OSIRI UNIVERSITY

Python Programming for Data Analysis

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Wise Osagie

Course Outline

Week One

- Overview of Python Programming Language
- Setting Up Python and Python Environment on PC (Windows/Mac/Linux)
- Using Integrated Development Environment (IDE)
- Variables, Data types and Booleans, Stings Lists, Tuple, Dictionaries, Sets
- Prints and String Formatting
- Loops, Conditional Statements

Week Two

- Python Functions, and Lambda**
- Object Oriented Programming (Intro)
- Introduction to python Modules (Packages)
- Working NumPy and SciPy Module
- Data Processing with Pandas Module
    - Data Visualization with Pandas
    - Data Visualization with Matplotlib and Seaborn Modules
    - Basic Statistics in python

Python Programming Language

What is it:

A high-level, easy to read and understand, **general-purpose** programming language. Python is a popular choice for both beginners and experienced programmers, making it a versatile tool for various applications.

Key Features:

- **Readability:** Clear and concise syntax and make code easy read and maintainable.
- **Versatility:** can be used for web/software development and data science to machine learning and scientific computing.
- **Interpreted Language:** Uses an interpreter, instead of a compilation. Enables faster development and prototyping
- **Dynamic Typing:** No need to explicitly declare data types, saving time and effort.
- **Garbage Collection:** Automatically manages memory allocation and deallocation,
- **Object-Oriented Programming (OOP):** Supports OOP principles, enabling modular programming, and reusable code.

Python Programming Language

Applications of Python:

Python is suitable for a wide range of applications, including:

- Web Development: Using frameworks like Django and Flask.
- **Data Science:** Using Python libraries like NumPy, Pandas, and Matplotlib.
- **Machine Learning:** Developing machine learning and AI frameworks, using TensorFlow and scikit-learn.
- Scientific Computing: With numerical libraries like NumPy and SciPy for scientific calculations and data analysis.
- Scripting and Automation: Automating tasks, data pipelines, integrating systems.

General Concepts of Programming

Some general concepts that are common to most programming languages:

- **Variables:** These are named storage locations that hold data, like numbers, text, or even lists of other data. Think of them as containers with labels that you can use to store and retrieve information later in your program.
- **Data types:** These define the kind of data that can be stored in a variable, such as integers, floats, strings, or booleans (true/false). Imagine different types of containers, like bowls for fruits, cups for liquids, and boxes for books, each holding a specific type of data.
- **Operators:** These are symbols that perform operations on data, such as addition, subtraction, comparison, or logical operations. They're like the tools you use in your recipe, like mixing, chopping, or baking, to manipulate the data in your program.

General Concepts of Programming

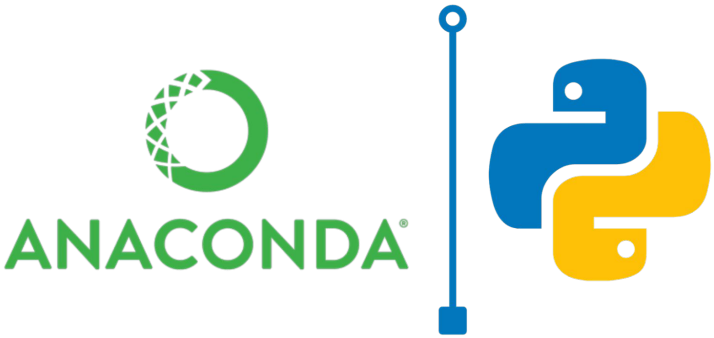
- **Control flow:** This determines the order in which instructions are executed. It allows you to make your program follow different paths based on conditions or user input.
- **Functions:** These are reusable blocks of code that perform specific tasks. You can call them from different parts of your program to avoid repeating the same code.
- **Loops:** These allow you to repeat a block of code multiple times, as long as a certain condition is met. Think of it like a loop in your recipe where you knead the dough repeatedly until it reaches the desired texture.

Setting Up Python Environment on PC with Anaconda

- Windows/Mac/Linux

- **Anaconda** is a popular open-source distribution of Python. It enables the easy to installation of Python and Python packages.
- Anaconda provides a convenient environment management system:
    - **Anaconda Navigator:** a Graphical User Interface (GUI) and
    - **Conda:** a Command Line Tool (CLI),

  that allows you to create and switch between different Python environments.
- Python environments are used to isolate different versions of Python and packages from each other.



Setting Up Python Environment on PC with Anaconda

- Windows/Mac/Linux

Step 1: Download and Install Anaconda

https://www.anaconda.com/download

Step 2: Create a Python Environment

With Anaconda Navigator (GUI)

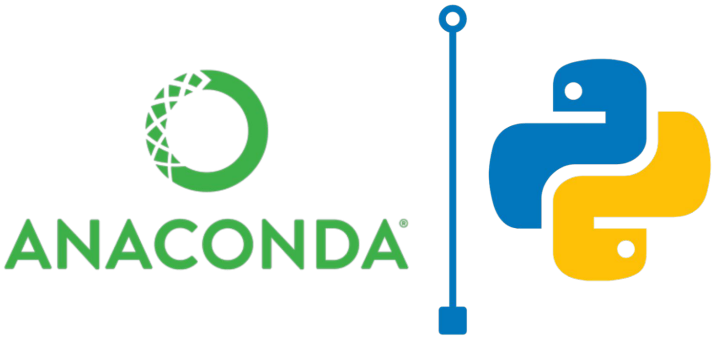
or

Open a terminal window (Windows) or command prompt (macOS and Linux) and run the following command:

```
conda create -n myenv python=3.8
```

