



# Machine Learning Certification Course

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## Lesson 01: Introduction to AI and Machine Learning

- 1.1 Learning Objectives
- 1.2 Emergence of Artificial Intelligence
- 1.3 Artificial Intelligence in Practice
- 1.4 Sci-Fi Movies with the concept of AI
- 1.5 Recommender Systems
- 1.6 Relationship between Artificial Intelligence, Machine Learning, and Data Science - Part A
- 1.7 Relationship between Artificial Intelligence, Machine Learning, and Data Science - Part B
- 1.8 Definition and Features of Machine Learning
- 1.9 Traditional Approach vs Machine Learning Approach
- 1.10 Machine Learning Techniques
- 1.11 Applications of Machine Learning - Part A
- 1.12 Applications of Machine Learning - Part B
- 1.13 Key Takeaways

## Lesson 02: Data Preprocessing

- 2.1 Learning Objectives
- 2.2 Data Exploration: Loading Files
- 2.3 Demo: Importing and Storing Data
- 2.4 Practice: Automobile Data Exploration I
- 2.5 Data Exploration Techniques: Part 1
- 2.6 Data Exploration Techniques: Part 2
- 2.7 Seaborn
- 2.8 Demo: Correlation Analysis
- 2.9 Practice: Automobile Data Exploration II
- 2.10 Data Wrangling
- 2.11 Missing Values in a Dataset
- 2.12 Outlier Values in a Dataset
- 2.13 Demo: Outlier and Missing Value Treatment
- 2.14 Practice: Data Exploration III
- 2.15 Data Manipulation
- 2.16 Functionalities of Data Object in Python: Part A
- 2.17 Functionalities of Data Object in Python: Part B
- 2.18 Different Types of Joins
- 2.19 Typecasting
- 2.20 Demo: Labor Hours Comparison
- 2.21 Practice: Data Manipulation
- 2.22 Key Takeaways

## **Lesson 03: Supervised Learning**

- 3.1 Learning Objectives
- 3.2 Supervised Learning
- 3.3 Supervised Learning- Real-Life Scenario
- 3.4 Understanding the Algorithm
- 3.5 Supervised Learning Flow
- 3.6 Types of Supervised Learning – Part A
- 3.7 Types of Supervised Learning – Part B
- 3.8 Types of Classification Algorithms
- 3.9 Types of Regression Algorithms - Part A
- 3.10 Regression Use Case
- 3.11 Accuracy Metrics
- 3.12 Cost Function
- 3.13 Evaluating Coefficients
- 3.14 Demo: Linear Regression
- 3.15 Practice: Boston Homes I
- 3.16 Challenges in Prediction
- 3.17 Types of Regression Algorithms - Part B
- 3.18 Demo: Bigmart
- 3.19 Practice: Boston Homes II
- 3.20 Logistic Regression - Part A

- 3.21 Logistic Regression - Part B
- 3.22 Sigmoid Probability
- 3.23 Accuracy Matrix
- 3.24 Demo: Survival of Titanic Passengers
- 3.25 Practice: Iris Species
- 3.26 Key Takeaways
- 3.27 Lesson-end Project

## **Lesson 04: Feature Engineering**

- 4.1 Learning Objectives
- 4.2 Feature Selection
- 4.3 Regression
- 4.4 Factor Analysis
- 4.5 Factor Analysis Process
- 4.6 Principal Component Analysis (PCA)
- 4.7 First Principal Component
- 4.8 Eigenvalues and PCA
- 4.9 Demo: Feature Reduction
- 4.10 Practice: PCA Transformation
- 4.11 Linear Discriminant Analysis
- 4.12 Maximum Separable Line
- 4.13 Find Maximum Separable Line
- 4.14 Demo: Labeled Feature Reduction

- 4.15 Practice: LDA Transformation
- 4.16 Key Takeaways
- 4.17 Lesson-end Project

## **Lesson 05: Supervised Learning: Classification**

- 5.1 Learning Objectives
- 5.2 Overview of Classification
- 5.3 Classification: A Supervised Learning Algorithm
- 5.4 Use Cases
- 5.5 Classification Algorithms
- 5.6 Decision Tree Classifier
- 5.7 Decision Tree: Examples
- 5.8 Decision Tree Formation
- 5.9 Choosing the Classifier
- 5.10 Overfitting of Decision Trees
- 5.11 Random Forest Classifier- Bagging and Bootstrapping
- 5.12 Decision Tree and Random Forest Classifier
- 5.13 Performance Measures: Confusion Matrix
- 5.14 Performance Measures: Cost Matrix
- 5.15 Demo: Horse Survival
- 5.16 Practice: Loan Risk Analysis
- 5.17 Naive Bayes Classifier
- 5.18 Steps to Calculate Posterior Probability: Part A

- 5.19 Steps to Calculate Posterior Probability: Part B
- 5.20 Support Vector Machines: Linear Separability
- 5.21 Support Vector Machines: Classification Margin
- 5.22 Linear SVM: Mathematical Representation
- 5.23 Non-linear SVMs
- 5.24 The Kernel Trick
- 5.25 Demo: Voice Classification
- 5.26 Practice: College Classification
- 5.27 Key Takeaways
- 5.28 Lesson-end Project

