Types of Machine Learning: Supervised, Unsupervised, Semi-Supervised, Reinforcement

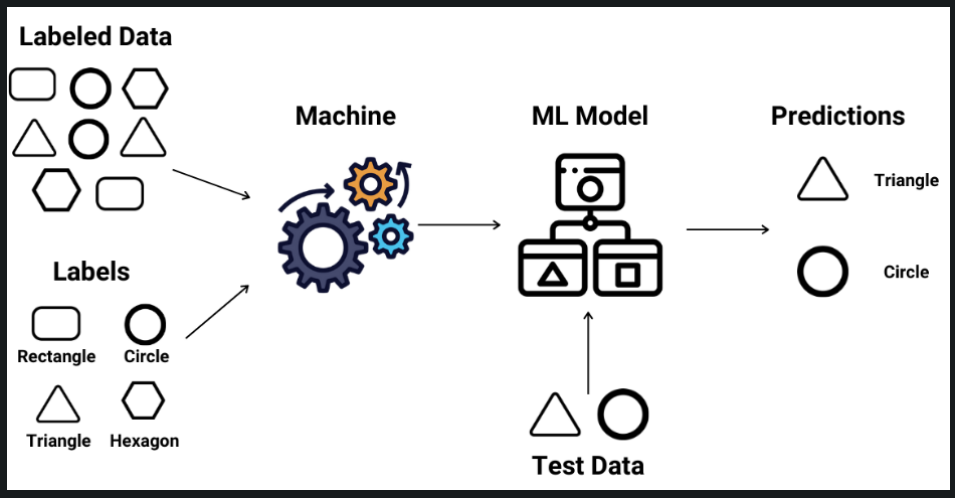
Machine learning, a subset of artificial intelligence, is a versatile field with several approaches to learning and problem-solving.

In machine learning, a dataset is a structured collection of information organized into rows and columns. Each row represents a unique data point, while columns correspond to specific features or attributes of those data points. The columns contain the input data (features) and the corresponding target values or labels (in supervised learning). This tabular format allows machine learning models to learn patterns and make predictions based on the relationships between features and labels.

Let's explore the main types of machine learning.

Supervised Learning

- Supervised learning involves training a model on labeled data, where the input data is paired with the corresponding correct output. The algorithm learns to map inputs to outputs and trace the pattern.



- Supervised learning is subdivided into two parts i.e. Regression

and Classification

1. Classification -

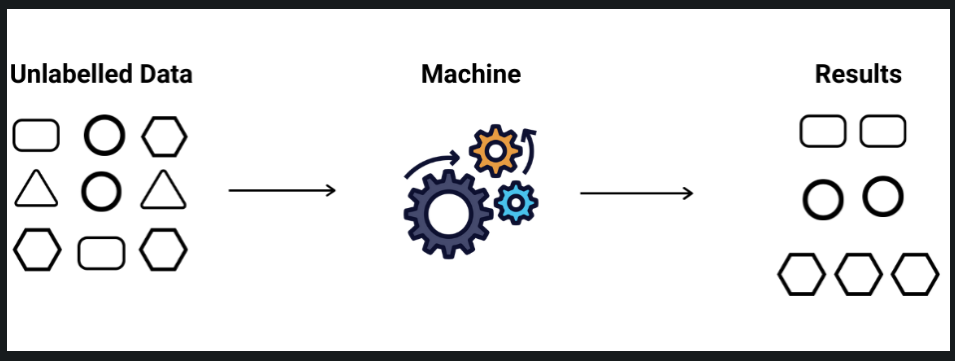
- Classification is a type of supervised learning where the goal is to predict the categorical class or label of a data point. The output of the model is a category.
- In classification the output or dependent variable is a category.
- **Example-** Suppose there's a dataset of patients, diabetic and non-diabetic. We have to design a model which classify the data as diabetic or non-diabetic. To classify the data the models needs some input as records of diabetic and non-diabetic patients from which the model will try to learn the pattern.

2. Regression -

- Regression is a type of supervised learning where the goal is to predict a continuous target variable.
- In regression, the output or dependent variable is a real value.
- **Example-** Suppose there's a dataset of features like No. of bedrooms, locality and other features, and the target value is to find the price of the buildings. Such type of model which output continuous values is regression supervised learning.

Unsupervised Learning

- Unsupervised learning involves training a model on unlabeled data, the problems which do not have labelled column for input are considered as unsupervised machine learning problem.
- The algorithm explores the inherent structure or patterns within the data without any predefined targets.