Your preferred name

Your preferred python version



Setting Up Python Environment on PC with Anaconda

- Windows/Mac/Linux

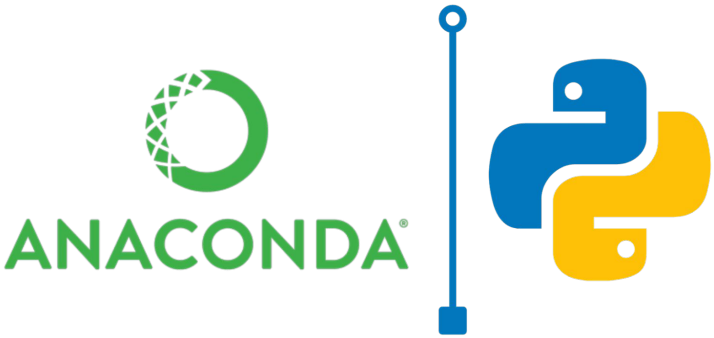
Step 3: Select or Activate the Environment

To use the Python environment, you need select it from the GUI or to activate it with conda .

`conda activate myenv`

You can deactivate the environment by running:

`conda deactivate`



Step 4: Install Packages

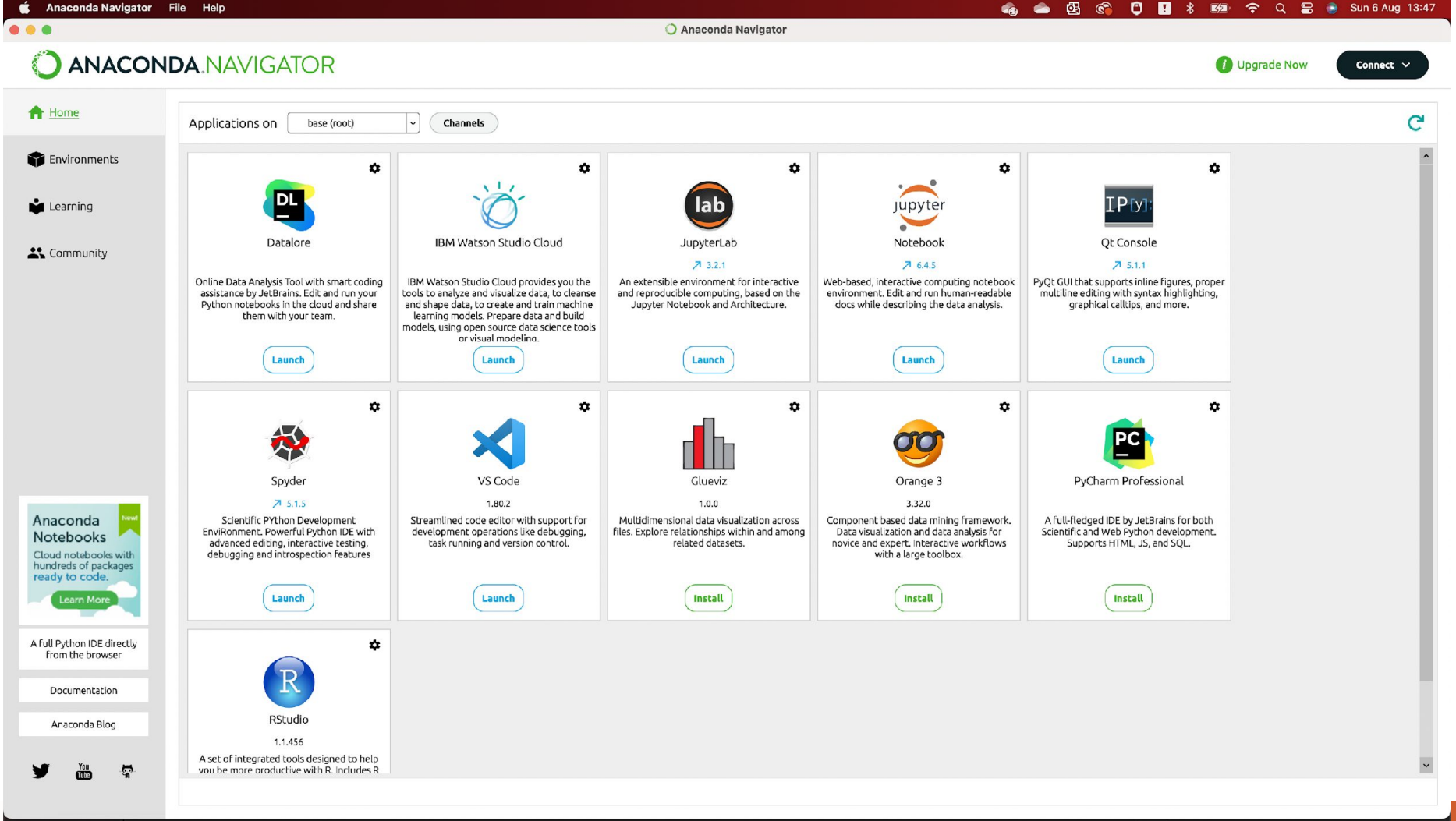
To install a package, search and install with GUI or run the following command:

