What is Programming?

Programming is the process of giving instructions to a computer so it can perform tasks for us.

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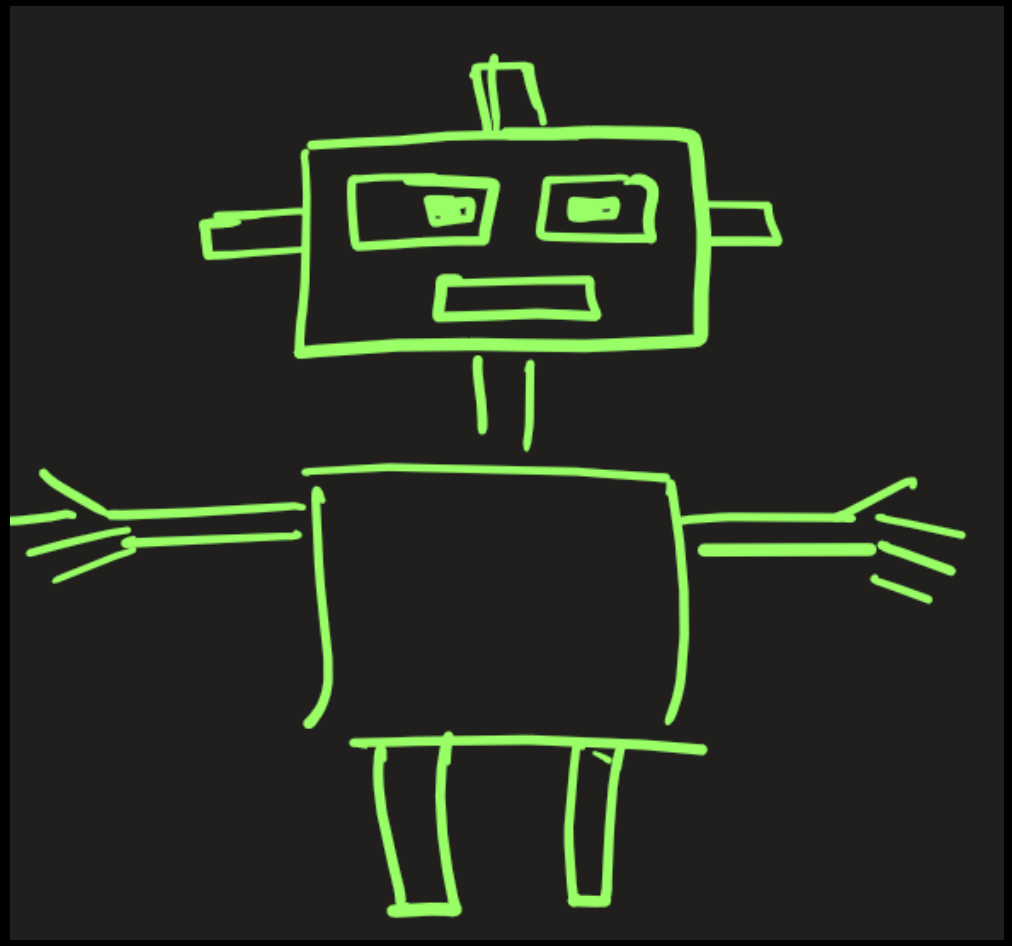


