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IV Year – II Semester

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MACHINE LEARNING

OBJECTIVES:
- Familiarity with a set of well-known supervised, unsupervised and semi-supervised
- learning algorithms.
- The ability to implement some basic machine learning algorithms
- Understanding of how machine learning algorithms are evaluated

UNIT -I:The ingredients of machine learning, Tasks: the problems that can be solved with machine learning, Models: the output of machine learning, Features, the workhorses of machine learning. **Binary classification and related tasks:** Classification, Scoring and ranking, Class probability estimation

UNIT- II:Beyond binary classification: Handling more than two classes, Regression, Unsupervised and descriptive learning. **Concept learning**: The hypothesis space, Paths through the hypothesis space, Beyond conjunctive concepts

UNIT- III: Tree models: Decision trees, Ranking and probability estimation trees, Tree learning as variance reduction. **Rule models:**Learning ordered rule lists, Learning unordered rule sets, Descriptive rule learning, First-order rule learning

UNIT -IV:Linear models: The least-squares method, The perceptron: a heuristic learning algorithm for linear classifiers, Support vector machines, obtaining probabilities from linear classifiers, Going beyond linearity with kernel methods.**Distance Based Models:** Introduction, Neighbours and exemplars, Nearest Neighbours classification, Distance Based Clustering, Hierarchical Clustering.

UNIT- V:Probabilistic models: The normal distribution and its geometric interpretations, Probabilistic models for categorical data, Discriminative learning by optimising conditional likelihoodProbabilistic models with hidden variables.**Features:** Kinds of feature, Feature transformations, Feature construction and selection. Model ensembles: Bagging and random forests, Boosting

UNIT- VI: Dimensionality Reduction: Principal Component Analysis (PCA), Implementation and demonstration. **Artificial Neural Networks:**Introduction, Neural network representation, appropriate problems for neural network learning, Multilayer networks and the back propagation algorithm.

OUTCOMES:

- Recognize the characteristics of machine learning that make it useful to real-world
- Problems.
- Characterize machine learning algorithms as supervised, semi-supervised, and
- Unsupervised.
- Have heard of a few machine learning toolboxes.
- Be able to use support vector machines.
- Be able to use regularized regression algorithms.
- Understand the concept behind neural networks for learning non-linear functions.

TEXT BOOKS:

1. Machine Learning: The art and science of algorithms that make sense of data, Peter Flach, Cambridge.
2. Machine Learning, Tom M. Mitchell, MGH.

REFERENCE BOOKS:

1. UnderstandingMachine Learning: From Theory toAlgorithms, Shai Shalev-Shwartz, Shai Ben-
David, Cambridge.
2. Machine Learning in Action, Peter Harington, 2012, Cengage.