

Data Science and Machine Learning Curriculum

In an age where data is generated at an unprecedented scale, the ability to extract meaningful insights and make data-driven decisions is invaluable. Data Science and Machine Learning stand at the forefront of this revolution, offering powerful tools and methodologies to understand the complex patterns hidden within data and predict future outcomes. This course is designed to introduce you to the exciting fields of Data Science and Machine Learning, guiding you from the fundamental concepts to more intermediate topics.

Duration: 1 month, minimum of 2 hours per week

Data Science: The Art of Uncovering Insights

Data Science is an interdisciplinary field that uses scientific methods, processes, algorithms, and systems to extract knowledge and insights from structured and unstructured data. It encompasses various techniques derived from statistics, data analysis, and computer science, particularly from the subdomains of machine learning, database systems, and visualization. As a data scientist, your goal will be to turn data into information and knowledge, understanding its implications and how it can benefit organizations and society.

Machine Learning: The Engine of Innovation

Machine Learning, a subset of artificial intelligence, focuses on developing algorithms that can learn from and make predictions or decisions based on data. It empowers computers to perform tasks without being explicitly programmed to do so, enabling them to adapt and improve from experience. Machine Learning is at the heart of many technological advancements and applications, from web search engines and recommendation systems to self-driving cars and personalized medicine.

Course Overview

This course is structured to take you on a comprehensive learning journey, starting with the basics of programming for data science, understanding and manipulating data, and progressing to the foundations of machine learning. You will learn through a blend of theoretical concepts and practical applications, culminating in a capstone project where you will apply what you've learned to solve a real-world problem.

Whether you are a soon-to-become graduate looking to enter the field or simply curious about the possibilities that data science and machine learning can offer, this course is designed to equip you with the knowledge and skills you need to embark on this exciting journey. Welcome aboard, and let's explore the limitless possibilities that data and algorithms hold together!

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Module 1: Introduction to Data Science and Basic Tools

Unit 1: Introduction to Data Science

- Overview of Data Science and its significance
- Programming for Data Science: Python Programming Basics

Unit 2: Data Manipulation and Analysis

- Data Manipulation with Pandas
- Data Visualization with Matplotlib and Seaborn
- Data manipulation and visualization projects

Module 2: Foundations of Machine Learning

Unit 3: Introduction to Machine Learning

- Overview of Machine Learning and its Applications
- Supervised vs. Unsupervised Learning
- Assignments: Literature review on ML applications

Unit 4: Machine Learning Algorithms

- Linear Regression and Logistic Regression
- Decision Trees and Random Forests
- Support Vector Machines and K-Nearest Neighbours
- Assignments: Implementation of ML algorithms

Unit 5: Model Evaluation and Selection

- Cross-Validation and Hyperparameter Tuning
- Metrics for Performance Evaluation
- Overfitting, Underfitting, and Model Complexity
- Assignments: Model evaluation exercises

Module 3: Intermediate Machine Learning and Data Science Projects

Unit 6: Feature Engineering and Data Preprocessing

- Handling Missing Data, Feature Scaling, and Categorical Data Encoding
- Feature Selection and Dimensionality Reduction Techniques
- Assignments: Data preprocessing projects

Unit 7: Advanced Machine Learning Models

- Ensemble Methods and Gradient Boosting Machines
- Introduction to Clustering Algorithms and PCA
- Implementation and analysis of advanced models

Unit 8: Capstone Project

- Planning and Proposal
- Implementation
- Presentation and Evaluation

Assessment Methods

- Quizzes and exams for theoretical understanding
- Project-based assessments for practical skills
- Peer reviews for collaborative and communication skills