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:** | 40  60  100 |
| **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 | |
| **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> | |