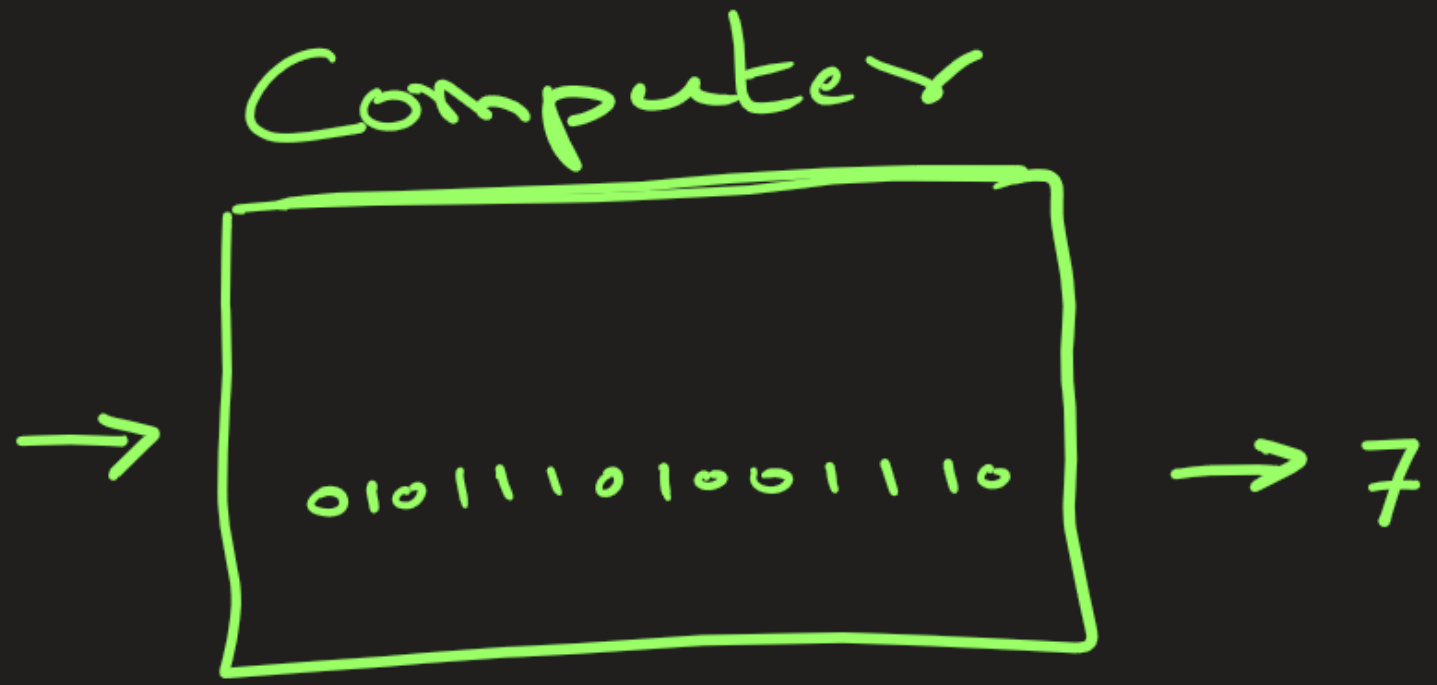
What Is a Program?

A **program** is a set of instructions written in a programming language.

```
a = 2
b = 5

result = a + b

print(result)
```

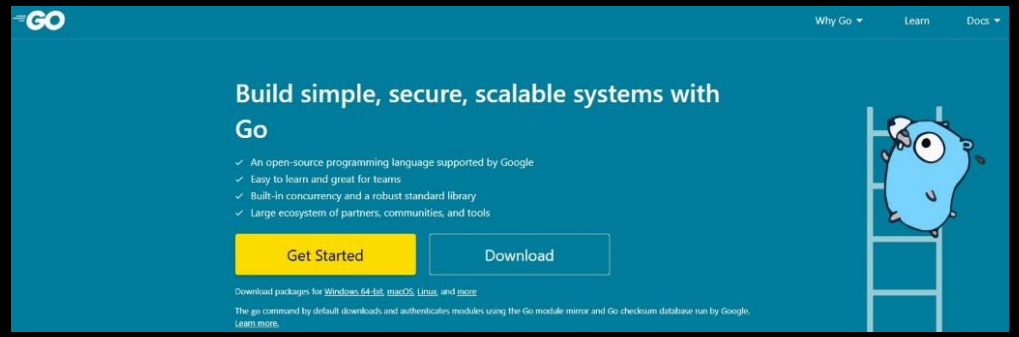


What are different programming languages ?

python

R

Java



C

C++

Perl

Fortran

What Can Programming Do?

With programming, we can:

- Build mobile apps
- Create websites
- Analyze data
- Build AI & Machine Learning models
- Create games
- Automate medical systems

Why should I learn Python instead of other languages?

Python Is Easy to Learn

Compare this to other languages:

- Fewer symbols
- Less confusing syntax
- Easy to read and write

✓ Perfect for **beginners**
✓ No programming background required

Why should I learn Python instead of other languages?

Python Is Beginner-Friendly but Powerful

Python is used by:

- Beginners
- Professionals, Scientists, AI Engineers

Why should I learn Python instead of other languages?

