**1. Supervised Machine Learning**

* **Definition:** Supervised machine learning is a type of machine learning where algorithms learn from labeled data. Labeled data consists of input features and corresponding desired outputs (labels). The algorithm learns the relationship between features and labels, enabling it to make predictions for new, unseen data.
* **Example:** Spam filtering uses supervised learning. Emails are labeled as spam or not spam. The algorithm analyzes features like sender address, keywords, and content to learn how to identify future spam emails.

**2. Unsupervised Machine Learning**

* **Definition:** Unsupervised machine learning is a type of machine learning where algorithms learn from unlabeled data. The data doesn't have predefined categories or labels. The goal is to discover hidden patterns or structures within the data itself.
* **Example:** Recommender systems use unsupervised learning. They analyze your past purchases or movie ratings to identify similarities with other users. Based on these patterns, the system recommends products or movies you might like.

**3. Reinforcement Learning**

* **Definition:** Reinforcement learning is a type of machine learning where algorithms learn through trial and error in an interactive environment. The algorithm takes actions and receives rewards or penalties based on the outcome. The goal is to learn an optimal policy for maximizing long-term rewards.
* **Example:** Self-driving cars use reinforcement learning. The car receives rewards for staying in the lane and avoiding obstacles, and penalties for collisions. Through trial and error, it learns to navigate effectively.

**4. Classification vs. Regression vs. Clustering**

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| **Feature** | **Classification** | **Regression** | **Clustering** |
| **Learning Type** | Supervised | Supervised | Unsupervised |
| **Data Type** | Discrete (Categorical) | Continuous (Numerical) | Unlabeled (No predefined categories) |
| **Goal** | Classify data points into predefined classes | Predict a continuous output value based on features | Group data points based on similarities |
| **Output** | Class label (e.g., cat, dog) | Continuous value (e.g., house price) | Cluster assignments (groups of similar data points) |
| **Examples** | Spam filtering, Image recognition, Fraud detection | Stock price prediction, Weather forecasting, Sales forecasting | Customer segmentation, Market research, Anomaly detection |
| **Common Algorithms** | Logistic Regression, Naive Bayes, Support Vector Machines | Linear Regression, Decision Trees, Random Forests | K-means Clustering, Hierarchical Clustering, DBSCAN |
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