III SEMESTER

MCA 5152 MACHINE LEARNING [4 0 0 4]

Introduction, Applications, Probability: Random Variables, Supervised Learning: Learning a Class, Vapnik-Chervonenkis Dimension, PAC Learning, Noise, Learning Multiple Classes, Regression, Model Selection and Generalization, Supervised Machine Learning, Bayesian Decision Theory: Classification, Losses and Risks, Discriminant Functions, Utility Theory, Association Rules, Parametric Methods: Maximum Likelihood Estimation, Evaluating an Estimator: Bias and Variance, Bayes' Estimator, Parametric Classification, Regression, Tuning Model Complexity: Bias/Variance Dilemma Model Selection Procedures, Dimensionality Reduction: Subset Selection, PCA, Factor Analysis, Multidimensional Scaling, Linear Discriminant Analysis, Clustering: Mixture Densities, k-Means Clustering, Expectation-Maximization Algorithm, Latent Variable Models, Supervised Learning after Clustering, Hierarchical Clustering, Nonparametric Methods: Density Estimation, Generalization to Multivariate Data, Nonparametric Classification, Condensed Nearest Neighbor, Nonparametric Regression: Smoothing Models, Smoothing Parameter, Decision Trees: Univariate Trees, Pruning, Rule Extraction from Trees, Learning Rules from Data, Multivariate Trees, Linear Discrimination: Generalizing Linear Model, Geometry of Linear Discriminant, Pairwise Separation, Parametric Discrimination, Gradient Descent, Logistic Discrimination, Discrimination by Regression, Multilayer Perceptrons: Perceptron, Training a Perceptron, Learning Boolean Functions, MLP as a Universal Approximator, Backpropagation Algorithm, Training Procedures, Tuning Network Size, Bayesian View of Learning, Dimensionality Reduction, Learning Time.

References:

1. Ethem Alpaydin, *Introduction to Machine Learning*, 3rd Edition, PHI Learning Private Limited, 2018.
2. Kevin P. Murphy, Machine *Learning: A Probabilistic Perspective*, MIT Press, 2012.
3. Mehryar Mohri, Afshin Rostamizadeh, and Ameet Talwalkar, *"Foundations of Machine Learning*, MIT Press, 2012.
4. Christopher M. Bishop, *Pattern Recognition and Machine Learning*, Springer, 2007.

MCA 5161 MACHINE LEARNING LAB [0 0 3 1]

Labs will be conducted as per the lab manual. Lab manual consists of exercises related to implementation/realization of concepts discussed in the theory class. The concepts included are Probability-based problems, Dimensionality reduction, Supervised Learning, Regression, Ensemble methods – classifiers and clusters and Unsupervised Learning.