Data Science

Master Program in Data Science

o **Python full coding from scratch**

o **Visualization with Python**

o **Machine Learning with Python - 6 different algorithms**

Machine Learning with Python - 6 different algorithms

1. Course Introduction

- Course Introduction

2. Introduction to AI and Machine Learning

- Learning Objectives
- The emergence of Artificial Intelligence
- Artificial Intelligence in Practice
- Sci-Fi Movies with the concept of AI
- Recommender Systems
- Relationship Between Artificial Intelligence, Machine Learning, and Data Science - Part A
- Relationship Between Artificial Intelligence, Machine Learning, and Data Science - Part B
- Definition and Features of Machine Learning
- Machine Learning Approaches
- Machine Learning Techniques
- Applications of Machine Learning - Part A
- Applications of Machine Learning - Part B
- Key Takeaways

3. Data Preprocessing

- Learning Objectives
- Data Exploration: Loading Files
- Demo: Importing and Storing Data
- Practice: Automobile Data Exploration I
- Data Exploration Techniques: Part 1
- Data Exploration Techniques: Part 2
- Seaborn
- Demo: Correlation Analysis

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- **Practice: Automobile Data Exploration II**
- **Data Wrangling**
- **Missing Values in a Dataset**
- **Outlier Values in a Dataset**
- **Demo: Outlier and Missing Value Treatment**
- **Practice: Data Exploration III**
- **Data Manipulation**
- **Functionalities of Data Object in Python: Part A**
- **Functionalities of Data Object in Python: Part B**
- **Different Types of Joins**
- **Typecasting**
- **Demo: Labor Hours Comparison**
- **Practice: Data Manipulation**
- **Key Takeaways**
- **Lesson-end project: Storing Test Results**

4. Supervised Learning

- **Learning Objectives**
- **Supervised Learning**
- **Supervised Learning- Real-Life Scenario**
- **Understanding the Algorithm**
- **Supervised Learning Flow**
- **Types of Supervised Learning – Part A**
- **Types of Supervised Learning – Part B**
- **Types of Classification Algorithms**
- **Types of Regression Algorithms - Part A**
- **Regression Use Case**
- **Accuracy Metrics**
- **Cost Function**
- **Evaluating Coefficients**
- **Demo: Linear Regression**
- **Practice: Boston Homes I**
- **Challenges in Prediction**
- **Types of Regression Algorithms - Part B**
- **Demo: Bigmart**
- **Practice: Boston Homes II**
- **Logistic Regression - Part A**
- **Logistic Regression - Part B**
- **Sigmoid Probability**
- **Accuracy Matrix**
- **Demo: Survival of Titanic Passengers**
- **Practice: Iris Species**
- **Key Takeaways**
- **Lesson-end Project: Health Insurance Cost**

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5. Feature Engineering

- **Learning Objectives**
- **Feature Selection**
- **Regression**
- **Factor Analysis**
- **Factor Analysis Process**
- **Principal Component Analysis (PCA)**
- **First Principal Component**
- **Eigenvalues and PCA**
- **Demo: Feature Reduction**
- **Practice: PCA Transformation**
- **Linear Discriminant Analysis**
- **Maximum Separable Line**
- **Find Maximum Separable Line**
- **Demo: Labeled Feature Reduction**
- **Practice: LDA Transformation**
- **Key Takeaways**
- **Lesson-end Project: Simplifying Cancer Treatment**

6. Supervised Learning: Classification

- **Overview of Classification**
- **Classification: A Supervised Learning Algorithm**
- **Use Cases**
- **Classification Algorithms**
- **Decision Tree Classifier**
- **Decision Tree: Examples**
- **Decision Tree Formation**
- **Learning Objectives**
- **Choosing the Classifier**
- **Overfitting of Decision Trees**
- **Random Forest Classifier- Bagging and Bootstrapping**
- **Decision Tree and Random Forest Classifier**
- **Performance Measures: Confusion Matrix**
- **Performance Measures: Cost Matrix**
- **Demo: Horse Survival**
- **Practice: Loan Risk Analysis**
- **Naive Bayes Classifier**
- **Steps to Calculate Posterior Probability: Part A**
- **Steps to Calculate Posterior Probability: Part B**
- **Support Vector Machines: Linear Separability**
- **Support Vector Machines: Classification Margin**

