INTRODUCTION TO MACHINE LEARNING

(Professional Elective-IV - Online)

Course Code : 15IT11M3

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Pre-requisites:

Mathematics, Discrete Mathematical Structures, Probability Statistics and Numerical Methods.

Course Outcomes:

At the end of the Course, the Student will be able to:

CO 1 Undersatnd Regression and Classification

CO 2 Understand Support Vector Machines and Artificial Neural Networks

CO 3 Understand Bayesian Learning and Decision Trees

CO 4 Understand Evaluation Measures and Hypothesis Testing

CO 5 Understand Ensemble Methods, Clustering and Graphical Models

UNIT-I: **(10 Lectures)**

INTRODUCTORY TOPICS:

A brief introduction to machine learning, Supervised Learning, Unsupervised Learning, Reinforcement Learning, Linear Regression, Multivariate Regression

LINEAR CLASSIFICATION:

Logistic Regression, Linear Discriminated Analysis 1, Linear Discriminated Analysis 2, Linear Discriminated Analysis 3, Weka Tutorial

UNIT-II: (10 Lectures)

SUPPORT VECTOR MACHINES:

Perceptron Learning, SVM - Formulation, SVM - Interpretation & Analysis, SVMs for Linearly Non Separable Data, SVM Kernels, SVM - Hinge Loss Formulation,

ARTIFICIAL NEURAL NETWORKS:

Early Models, Back propagation I, Back propagation II, Initialization, Training & Validation

UNIT-III: (10 Lectures)

BAYESIAN LEARNING:

Maximum Likelihood Estimate, Priors & MAP Estimate,,Bayesian Parameter Estimation

DECISION TREES:

Introduction, Regression Trees, Stopping Criteria & Pruning, Loss Functions for Classification, Categorical Attributes, Multiway Splits, Missing Values, Imputation & Surrogate Splits,Instability, Smoothness & Repeated Subtrees, Tutorial

UNIT-IV: (9 Lectures)

EVALUATION MEASURES:

Evaluation Measures I, Bootstrapping & Cross Validation, 2 Class Evaluation Measures, The ROC Curve, Minimum Description Length & Exploratory Analysis

HYPOTHESIS TESTING:

Introduction to Hypothesis Testing,BasicConcepts,Sampling Distributions & the Z Test,Student\'s t-test,The Two Sample & Paired Sample t-tests,Confidence Intervals

UNIT-V: (11 Lectures)

ENSEMBLE METHODS:

Bagging, Committee Machines & Stacking, Boosting, Gradient Boosting, Random Forest

CLUSTERING:

Threshold Graphs,The BIRCH Algorithm,The CURE Algorithm

GRAPHICAL MODELS:

Naive Bayes, Bayesian Networks, Undirected Graphical Models - Introduction, Undirected Graphical Models - Potential Functions, Hidden Markov Models, Variable Elimination, Belief Propagation

REFERENCES:

1. T. Hastie, R. Tibshirani, J. Friedman. The Elements of Statistical Learning, 2nd edition, 2008.
2. Christopher Bishop. Pattern Recognition and Machine Learning, 2nd Edition.

WEB REFERENCE:

http://nptel.ac.in/courses/106106139/