17CS41E4 – MACHINE LEARNING

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| **Course Category:** | Professional Elective | **Credits:** | 3 |
| **Course Type:** | Theory | **Lecture – Tutorial – Practical:** | 3-0-0 |
| **Prerequisite:** | Basic concepts of Discrete Mathematics and Artificial Intelligence is required | **Sessional Evaluation:****Univ. Exam Evaluation:****Total Marks:** | 4060100 |
| **Objectives** | * To learn the basics and various Machine learning algorithms to solve problems of moderate complexity.
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| **Course Outcomes** | Upon the successful completion of the course, the students will be able to: |
| CO1 | Understand the importance of learning and some classification models |
| CO2 | Study and understand the multi variant procedures and analysis |
| CO3 | Learn and understand the various clustering algorithms |
| CO4 | Understand the basic concepts of decision trees |
| CO5 | Study and understand multi-layer perceptrons  |
| CO6 | Explore the basics of kernel machines |
| **Course Content** | **UNIT – I****Basics:** Definition-Machine Learning, Classification, Supervised/Unsupervised Learning, Probably Approximately Correct (PAC) Learning.**Bayesian Decision Theory:**Classification, Losses and Risks, Discriminant Functions, Utility Theory, Evaluating an Estimator: Bias and Variance, The Bayes' Estimator, Parametric Classification, Model Selection Procedures.**UNIT – II****Multivariate Methods:**Multivariate Data - Parameter Estimation - Estimation of Missing Value - Multivariate Normal Distribution - Multivariate Classification - Multivariate Regression - Dimensionality Reduction Factor Analysis - Multidimensional Scaling - Locally Linear Embedding.**UNIT – III****Clustering:**k-Means Clustering - Mixtures of Latent Variable Models - Hierarchical Clustering - Nonparametric Methods : Nonparametric Density Estimation - k-Nearest Neighbor Estimator - Nonparametric Classification - Smoothing Models.**UNIT – IV****Decision Trees:**Univariate Trees - Pruning - Rule Extraction from Trees - Multivariate Trees - Linear Discrimination : Generalizing the Linear Model - Logistic Discrimination - Discrimination by Regression **UNIT – V****Multilayer Perceptrons:**Neural Networks - Training a Perceptron - Learning Boolean Functions - Multilayer Perceptrons - Back propagation Algorithm - Training Procedures - Tuning the Network Size - Radial Basis Functions.**UNIT –VI****Kernel Machines:**Optimal Separating Hyperplane - The Non separable Case: Soft Margin Hyper plane - v-SVM - Kernel Machines for Regression- One-Class Kernel Machines - Kernel Dimensionality Reduction. |
| **Text Books and References** | **TEXT BOOKS:** 1. Ethem Alpaydi, Introduction to Machine Learning, Second Edition, The MIT Press, 2015.

**REFERENCE BOOKS:**1. Russell and Norvig, Artificial Intelligence, Third Edition, Prentice Hall, 2015
2. Mitchell, Tom, Machine Learning, Tata McGraw-Hill, 2017
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| **E-Resources** | 1. https://onlinecourses.nptel.ac.in/noc18\_cs26/preview
2. https://nptel.ac.in/courses/106106139/
3. <https://onlinecourses.nptel.ac.in/noc18_cs40/preview>
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