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
4. 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