`conda install package_name`

`E.g. conda install pandas`

Or install multiple packages

E.g. `conda install numpy pandas matplotlib`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Anaconda Navigator
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Upgrade Now
Connect
Home
Environments
Learning
Community
Applications on
base (root)
Channels
Datalore
Online Data Analysis Tool with smart coding assistance by JetBrains. Edit and run your Python notebooks in the cloud and share them with your team.
Launch
IBM Watson Studio Cloud
IBM Watson Studio Cloud provides you the tools to analyze and visualize data, to cleanse and shape data, to create and train machine learning models. Prepare data and build models, using open source data science tools or visual modeling.
Launch
JupyterLab
3.2.1
An extensible environment for interactive and reproducible computing, based on the Jupyter Notebook and Architecture.
Launch
Notebook
6.4.5
Web-based, interactive computing notebook environment. Edit and run human-readable docs while describing the data analysis.
Launch
Qt Console
5.1.1
PyQt GUI that supports inline figures, proper multiline editing with syntax highlighting, graphical calltips, and more.
Launch
Spyder
5.1.5
Scientific PYthon Development EnviRonment. Powerful Python IDE with advanced editing, interactive testing, debugging and introspection features
Launch
VS Code
1.80.2
Streamlined code editor with support for development operations like debugging, task running and version control.
Launch
Glueviz
1.0.0
Multidimensional data visualization across files. Explore relationships within and among related datasets.
Install
Orange 3
3.32.0
Component based data mining framework. Data visualization and data analysis for novice and expert. Interactive workflows with a large toolbox.
Install
PyCharm Professional
A full-fledged IDE by JetBrains for both Scientific and Web Python development. Supports HTML, JS, and SQL.
Install
RStudio
1.1.456
A set of integrated tools designed to help you be more productive with R. Includes R
Anaconda Notebooks
New!
Cloud notebooks with hundreds of packages ready to code.
Learn More
A full Python IDE directly from the browser
Documentation
Anaconda Blog
Slide 8 of 8
English (United States)
Accessibility: Investigate
Notes
Comments
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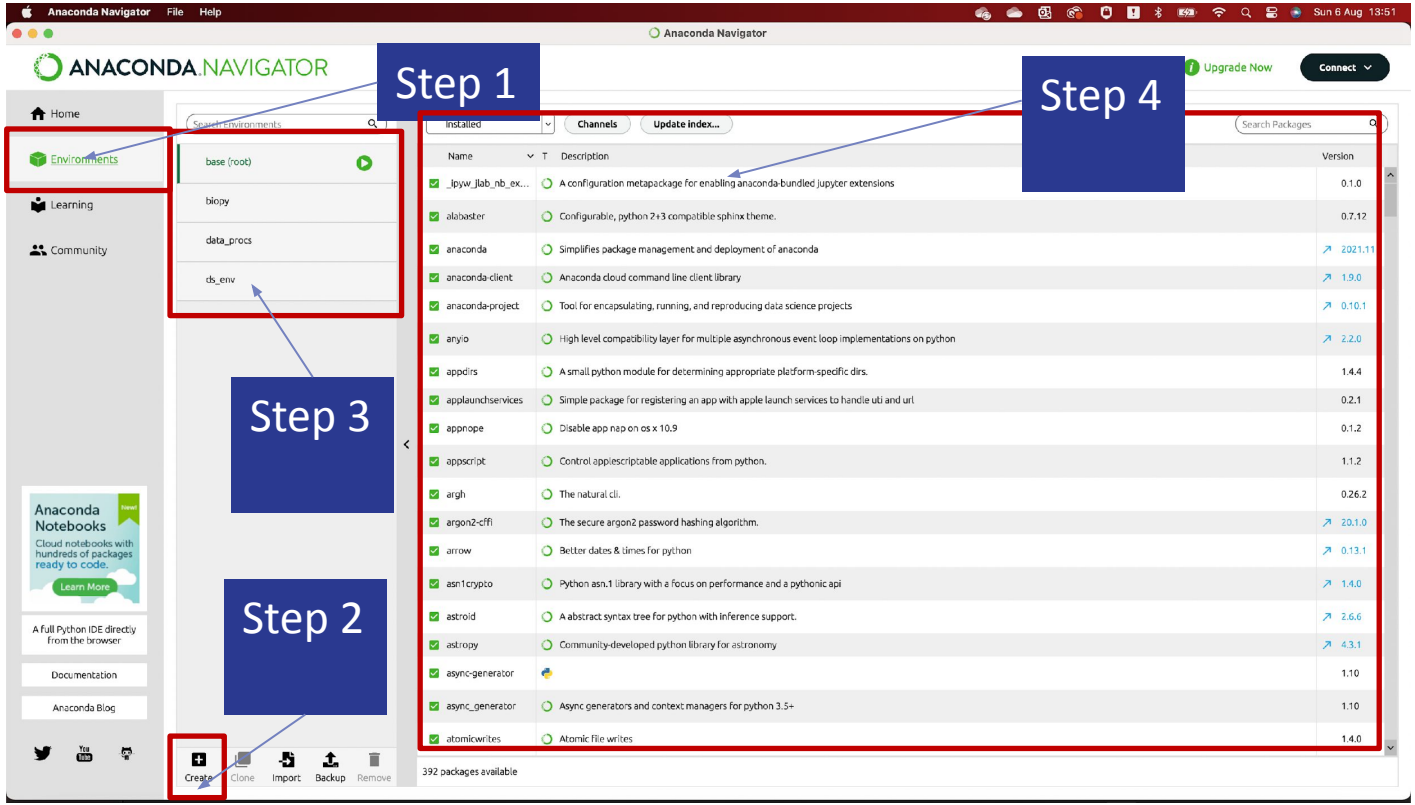
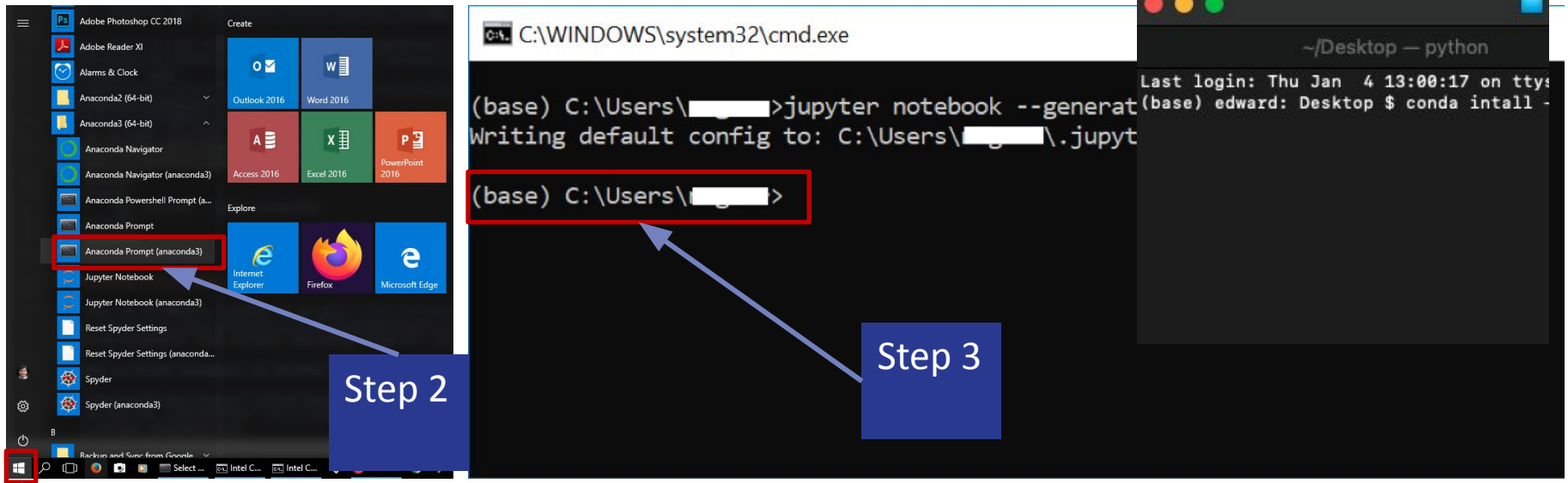
Setting Up PC (Working Environment)



