



PYTHON FOR MATHEMATICIANS

International Masters Program in Mathematics (IMPM)



Overview of Python, Installation, and Setting up an IDE.

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What is Python?





What is Python?

- Python is a high-level, interpreted programming language known for its readability and simplicity.
- It was created by Guido van Rossum, and released in 1991.
- Python works on different platforms (Windows, Mac, Linux, Raspberry Pi, etc.).
- Python has a simple syntax similar to the English language.
- Python has syntax that allows developers to write programs with fewer lines than some other programming languages.

```
1
2
3 #include <iostream>
4
5 using namespace std;
6
7 int main(){
8
9    cout <<"Hello World!"<< endl;
10
11    return 0;
12 }</pre>
```

```
public class HelloWorld {

   public static void main(String[] args) {
       System.out.println("Hello world!");
   }
}
```



Why Python is Important for Mathematician?





Why Python is Important for Mathematician?

Python is an excellent programming language for Mathematicians due to the following reasons.

- Easy to learn.
- Mathematical Libraries.
- Visualization
- Automation
- Statistical Analysis, Linear Algebra, Solving Algebraic expressions etc.



Assignment

List real-world math specific python applications.



New Opportunities For Mathematicians

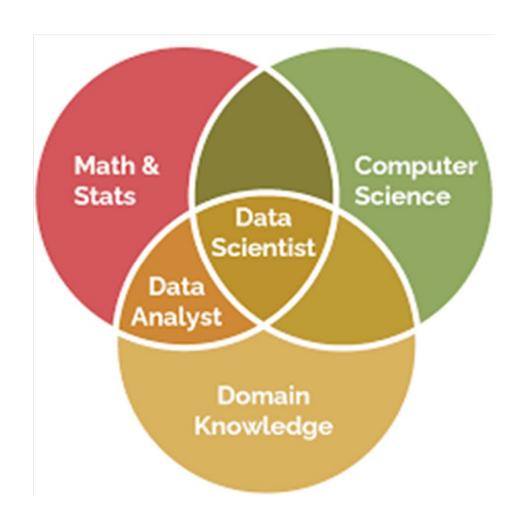


Data Science and Analytics

Role: Data Scientist, Data Analyst

Opportunities: With Python, mathematicians can analyze large datasets, extract meaningful insights, and apply statistical methods. Libraries like **Pandas** and **NumPy** are crucial for handling data, while **Matplotlib** and **Seaborn** help visualize trends.

Why it fits: Mathematicians can apply their problem-solving skills and knowledge of statistics to interpret data and make data-driven decisions.

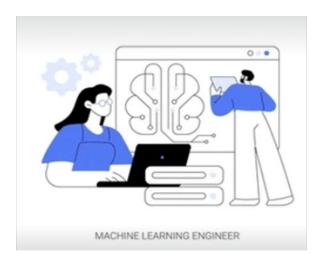


Machine Learning and Artificial Intelligence

Role: Machine Learning Engineer, AI Researcher.

Opportunities: Python is the primary language for AI and machine learning. Mathematicians can use libraries like scikit-learn, TensorFlow, and PyTorch to build predictive models, perform regression analysis, and optimize algorithms.

Why it fits: A strong foundation in linear algebra, probability, and calculus is key to understanding machine learning models, making mathematicians well-suited for these roles.





Cryptography and Cybersecurity

Role: Cryptography Analyst, Security Engineer.

Opportunities: Python can be used to implement cryptographic algorithms and analyse security protocols. This field often involves number theory and complex algorithms, areas where mathematicians excel.

Why it fits: A strong understanding of algebra and discrete mathematics helps in understanding and developing encryption techniques.



Academic and Research Roles

Role: Research Scientist, Educator.

Opportunities: Python is used in mathematical research to simulate complex systems, solve equations symbolically, or perform numerical experiments. Tools like SymPy and SciPy are invaluable in conducting research.

Why it fits: Mathematicians can use Python to conduct computational research, allowing for more complex and large-scale problem-solving.





Installation and Setting Up an IDE

- Python
- IDE (VS Code)
- Python Extension.
- Setting up environment
- Google Colab







Installation and Setting Up an IDE.

- First download Python https://www.python.org/downloads/
- Then, install IDE (VS Code) and setting up an environment.
- Install python extension in VS code to run python program.

What is IDE?

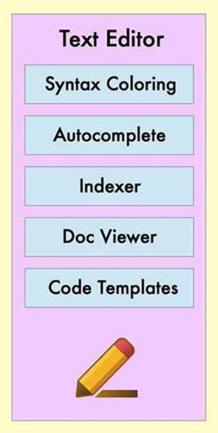
An **IDE** (Integrated Development Environment) is a software application that provides comprehensive tools and features to help programmers write, test, and debug code efficiently. It integrates all the tools needed for software development into a single interface, streamlining the coding process.

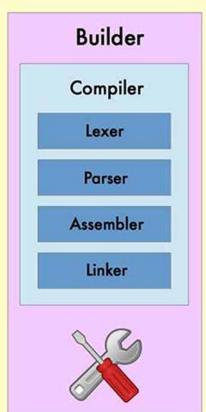
Why IDE?





Integrated Development Environment

























What is Google Colab?



Google Colab is a free cloud-based platform developed by Google that allows users to write, execute, and share Python code through a web-based interface. It is particularly popular for data science, machine learning, and deep learning projects due to its ease of use and integration with popular libraries.

Features & Benefits

Accessible from any web browser.



No setup needed, just login & code.

Pre-installed libraries.



Build complex models.

Powerful computing resources.



Works best with large datasets.

Easy collaboration with real-time sharing.



Affordable, free for most tasks.

Q&A