Python Has Huge Community & Libraries

Python has **ready-made tools** (called libraries):

- **numpy** → math & arrays
- **pandas** → data analysis
- **matplotlib** → plotting graphs
- **scikit-learn** → machine learning
- **tensorflow**, **pytorch** → deep learning

You write **less code and** You build **more powerful applications**

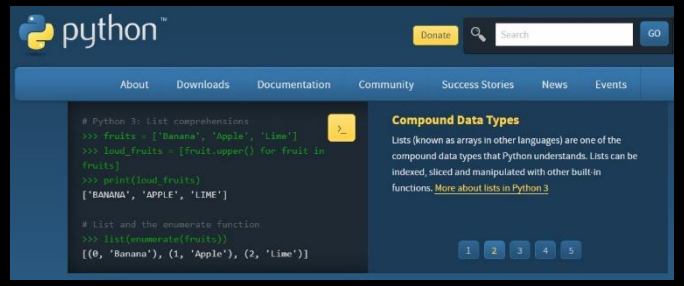
Why should I learn Python instead of other languages?

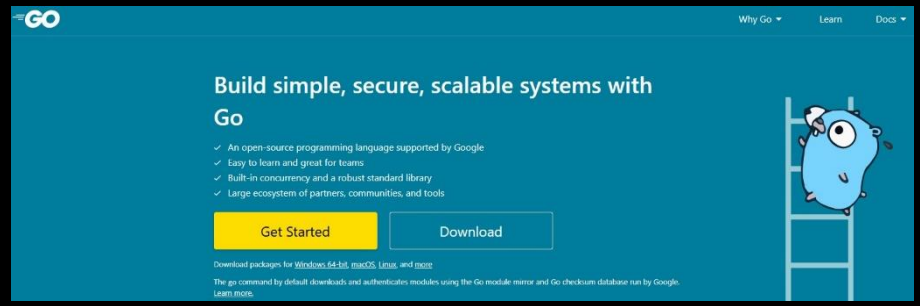
Ideas into Reality

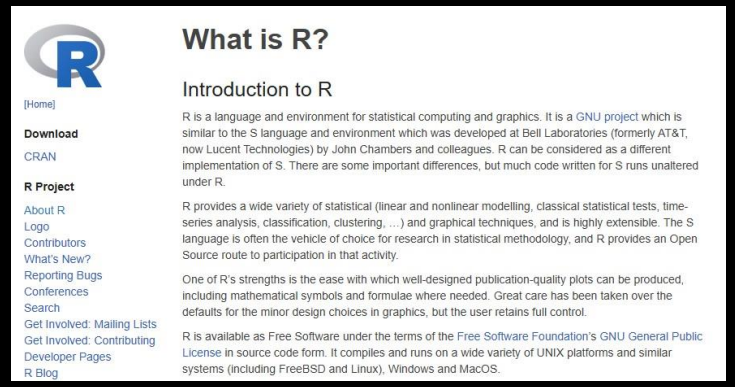
EXTRA

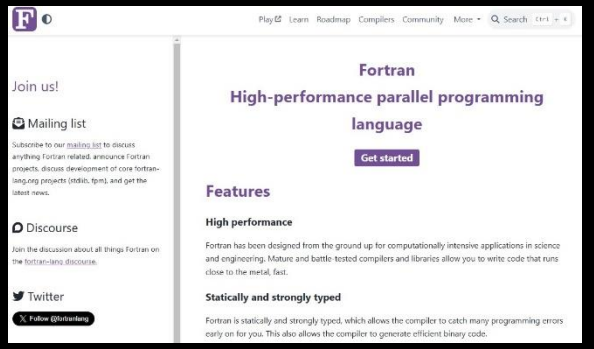
2. Introduction to Programming

- Process that involves writing instructions for a computer to follow in order to solve problems. The instructions are written in a language that the computer can understand, and this process is a collaboration between humans and computers.
- Common languages are Python, C, C++, java, GoLang, C#, R, VB.Net, PHP, R, Fortran, Pascal, Bash, PERL, prolog etc









Types of programming Language

- **Procedural programming languages**: These languages follow a sequence of commands or statements to achieve a desired output. Example: Python, C, Fortran, Pascal, etc

- **Object-oriented programming languages (OOP)**: These languages help manage complexity in large programs by using class(say, Planets) and objects(say mars, saturn, earth,etc). Example: Java, Python, C++, C#, Delphi/Object Pascal, VB.NET