Setting Up PC (Working Environment)

- Create Python environment and install required packages (Terminal , Conda)



At step 3 the “Conda” the command line tool for anaconda can be used to create and manage python environment.
Link to ”Conda” documentation: https://docs.conda.io/en/latest/
Link to ”Conda” user guide: https://tinyurl.com/conda-user

Setting Up PC (Working Environment)

- Create Python environment and install required packages (Terminal , Conda)

CONDA CHEATSHEET

QUICK START	
Tip: It is recommended to create a new environment for any new project or workflow.	
verify conda install and check version	`conda info`
update conda in base environment	`conda update -n base conda`
install latest anaconda distribution (see release notes)	`conda install anaconda=2022.05`
create a new environment (tip: name environment descriptively)	`conda create --name ENVNAME` ← Step 1
activate environment (do this before installing packages)	`conda activate ENVNAME` ← Step 2

https://tinyurl.com/conda-cheat

Setting Up PC (Working Environment)

- Create Python environment and install required packages (Terminal , Conda)

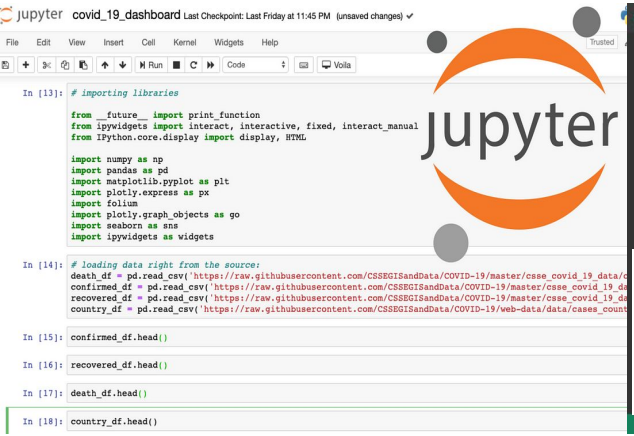
CHANNELS AND PACKAGES	
Tip: Package dependencies and platform specifics are automatically resolved when using conda.	
list installed packages	`conda list`
list installed packages with source info	`conda list --show-channel-urls`
update all packages	`conda update --all`
install a package from specific channel	`conda install -c CHANNELNAME PKG1 PKG2`
install specific version of package	`conda install PKGNAME=3.1.4`
install a package from specific channel	`conda install CHANNELNAME::PKGNAME`
install package with AND logic	`conda install "PKGNAME>2.5,<3.2"`
install package with OR logic	`conda install "PKGNAME [version='2.5|3.2']"`
uninstall package	`conda uninstall PKGNAME`

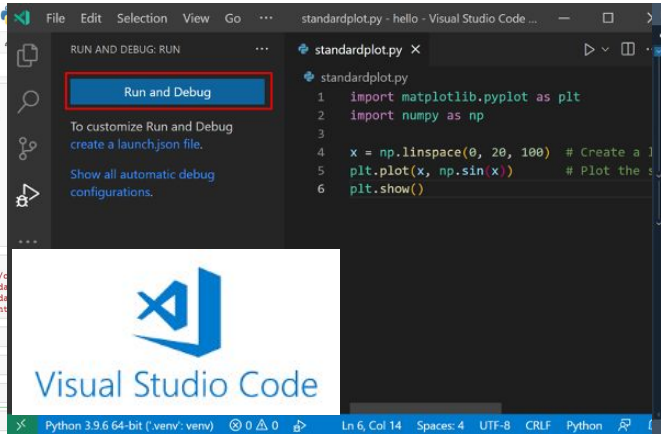
Step 3

https://tinyurl.com/conda-cheat

Integrated Development Environments (IDE)

- An Integrated Development Environment (IDE) is a software application designed to make programming easier and more efficient.
- It combines essential tools for writing, editing, running, debugging, and managing Python code in a single interface.
- Popular Python IDEs > PyCharm, Visual Studio Code, Spyder, Jupyter Notebook and JupyterLab





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Integrated Development Environments (IDE)

Popular Python IDEs:

- **PyCharm**: Powerful and feature-rich, excellent for professional development.
- **Visual Studio Code**: Versatile and customizable, widely used for various languages.
- **Spyder**: Scientific Python Development Environment, designed for data science and scientific computing.
- **Jupyter Notebook and JupyterLab**: *An interactive computing IDE, especially useful for data analysis, visualization, and machine learning. But here's a quick breakdown of their key differences*

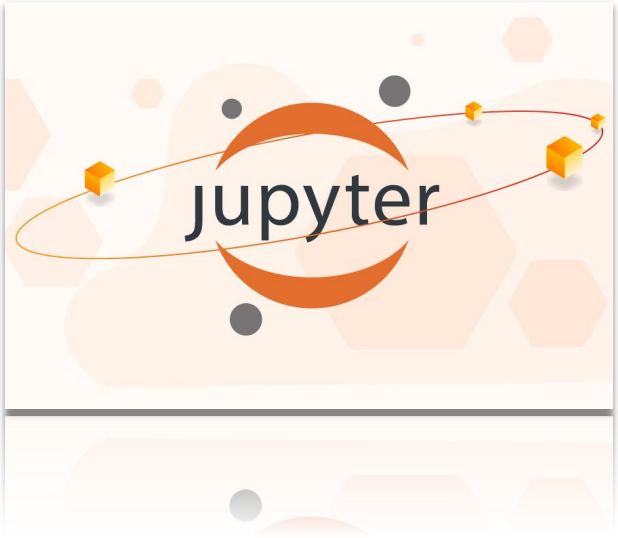
Jupyter IDE

Jupyter Notebook:

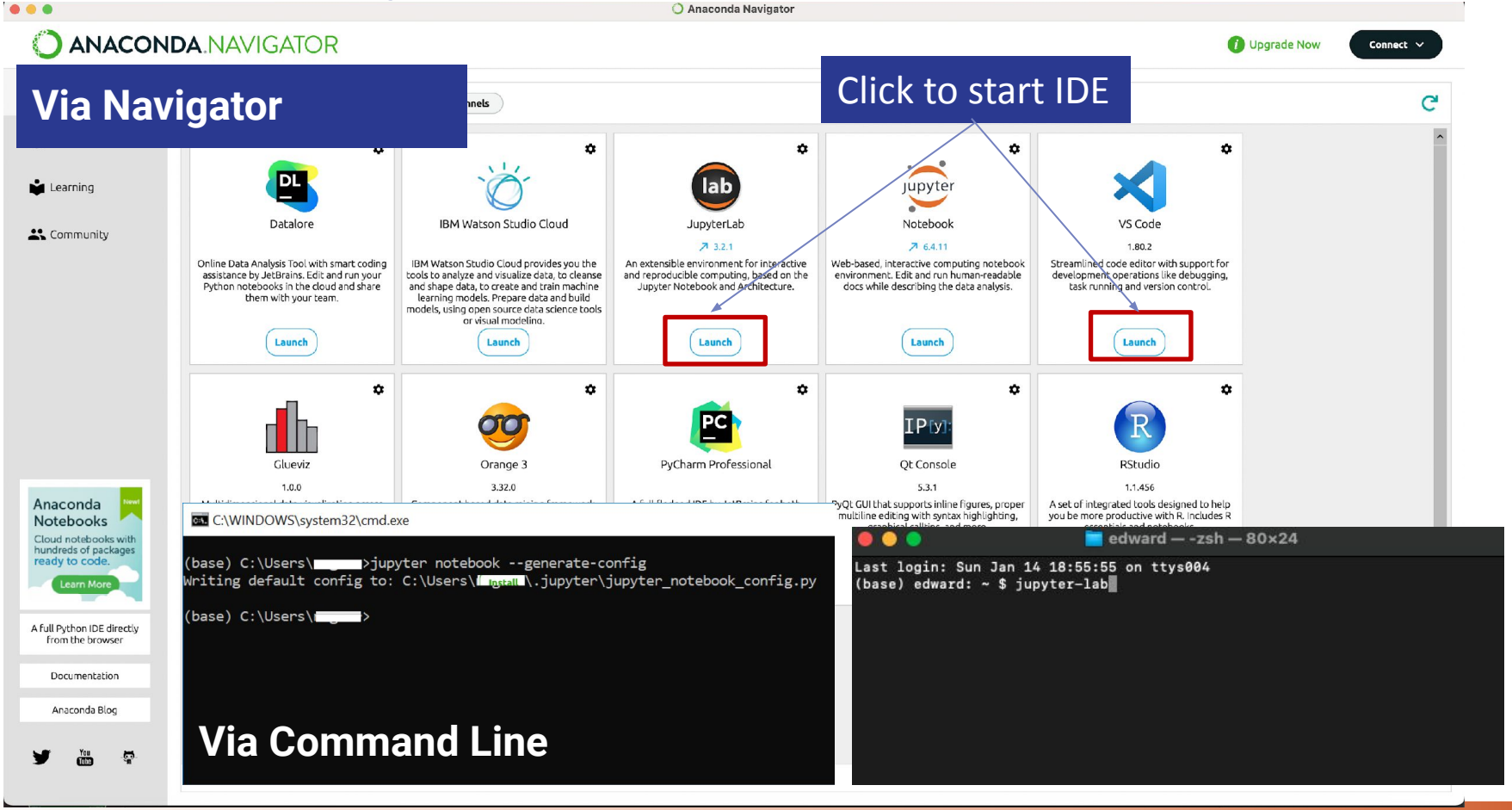
- Simple, Lightweight and focused on **python notebooks**
- Good for beginners and quick exploration
- Can feel limited for complex workflows

JupyterLab:

- Modern and flexible interface ,offers a workspace with tabs for notebooks, terminals, text editors
- More feature-rich and customizable, extensible with plugins for additional functionality and workflows.
- Ideal for advanced users and complex projects



Loading Jupyter Notebook IDE



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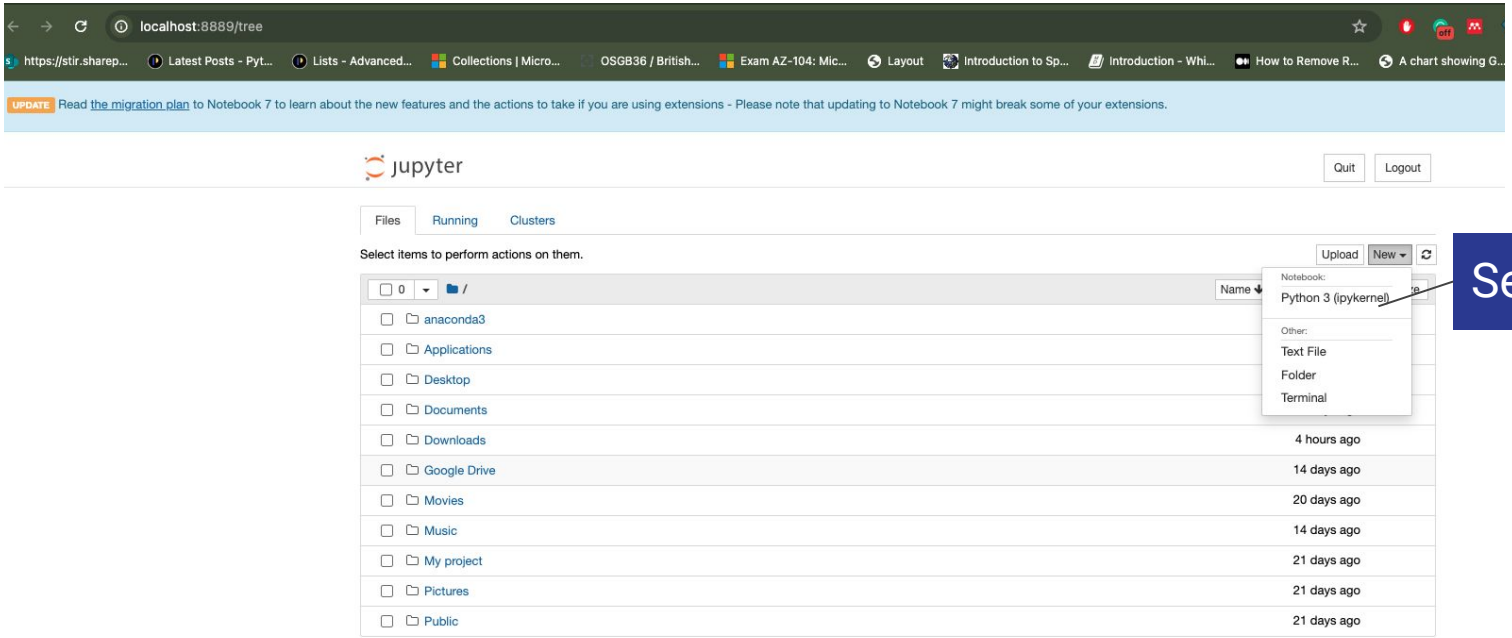

