Data Science Roadmap

Module 1: Course Overview

- What is Data Science?
- What is Data Science Life Cycle?
- What is Difference Between ML vs DL vs NLP
- Data Science Tools
- Applications of Data Science

Module 2: Python Course

Introduction to Python Language

- What is Python.
- Uses of Python Programming Language / Python Applications
- Python for Software development
- Python for Networking
- Python for Automated Testing
- Features of Python Programming Language
- Implementations of Python
- Python career opportunities.

Download & Install Python

- Download Python Interpreter
- Install Python
- Set environment variable
- Customize Python shell
- Jupyter Notebook

Python Language Syntax

- Creating Python program file
- Python Identifiers
- Python keywords
- Indentation
- Comments in Python
- Python Keywords

Python Variables

- What is Variable?
- Declaration of Variables
- Assign Values to Variables

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- Initialization
- Reading
- Variable naming restrictions
- Types of Python Variables.

Python Data Types - I

- What is Data Type?
- Implicit Declaration of Data Types
- Python Numbers (Integers, floating-point numbers, and complex numbers)
- Python boolean data type.

Python Data Types - II

- List
- String
- Tuple
- Dictionary
- Set

Python Operators

- Python Arithmetic
- Comparison/Relational Operators
- Increment Operators
- Logical operators
- Python Identity Operators
- Python Operators Precedence.

Python Conditional Statements

- IF statement
- ELSE Statement
- ELIF Statement
- Pass Statement
- Break Statement
- Continue Statement

Python Loops

- FOR Loops
- While Loops

Python Functions

- What is Function
- How to Call Function

- How Create Function

Python OOPs Concept

- class
- Object
- Inheritance
- Polymorphism
- Encapsulation
- Abstraction

Python Advanced Topics

- Files and Handling
- Decorators
- Regular Regression

Module 3: Statistics and Probability

Descriptive Statistics:

- Measures of Central Tendency (mean, median, mode)
- Measures of Dispersion (variance, standard deviation)

Probability Basics:

- Sample Spaces and Events
- Probability Axioms
- Combinatorics (Permutations and Combinations)

Conditional Probability:

- Bayes' Theorem
- Independence and Dependence

Discrete Probability Distributions:

- Probability Mass Functions (PMFs)
- Cumulative Distribution Functions (CDFs)
- Expected Values and Variance

Continuous Probability Distributions:

- Probability Density Functions (PDFs)
- Cumulative Distribution Functions (CDFs)
- Expected Values and Variance

Joint Probability Distributions:

- Joint PMFs and PDFs
- Marginal and Conditional Distributions
- Covariance and Correlation

Sampling Distributions:

- Central Limit Theorem
- Sampling Distribution of the Sample Mean

Estimation:

- Point Estimation
- Confidence Intervals

Hypothesis Testing:

- Null and Alternative Hypotheses
- Type I and Type II Errors
- p-values

ANOVA (Analysis of Variance):

- One-Way ANOVA
- Two-Way ANOVA

Module 4: MySQL

Introduction:

- What is SQL
- what are Relational Databases?
- RDBMS Benefits and Limiations
- SQL vs NoSQL Databases

Basics Syntax - I:

- SQL Keywords
- Data Types
- Operators

Basics Syntax - II:

- DDL
- DML
- DCL
- TCL

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Aggregate Queries:

- SUM
- COUNT
- AVG
- MIN
- MAX
- GROUP BY
- HAVING

Data Constraints:

- Primary Key
- Foreign Key
- Unique
- NOT NULL
- CHECK

Join Queries:

- INNER JOIN
- LEFT JOIN
- RIGHT JOIN
- FULL OUTER JOIN

Advanced SQL - I:

- Sub Queries
- Conditional functios
- Views
- Indexes

Advanced SQL - II:

- Recursive Queries
- Window Functions

Module 5: Feature Engineering and Selection

Feature Engineering:

- What is Feature Engineering?
- Why we use Feature Engineering?

Feature Engineering Techniques:

- Numerical Variables

- Categorical Variables
- Missing Values
- Outliers
- Imputation methods
- One Hot encoding

Feature Selection:

- What is Feature Selection?
- Why Feature Selection?

Feature Selection Techniques:

- Information Gain
- Chi-square Test
- Fisher's Score
- Correlation Coefficient
- Variance Threshold
- Mean Absolute Difference

Module 6: Exploratory Data Analysis (EDA)

- What is Exploratory Data Analysis (EDA)?
- Why we use Exploratory Data Analysis (EDA)?

Python Packages:

- Numpy
- Pandas
- Matplotlib
- Seaborn

Data Visualization:

- Univariate plots (histograms, box plots, kernel density plots).
- Bivariate plots (scatter plots, pair plots).
- Multivariate plots (heatmaps).

Correlation Analysis:

- Correlation coefficients (Pearson, Spearman).
- Correlation matrix and heatmaps

Data Transformation:

- Log transformations.
- Box-Cox transformations.

Exploring Time Series Data:

- Time series plots.
- Seasonal decomposition.

Categorical Variable Analysis:

- Frequency tables.
- Bar charts.
- Pie charts.

Module 7: Machine Learning

Machine Learning Introduction

- What is Machine Learning
- Why we use Machine Learning
- Types of Machine Leaning
- Applications of Machine Learning

Supervised Learning:

- What is Supervised Learning
- Types of Supervised Learning
- Linear Regression
- Logistic Regression
- Decision Trees
- Ensemble Methods
- Support Vector Machines
- K-Nearest Neighbors(K-NN)

Unsupervised Learning:

- What is Unsupervised Learning
- What is Clustering
- K-Means Clustering
- Hierarchical Clustering
- What is Dimensionality Reduction
- Principal Component Analysis (PCA)
- t-Distributed Stochastic Neighbor Embedding(t-SNE)

Module 8: Deep Learning

- Introduction to Deep Learning
- What is Neural Network
- What is Perceptron
- What is Backpropagation

- What is Activation Function
- What is Optimizer in Deep Learning

Deep Learning Algorithms

- Artificial Neural Networks (ANN)
- Convolutional Neural Networks (CNNs)
- Long Short-Term Memory Networks (LSTMs)
- Recurrent Neural Networks (RNNs)
- Generative Adversarial Networks (GANs)
- Multilayer Perceptron's (MLPs)
- Autoencoders
- Radial Basis Function Networks (RBFNs)

Module 9: Natural Language Processing

Introduction to NLP

- What is Natural Language Processing
- Why we use NLP
- Application of Natural Language Processing
- What is Stop Words

NLP Algorithms

- Lemmatization
- Stemming
- Tokenization
- Bag of Words
- TF-IDF
- Word2Vec
- Word Embedding
- Skip-Gram
- CBOW
- Named-entity recognition
- Text summarization

Module 10: Resume Projects

- Projects on python
- Projects on Machine Learning
- Projects on Deep Learning
- Projects on Natural Language Processing