

Machine learning

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Machine [learning](#) is a subfield of [artificial intelligence](#) (AI) that focuses on the development of algorithms and statistical models that enable computer systems to learn and make predictions or decisions without being explicitly programmed. In essence, machine learning systems are designed to improve their performance on a task as they are exposed to more data, allowing them to generalize and make accurate predictions or decisions on new, unseen data.

Definition

ML allows systems to learn from data without being explicitly programmed. It uses statistical methods to find patterns and improve decision-making over time.

- **Example:** Image recognition, [natural language processing](#), and fraud detection. - **Key Features:** Learns from data, improves with experience, includes techniques such as supervised learning, unsupervised learning, and reinforcement learning.

Key elements

[Data](#): Machine learning algorithms require data as input. This data can come in various forms, including text, images, numerical values, and more. The data is used for [training](#), validating, and testing machine learning models.

[Learning](#): Machine learning models learn patterns and relationships within the data. They adapt their internal parameters or structure to optimize their performance on a specific task. Learning can

involve finding patterns, making predictions, clustering data, or reducing dimensionality, depending on the type of machine learning.

Generalization: The primary goal of machine learning is to generalize from the data it has been trained on. In other words, a machine learning model should be able to make accurate predictions or decisions on new, unseen data that it has not been explicitly trained on.

Feedback and Adaptation: Machine learning models often receive feedback on the correctness of their predictions or decisions. This feedback is used to adjust the model's parameters or structure, improving its performance over time. This process is known as training or learning.

Algorithms: Machine learning relies on algorithms that define how data is processed and used to make predictions or decisions. These algorithms can range from linear regression and decision trees to complex neural networks and deep learning models.

Machine learning is applied in a wide range of applications, including but not limited to:

Natural Language Processing: Understanding and generating human language, used in chatbots, language translation, sentiment analysis, and more.

Computer Vision: Analyzing and interpreting visual information from images and videos, used in image recognition, object detection, and autonomous vehicles.

Recommendation Systems: Providing personalized product recommendations, content recommendations, and more, based on user behavior and preferences.

Healthcare: Diagnosing diseases, predicting patient outcomes, and drug discovery.

Finance: Fraud detection, stock market predictions, credit scoring, and algorithmic trading.

Autonomous Systems: Self-driving cars, robotics, and drones that make decisions based on their environment.

Anomaly Detection: Identifying unusual patterns or outliers in data, used for fraud detection, network security, and quality control.

Machine learning has the potential to automate complex tasks, improve decision-making, and make predictions based on large and complex datasets. It has become a fundamental tool in various industries and continues to evolve with advancements in AI research and technology.

Machine learning algorithm

[Machine learning algorithm.](#)

Machine learning model

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Machine learning indications

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Machine learning in neurosurgery

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