Types of Machine Learning

Introduction

Machine Learning is broadly classified into different types based on the nature of data and the learning approach. Each type is suitable for specific problem domains.

1. Supervised Learning

Supervised Learning uses labeled data, where each input is associated with a correct output. The model learns a mapping from inputs to outputs.

1. Uses labeled data
2. Trainer is available
3. Used for prediction tasks

Example: Email spam detection, house price prediction.

```
[ Labeled Data ] ---> [ Learning Algorithm ] ---> [ Model ]
[ New Input ] ----------------------------> [ Output ]
```

2. Unsupervised Learning

Unsupervised Learning works with unlabeled data. The model identifies hidden patterns or structures in the data.

1. Uses unlabeled data
2. Finds patterns automatically
3. No predefined output

Example: Customer segmentation, clustering similar data.

```
[ Unlabeled Data ] ---> [ Algorithm ] ---> [ Clusters ]
```

3. Semi-Supervised Learning

Semi-Supervised Learning uses a small amount of labeled data and a large amount of unlabeled data.

1. Combines supervised and unsupervised learning
2. Reduces labeling effort
3. Improves model performance

Example: Image classification with limited labeled images.

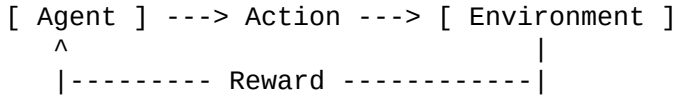
```
[ Few Labeled Data ] + [ Many Unlabeled Data ] ---> [ Model ]
```

4. Reinforcement Learning

Reinforcement Learning involves an agent that learns by interacting with an environment and receiving rewards or penalties.

1. Learning by trial and error
2. Uses reward mechanism
3. No labeled dataset

Example: Game playing, robotics, autonomous systems.



Summary

Machine Learning types are selected based on data availability and problem requirements. Understanding these types is essential for building effective ML solutions.