

# Python for Data Science, AI & Development

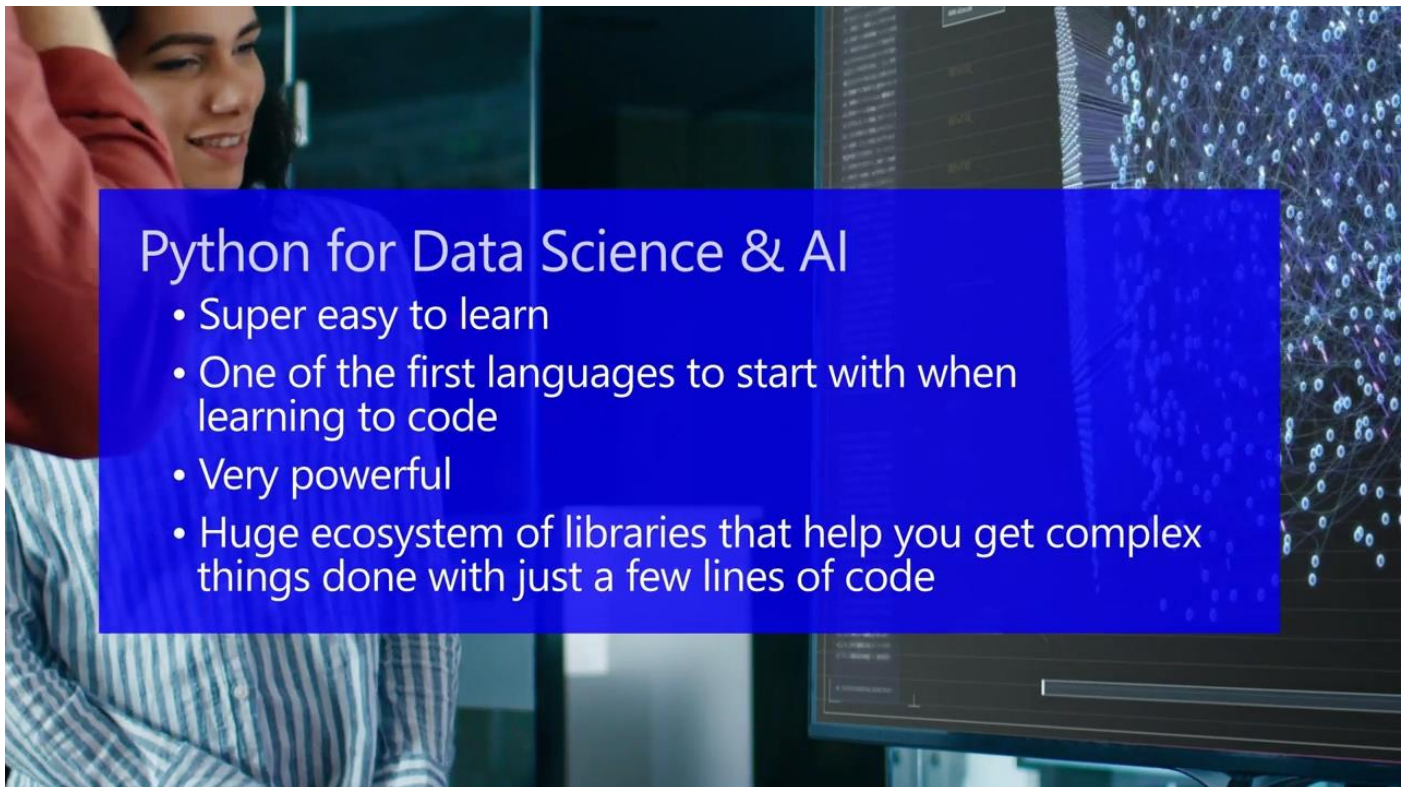
## Module 1: Python Basics

This module teaches the basics of Python and begins by exploring some of the different data types such as integers, real numbers, and strings. Continue with the module and learn how to use expressions in mathematical operations, store values in variables, and the many different ways to manipulate strings.

### Learning Objectives

- Demonstrate an understanding of types in Python by converting or casting data types such as strings, floats, and integers.
- Interpret variables and solve expressions by applying mathematical operations.
- Describe how to manipulate strings by using a variety of methods and operations.
- Build a program in JupyterLab to demonstrate your knowledge of types, expressions, and variables.
- Work with, manipulate, and perform operations on strings in Python.