Select Kernel

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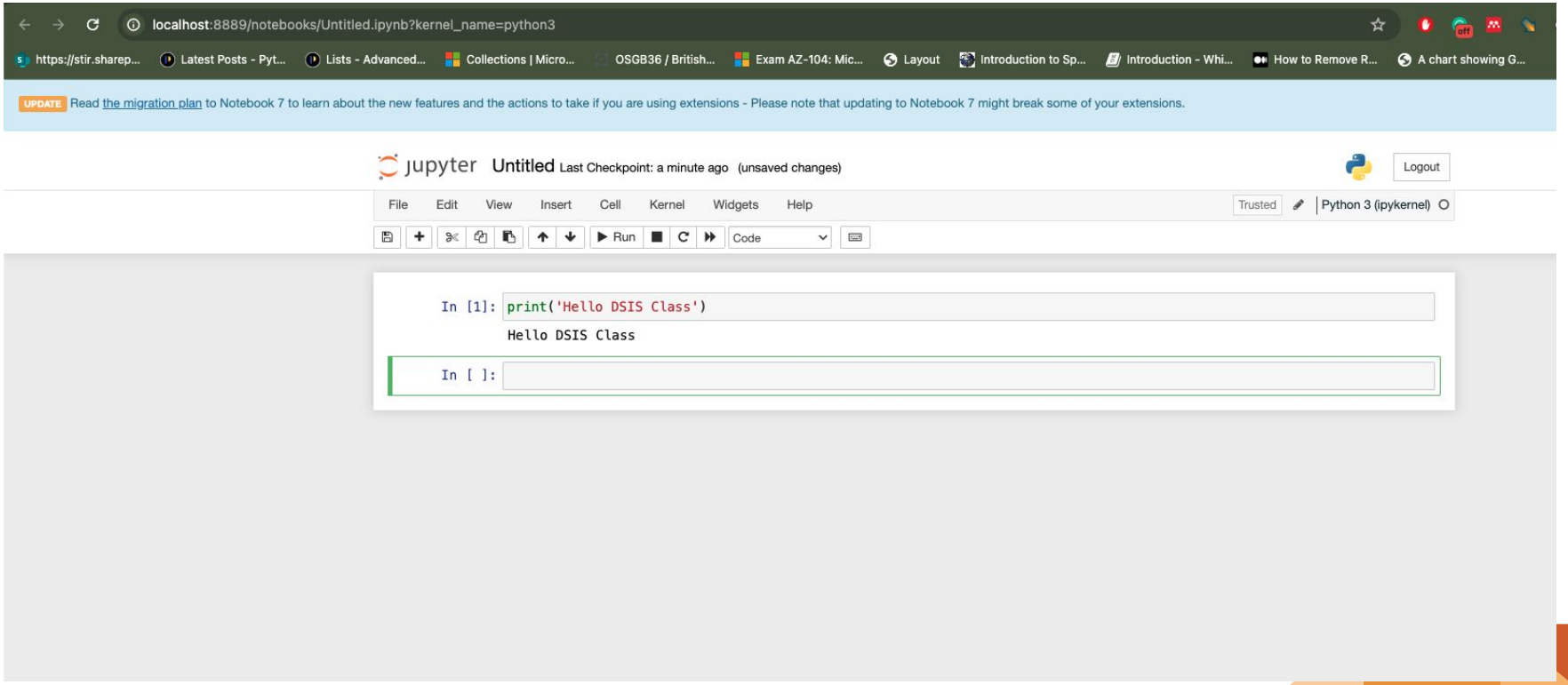

