



# MACHINE LEARNING

*Types of ML*

SUPERVISED

UNSUPERVISED

REINFORCEMENT

# WHAT IS MACHINE LEARNING

Machine Learning (ML) is a subfield of artificial intelligence (AI) that focuses on enabling machines to learn from data and improve their performance over time without being explicitly programmed for each task. It uses algorithms trained on data sets to create models that can predict outcomes, classify information, and make decisions based on patterns and relationships in the data

Machine learning algorithms operate through a process that involves several key steps:

1. **Data Collection:** Relevant data is gathered, which could include images, text, numerical data, etc.
2. **Data Preprocessing:** The data is cleaned, transformed, and split into training and test sets.
3. **Model Selection:** A suitable machine learning model is chosen based on the task, such as classification or regression.
4. **Training the Model:** The model is trained using the training data, learning patterns and relationships.
5. **Evaluating the Model:** The model's performance is assessed using the test data.
6. **Fine-tuning:** Hyperparameters are adjusted to improve the model's performance.
7. **Prediction or Inference:** The trained model is used to make predictions or decisions on new data

TYPES OF ML

# SUPERVISED LEARNING

involves training algorithms using labeled datasets, where each input is paired with the correct output. This allows the algorithm to learn the mapping from inputs to outputs, enabling it to make predictions or decisions when presented with new, unseen data



# UNSUPERVISED LEARNING

Unsupervised learning works by analyzing unlabeled data to identify patterns and relationships. The data is not labeled with any predefined categories or outcomes, so the algorithm must find these patterns and relationships on its own. This can be challenging but rewarding, as it can reveal insights into the data that would not be apparent from a labeled dataset





TYPES OF ML

# SEMI-SUPERVISED LEARNING

In semi-supervised learning, labeled data provides the necessary context and correct predictions for each sample input, while unlabeled data helps to improve the model's performance by providing additional information<sup>1</sup>. This approach is particularly useful when obtaining labeled data is expensive or time-consuming, but unlabeled data is readily available



TYPES OF ML

# REINFORCEMENT LEARNING

Unlike supervised learning, which relies on a training dataset with predefined answers, RL involves learning through experience. In RL, an agent learns to achieve a goal in an uncertain, potentially complex environment by performing actions and receiving feedback through rewards or penalties



# SUMMARY

- Supervised Learning: Algorithms are trained on labeled data sets, learning to map input features to output labels. Examples include linear regression, logistic regression, and support vector machines
- Unsupervised Learning: Algorithms analyze and cluster unlabeled data sets, discovering hidden patterns without human intervention. Examples include k-means clustering and principal component analysis (PCA)
- Semi-supervised Learning: Combines a small amount of labeled data with a large amount of unlabeled data to guide the learning process
- Reinforcement Learning: Algorithms learn through trial and error, receiving feedback from their actions to optimize their performance over time. Examples include Q-learning and deep reinforcement learning

