

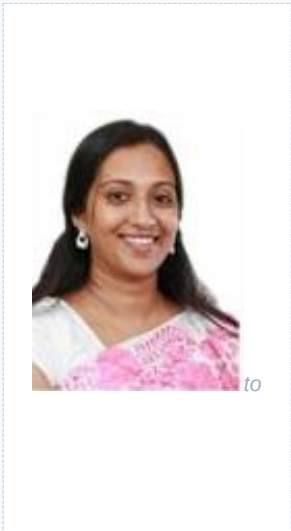
Topic: Machine Learning

About the Course

This course provides a comprehensive introduction to Machine Learning, covering essential supervised, unsupervised, and generative modeling techniques. The course is designed to develop practical core competencies in predictive modeling, data workflow design, and business intelligence analytics. Essential concepts such as linear and logistic regressions, tree-based models, neural networks, support vector machines, clustering algorithms, dimensionality reduction, and introductory natural language processing will be introduced. The course also emphasizes practical application through hands-on data manipulation, model tuning, and visualization, enabling learners to build, evaluate, and deploy analytical software applications independently.

Duration: 30 hours
Total Days Required: 15 days (2 hours per day)
Course Faculty: Dr. Ruby Maria Syriac

Faculty Photograph



Weekly Plan for Topic Coverage

Week	Topics Covered	Learning Outcomes / Activities
1	Introduction to Machine Learning & Linear Regression	Overview of Machine Learning paradigms; introduction to simple and multiple Linear Regression; understanding loss functions and gradient descent; hands-on exercises setting up baseline regression models.

2	Logistic Regression & Machine Learning Workflow	Introduction to Logistic Regression and classification metrics; mastering the end-to-end Machine Learning Workflow including data preprocessing, feature engineering, and model validation techniques.
3	Tree-Based Models & Naive Bayes	Understanding Decision Trees and ensemble methods like Random Forests; introduction to probabilistic classification using the Naive Bayes Classifier; implementing structural and statistical models.
4	Generative Models & Neural Network Basics	Exploring Generative Models and Fisher's Discriminant Analysis (FDA); introduction to Neural Networks, including the Perceptron Learning Rule, Forward Propagation, and Back Propagation mechanics.
5	Support Vector Machines & Unsupervised Foundations	Implementing Support Vector Machines (SVM) for both Classification and Regression; introduction to Unsupervised Learning paradigms and the K-Means clustering algorithm.
6	Business Intelligence & Advanced Clustering	Creating analytical dashboards using Power BI & Tableau; implementing advanced unsupervised algorithms including Hierarchical clustering, DBSCAN, Gaussian Mixture Models (GMM), and calculating Cluster Validity via Silhouette coefficients.
7	Statistical Estimation & Dimensionality Reduction	Understanding Maximum Likelihood Estimation (MLE), the Expectation-Maximization (EM) Algorithm, and Spectral Clustering; implementing Principal Component Analysis (PCA) for dimensionality reduction.
8	Natural Language Processing & Text Mining	Introduction to Natural Language Processing (NLP) text-processing pipelines; mastering Topic Modelling and Latent Dirichlet Allocation (LDA) for unsupervised text categorization.

Total no of assignments in plan: 2

Final Evaluation Plan: Written Exam