### M1-S1: About the course



**Python for Data Science & AI**

- Super easy to learn
- One of the first languages to start with when learning to code
- Very powerful
- Huge ecosystem of libraries that help you get complex things done with just a few lines of code

Hello. I'm Joseph, and I will be your instructor for this course. You made the right choice. If there's just one programming language, I had to learn for data science and AI, it would unquestionably be Python. The best part is Python is super easy to learn and is often one of the first languages people turn to when trying to learn to code.

# Python is great for a huge range of tasks:



Data Analysis



Web Scraping



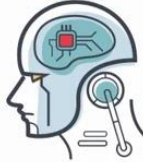
Big Data



Finance



Computer Vision



Natural Language  
Processing

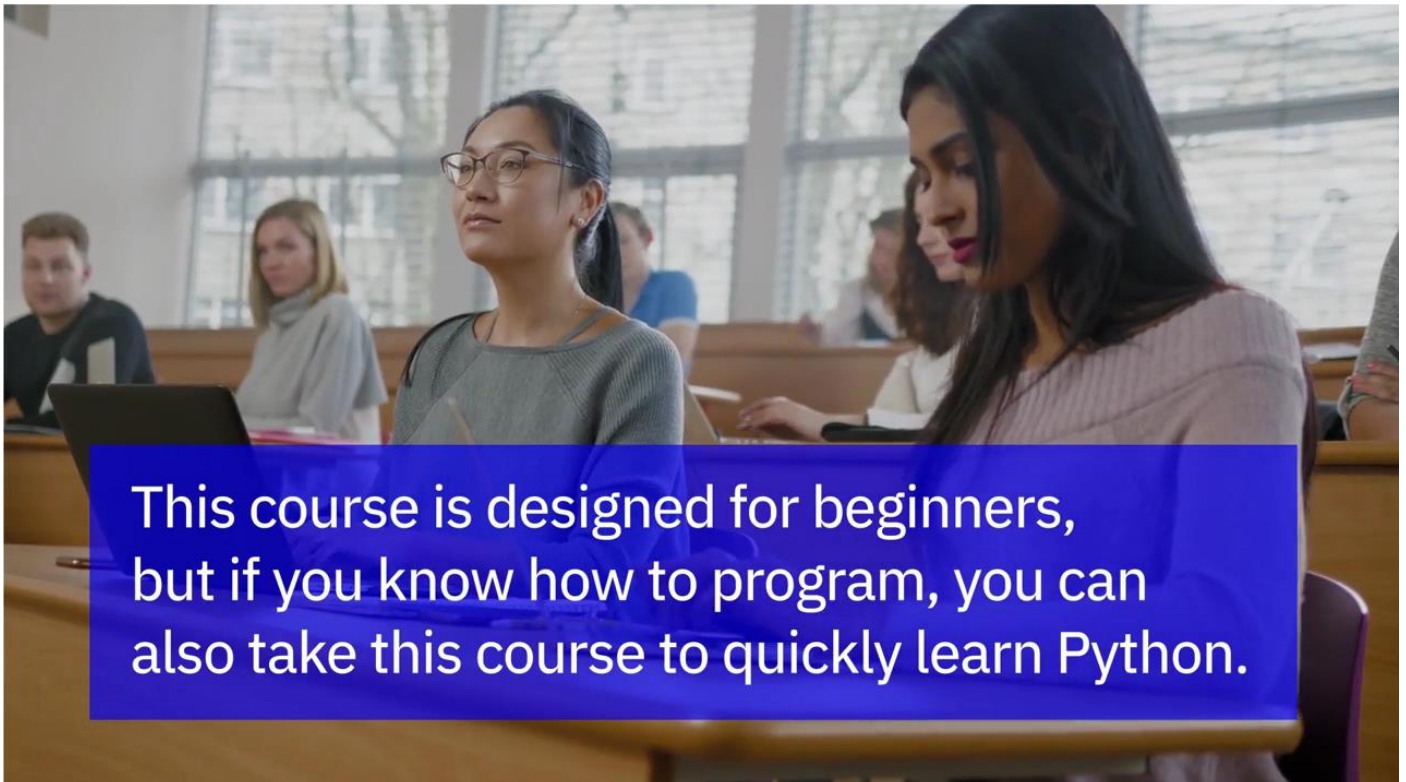


Machine Learning



Deep Learning

Python is very powerful. It has a huge ecosystem of libraries that will help you get the most complex things done with just a few lines of code. Python is great from everything from data analysis, web scraping, to working with big data, finance, computer vision, natural language processing, machine learning, deep learning, and much more. Python can do anything you can throw at it.

