

Applied Machine Learning & Data Science Techniques

Duration: 03 days

Courseware: Unofficial

Table of Contents

Module 1: Data Exploration & Clustering

1.1 Introduction to Data Exploration

- Overview of data exploration techniques
- Importance of data preprocessing and cleaning

1.2 Exploratory Data Analysis (EDA)

- Visualizations and feature engineering
- Understanding distributions, correlations, and patterns

1.3 Clustering Techniques

- K-means clustering
- Hierarchical clustering
- Density-based clustering (DBSCAN)
- Applications of clustering in business

Module 2: Recommendation Systems

2.1 Fundamentals of Recommendation Systems

- Types of recommendation systems: collaborative, content-based, hybrid
- Evaluation metrics: precision, recall, F1 score

2.2 Collaborative Filtering

- User-based and item-based filtering
- Matrix factorization techniques (e.g., SVD)

2.3 Content-Based Recommendations

- Feature extraction and similarity measures

2.4 Advanced Techniques

- Hybrid recommendation systems
- Deep learning-based recommenders

Module 3: Regression Analysis

3.1 Introduction to Regression

- Applications and use cases of regression
- Simple linear regression

3.2 Multiple Linear Regression

- Assumptions and diagnostics
- Feature selection and regularization (Lasso, Ridge)

3.3 Advanced Regression Techniques

- Polynomial regression, stepwise regression
- Non-linear regression techniques
- Handling multicollinearity and heteroscedasticity

Module 4: Decision Systems

4.1 Overview of Decision Systems

- Decision trees and rule-based systems
- Applications of decision systems

4.2 Decision Tree Models

- Classification and regression trees (CART)
- Pruning and tuning decision trees

4.3 Ensemble Methods

- Random forests, boosting (AdaBoost, XGBoost)

- Bagging and stacking techniques

Module 5: Forecasting Systems

5.1 Fundamentals of Forecasting

- Understanding time series data and trends
- Types of forecasting models and applications

5.2 Statistical Forecasting Models

- ARIMA, SARIMA models
- Seasonal decomposition

5.3 Machine Learning for Time Series Forecasting

- Prophet, LSTM, and other deep learning models
- Evaluating forecasting accuracy

Module 6: Neural Networks

6.1 Introduction to Neural Networks

- Basic concepts and structure of neural networks
- Activation functions, loss functions, and backpropagation

6.2 Deep Learning Models

- Convolutional Neural Networks (CNNs) for image data
- Recurrent Neural Networks (RNNs) for sequence data

6.3 Advanced Neural Network Architectures

- Transfer learning and fine-tuning
- Attention mechanisms and transformers