



Machine learning: Types of Machine learning

Machine learning is the advanced technology in which an AI model is trained from data and make real life decisions. This article covers the three main part of machine learning: supervised, unsupervised and reinforcement learning.

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Introduction

In today's digital era, machine learning has become a vital part of modern technology. Machine learning refers to design of algorithm or system that can make predictions and decisions on its own by extracting data. From the recommendation systems on platforms like Youtube or Netflix to spam filtering email, Machine learning models are used. It's main goal is to develop a system that don't need explicit programming.

As the world is constantly revolving and the use of data is continues to grow, it is very essential for IT students and professionals to learn machine learning to keep up with the world. Among its different approaches, unsupervised, supervised and reinforcement learning are that ones that makes the basis of machine learning model.

"A baby learns to crawl, walk and then run. We are in the crawling stage when it comes to applying machine learning."

~Dave Waters

What is Machine learning?

Machine learning is a branch of artificial intelligence that allows the system to learn from training data, and apply that knowledge to real-world decision-making. It enables systems to identify and understand the patterns from data and use them to make decision and improves its performance over time without hard-coded programming.

For example, email can automatically detect spam or non-spam emails. Recommendation system suggest content based on your interests. These systems learn from their past data and constantly improving their performance.

Machine learning is widely used in many fields like medical, finance or entertainment etc.



Technology Overview

Machine Learning is developed with different technologies that work together to process data and produce useful results. These technologies include programming language, data processing systems and computing resources. Understanding these technologies help in building an efficient machine learning system.

The most vital and important part is data. You know like machine learning models need vast amount of data to learn from. They heavily depend on the larger datasets to learn patterns and make predictions. Because of simplicity and strong library support, Python is the programming language that is commonly for developing machine learning models. Also, algorithm plays vital role in defining how the model learns from data and makes decisions.

Machine learning models also depend on computing power. For example, if you're building a large data model, you may need vast amount of computing power such as GPU to process large amount of data efficiently. Tools like Scikit-learn, TensorFlow, Numpy and Pandas are the libraries that are widely used to design models, test them and deploy them.

All these technologies together make it possible to build an effective and intelligent system that can solve the real-world problems.