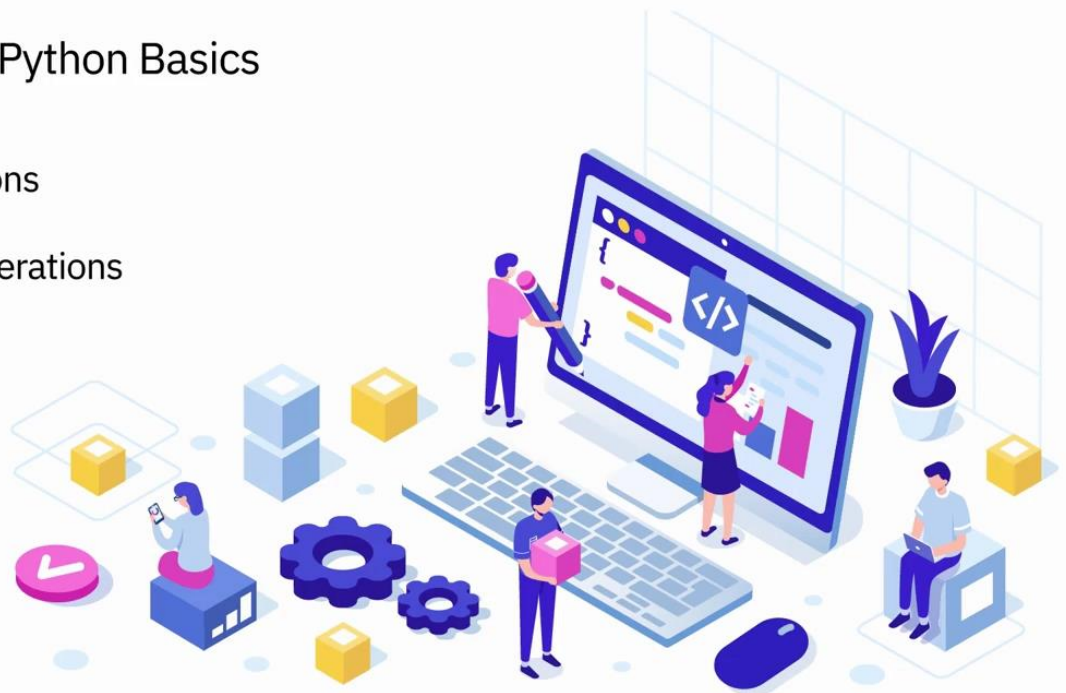


This course is designed for beginners,  
but if you know how to program, you can  
also take this course to quickly learn Python.

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## Module 1: Python Basics

- Types
- Expressions
- Variables
- String Operations



In Module 1, you will learn Python basics, including types, expressions, variables, and string operations.

## Module 2: Python Data Structures

- Lists
- Tuples
- Dictionaries
- Sets

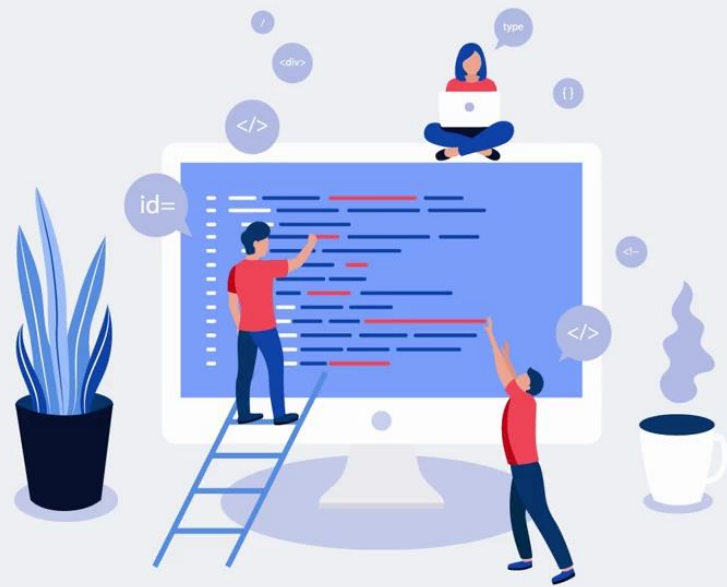


In Module 2, you will cover Python data structures, including lists, tuples, dictionaries, and sets.



