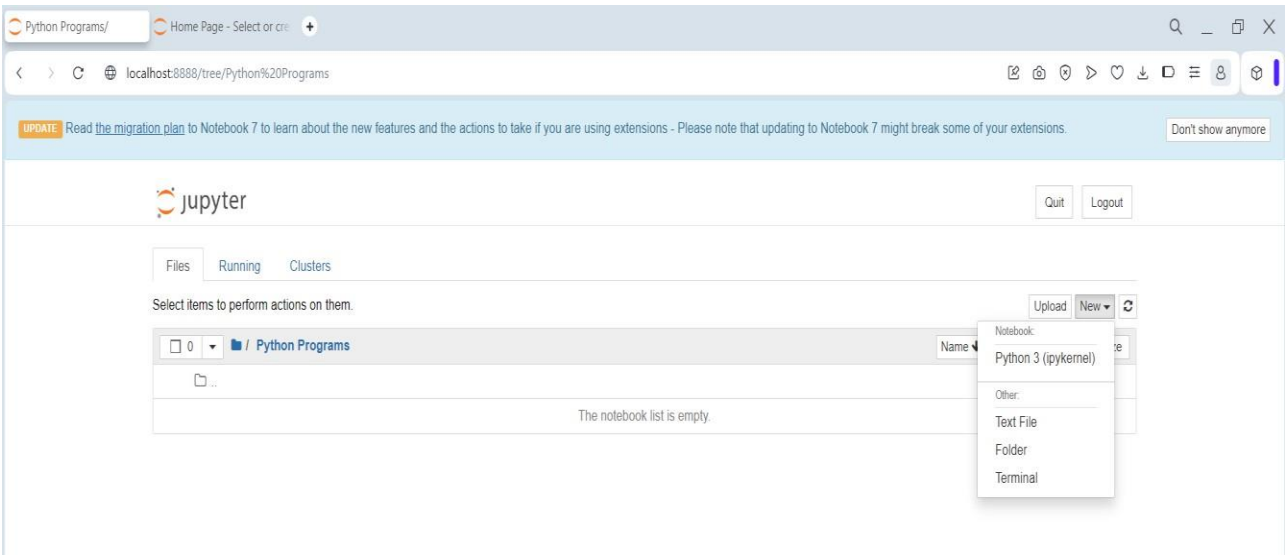
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The notebook list is empty.
Notebook:
Python 3 (ipykernel)
Other:
Text File
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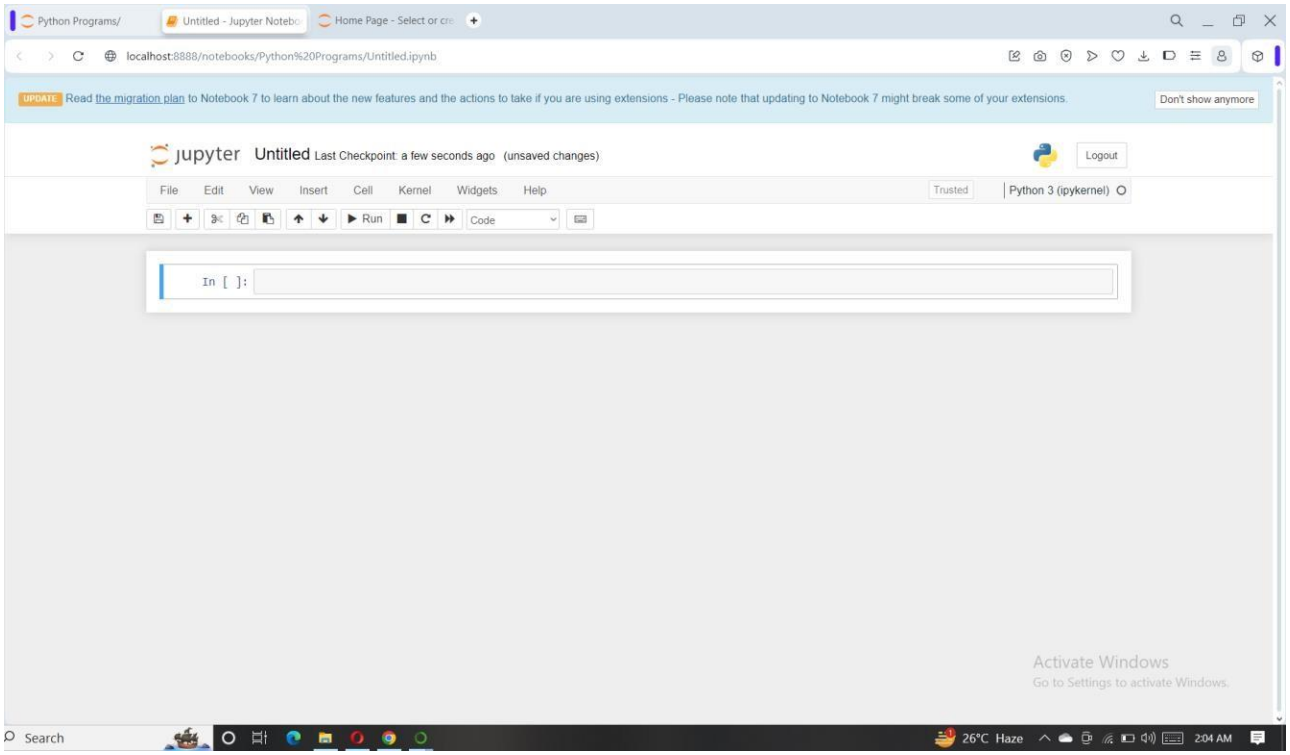
Terminal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UPDATE Read the migration plan to Notebook 7 to learn about the new features and the actions to take if you are using extensions - Please note that updating to Notebook 7 might break some of your extensions.
Don't show anymore
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Logout
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Code
