

CSE11134	Machine Learning	L	T	P	C
Version 1.0	Contact Hours 45	3	0	0	3
Pre-requisite/Exposure	Probability & Statistics				
Co-requisite	NIL				

Course Objectives:

- Understand the concepts of machine learning.
- Understand the clustering techniques and their utilization in machine learning.
- Study the neural network systems for machine learning.
- Learn and understand the linear learning models in machine learning.
- Study the tree based machine learning techniques and to appreciate their capability.

Course Outcomes:

On the completion of this course the student will be able to

CO1: List the various types of machine learning techniques **CO2 :** Explain basic machine learning techniques

CO3: Compare classification and clustering techniques

CO4: Design modern machine learning techniques

CO5: Apply machine learning techniques in various domains

Course Description:

This subject aims to introduce undergraduate students to the world of Machine Learning. This course serves as a first course and expect the learners pile their fundamentals in this field. . The course introduces the motivation for machine learning and other cognitive techniques by different learning methods. It emphasizes on different categories of machine learning like supervised, unsupervised learning. Each of these categories is further described in detail through several problems in each class.

Course Content:

Units	Lecture Hours
Unit-I: Overview of Machine Learning The Landscape. The Learning Problem. Feasibility of Learning. General-to- SpecificHypotheses Ordering. Find-S and Candidate Elimination Algorithm. Version Space and Inductive Bias. Linear Classification. Linear Regression. Non-linear Transformation. Logistic Regression.	9
Unit-II: Bayesia n Learning : Probability Overview. MLE and MAP Estimates. Naive Bayes Classifier. Gaussian Naive Bayes Classifier. Bayesian Networks.	9

Units	Lecture Hours
Decision Trees: Decision Tree Representation and Learning Algorithm (ID3). Attribute Selection using Entropy Measures and Gains. Hypotheses Space and Inductive bias. Overfitting, Generalization and Occam's Razor.	
Unit-III: Instance based Learning : k-Nearest Neighbour (kNN) Classifier, Voronoi Diagram and Distance-Weighted kNN. Distance Metrics and Curse of Dimensionality. Computational Complexity: Condensing and High Dimensional Search(kd-tree). Clustering: Partitional Clustering and Hierarchical Clustering. Cluster Types, Attributes and Salient Features. k- Means, Hierarchical and Density-based Clustering Algorithms. Inter and Intra Clustering Similarity, Cohesion and Separation.MST and DBSCAN Clustering Algorithms.	9
Unit-IV: Neural Networks : Advanced Topics: Perceptron Learning Algorithm: Delta Rule and Gradient Descent. Multi- layerPerceptron Learning: Backpropagation and Stochastic Gradient Descent. Hypotheses Space, Inductive Bias and Convergence. Variants of Neural Network Structures. Support Vector Machine: Decision Boundary and Support Vector: Optimization and Primal-Dual Problem. Extensionto SVM: Soft Margin and Non-linear Decision Boundary. Kernel Functions and Radial Basis Functions (detailed later).	12
Unit-V: Applied Machine Learning : Accuracy, Precision, Recall and F-Measures. Scores, Sampling, Bootstrapping and ROC. Hypotheses Testing and Cross-validation. Bagging and Boosting. Adaboost and Random Forest. Dimensionality Reduction and Principal Component Analysis (PCA). Modern Learning Techniques: Reinforcement Learning, Deep Learning, Transfer Learning, Semi-supervised Learning, Active Learning.	6

Examination Scheme:

Components	Mid Term	Class Assessment	End Term
Weightage (%)	20	30	50

Relationship between Course Outcomes (COs) and Program Outcomes (POs):

1 = Weakly Mapped

2 = Moderately Mapped3 = Strongly Mapped

Course Code	Cours e Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE11134	Machi ne	CO11134.1	3	3	3	3	3	3	1	-	3	-	3	2	3	1	1

	Learn ing	CO1113 4.2	2	2	3	3	3	2	3	-	3	-	2	2	3	2	2
	Learn ing	CO1113 4.3	3	2	2	2	3	2	3	-	2	-	3	1	2	1	3
	Learn ing	CO1113 4.4	3	3	2	2	2	1	1	-	3	-	2	1	1	2	2
	Learn ing	CO1113 4.5	2	3	2	2	3	1	1	-	3	-	3	1	1	1	2
	Learn ing	CO1113 4	2.6	2.6	2.4	2.4	2.8	1.8	1.8	-	2.8	-	2.6	1.4	2.0	1.4	2.0