- **Scripting languages**: These languages are used for specific purposes, such as web development. Example JavaScript, PHP, Python, Bash, Perl

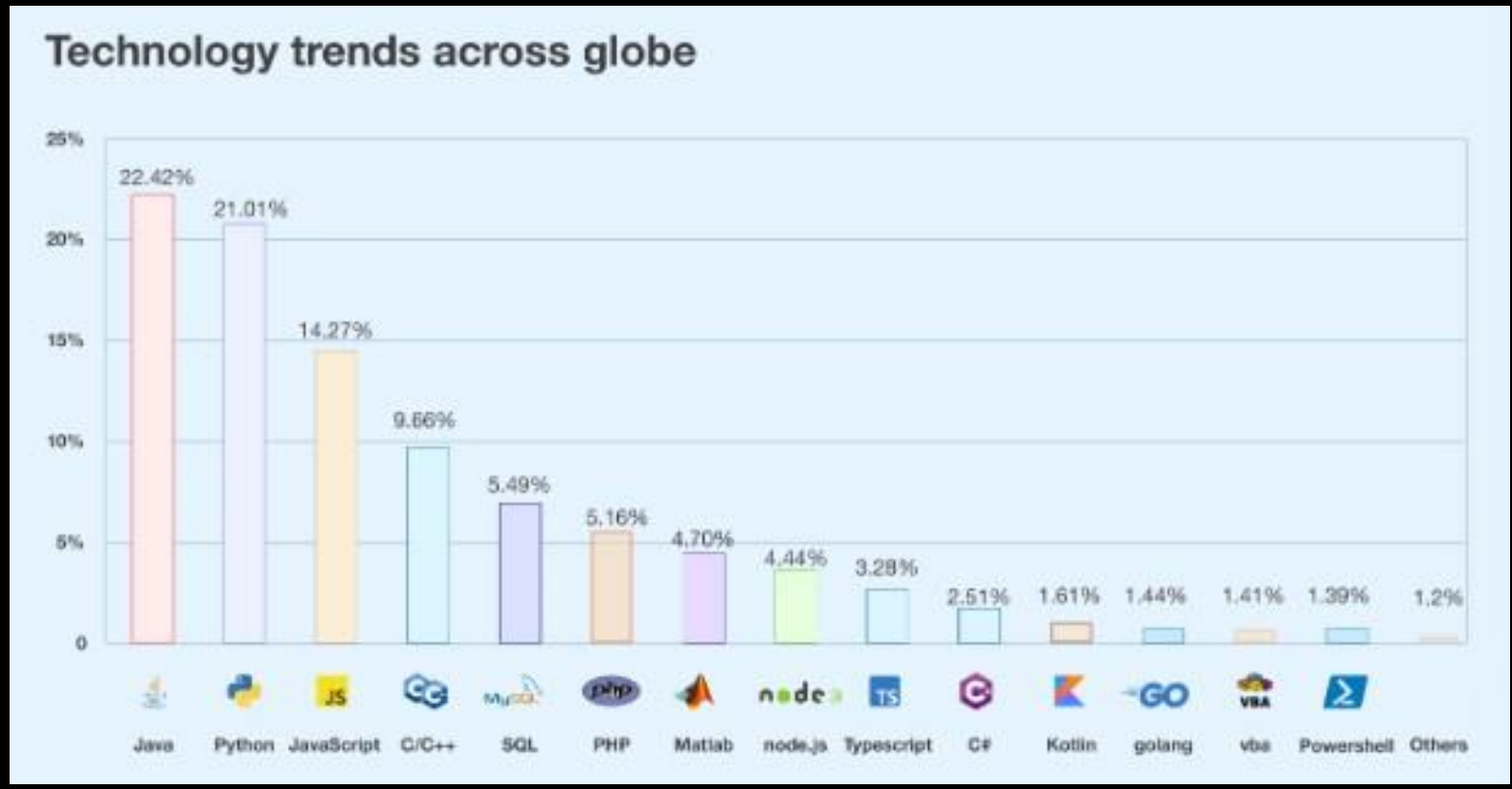
- **Logic programming languages**: These are another type of programming language. logic programming focuses on what the program should achieve: You define rules and facts**(Knowledge Representation),** and the system determines how to use them to reach a solution. Example Prolog, Answer Set Programming (ASP)