- Unsupervised learning algorithm is subdivided into two parts i.e. Clustering and Association.

1. Clustering -

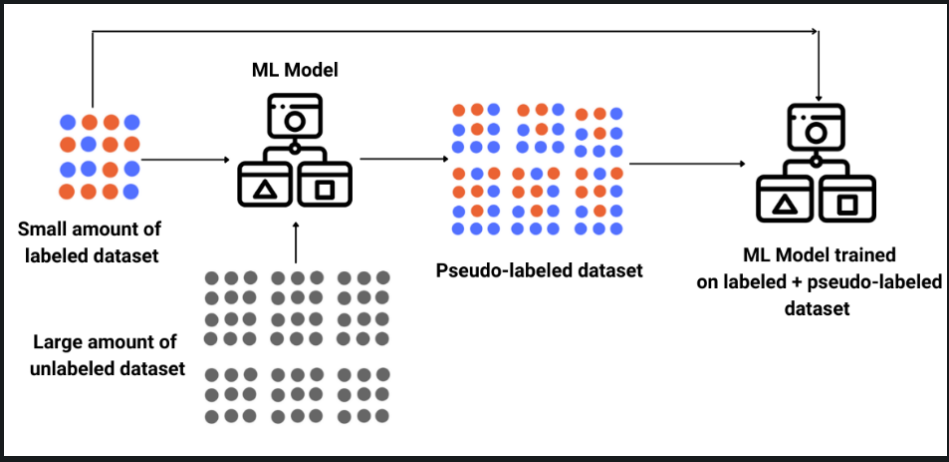
- Clustering is an unsupervised learning technique where the algorithm groups similar data points together based on their features, without any predefined labels.
- **Example -** Retailers use clustering to segment their customer base based on purchasing behavior, demographics, and preferences.

2. Association -

- Association is a rule-based learning technique used to discover interesting relationships or patterns within large datasets. It's often used in market basket analysis, where the goal is to find associations between different products that are frequently purchased together.
- **Example -** Association rules can be applied to electronic health records to identify associations between patient characteristics, treatments, and outcomes.

Semi-Supervised Learning

- Semi-supervised is the blend of supervised and unsupervised learning.
- It is basically used when providing labelled data is either expensive or time-consuming.
- The model initially trains on the labeled data. Then, it predicts labels for the unlabeled data, and the high-confidence predictions are added to the labeled dataset for further training.
- **Example -** Semi-supervised learning is used in tasks like sentiment analysis, where labeled data may be limited.



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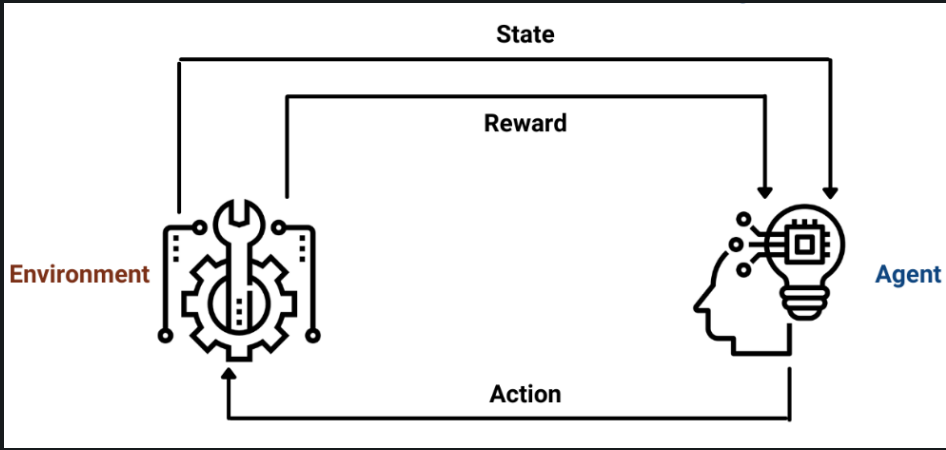
agent learns by interacting with an environment.

- The agent receives feedback in the form of rewards or penalties for its actions, allowing it to learn a strategy that maximizes the cumulative reward over time.
- **Example -** Self driven cars works on reinforcement learning, they learn from rewards and penalty received on performing any actions, it store the result of those actions and then continuously train itself by maximizing the cumulative reward.



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