## **Lesson 06: Unsupervised Learning**

- 6.1 Learning Objectives
- 6.2 Overview
- 6.3 Example and Applications of Unsupervised Learning
- 6.4 Clustering
- 6.5 Hierarchical Clustering
- 6.6 Hierarchical Clustering: Example
- 6.7 Demo: Clustering Animals
- 6.8 Practice: Customer Segmentation
- 6.9 K-means Clustering
- 6.10 Optimal Number of Clusters
- 6.11 Demo: Cluster Based Incentivization

- 6.12 Practice: Image Segmentation
- 6.13 Key Takeaways
- 6.14 Lesson-end Project

## **Lesson 07: Time Series Modeling**

- 7.1 Learning Objectives
- 7.2 Overview of Time Series Modeling
- 7.3 Time Series Pattern Types Part A
- 7.4 Time Series Pattern Types Part B
- 7.5 White Noise
- 7.6 Stationarity
- 7.7 Removal of Non-Stationarity
- 7.8 Demo: Air Passengers I
- 7.9 Practice: Beer Production I
- 7.10 Time Series Models Part A
- 7.11 Time Series Models Part B
- 7.12 Time Series Models Part C
- 7.13 Steps in Time Series Forecasting
- 7.14 Demo: Air Passengers II
- 7.15 Practice: Beer Production II
- 7.16 Key Takeaways
- 7.17 Lesson-end Project



## **Lesson 08: Ensemble Learning**

- 8.1 Learning Objectives
- 8.2 Overview
- 8.3 Ensemble Learning Methods Part A
- 8.4 Ensemble Learning Methods Part B
- 8.5 Working of AdaBoost
- 8.6 AdaBoost Algorithm and Flowchart
- 8.7 Gradient Boosting
- 8.8 XGBoost
- 8.9 XGBoost Parameters Part A
- 8.10 XGBoost Parameters Part B
- 8.11 Demo: Pima Indians Diabetes
- 8.12 Practice: Linearly Separable Species
- 8.13 Model Selection
- 8.14 Common Splitting Strategies
- 8.15 Demo: Cross Validation
- 8.16 Practice: Model Selection
- 8.17 Key Takeaways
- 8.18 Lesson-end Project





## **Lesson 9: Recommender Systems**

- 9.1 Learning Objectives
- 9.2 Introduction
- 9.3 Purposes of Recommender Systems
- 9.4 Paradigms of Recommender Systems
- 9.5 Collaborative Filtering Part A
- 9.6 Collaborative Filtering Part B
- 9.7 Association Rule Mining
- 9.8 Association Rule Mining: Market Basket Analysis
- 9.9 Association Rule Generation: Apriori Algorithm
- 9.10 Apriori Algorithm Example: Part A
- 9.11 Apriori Algorithm Example: Part B
- 9.12 Apriori Algorithm: Rule Selection
- 9.13 Demo: User-Movie Recommendation Model
- 9.14 Practice: Movie-Movie recommendation
- 9.15 Key Takeaways
- 9.16 Lesson-end Project



## **Lesson 10: Text Mining**

- 10.1 Learning Objectives
- 10.2 Overview of Text Mining
- 10.3 Significance of Text Mining
- 10.4 Applications of Text Mining
- 10.5 Natural Language ToolKit Library
- 10.6 Text Extraction and Preprocessing: Tokenization
- 10.7 Text Extraction and Preprocessing: N-grams
- 10.8 Text Extraction and Preprocessing: Stop Word Removal
- 10.9 Text Extraction and Preprocessing: Stemming
- 10.10 Text Extraction and Preprocessing: Lemmatization
- 10.11 Text Extraction and Preprocessing: POS Tagging
- 10.12 Text Extraction and Preprocessing: Named Entity Recognition
- 10.13 NLP Process Workflow
- 10.14 Demo: Processing Brown Corpus
- 10.15 Practice: Wiki Corpus
- 10.16 Structuring Sentences: Syntax
- 10.17 Rendering Syntax Trees
- 10.18 Structuring Sentences: Chunking and Chunk Parsing
- 10.19 NP and VP Chunk and Parser

- 10.20 Structuring Sentences: Chinking
- 10.21 Context-Free Grammar (CFG)
- 10.22 Demo: Twitter Sentiments
- 10.23 Practice: Airline Sentiment
- 10.24 Key Takeaways
- 10.25 Lesson-end Project

## Projects Covered:

### 1. Project Name: Uber Fare Prediction

**Problem Objective:** Design an algorithm that will tell the fare to be charged for a passenger.

### 2. Project Name: Mercedes-Benz Greener Manufacturing

**Problem Objective:** Reduce the time a Mercedes-Benz spends on the test bench.

### 3. Project Name: Amazon.com - Employee Access

**Problem Objective:** Design an algorithm to accurately predict the access status to certain resources of employees.

### 4. Project Name: Income Qualification

**Problem Objective:** Identify the level of income qualification needed for the families in Latin America.

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