## Module 3: Python Programming Fundamentals

- Conditions
- Branching
- Loops
- Functions
- Objects
- Classes



In Module 3, I will teach you Python programming fundamentals, such as conditions, branching, loops, functions, and objects and classes.

## Module 4: How to Work with Data

- Loading data with Python's built-in functions
- Using libraries like Numpy and Pandas
- Application Programming Interfaces (APIs)



In Module 4, I will teach you how to work with data, including loading data with Python's built-in functions, using popular libraries such as NumPy and Pandas, followed by application programming interfaces, or APIs for short.

You will apply what you learn by doing projects using real-world datasets. If you have any questions or require clarification, feel free to post on the course discussion forum. Good luck and happy learning.

### ❖ About this course

This course was designed to provide the building blocks for Python programming and data collection for those choosing a career in Data Science, Data Engineering, AI or Application Development.

Initially conceived as a foundation course for Data Science and AI it has been refreshed several times to keep pace with emerging career options. Additional content has been added which is applicable to Data Science, Data Engineering, AI or Application Development.

After completing this course you will have learned foundational skills in Python programming which you can then go on to apply in the Python Project course for your chosen career. The Python Project courses involve real world scenarios where you are in charge of a final project as a Data Scientist, a Data Engineer, or in AI and Application Development. By finishing this course and your follow-on Python Project, you will gain the basic skills to continue the steps on your chosen career path.

**Note: This course is a pre-requisite for the Python Project courses and should be completed in full before attempting the appropriate Python Project course.**

#### ❖ [Course Overview](#)

Welcome to the Python for Data Science, AI, and Development course. After completing this course, you'll possess the basic knowledge of Python and acquire a good understanding of different data types. You'll also learn to use lists and tuples, dictionaries, and Python sets. Additionally, you'll acquire the concepts of condition and branching and will know how to implement loops, create functions, perform exception handling, and create objects. Furthermore, you'll be proficient in reading and writing files and will be able to implement unique ways to collect data using APIs and web scraping. In addition to the module labs, you'll prove your skills in a peer-graded project and your overall knowledge with the final quiz.

#### **Course Content**

This course is divided into five modules. You should set a goal to complete at least one module per week.

##### **Module 1: Python Basics**

- About the Course
- Types
- Expressions and Variables
- String Operations

##### **Module 2: Python Data Structures**

- Lists and Tuples
- Dictionaries
- Sets

##### **Module 3: Python Programming Fundamentals**

- Conditions and Branching
- Loops
- Functions
- Exception Handling
- Objects and Classes
- Practice with Python Programming Fundamentals

##### **Module 4: Working with Data in Python**

- Reading and Writing Files with Open
- Pandas

- Numpy in Python

## Module 5: APIs and Data Collection

- Simple APIs
- REST APIs, Web Scraping, and Working with Files
- Final Exam

The course contains a variety of learning assets: Videos, activities, labs, projects, practice, graded quizzes, and readings. The videos and readings present the instruction. Labs and activities support that instruction with hands-on learning experiences. Discussions allow you to interact and learn from your peers. A peer-review project that mimics real-world scenarios encourage you to showcase your skills, Practice quizzes enable you to test your knowledge of what you learned. Finally, graded quizzes indicate how well you have learned the course concepts.

M1-S2: Getting Started with Python and Jupyter

### ➤ Introduction to Python

## What you will learn



Identify the users of Python



List the benefits of using Python



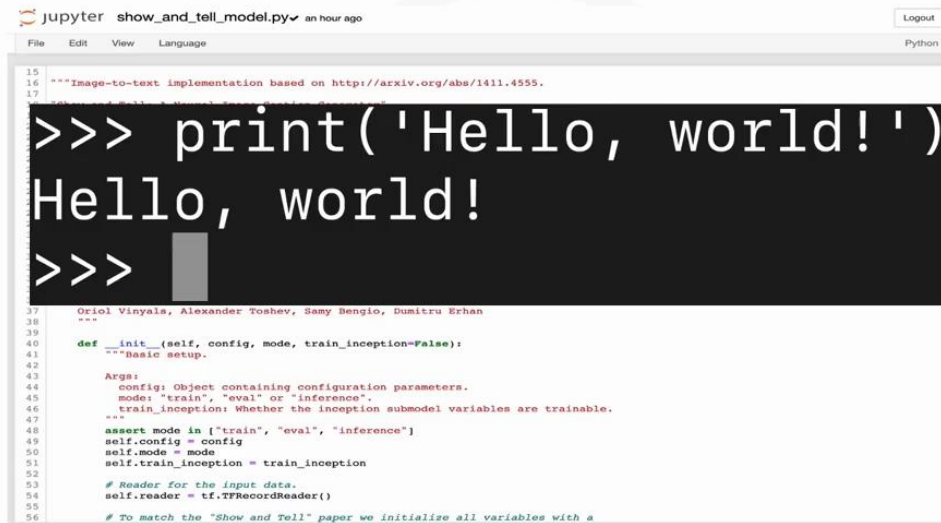
Describe the diversity and inclusion efforts of the Python community