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Activate Windows
Go to Settings to activate Windows.
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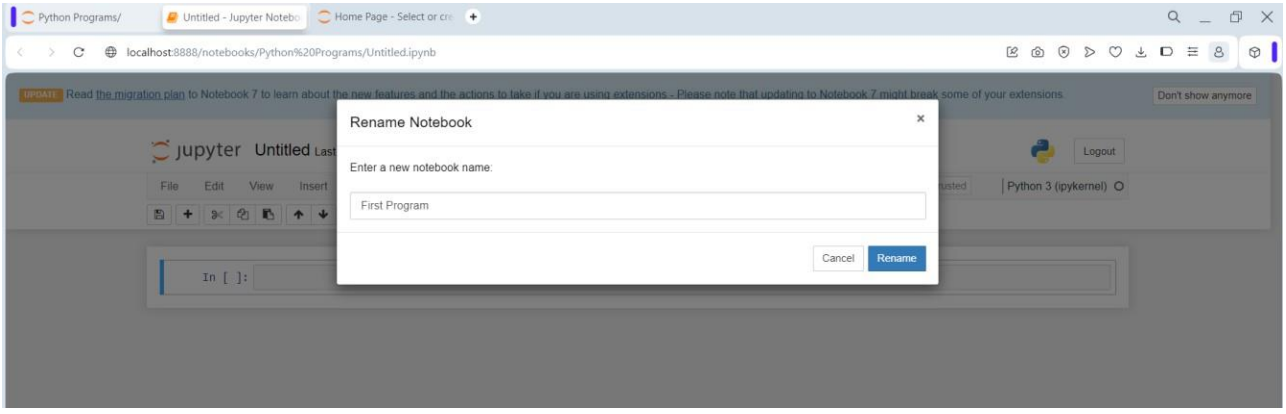
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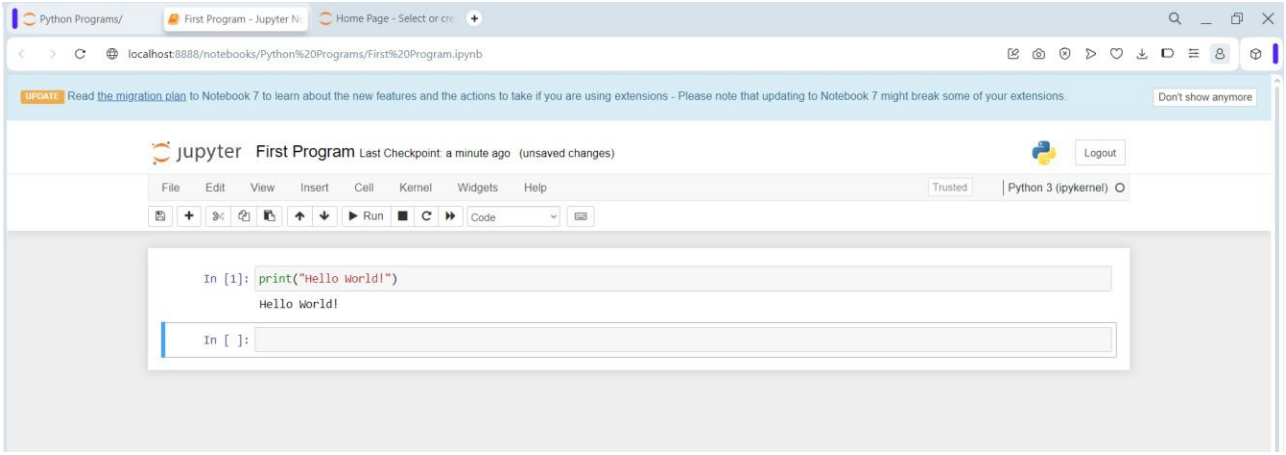
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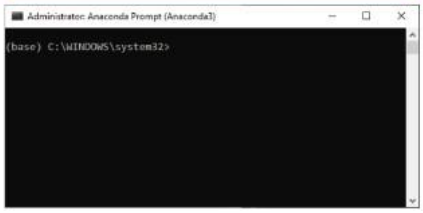
Don't show anymore
jupyter First Program Last Checkpoint: a minute ago (unsaved changes)
Logout
File Edit View Insert Cell Kernel Widgets Help
Trusted
Python 3 (ipykernel)
Run
Code
In [1]: print("Hello World!")
Hello World!
In [ ]:

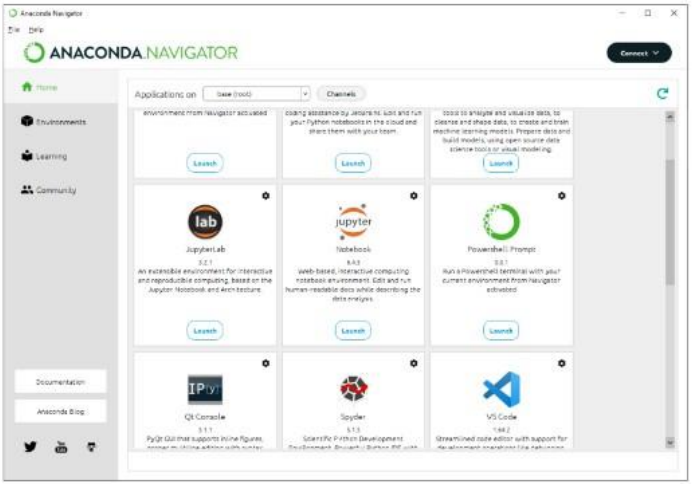
Python

- https://www.python.org
- "Monty Python's Flying Circus", a BBC comedy series from the 1970s
- Guido van Rossum at Centrum Wiskunde & Informatica (CWI) in the Netherlands in December 1989
  - Python 2.0 was released on 16 October 2000
  - Python 3.0 released on 3 December 2008
  - Latest version Python 3.11
- Applications
  - Web and Internet Development
  - Database Access
  - Desktop GUIs
  - Scientific & Numeric
  - Education
  - Network Programming
  - Software & Game Development
- Fast, open and runs everywhere
- https://docs.python.org/3/
  - Python standard library

