



(Institute of Technology and Science)



CAR SALES

(Group Members of this Project)

Name	Roll No.	Section
1. PRIYANSHU MITRA	220934106320	F
2. MOHD RAIYYAN	220934106249	F

BCA (Batch 2022_25)



(Chaudhary Charan Singh University)



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PYTHON

ABOUT

Python is a high-level, interpreted programming language that is noted for its ease of use and readability. It was invented by Guido van Rossum and originally made available in 1991. Python is extensively used in web development, data analysis, artificial intelligence, scientific computing, and automation. Its design philosophy prioritizes code clarity and simplicity of use, making it an ideal choice for both new and seasoned developers.

KEY FEATURES

- High Level
- Procedural and OOP's
- Python is case sensitive
- It is Fast
- Easy to Understand
- Read line by line(Interpreted Language)
- Simple Syntax
- Widely used by Industries
- Best package for AI and ML
- Portable
- Platform Independent



PYTHON

ADVANTAGES

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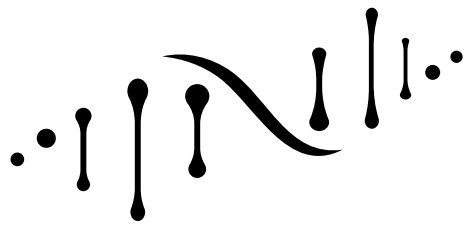
- Ease of Learning and Use: Python's simple syntax and readability make it an excellent choice for beginners.
- High Productivity: Python's simplicity allows developers to focus on solving problems rather than dealing with syntax issues, leading to higher productivity.
- Versatility: Python can be used for a wide range of applications, from web development to machine learning, making it highly versatile.
- Extensive Libraries: The availability of extensive libraries and frameworks means you can find a library to help with almost any task.

DISADVANTAGES

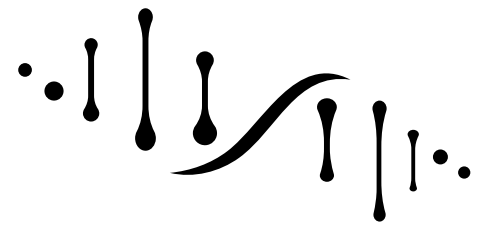
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- Performance: Python is slower compared to some other languages like C++ or Java because it is an interpreted language.
- Memory Consumption: Python can be memory-intensive, which might be a concern for certain applications.
- Mobile Development: Python is not the first choice for mobile app development. While it's possible to create mobile apps with Python, it's not as common or straightforward as using languages like Java or Swift.

PYTHON LIBRARIES



ABOUT



Python libraries are collections of pre-written code that may be used to do certain tasks without having to start from scratch. They make Python a strong programming language by letting developers to rapidly and effectively create complicated features.

TYPES OF PYTHON LIBRARIES

- **Standard Libraries:** These come with Python and provide modules for various common tasks like file I/O, system calls, math operations, etc.
Example: os, sys, math, datetime, json and more.....
- **Third-Party Libraries:** These are developed by the community and can be installed via package managers like pip.
Example: numpy, pandas, matplotlib and more.....
- **Domain-Specific Libraries:** These are designed for specific fields like data science, web development, machine learning, etc.
Example: Data Science: Pandas, NumPy, SciPy and more...
Web Development: Django, Flask and more...
Machine Learning: TensorFlow, Scikit-learn and more...

PYTHON LIBRARIES

POPULAR PYTHON LIBRARIES

Python has a vast and continuously growing ecosystem of libraries. The total numbers of Python are **more than 137000** libraries. All these libraries are used in machine learning, data science, data manipulation and visualization, and more. But most usable and popular libraries according to data science & data analysis, AI & ML and web development are,

Data Science and Data Analysis :-

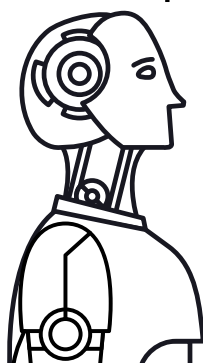


- NumPy: Fundamental package for numerical computations in Python. It provides support for arrays, matrices, and many mathematical functions.
- Pandas: Powerful data manipulation and analysis library. It provides data structures like DataFrames to handle structured data.
- Matplotlib: Comprehensive library for creating static, animated, and interactive visualizations in Python. It's especially useful for 2D plots and graphs.
- Seaborn: Built on top of Matplotlib, Seaborn provides a high-level interface for drawing attractive statistical graphics.

PYTHON LIBRARIES

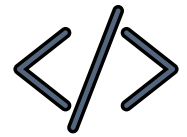
Artificial Intelligence And Machine Learning :-

- Scikit-learn: A simple and efficient tool for data mining and data analysis, built on NumPy, SciPy, and Matplotlib. It provides a wide range of supervised and unsupervised learning algorithms.
- TensorFlow: An open-source library developed by Google for machine learning and deep learning tasks. TensorFlow supports neural networks, natural language processing, and much more.
- Keras: A high-level neural networks API, written in Python and capable of running on top of TensorFlow, CNTK, or Theano. It's user-friendly, modular, and extensible.
- PyTorch: An open-source machine learning library developed by Facebook's AI Research lab. It's popular for its flexibility and ease of use, especially in the research community.
- XGBoost: An optimized distributed gradient boosting library designed to be highly efficient, flexible, and portable. It's popular for machine learning competitions.