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Welcome to “Introduction to Python”. After watching this video, you will be able to identify the users of Python. List the benefits of using Python. Describe the diversity and inclusion efforts of the Python community.

# Python



```
jupyter show_and_tell_model.py ✓ an hour ago
File Edit View Language Python
15 """Image-to-text implementation based on http://arxiv.org/abs/1411.4555.
16
17
>>> print('Hello, world!')
Hello, world!
>>>

37 Oriol Vinyals, Alexander Toshev, Samy Bengio, Dumitru Erhan
38 """
39
40 def __init__(self, config, mode, train_inception=False):
41     """Basic setup.
42
43     Args:
44         config: Object containing configuration parameters.
45         mode: "train", "eval" or "inference".
46         train_inception: Whether the inception submodel variables are trainable.
47     """
48     assert mode in ["train", "eval", "inference"]
49     self.config = config
50     self.mode = mode
51     self.train_inception = train_inception
52
53     # Reader for the input data.
54     self.reader = tf.TFRecordReader()
55
56     # To match the "Show and Tell" paper we initialize all variables with a
```

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Python is a powerhouse of a language. It is the most widely used and most popular programming language used in the data science industry. According to the 2019 Kaggle Data Science and Machine Learning Survey,  $\frac{3}{4}$  of the over 10,000 respondents worldwide reported that they use Python regularly. Glassdoor reported that in 2019 more than 75% of data science positions listed included Python in their job descriptions. When asked which language an aspiring data scientist should learn first, most data scientists say Python.

## Who is Python for?

- People who already know how to program
- People who want to learn to program
- Over 80% of data professionals worldwide
- Areas like data science, AI and machine learning, web development, and Internet of Things (IoT) with devices like Raspberry Pi
- Large organizations like IBM, Wikipedia, Google, Yahoo!, CERN, NASA, Facebook, Amazon, Instagram, Spotify, and Reddit

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Let's start with the people who use Python.

If you already know how to program, then Python is great for you because it uses clear and readable syntax. You can develop the same programs from other languages with lesser code using Python.

For beginners, Python is a good language to start with because of the huge global community and wealth of documentation.

Several different surveys done in 2019 established that over 80% of data professionals use Python worldwide.

Python is useful in many areas including data science, AI and machine learning, web development, and Internet of Things (IoT) devices, like the Raspberry Pi.

Large organizations that heavily use python include IBM, Wikipedia, Google, Yahoo!, CERN, NASA, Facebook, Amazon, Instagram, Spotify, and Reddit.

Python is widely supported by a global community and shepherded by the Python Software Foundation.

## What makes Python great

Is a general-purpose language

Has a large standard library

For data science, it has scientific computing libraries like Pandas, NumPy, SciPy, and Matplotlib

For AI, it has libraries like TensorFlow, PyTorch, Keras, and Scikit-learn

Can be used for Natural Language Processing (NLP) using the Natural Language Toolkit (NLTK)

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Python is a high-level, general-purpose programming language that can be applied to many different classes of problems.

It has a large, standard library that provides tools suited to many different tasks including but not limited to Databases, Automation, Web scraping, Text processing, Image processing, Machine learning, and Data analytics.

For data science, you can use Python's scientific computing libraries like Pandas, NumPy, SciPy, and Matplotlib.

For artificial intelligence, it has TensorFlow, PyTorch, Keras, and Scikit-learn.

Python can also be used for Natural Language Processing (NLP) using the Natural Language Toolkit (NLTK).



## Diversity and inclusion efforts

### Diversity Statement:

"The Python Software Foundation and the global Python community welcome and encourage participation by everyone. Our community is based on mutual respect, tolerance, and encouragement, and we are working to help each other live up to these principles. We want our community to be more diverse: whoever you are, and whatever your background, we welcome you."

