

Prasad V. Potluri Siddhartha Institute of Technology:: Vijayawada.
Department of Computer Science and Engineering

I/II M.Tech. (CSE) (First Semester)

17CSCS1T4

MACHINE LEARNING

Credits: 4

Lecture: 4 Periods/week

Internal Assessment: 40 Marks
Semester end examination: 60 Marks

Course Description:

The main aim of this course is to understand concepts of machine learning theory. It covers linear and non-linear models used in machine learning. This course describes various clustering techniques and tree & rule based models.

Course Outcomes:

Upon Completion of the course, the students will be able:

- CO1:** To explain theory underlying machine learning
- CO2:** To construct algorithms to learn linear and non-linear models
- CO3:** To implement data clustering algorithms
- CO4:** To construct algorithms to learn tree and rule-based models

UNIT – I:

Introduction - What Is Machine Learning? Examples of Machine Learning Applications
 Supervised Learning, Learning a Class from Examples Vapnik – Chervonenkis (VC)
 Dimension-Probably Approximately Correct (PAC) Learning- Noise-Learning Multiple
 Classes-Regression-Model Selection and Generalization-Dimensions of a Supervised
 Machine Learning Algorithm.

UNIT – II:

Bayesian Decision Theory – Introduction, Classification-Losses and Risks-Discriminant
 Functions-Utility Theory-Association Rules, Multivariate Methods Multivariate Data-
 Parameter Estimation Estimation of Missing Values Multivariate Normal Distribution-
 Multivariate Classification-Tuning Complexity-Discrete Features-Multivariate Regression.
 Dimensionality Reduction-Introduction-Subset Selection Principal Components Analysis--
 Factor Analysis-Multidimensional Scaling-Linear Discriminant Analysis – Isomap - Locally
 Linear Embedding.

UNIT – III:

Clustering-Introduction -Mixture Densities -k-Means Clustering-Expectation-Maximization Algorithm-Mixtures of Latent Variable Models-Supervised Learning after Clustering-Hierarchical Clustering-Choosing the Number of Clusters.

Decision Trees-Introduction-Univariate Trees-Classification Trees-Regression Trees-Pruning-Rule Extraction from Trees-Learning Rules from Data-Multivariate Trees-Notes.

UNIT – IV:

Multilayer Perceptrons-Introduction-Understanding the Brain-Neural Networks as a Paradigm for Parallel Processing-The Perceptron-Training a Perceptron-Learning Boolean Functions-Multilayer Perceptrons-MLP as a Universal Approximator-Backpropagation Algorithm-Nonlinear Regression-Two-Class Discrimination-Multiclass Discrimination-Multiple Hidden Layers-Training Procedures-Improving Convergence-Overtraining-Structuring the Network-Tuning the Network Size-Bayesian View of Learning-Dimensionality Reduction-Learning Time- Time Delay Neural Networks-Recurrent Networks.

Text Books:

1. Ethem Alpaydin “Introduction to Machine Learning” Second Edition, PHI, 2010.

References:

1. Y. S. Abu-Mostafa, M. Magdon-Ismail, and H.-T. Lin, “Learning from Data”, AMLBook Publishers, 2012.
2. P. Flach, “Machine Learning: The art and science of algorithms that make sense of data”, Cambridge University Press, 2012.
3. T. M. Mitchell, “Machine Learning”, McGraw Hill, 1997.
4. K. P. Murphy, “Machine Learning: A probabilistic perspective”, MIT Press, 2012.
5. C. M. Bishop, “Pattern Recognition and Machine Learning”, Springer, 2007.
6. D. Barber, “Bayesian Reasoning and Machine Learning”, Cambridge University Press, 2012.
7. M. Mohri, A. Rostamizadeh, and A. Talwalkar, “Foundations of Machine Learning”, MIT Press, 2012.