Anaconda

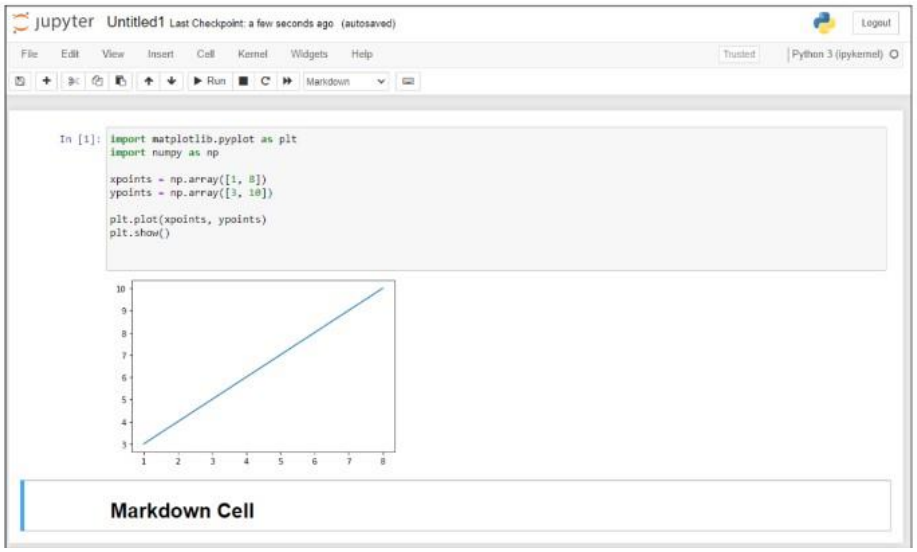
- Anaconda offers the easiest way to perform Python data science, machine learning and computer vision tasks
- Allows working with thousands of open-source packages and libraries.
- Easy way to create and manage multiple python environments
- It is built on top of **conda**, the open-source package and environment manager, and allows you to manage your packages and environments from a graphical user interface (GUI)



