Introduction

David Robinson

Supervised Learning

Supervised learning involves training a model on a labeled dataset, where the correct output is provided for each input.

1. **Data Collection**: Gather labeled data for training
2. **Model Training**: Use algorithms to learn the mapping from inputs to outputs
3. **Model Evaluation**: Test the model on unseen data to evaluate its performance

Applications

1. **Linear Regression**: Finds the line of best fit through the data points to predict output based on input features
2. **Logistic Regression**: Uses the sigmoid function to map predicted values to probabilities between 0 and 1
3. **Decision Trees**: Splits the data into subsets based on the most informative features, forming a tree-like structure

Unsupervised Learning

Unsupervised learning involves training a model on data without labeled responses, where the model attempts to identify patterns, relationships, or structures within the data.

1. **Data Collection**: Gather data without labels
2. **Model Training**: Use algorithms to find hidden structures within the data
3. **Interpretation**: Analyze the output to gain insights or make decisions

Applications

1. **K-Means Clustering**: Divides the data into K clusters, where each point belongs to the cluster with the nearest mean
2. **Principle Component Analysis (PCA)**: Transforms the data into a set of linearly uncorrelated components that capture the most variance

Reinforcement Learning

Reinforcement learning involves training a model to learn how to behave in an environment by performing actions and seeing the results.

Applications

1. **Q-Learning**: Updates a Q-table that maps state-action pairs to expected future rewards
2. **Deep Q-Networks (DQN)**: Uses a neural network to approximate the Q-function, allowing it to handle large state spaces