

Data Science Full Syllabus and Course Overview

Importance of Data Science in Real Life and Industry

Data Science is a game-changer in today's world, enabling businesses and organizations to make data-driven decisions and uncover hidden patterns. It combines statistical methods, programming, and domain expertise to derive actionable insights. From predicting customer behavior to optimizing supply chains, Data Science is revolutionizing industries like healthcare, finance, e-commerce, and technology. Its application extends to artificial intelligence, making machines smarter and more efficient.

1. Introduction to Data Science

- What is Data Science?
- Applications of Data Science in Real Life
- Data Science Workflow
- Key Roles in Data Science: Data Scientist, Analyst, Engineer

2. Essential Mathematics for Data Science

- Linear Algebra Basics
- Probability and Statistics Essentials
- Calculus for Optimization
- Understanding Distributions and Hypothesis Testing

3. Data Collection and Integration

- Data Sources: APIs, Databases, Web Scraping
- Structured vs. Unstructured Data
- Data Integration Techniques
- Handling Big Data: Hadoop and Spark

4. Data Preprocessing

- Data Cleaning: Handling Missing and Outlier Data
- Data Transformation and Encoding
- Feature Scaling and Normalization

- Splitting Data: Train-Test-Validation Sets

5. Exploratory Data Analysis (EDA)

- Descriptive Statistics
- Data Visualization with Python: Matplotlib, Seaborn
- Identifying Relationships and Correlations
- Techniques for Detecting Patterns

6. Machine Learning Basics

- Supervised vs. Unsupervised Learning
- Algorithms Overview: Regression, Classification, Clustering
- Overfitting and Underfitting
- Evaluating Model Performance: Accuracy, Precision, Recall

7. Advanced Machine Learning

- Neural Networks and Deep Learning Fundamentals
- Ensemble Methods: Random Forest, Gradient Boosting
- Natural Language Processing Basics
- Recommendation Systems

8. Data Visualization and Communication

- Importance of Storytelling with Data
- Tools: Tableau, Power BI, Python Visualization Libraries
- Effective Chart Design Principles
- Creating Dashboards

9. Big Data and Cloud Technologies

- Introduction to Big Data Frameworks: Hadoop, Spark
- Cloud Platforms for Data Science: AWS, Azure, Google Cloud
- Implementing Scalable Data Pipelines

10. Real-World Projects and Case Studies

- Sentiment Analysis of Social Media Data

- Sales Forecasting for Retail Businesses
- Customer Segmentation Using Clustering
- Fraud Detection in Financial Transactions
- Predictive Modeling for Healthcare

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