



Subject with Code: ADVANCED MACHINE LEARNING (25CS5805)

Course & Branch: M.TECH CSE

Year &Sem: I-M.TECH & I-Sem

Regulation :R25

UNIT – I
Introduction to Machine Learning

1	Define Machine Learning and explain various types of learning.	[L1] [CO1]	[10M]
2	Discuss major applications of Machine Learning with examples.	[L2] [CO1]	[10M]
3	Explain Probably Approximately Correct (PAC) learning with an example	[L2] [CO1]	[10M]
4	Illustrate the process of learning a class from examples	[L3] [CO1]	[10M]
5	Analyze model selection and generalization issues	[L4] [CO1]	[10M]
6	Compare linear regression and logistic regression techniques.	[L4] [CO1]	[10M]
7	a) Define multiple linear regression.	[L1] [CO1]	[5M]
	b) Explain its real-world applications.	[L2] [CO1]	[5M]
8	a) Explain supervised learning.	[L1] [CO1]	[5M]
	b) Describe multi-class classification.	[L2] [CO1]	[5M]
9	Discuss the limitations of logistic regression.	[L4] [CO1]	[10M]
10	Design a regression model for a given prediction scenario.	[L6] [CO1]	[10M]

UNIT – II
The Ingredients of Machine Learning

1	Define ML tasks and explain their significance	[L1] [CO2]	[10M]
2	Discuss the role of feature engineering in machine learning.	[L2] [CO2]	[10M]
3	Explain binary classification with suitable examples	[L2] [CO2]	[10M]
4	Illustrate ROC curves and visualize classification performance	[L3] [CO2]	[10M]
5	Analyze metrics derived from confusion matrix	[L4] [CO2]	[10M]
6	Compare binary and multi-class classification methods	[L4] [CO2]	[10M]
7	a) Define precision and recall	[L1] [CO2]	[5M]
	b) Explain F1-score	[L2] [CO2]	[5M]
8	a) Describe unsupervised learning tasks	[L2] [CO2]	[5M]
	b) Explain clustering as a descriptive task.	[L2] [CO2]	[5M]
9	Evaluate performance of multi-class classifiers using macro/micro averaging.	[L5] [CO2]	[10M]
10	Design a feature extraction pipeline for a classification problem	[L6] [CO2]	[10M]

UNIT – III
Decision Tree Learning

1	Define decision tree learning and explain its representation	[L2] [CO3]	[10M]
2	Discuss the basic decision tree learning algorithm.	[L2] [CO3]	[10M]
3	Explain inductive bias and issues in decision tree learning	[L2] [CO3]	[10M]
4	Illustrate multivariate linear regression.	[L3] [CO3]	[10M]
5	Analyze the perceptron algorithm and its limitations.	[L4] [CO3]	[10M]
6	Compare hard margin and soft margin SVM	[L4] [CO3]	[10M]
7	a) Describe kernel methods for non-linear classification	[L1] [CO4]	[5M]
	b) Explain RBF kernel	[L2] [CO4]	[5M]
8	a) Define least-squares method	[L1] [CO4]	[5M]
	b) Explain gradient descent	[L2] [CO4]	[5M]
9	Evaluate SVM performance on separable and non-separable data	[L5] [CO4]	[10M]
10	Design a decision tree classifier for a given application.	[L6] [CO4]	[10M]

UNIT – IV
Distance-Based Models

1	Define distance-based models and explain their role	[L1] [CO5]	[10M]
2	Discuss the K-Nearest Neighbours algorithm.	[L2] [CO5]	[10M]
3	Explain the K-Means clustering algorithm	[L2] [CO5]	[10M]
4	Illustrate clustering around medoids (PAM).	[L3] [CO5]	[10M]
5	Analyze challenges in clustering high-dimensional data.	[L4] [CO5]	[10M]
6	Compare Naïve Bayes classifier and Gaussian Mixture Models.	[L4] [CO5]	[10M]
7	a) Define Expectation Maximization (EM)	[L1] [CO5]	[5M]
	b) Explain EM steps for GMM.	[L2] [CO5]	[5M]
8	a) Define prior and likelihood in Naïve Bayes	[L1] [CO5]	[5M]
	b) Explain Laplace smoothing	[L2] [CO5]	[5M]
9	Evaluate GMM for clustering unlabeled datasets	[L5] [CO5]	[10M]
10	Design a KNN-based recommendation model.	[L6] [CO5]	[10M]

UNIT – V
Artificial Neural Networks & Reinforcement Learning

1	Explain Artificial Neural Networks and their representation	[L1] [CO6]	[10M]
2	Discuss multilayer networks and the backpropagation algorithm	[L2] [CO6]	[10M]
3	Explain activation functions with examples.	[L2] [CO6]	[10M]
4	Illustrate issues in training deep neural networks	[L3] [CO6]	[10M]
5	Analyze vanishing and exploding gradient problems	[L4] [CO6]	[10M]
6	Compare neural networks with SVM	[L4] [CO6]	[10M]
7	a) Define reinforcement learning	[L1] [CO6]	[5M]
	b) Explain components of RL	[L2] [CO6]	[5M]
8	a) Describe Q-learning	[L2] [CO6]	[5M]
	b) Explain exploration vs. exploitation	[L3] [CO6]	[5M]
9	Evaluate reinforcement learning applications	[L5] [CO6]	[10M]
10	Design a neural network model for image classification.	[L6] [CO6]	[10M]

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PROFESSOR

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