

Machine Learning with Python & Deep Learning

Professional Course Outline

Course Overview

This course provides a structured pathway to learn Machine Learning and Deep Learning using Python. It is designed for students and professionals who want to build strong practical skills in data analysis, machine learning algorithms, and neural networks. The course focuses on hands-on implementation using Python libraries and real-world datasets.

Course Objectives

- Understand the fundamentals of machine learning
- Develop strong Python skills for data analysis
- Implement supervised and unsupervised learning algorithms
- Understand evaluation metrics and model performance
- Build deep learning models using neural networks
- Work with computer vision and image classification models
- Prepare students for AI, data science, and research projects

Course Modules

Module 1: Python for Data Science

- Introduction to Python for machine learning
- NumPy fundamentals
- Pandas for data analysis
- Data cleaning and preprocessing
- Data visualization using Matplotlib

Module 2: Introduction to Machine Learning

- What is Machine Learning
- Types of Machine Learning (Supervised, Unsupervised, Reinforcement)
- Machine Learning workflow
- Train-test split
- Feature engineering basics

Module 3: Supervised Learning Algorithms

- Linear Regression
- Logistic Regression
- K-Nearest Neighbors (KNN)
- Decision Trees
- Random Forest
- Support Vector Machines (SVM)

Module 4: Model Evaluation & Optimization

- Model evaluation metrics
- Accuracy, Precision, Recall, F1 Score
- Confusion Matrix
- Cross-validation
- Hyperparameter tuning

Module 5: Unsupervised Learning

- Clustering concepts
- K-Means clustering
- Hierarchical clustering
- Dimensionality reduction
- Principal Component Analysis (PCA)

Module 6: Introduction to Deep Learning

- Neural networks fundamentals
- Perceptron and multilayer perceptron
- Activation functions
- Forward propagation and backpropagation
- Introduction to TensorFlow and Keras

Module 7: Deep Learning for Computer Vision

- Introduction to Convolutional Neural Networks (CNN)
- Image classification basics
- Working with image datasets
- Transfer learning
- Using pretrained models (MobileNet, EfficientNet)

Module 8: Model Deployment Basics

- Saving and loading ML models
- Introduction to Flask / API deployment
- Using models in real applications
- Project deployment concepts

Module 9: Capstone Project

- End-to-end machine learning project

- Dataset selection
- Model development
- Evaluation and improvement
- Final project presentation

Course Outcomes

- Ability to build machine learning models using Python
- Understanding of deep learning and neural networks
- Experience with real-world datasets
- Ability to evaluate and improve ML models
- Completion of an end-to-end AI project

Tools & Technologies Covered

- Python
- NumPy
- Pandas
- Matplotlib
- Scikit-learn
- TensorFlow
- Keras
- Jupyter Notebook