

Machine Learning:

From Model Development to Model Deployment

Duration: 5 Days (40 Hours)

Courseware: Unofficial PDF

Lab: Open-source

Course Outcomes

- Gain a solid understanding of core machine learning concepts.
 - Learn techniques for data cleaning, preprocessing, and feature engineering.
 - Explore predictive analytics, regression models, and advanced algorithms.
 - Master key machine learning algorithms, including linear models, decision trees, clustering, and SVM.
 - Develop a strong foundation in model evaluation, cross-validation, and dimensionality reduction.
 - Understand the essentials of NLP and sentiment analysis.
 - Learn to deploy machine learning models in production environments.
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Module 1: Introduction to Machine Learning

- Overview of Machine Learning
 - Types of Machine Learning: Supervised, Unsupervised, Reinforcement Learning
 - Key Machine Learning Concepts
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Module 2: Data Cleaning

- Importance and Techniques for Data Cleaning
 - Handling Missing Data and Outliers
 - Data Imputation Methods
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Module 3: Exploratory Data Analysis (EDA)

- Descriptive Statistics and Data Visualization
- Detecting Patterns and Anomalies

- Correlation Analysis
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Module 4: Predictive Analysis

- Understanding Predictive Models
 - Supervised vs. Unsupervised Predictions
 - Model Selection
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Module 5: Feature Selection

- Importance of Feature Selection
 - Methods: Filter, Wrapper, Embedded
 - Techniques: Variance Threshold, Chi-Square, RFE
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Module 6: Feature Engineering

- Creating New Features
 - Encoding Categorical Variables
 - Binning, Scaling, and Normalization
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Module 7: Data Preprocessing

- Standardization and Normalization
 - Handling Categorical Data and Imbalanced Datasets
 - Data Transformation Techniques
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Module 8: Reinforcement Learning

- Introduction to Reinforcement Learning
 - Markov Decision Process
 - Popular RL Algorithms
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Module 9: Simple Linear Regression

- Concept of Linear Regression
 - Least Squares Method
 - Model Evaluation
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Module 10: Multiple Linear Regression

- Extending to Multiple Variables
 - Model Assumptions
 - Multicollinearity and Diagnostics
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Module 11: Advanced Regression Techniques

- Ridge, Lasso, and ElasticNet Regression
 - Regularization
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Module 12: Logistic Regression

- Binary Classification and Sigmoid Function
 - Model Evaluation: ROC, AUC
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Module 13: Model Evaluation and Selection

- Cross-Validation Techniques
 - Metrics: Accuracy, Precision, Recall, F1 Score, AUC
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Module 14: Dimensionality Reduction using PCA

- Principal Component Analysis
 - Variance and Eigenvectors
 - Applications of PCA
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Module 15: k-nearest neighbor (KNN) Algorithm

- Distance-based Learning

- Choosing the 'k' Value
 - Applications and Evaluation
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Module 16: Decision Trees

- Splitting Criteria and Decision Tree Structure
 - Pruning and Avoiding Overfitting
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Module 17: Naive Bayes

- Bayes' Theorem and Assumptions
 - Gaussian, Multinomial, Bernoulli Naive Bayes
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Module 18: Ensemble ML Algorithms

Bagging (Bootstrap Aggregating)

- Concept and Process of Bagging
- Random Forests

Boosting

- Adaboost, Gradient Boosting, XGBoost
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Module 19: Clustering

- K-means and Hierarchical Clustering
 - Applications in Market Segmentation
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Module 20: Time Series Analysis

- Trend, Seasonality, and Noise
 - ARIMA Model
 - Forecasting Techniques
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Module 21: Support Vector Machine (SVM)

- Support Vectors and Hyperplane
 - Kernel Functions
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Module 22: Types of Sampling

- Random, Stratified, Systematic Sampling
 - Importance of Sampling
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Module 23: A/B Testing

- Basics and Hypothesis Testing in A/B Testing
 - Statistical Significance and P-values
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Module 24: Hypothesis Testing

- Null and Alternative Hypotheses
 - Type I and Type II Errors
 - Common Hypothesis Testing Methods
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Module 25: Loss Functions

- Loss Functions for Regression and Classification
 - Cross-Entropy and MSE
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Module 26: Basics of Natural Language Processing (NLP)

- Tokenization, Lemmatization, Stop Words
 - Bag of Words and TF-IDF
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Module 27: Sentiment Analysis

- Lexicon-based and Machine Learning Approaches
 - Applications in Business
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Module 28: Model Deployment

- Introduction to Model Deployment
 - Deployment and Consuming model using Streamlit
 - Deploying and Consuming model on Azure Cloud
 - Monitoring Deployed Models
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