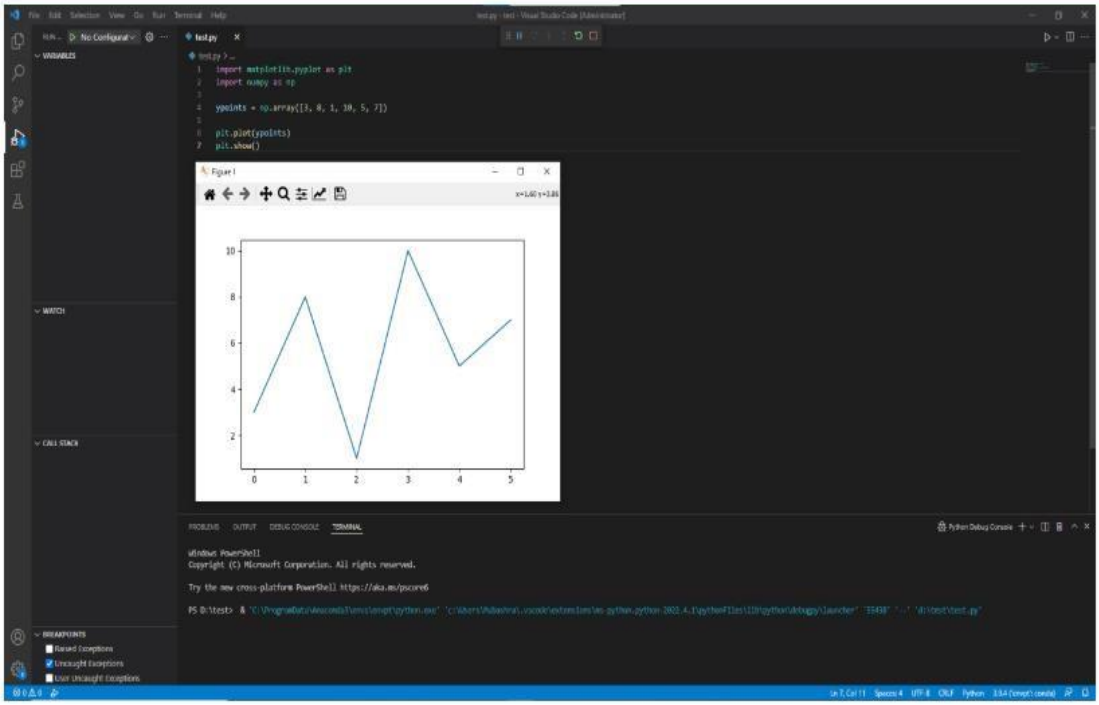


Jupyter Notebook

- How to start?
  - Command: jupyter notebook (**start from a working directory**)
  - Navigator

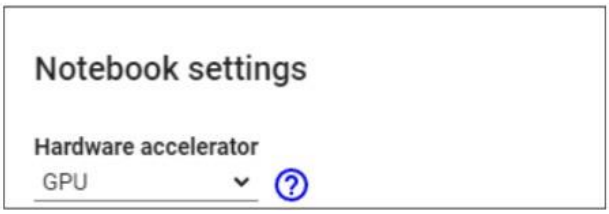


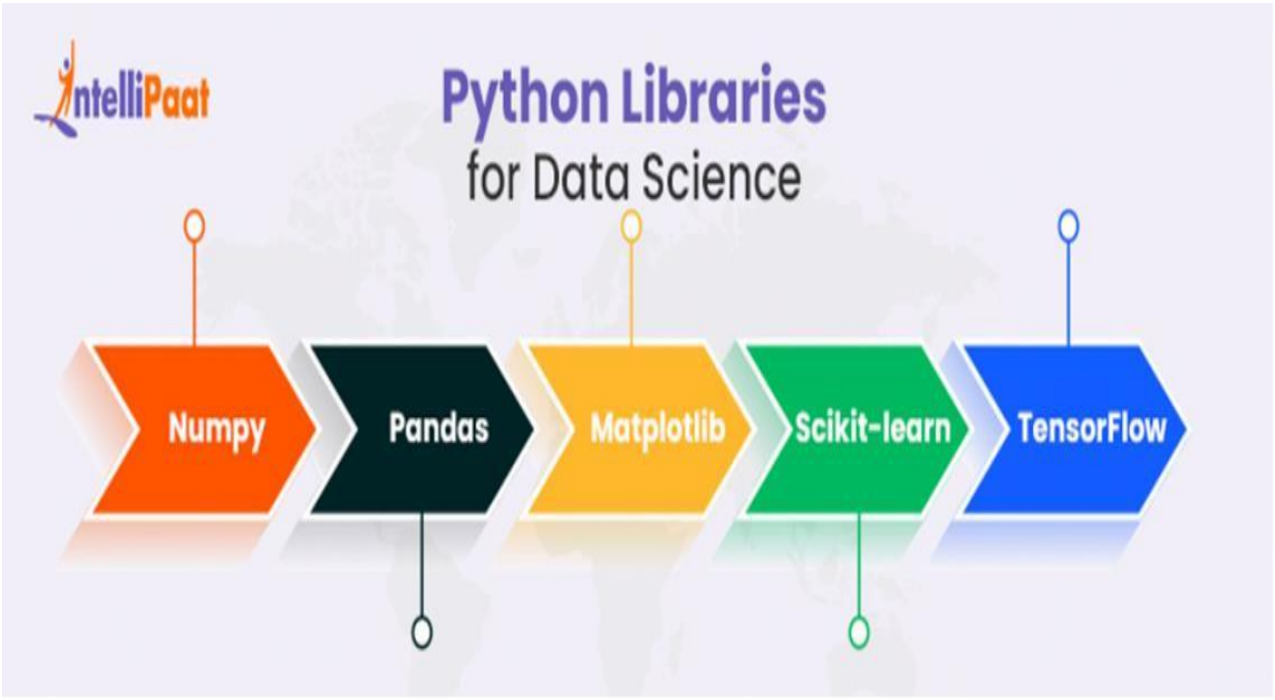
VSCode



Google Colaboratory

- Free Jupyter Notebook environment that runs in cloud
- Teams can work simultaneously
- Supports GPU
- Supports all common AI libraries
- Import/export google drive and GitHub
- https://colab.research.google.com/