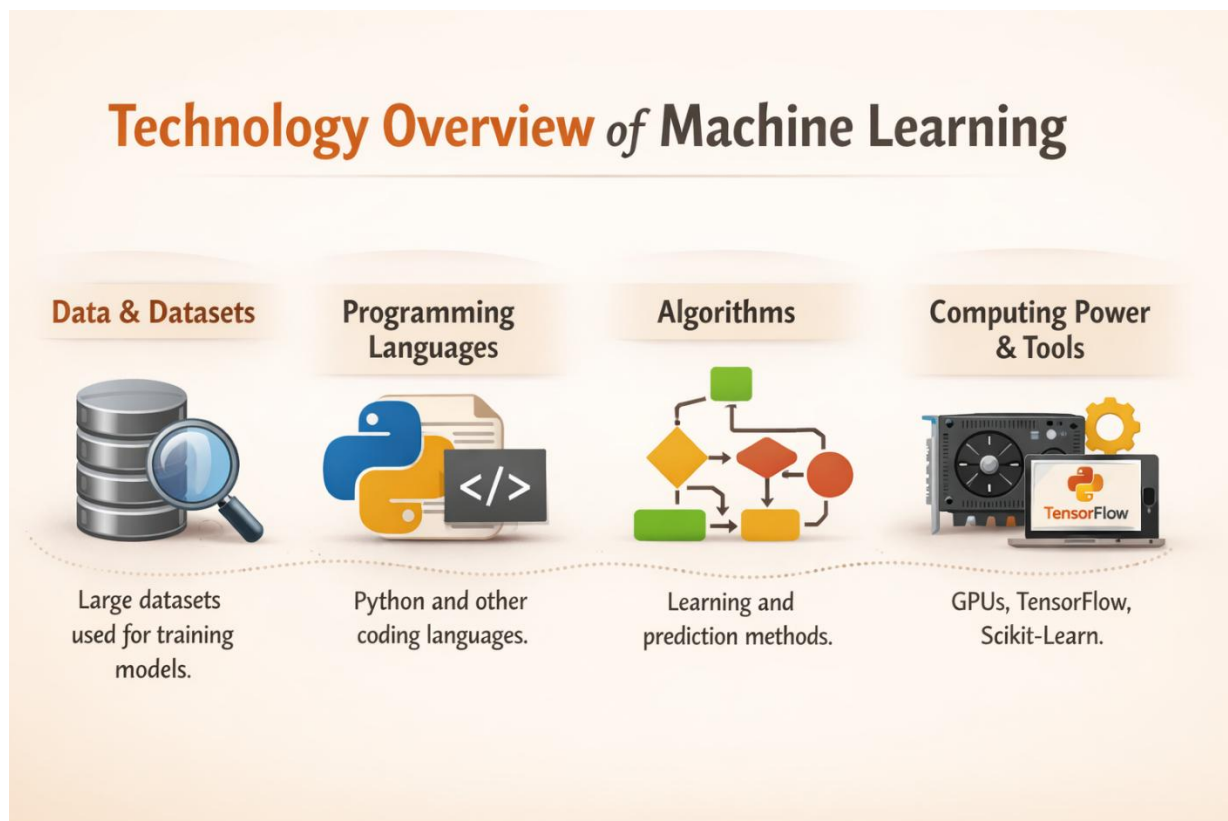


Figure 1: Technology overview of machine learning

Challenges in Machine learning

Regardless of its fast growth and wide applications, machine learning encounters several important challenges. One of the biggest challenge is the need of large amounts of high quality data. If data is incorrect, biased and incomplete, model may give wrong and unreliable results.



Another challenge is model bias, which is systematic error in prediction because of skewed training data or flawed assumptions, resulting in incorrect and unfair decisions. This can be a grave matter in the fields such as healthcare, justice and finance. Therefore, It is very important for the model to generalize well on training data so that it can produce correct and fair results.

Furthermore, Machine learning models also need very high computational power, especially dealing with large datasets, which can increase complexity and cost.

Moreover, understanding and implementing machine learning algorithms can be difficult, especially for complex systems. This lack of transparency makes it harder to trust the decisions made by these models. Therefore, resolving these challenges is important for effective and responsible use of machine learning. Addressing these challenges is crucial for building trust worthy and reliable machine learning models.

Types of Machine learning

Machine learning is commonly classified into three major aspects:

Supervised Learning: In Supervised learning, model is trained using labeled data means Input is paired with known output. Model learns the relationship between input and output, trained on that data and then uses the information on new and unseen data. It is widely used because it provide reliable and accurate results.

Its major types are **classification** and **regression**.

For example, in banks, supervised learning is used to train model to detect unauthorized or illegal transactions. They train model on previous data labeled as “fraudulent” and “legitimate” and model make predictions on new transactions. Similarly, it is also widely used in tasks like image processing or predicting house prices.

Unsupervised Learning: Unsupervised learning is the type of machine learning in which model is trained using unlabeled data meaning output is not already known. Unlike supervised learning, the model does not rely on predefined answers, it learns on its own and groups or organizes data based on similarities. The model learns the hidden patterns from training data on its own and use them to group data. This type of model is useful where data is not known in advance or when there is no available labeled data.

Its major types include clustering, dimensionality reduction, association and anomaly detection.

For example, platforms like Google News cluster the articles on same topics from different sources. Similarly, companies used these models to group customers based on their interests, behavior and purchasing pattern.

Reinforcement Learning : It is the type of machine learning where model is not trained using labeled input or labeled output. Model learns by interacting with its environment and improves performance by receiving feedback from the user in the form of reward and penalties. The main focus of model is to maximize reward. This learning is essential in the situations where decisions are made step by step.

In reinforcement learning, the system is commonly referred to as “agent” that makes decisions and learn from the results.

For example, In gaming, AI system learns patterns from playing with human repeatedly and make decisions based on previous interaction such as in chess. Reinforcement learning model is also used in Natural language processing systems like Chatgpt records human feedback and gives better answers over time.

Why It Matters



Machine learning matters because it allows the systems to make intelligent decisions in environment where traditional programming is not effective. In this digital age where data is growing with high speed, It helps companies and organizations to inspect large amounts of information and extract useful and meaningful insights. This enables organizations and businesses to increase efficiency, reducing human error and make more accurate decisions.

It also plays a crucial role in many real-world applications such as entertainment, healthcare and finance. For example, machine learning models help doctors in identifying diseases by examining the symptoms, banks in fraud detection and streaming platforms in providing personalized recommendations. These applications highlights the importance of machine learning how it is directly impacting our daily lives.

Key Findings & Impact

This discussion shows that machine learning is an advanced and powerful technology that can make our life easier. As an IT student, It is very fascinating to see how a machines can learn from data and make the decisions on their own.

Machine learning has significant impacts on every field of life such as healthcare, finance, entertainment and cybersecurity. It has made the life easier by making the small tasks automatic. As the data continue to grow, the importance of machine learning also gonna increase making it the important aspect in information technology.

It also plays an important part in boosting and enhancing user experience by providing reliable recommendations. Moreover, machine learning models are also widely used in developing intelligent systems like virtual assistant or self-driving cars.

What's Next?

As machine learning continues to grow, its role is going to become more important in this digital era. With the rapid increase in data and advancements in computing, machine learning is looking forward to drive innovation in the fields like artificial intelligence, healthcare and automation.

For newcomers and students, it is very important for them to learn Python, write basic algorithms and work on small projects to enhance their skills. To understand machine learning efficiently, it is very important to gain experience through practice and real-world applications.

By continuous learning and working, anyone can develop an intelligent systems that can benefit society and contribute to future technology advancements.

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