Specialised Programme on Machine Learning – 12 weeks

Introduction to Python Programming (2 weeks)

Introduction to Python programming, Installing Python, Basic Syntax, Data Types, Variables, Operators, Input/output, Declaring variable, data types in programs, Your First Python Program

Flow of Control (Modules, Branching), If, If- else, Nested if-else, Looping, For, While, Nested loops, Control Structure, Uses of Break & Continue, Working with strings: Accessing Strings, Basic Operations, Assigning Multiple Values at Once, Formatting Strings, String slices

Working with Lists, Working with Tuples: Introducing Tuples, Accessing tuples, Operations on tuples, Working with Dictionaries and set
Function and Methods: Defining a function, calling a function, Types of functions, Function Arguments, Anonymous functions, lambda function, Global and local variables

Working with classes and objects, define class, creating objects, constructor and destructor, special magic functions, Object oriented programming concepts, inheritance, overloading and overriding, data hiding

Mathematics for ML (1 week)

Linear algebra: Vectors, Matrix from 2D to ND, Inferential Statistics: Probability theory, Probability Distribution, Expected Values, Without Experiment, Binomial Distribution, Cumulative Distribution, Probability distribution function, Normal Distribution, Z-Score, Sampling, Sampling Distribution, Central Limit Theorem, Confidence Interval

Hypothesis Testing: Introduction, Null and alternate hypothesis, one/two tail test, Critical value method, Z-Table, P-value, T-distribution

Introduction to Machine Learning (4 weeks)

Introduction to Data science, data analytics, Different types of data analytics, Introduction to Machine Learning, Types of learning, Applications of Machine learning. Working with data using python Numpy and pandas, working with data and dataset using pandas.

Data Preparation, Feature creation, Data cleaning & transformation, Data Validation & Modelling, Feature selection Techniques, Dimensionality reduction, Recommendation Systems and anomaly detection, PCA, t-SNE

ML Algorithms: ML Algorithms: , Linear and Nonlinear classification, Regression Techniques, Support vector Machines, KNN, K-means , Decision Trees, Oblique trees, Random forest, Bayesian   analysis and Naive Bayes classifier,   Gradient   boosting, Ensemble   methods,

Bagging & Boosting , Association rules learning, Apriori and FP growth algorithms, Clustering, Overview of Factor Analysis, ARIMA, ML in real time, Algorithm performance metrics, ROC, AOC, Confusion matrix, F1 score, MSE, MAE, DBSCAN Clustering in ML, Anomaly Detection, Recommender System

Introduction to Deep Neural Network   (4 weeks)

Introduction to Deep Neural Network, Constructing Neural Networks model, Introduction to Tensorflow, Tensorflow 2.x,Keras , Activation functions, Different optimizers, building a basic neural network using Keras with Tensor Flow, Training deep neural network, Tuning Deep Learning Models, Troubleshoot deep learning models, building deep learning project. (A log model), CNN introduction, CNN over ANN for images, Convolution layers, Pooling layers, Data cleaning using spacy, RNN, LSTM, Transfer Learning, Encoder-Decoder, Transformer(s).

Case Study (1 week)

Machine Learning and Deep Learning based Case Studies