Evolution of Python

- Created by **Guido van Rossum** in 1991.
- **Python 1.x (1991-2000)**
  - Introduced core features like exception handling, functions, and modules.
  - Included basic data structures like lists, tuples, and dictionaries.
- **Python 2.x (2000-2010)**
  - Added list comprehensions, garbage collection, and Unicode support.
  - However, it suffered from inconsistencies, leading to Python 3.
- **Python 3.x (2008-Present)**
  - Introduced better Unicode handling, print as a function, and type hints.
  - Removed legacy features for better consistency.
  - Gained popularity for web development, AI, and data science.
- Over time, Python has become one of the most widely used programming languages, with major contributions in **machine learning, data science, automation, and web development**.

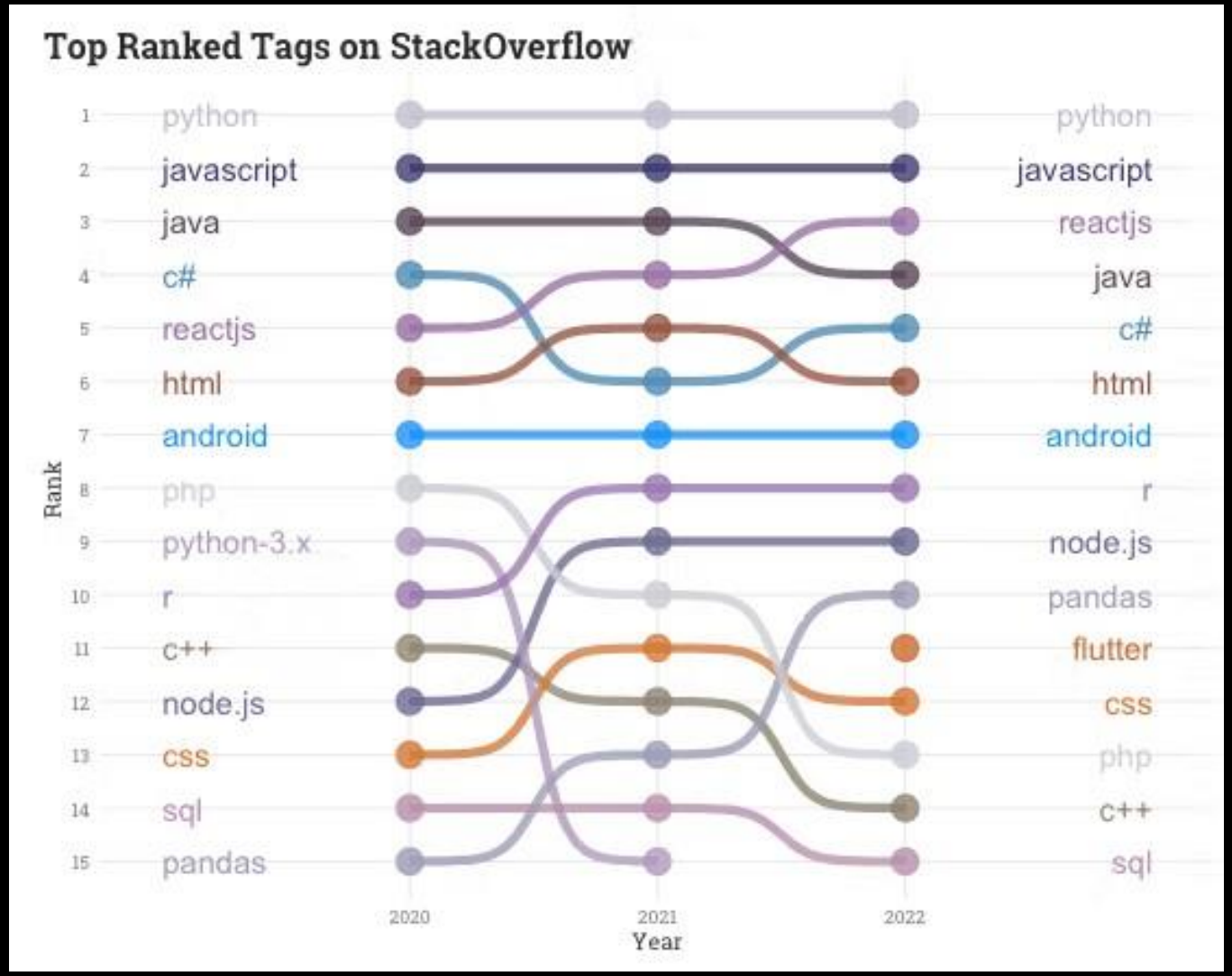
Where is Python Used?

