24PC1005 MACHINE LEARNING (3-0-0)

Objective:

1.   To understand the principles of Machine Learning.
2.   To be familiar with the various Machine Learning Models and their applications.

MODULE – I
Introduction toML: Motivation and role of machine learning in computer science and problem solving. Representation (features), line art transformations, Appreciate linear transformations and matrix vector operations in the context of data and representation. Problem formulations (classification and regression). Appreciate the probability distributions in the context ofdata, Prior probabilities and Bayes Rule. Introduce paradigms of Learning (primarily supervised and unsupervised. Also a brief overview of others)

MODULE – II
Fundamentals of ML: PCA and Dimensionality Reduction, Nearest Neighbours and KNN. Linear Regression, Decision Tree Classifiers, Notion of Generalization and concern of Over fitting, Notion of Training, Validation and Testing; Connect to generalization and over fitting.

MODULE – III
Ensembling and RF, Linear SVM,K Means, Logistic Regression, Naive Bayes, Role of Loss Functions and Optimization, Gradient Descent and Perceptron/ Delta Learning, MLP, Back propagation MLP for Classification and Regression, Regularisation, Early Stopping, Introduction to Deep Learning, CNNs

MODULE – IV

Kernels (with SVM), Bayesian Methods, Generative Methods, HMM, EM, PAC learning, Popular CNN, Architectures, RNNs, GANS and Generative Models, Advances in Back propagation and Optimization for Neural Networks, Adversarial Learning

Outcome:

1.   Technical knowhow of the Machine Learning techniques for real time applications.

Books Recommended:

1.   Marc Peter Deisenroth, A. Aldo Faisal, Cheng Soon Ong, Mathematics for Machine Learning, Cambridge University Press (23 April 2020)
1.   Tom M. Mitchell- Machine Learning - McGraw Hill Education, International Edition
2.   AurélienGéron Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, O'ReillyMedia, Inc. 2nd Edition
3.   Ian Goodfellow, YoshouaBengio, and Aaron Courville Deep Learning MIT Press Ltd,Illustrated edition
4.   Christopher M. Bishop Pattern Recognition and Machine Learning - Springer, 2nd edition
        Trevor Hastie, Robert Tibshirani, and Jerome Friedman - The Elements ofStatistical Learning: Data Mining, Inference, and Prediction - Springer, 2nd edition