PYTHON LIBRARIES

Web Development :-



- Django: A high-level Python web framework that encourages rapid development and clean, pragmatic design. It's known for its simplicity and ability to build robust web applications quickly.
- Flask: A lightweight WSGI web application framework. It is designed to be simple, allowing developers to create web applications with a minimalistic approach.
- FastAPI: A modern, fast (high-performance), web framework for building APIs with Python 3.7+ based on standard Python type hints.
- Requests: A simple yet powerful library for making HTTP requests. It's used for interacting with web services and APIs.

BENEFITS



- Saves Time: No need to write code from scratch.
- Reliability: Often maintained by large communities or organizations.
- Performance: Optimized and tested for performance.
- Scalability: Can be used to handle large-scale data and applications.

MACHINE LEARNING

ABOUT

Machine learning (ML) is a subfield of artificial intelligence (AI) that focuses on creating systems that can learn from and make data-driven judgments or predictions. Instead of being directly programmed to execute a job, machine learning models are trained on massive volumes of data, allowing them to find patterns and improve their performance over time.

KEY FEATURES

- Automation of Processes
- Learning from Data
- Scalability
- Versatility
- Prediction and Forecasting
- Personalization
- Model Generalization
- Feature Engineering
- Continuous Improvement
- Complex Problem Solving
- Unsupervised Learning Capabilities
- Model Interpretability (in some cases)



MACHINE LEARNING

ADVANTAGES

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- Automates Complex Decision-Making: ML can handle intricate tasks and make decisions without human intervention.
- Scalable Data Processing: Capable of processing large volumes of data efficiently.
- Adaptive Learning: Improves over time as more data becomes available.
- Predictive Power: Provides accurate predictions and forecasts based on historical data.
- Personalization: Customizes user experiences and recommendations effectively.
- Handles Complex Data Types: Works with structured and unstructured data like images, text, and video.

DISADVANTAGES

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- Data Dependency: Requires large amounts of high-quality data to perform well.
- Overfitting Risk: May perform well on training data but poorly on new data if overfitted.
- Complexity in Interpretation: Some models, like deep neural networks, can be difficult to interpret and understand.
- Challenges in Generalization: Models might not generalize well to data outside the training set.

MACHINE LEARNING TYPES

SUPERVISED MACHINE LEARNING

Supervised machine learning is a type of machine learning in which the model is trained using a labeled dataset. In this context, "labeled" refers to each training example containing both the input data and the correct output, or label. The goal of supervised learning is for the model to learn a mapping from inputs to outputs that will allow it to accurately predict the output of new, unseen data.

KEY FEATURES

- Labeled Data
- Input-Output Mapping
- Common Algorithms
- Hyperparameter Tuning
- Cross-Validation



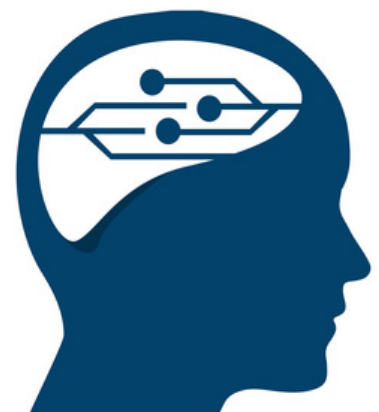
MACHINE LEARNING TYPES

UNSUPERVISED MACHINE LEARNING

Unsupervised machine learning is a type of machine learning in which the model is trained on data that lacks explicit labels or predefined results. The goal is to investigate the structure and patterns in the data rather than predict specific outcomes.

KEY FEATURES

- No Labeled Data
- Data Exploration
- Clustering
- Anomaly Detection
- Pattern Recognition
- Scalability
- Self-Organizing Maps



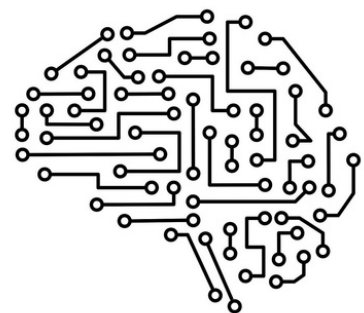
MACHINE LEARNING TYPES

REINFORCEMENT LEARNING

Reinforcement Learning (RL) is a type of machine learning that focuses on how agents should behave in an environment to maximize cumulative rewards. Reinforcement learning, as opposed to supervised learning, involves an agent learning through interaction with its environment.

KEY FEATURES

- Agent and Environment
- Value Function
- Discount Factor (γ)
- Learning
- Convergence
- Trial and Error
- Markov Decision Process (MDP)



CONCLUSION



Python is a top-tier machine learning language due to its simplicity, extensive libraries, strong community support, and versatility. Its ecosystem enables the efficient development, experimentation, and deployment of machine learning models, meeting both research and production requirements. As the field of machine learning evolves, Python remains a critical tool for data scientists and practitioners, driving innovation and enabling advancements across multiple domains.





THANK YOU