Print Statement

```
print("Intro to DS Lab")
```

```
Intro to DS Lab
```

Variables

In Python, variables are used to store data, and each variable has a name and a value. A variable name can include letters (a–z, A–Z), numbers (0–9), and the underscore (_), but it must start with a letter or an underscore, not a number. By convention, variable names usually start with a lowercase letter, while class names start with a capital letter. Some words are reserved by Python and cannot be used as variable names, such as if, else, while, class, def, import, and others.

Syntax

```
#Assigning values to variable
x = 10
name = "Palwasha"
is_student = True

#print the variable
print(x, name, is_student)
```

```
10 Palwasha True
```

```
#using input and output in python

name= input("What is your name?")
print("Name:", name)
```

```
What is your name?Palwasha
Name: Palwasha
```

Operators

Python language supports the following types of operators.

- Arithmetic Operators
- Comparison (Relational) Operators
- Assignment Operators
- Logical Operators
- Membership Operators

Arithmetic Operators

Operator	Example
Addition	a + b = 30
Subtraction	a - b =10
Multiplication	a * b
Division	a / b
Modulus	b % a
Exponent	a ** b

Comparison Operators:

Operator	Description	Example
==	If the values of two operands are equal, then the condition becomes true	a == b
!=	If values of two operands are not equal, then condition becomes true.	a != b
< >	If values of two operands are not equal, then condition becomes true.	a < > b
>	If the value of left operand is greater than the value of right operand, then condition becomes true.	a > b
<	If the value of left operand is less than the value of right operand, then condition becomes true.	a < b
>=	If the value of left operand is greater than or equal to the value of right operand, then condition becomes true.	a >= b
<=	If the value of left operand is less than or equal to the value of right operand, then condition becomes true.	a <= b

Logical Operators:

Operator	Description	Example
and	If both the operands are true, then condition becomes true.	a and b
or	If any of the two operands are non-zero, then condition becomes true.	a or b
not	Used to reverse the logical state of its operand	a not b

Membership Operators:

Operator	Description	Example
in	Evaluates to true if it finds a variable in the specified sequence and false otherwise.	if a in b then: statement
not in	Evaluates to true if it does not find a variable in the specified sequence and false otherwise.	if a not in b then: statements;

Control Statements

In Python, control statements are used to guide the program's flow of operations. Depending on specific conditions, they choose which statements to perform first or repeatedly go through a list of statements.

If-else Statement:

```
if condition:
    # Statements
elif another_condition:
    # Statements
else:
    # Statements
```

Lab Tasks

Task # 01

Write a program where you create 5 variables with valid names and assign them any values.Then, try to create 3 variables with invalid names (like starting with a number or using a keyword) and see what error Python gives. Finally, print all the valid variables.

Task # 02

Write a Python program that asks the user to enter two numbers and an operator (`+`, `-`, `*`, `/`, `//`, `**`).

- Perform the operation based on the entered operator.
- If the operator is valid, display the result.
- If the operator is invalid, print **"Invalid operator"**.

Task # 03

Write a Python program that asks the user to enter three numbers.

- Compare the numbers and determine the **largest** and **smallest** among them.
- Check if all three numbers are **equal**.
- Check if the numbers are in **ascending** order or **descending** order.
- Display all results with clear messages.

Task # 04

Write a Python program that takes two numbers from the user and swaps their values using a temporary variable. Print the numbers before and after swapping.

Task # 05

Write a Python program that shows how multiple assignment works.

1. Assign values to three variables in one line (e.g., `x, y, z = 5, 10, 15`).
2. Print all the variables.
3. Change the values of the variables in one line using multiple assignment.
4. Print the updated values.