Machine Learning with Python

Duration: 20–24 weeks | 2–3 hours/week

Goal: Equip learners with essential machine learning knowledge and implementation skills using Python.

Module 1: Introduction to Machine Learning

- - What is Machine Learning?
- - Types of Machine Learning (Supervised, Unsupervised, Reinforcement)
- - ML vs AI vs DL
- - ML project life cycle

Module 2: Python for ML Recap

- - NumPy and Pandas overview
- - Matplotlib and Seaborn for visualization
- - Scikit-learn structure and usage

Module 3: Data Preprocessing

- - Data cleaning (missing values, outliers)
- - Encoding categorical data
- - Feature scaling and normalization
- - Splitting datasets

Module 4: Supervised Learning - Regression

- - Linear Regression
- - Polynomial Regression
- - Evaluation Metrics: MSE, RMSE, R^2 Score

Module 5: Supervised Learning - Classification

- - Logistic Regression
- - K-Nearest Neighbors (KNN)
- - Support Vector Machines (SVM)
- - Naive Bayes Classifier
- - Decision Trees and Random Forests

Module 6: Unsupervised Learning

- - Clustering: K-Means, Hierarchical, DBSCAN
- - Dimensionality Reduction: PCA, t-SNE

Module 7: Model Evaluation and Tuning

- - Cross-validation
- - Confusion Matrix, Precision, Recall, F1 Score
- - ROC Curve and AUC
- - Hyperparameter Tuning (GridSearchCV, RandomizedSearchCV)

Module 8: Real-World Data Analysis

- - Working with open datasets (Titanic, Iris, Wine)
- - Kaggle-style mini projects

Module 9: Advanced Topics Introduction

- - Intro to Neural Networks with Keras
- - Intro to NLP: Text classification
- - Model deployment overview with Flask

Module 10: Capstone Project

- - Student-selected end-to-end ML project
- - Model selection, evaluation, and final report