- Web Development (Django, Flask)
- Data Science & AI (NumPy, Pandas, TensorFlow)
- Automation & Scripting (Selenium, PyAutoGUI)
- Cybersecurity (Scapy, Nmap)
- Game Development (Pygame)
- Embedded Systems & IoT (MicroPython, Raspberry Pi)



Popularity contest

- According to current trends, the most widely used programming languages are **Python, Java, and JavaScript**; with Python generally considered the most popular overall, followed by Java and then JavaScript, based on data from the TIOBE Index and other developer surveys.



Companies that use Python:

- Google makes extensive use of Python in its web search systems.
- The popular YouTube video sharing service is largely written in Python.
- The Dropbox storage service codes both its server and desktop client software primarily in Python.
- The Raspberry Pi single-board computer promotes Python as its educational language.
- EVE Online, a massively multiplayer online game (MMOG) by CCP Games, uses Python broadly.
- The widespread BitTorrent peer-to-peer file sharing system began its life as a Python program.
- Industrial Light & Magic, Pixar, and others use Python in the production of animated movies.
- ESRI uses Python as an end-user customization tool for its popular GIS mapping products.
- Google's App Engine web development framework uses Python as an application language.
- The IronPort email server product uses more than 1 million lines of Python code to do its job.
- Maya, a powerful integrated 3D modeling and animation system, provides a Python scripting API.
- The NSA uses Python for cryptography and intelligence analysis.
- iRobot uses Python to develop commercial and military robotic devices.
- Netflix and Yelp have both documented the role of Python in their software infrastructures.
- Intel, Cisco, Hewlett-Packard, Seagate, Qualcomm, and IBM use Python for hardware testing.
- JPMorgan Chase, UBS, Getco, and Citadel apply Python to financial market forecasting.
- NASA, Los Alamos, Fermilab, JPL, and others use Python for scientific programming tasks

Python in AI & Data Science

- **Machine Learning** (scikit-learn, TensorFlow, PyTorch)
- **Data Visualization** (Matplotlib, Seaborn)
- **Big Data Processing** (Dask, PySpark)

Compared with other languages

5 Python vs Other Languages

Feature	Python	C++	Java	JavaScript	Go
Ease of Use	✅	❌	❌	✅	❌
Speed	❌	✅	✅	✅	✅
AI & Data Science	✅	❌	❌	❌	❌
Web Development	✅	❌	✅	✅	✅
System Programming	❌	✅	❌	❌	✅

Disadvantages of Python(p2)

2. High Memory Usage

Reason: Python's dynamic typing and garbage collection lead to high memory consumption.
Impact: Not ideal for applications with **limited memory** (e.g., embedded systems).

```python
import sys

x = 10  # Small integer
y = [i for i in range(10000)]  # Large list

print(sys.getsizeof(x))  # Output: 28 bytes
print(sys.getsizeof(y))  # Output: ~87,000 bytes
```

Lists consume **more memory** than arrays in C/C++.
Solution: Use **NumPy arrays** instead of lists for large data.

Disadvantages of Python(p3)

3. **Global Interpreter Lock (GIL)**

- Reason: Only one thread executes at a time
- Impact: Inefficient multi-threading for CPU-bound tasks
- Solution: Use multiprocessing for CPU-heavy tasks

4. Weak in Mobile & Game Development

- Reason: Not optimized for mobile or games
- Impact: Rarely used for Android/iOS apps or major games
- Solution: Use Kivy or BeeWare (limited support)

5. Limited Support for Frontend Web Development

- Reason: Primarily a backend language
- Impact: Cannot replace JavaScript for frontend
- Solution: Use JavaScript + Python for full-stack

6. Poor Performance in Real-Time Applications

Reason: Interpreted nature and GIL cause delays
Impact: Not ideal for real-time systems
Solution: Use Cython or C/C++ modules

7. Dependency Management Issues

- Reason: Multiple versions & libraries lead to conflicts
- Impact: Harder to maintain projects
- Solution: Use virtual environments (venv, conda)

Heading Goes Here

Fhdsklf
Fjdsklf
Fjskldf