*Adopted October 12, 2009*

**Code of Conduct:** <https://www.Python.org/psf/conduct/>

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Another great selling point for Python is that the Python community has a well-documented history of paving the way for diversity and inclusion efforts in the tech industry as a whole. The Python language has a code of conduct executed by the Python Software Foundation that seeks to ensure safety and inclusion for all, in both online and in-person

## Diversity and inclusion efforts



International mentorship group with a focus on helping more women become active participants and leaders in the Python open-source community.

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Python communities. Communities like PyLadies seek to create spaces for people interested in learning Python in safe and inclusive environments. PyLadies is an international mentorship group with a focus on helping more women become active participants and leaders in the Python open-source community.

# Summary

In this video, you learned that:

- Python uses clear and readable syntax
- Python has a huge global community and a wealth of documentation
- For data science you can use Python's scientific computing libraries like Pandas, NumPy, SciPy, and Matplotlib
- Python can also be used for Natural Language Processing (NLP) using the Natural Language Toolkit (NLTK)
- Python community has a well-documented history of paving the way for diversity and inclusion efforts in the tech industry as a whole

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In this video, you learned that Python uses clear and readable syntax. Python has a huge global community and a wealth of documentation. For data science, you can use python's scientific computing libraries like Pandas, NumPy, SciPy, and Matplotlib. Python can also be used for Natural Language Processing (NLP) using the Natural Language Toolkit (NLTK). Python community has a well-documented history of paving the way for diversity and inclusion efforts in the tech industry as a whole.

## ➤ Introduction to Jupyter

Jupyter is a freely available web application that enables creation and sharing of documents containing equations, live coding, visualizations, and narrative text. Jupyter provides an interactive computing environment that supports multiple programming languages, including Python, R, Julia, and more, but it shines brightest when used with Python. Jupyter revolves around notebooks, documents containing a mix of code, visualizations, narrative text, equations, and multimedia content. These notebooks allow users to create, share, and collaborate on computational projects seamlessly.

### Why Jupyter?

Jupyter's popularity stems from its flexibility and ease of use. Regardless of your level of programming expertise, whether you're an experienced coder or embarking on your data science journey, Jupyter offers an intuitive platform for writing, testing, and sharing code. Its interactive interface enables data exploration, algorithm experimentation, and result visualization—all seamlessly integrated within a unified environment.

### Key Features of Jupyter

Here are some key features and advantages of Jupyter:

1. **Interactive Computing:** Jupyter notebooks enable users to write and execute code interactively. This means you can run code cells individually and see the output immediately, fostering an iterative approach to coding and experimentation.
2. **Support for Multiple Languages:** While Jupyter was initially developed for Python (hence the name, which stands for Julia, Python, and R), it now supports various programming languages through its kernel system. This flexibility makes Jupyter suitable for various computational tasks and interdisciplinary collaboration.

3. **Rich Output:** Jupyter Notebooks support rich media integration, allowing users to generate interactive plots, charts, images, videos, and more directly within the document. This makes visualizing data, communicating findings, and creating compelling narratives easier.
4. **Integration with Data Science Libraries:** Jupyter seamlessly integrates with popular libraries and frameworks used in the data science ecosystem, such as NumPy, Pandas, Matplotlib, sci-kit-learn, TensorFlow, and PyTorch. This allows users to leverage the full power of these tools within the notebook environment for tasks like data manipulation, visualization, machine learning, and deep learning.
5. **Collaboration and Sharing:** Jupyter promotes collaboration and reproducibility by allowing users to share their notebooks with others via email, GitHub, or the Jupyter Notebook Viewer. This facilitates knowledge sharing, peer review, and interdisciplinary collaboration, as users can easily exchange ideas, code snippets, and best practices.

## **Jupyter in Data Science**

Jupyter has become an indispensable tool for researchers, analysts, and developers in data science. Its seamless integration with popular libraries such as NumPy, pandas, and sci-kit-learn makes it the go-to choice for data manipulation, analysis, and machine learning. Jupyter provides a user-friendly interface, interactive capabilities, and robust collaboration features, making it an essential tool for anyone involved in data analysis, scientific research, education, or software development. Whether you're exploring data, building machine learning models, teaching a class, or conducting research, Jupyter empowers you to work more efficiently and share your insights with others.

## **Getting Started with Jupyter**

Now that you can glimpse what Jupyter offers, it's time to dive in and experience its capabilities firsthand. Our Getting Started with Jupyter video will walk you through the basics of setting up and using Jupyter, empowering you to unleash the full potential of Python and embark on your data science journey with confidence.

So, let's jump into the world of Jupyter and unlock a world of possibilities in Python and data science!