

Machine Learning Overview

Foundations of Machine Learning

Machine Learning is a subset of artificial intelligence that focuses on building systems that learn from data.

Instead of explicit programming, models identify patterns and relationships within datasets.

Machine learning is widely used in finance, healthcare, marketing, and engineering.

Types of Machine Learning

Supervised learning involves labeled data and is commonly used for classification and regression tasks.

Unsupervised learning works with unlabeled data to discover hidden structures or clusters.

Reinforcement learning focuses on agents learning through interaction with an environment.

Model Training and Evaluation

Training a model involves optimizing parameters to minimize a loss function.

Evaluation metrics such as accuracy, precision, recall, and RMSE help assess performance.

Proper validation techniques reduce the risk of overfitting.

Deployment and Monitoring

Once trained, models can be deployed as APIs, batch jobs, or embedded systems.

Monitoring ensures models remain accurate as data distributions change.

Model drift is a key challenge in production machine learning systems.

Machine Learning in Production Systems

Production ML systems require robust pipelines for data ingestion, training, and inference.

Scalability, reliability, and explainability are critical considerations.

MLOps practices help manage the lifecycle of machine learning models.