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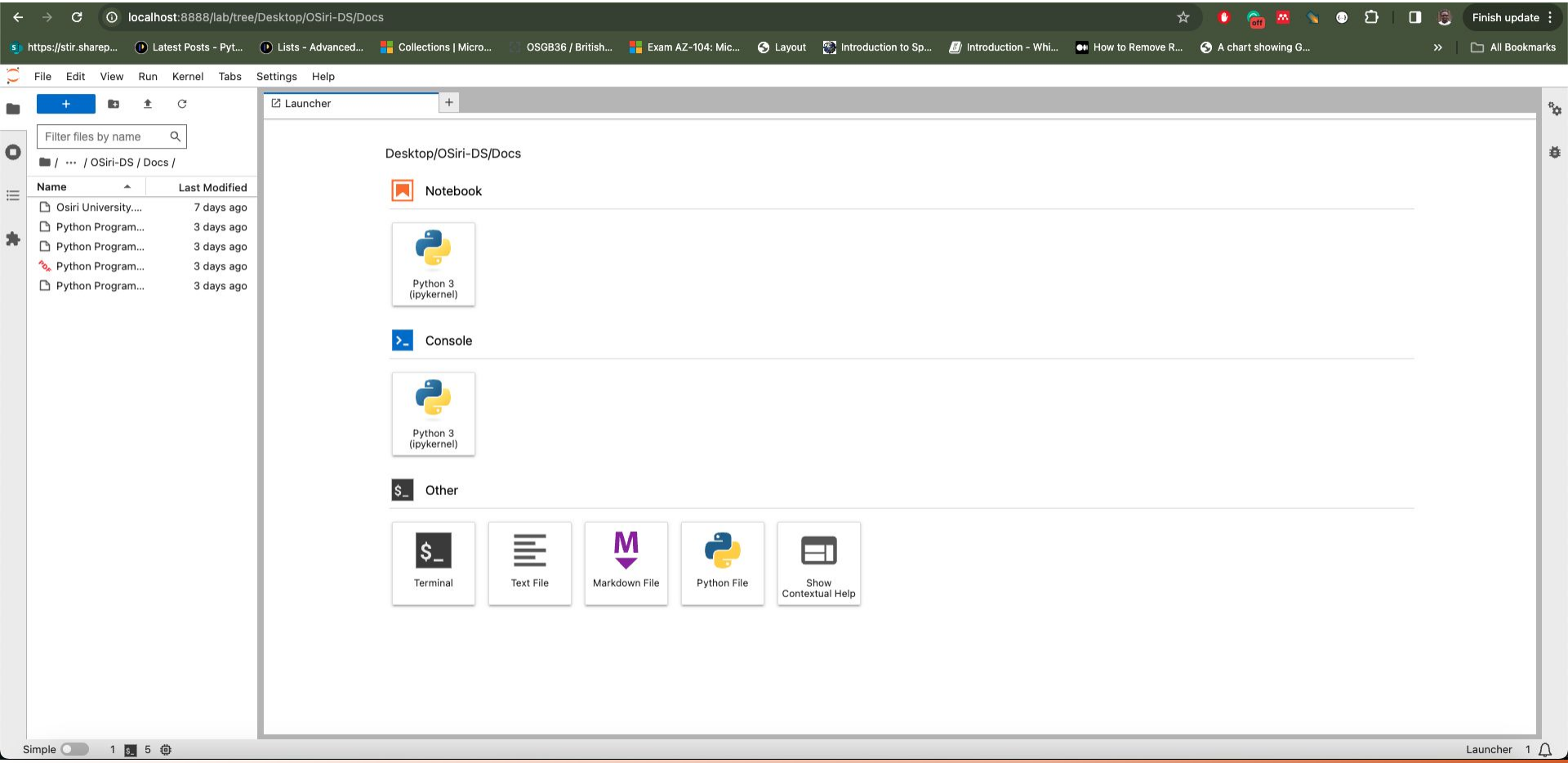
Jupyter Lab (Advanced Notebook)



Jupyter Lab (Advanced Notebook)

File Edit View Run Kernel Tabs Settings Help

Filter files by name

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Name	Last Modified
Osiri University....	7 days ago
Python Program...	3 days ago
Python Program...	3 days ago
Python Program...	3 days ago
Python Program...	3 days ago

Launcher | Data_analysis_python.ipynb

Markdown

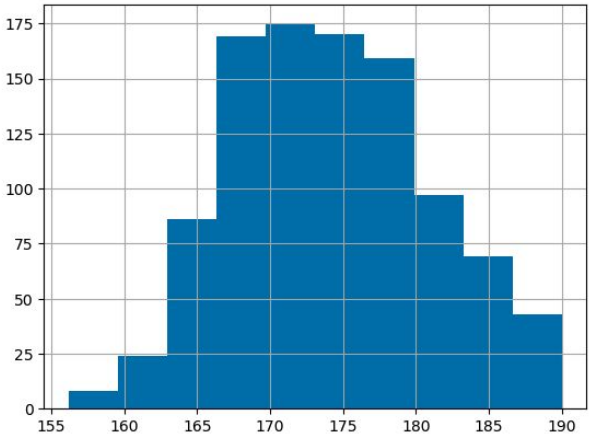
[13]:
```
data_df.describe().head()
```

[13]:

	age	height	income
count	1000.000000	1000.000000	1000.000000
mean	35.128051	174.157119	172852.546186
std	4.911164	6.768793	102808.805118
min	19.975148	156.182432	28044.867412
25%	31.915504	169.106453	97708.147697

[12]:
```
data_df.height.hist()
```

[12]: <Axes: >



Simple 1 5 Python 3 (ipykernel) | Idle

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