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- **Linear SVM: Mathematical Representation**
- **Non-linear SVMs**
- **The Kernel Trick**
- **Demo: Voice Classification**
- **Practice: College Classification**
- **Key Takeaways**
- **Lesson-end Project: Classify Kinematic Data**

7. Unsupervised Learning

- **Learning Objectives**
- **Overview**
- **Example and Applications of Unsupervised Learning**
- **Clustering**
- **Hierarchical Clustering**
- **Hierarchical Clustering: Example**
- **Demo: Clustering Animals**
- **Practice: Customer Segmentation**
- **K-means Clustering**
- **Optimal Number of Clusters**
- **Demo: Cluster-Based Incentivization**
- **Practice: Image Segmentation**
- **Key Takeaways**
- **Lesson-end Project: Clustering Image Data**

8. Time Series Modeling

- **Learning Objectives**
- **Overview of Time Series Modeling**
- **Time Series Pattern Types Part A**
- **Time Series Pattern Types Part B**
- **White Noise**
- **Stationarity**
- **Removal of Non-Stationarity**
- **Demo: Air Passengers I**
- **Practice: Beer Production I**
- **Time Series Models Part A**
- **Time Series Models Part B**
- **Time Series Models Part C**
- **Steps in Time Series Forecasting**
- **Demo: Air Passengers II**
- **Practice: Beer Production II**
- **Key Takeaways**
- **Lesson-end Project: IMF Commodity Price Forecast**

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9. Ensemble Learning

- Learning Objectives
- Overview
- Ensemble Learning Methods Part A
- Ensemble Learning Methods Part B
- Working of AdaBoost
- AdaBoost Algorithm and Flowchart
- Gradient Boosting
- XGBoost
- XGBoost Parameters Part A
- XGBoost Parameters Part B
- Demo: Pima Indians Diabetes
- Practice: Linearly Separable Species
- Model Selection
- Common Splitting Strategies
- Demo: Cross-Validation
- Practice: Model Selection
- Key Takeaways
- Lesson-end Project: Tuning Classifier Model with XGBoost

10. Recommender Systems

- Learning Objectives
- Introduction
- Purposes of Recommender Systems
- Paradigms of Recommender Systems
- Collaborative Filtering Part A
- Collaborative Filtering Part B
- Association Rule Mining
- Association Rule Mining: Market Basket Analysis
- Association Rule Generation: Apriori Algorithm
- Apriori Algorithm Example: Part A
- Apriori Algorithm Example: Part B
- Apriori Algorithm: Rule Selection
- Demo: User-Movie Recommendation Model
- Practice: Movie-Movie recommendation
- Key Takeaways
- Lesson-end Project: Book Rental Recommendation

11. Text Mining

- Learning Objectives
- Overview of Text Mining
- Significance of Text Mining

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- Applications of Text Mining
- Text Extraction and Preprocessing: Named Entity Recognition
-
- Natural Language Toolkit Library
- Text Extraction and Preprocessing: Tokenization
- Text Extraction and Preprocessing: N-grams
- Text Extraction and Preprocessing: Stop Word Removal
- Text Extraction and Preprocessing: Stemming
- Text Extraction and Preprocessing: Lemmatization
- Text Extraction and Preprocessing: POS Tagging
-
- NLP Process Workflow
- Demo: Processing Brown Corpus
- Practice: Wiki Corpus
- Structuring Sentences: Syntax
- Rendering Syntax Trees
- Structuring Sentences: Chunking and Chunk Parsing
- NP and VP Chunk and Parser
- Structuring Sentences: Chinking
- Context-Free Grammar (CFG)
- Demo: Twitter Sentiments
- Practice: Airline Sentiment
- Key Takeaways
- Lesson-end Project: FIFA World Cup

o **Robotic Automation**

o **Data handling in R Programming**

o **Additional functions of R**

o **Data Analytics with MS-excel**

o **Advanced Analytics with Excel**

o **NLP, DL, XGBoost & other classification techniques with Python**

o **Artificial Neural Network**

o **Introduction to Power BI**

o **Power BI Query Editor**