CMR Technical Campus

B. Tech. Mid Question Bank (R22 Regulation)

Academic Year:2024-2025 Semester: VI

Subject Name: Machine Learning

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PART-A

Q.No	Questions	Marks	BL	CO	Unit No
1	Define machine learning.	2	L1	1	1
2	List the types of machine learning.	2	L1	1	1
3	Explain perspectives and issues in machine learning.	2	L2	1	1
4	Illustrate an activation function.	2	L2	1	1
5	Recall the Perceptron in neural network.	2	L1	1	1
6	Solve the classification and Regression Problem with an example.	2	L3	1	1
7	Describe a Multi-Layer Perceptron (MLP).	2	L1	2	2
8	Compare the Different Output Activation Functions.	2	L2	2	2
9	Apply The Radial Basic Function Algorithm with an example.	2	L3	2	2
10	Describe The Cubic Spline.	2	L1	2	2
11	Describe the Curse of Dimensionality.	2	L1	2	2
12	Explain about Support Vector Machines.	2	L2	2	2
13	Define classification and regression trees (CART).	2	L1	3	3
14	Explain the difference between boosting and bagging techniques.	2	L2	3	3
15	Show how to combine multiple classifiers using voting mechanisms in ensemble learning.	2	L3	3	3
	MID-II Questions				
16	Define Gaussian Mixture Models (GMM).	2	L1	3	3
17	Explain the importance of node splitting criteria in decision trees (e.g., Gini index or entropy).	2	L2	3	3
18	What are the advantages and disadvantages of using decision trees in machine learning?	2	L1	3	3
19	How does LDA differ from PCA?	2	L1	4	4
20	Apply PCA to reduce the dimensionality of a dataset with many correlated features)	2	L3	4	4
21	What is the purpose of Linear Discriminant Analysis (LDA)?	2	L1	4	4
22	What are genetic algorithms used for in optimization problems?	2	L1	4	4
23	Explain the concept of factor analysis.	2	L2	4	4
24	Explain the working of crossover and mutation in genetic algorithms.	2	L2	4	4
25	What is the primary goal of reinforcement learning?	2	L1	5	5

26	Define Markov Chain Monte Carlo (MCMC) methods.	2	L2	5	5
27	How does reinforcement learning differ from supervised learning?	2	L1	5	5
28	Explain the concept of a Bayesian Network?	2	L2	5	5
29	What is the purpose of a Hidden Markov Model (HMM)?	2	L1	5	5
30	Apply the Hidden Markov Models and check the result.	2	L3	5	5

PART-B

Q.No	Questions	Marks	BL	CO	Unit No
1	Compare the Hebb's Rule and McCulloch and Pitts Neurons.	4	L2	1	1
2	Explain about Artificial Neural Network.	4	L2	1	1
3	Explain the Design a Learning System.	4	L2	1	1
4	Apply the Concept Learning as Task with an example.	4	L3	1	1
5	Analyze the Version Space algorithm with an example.	4	L4	1	1
6	Apply the linear separability with an example.	4	L3	1	1
7	Compare and Contrast the Candidate Elimination Algorithm and Find-S Algorithm with an example.	8	L4	1	1
8	Construct the linear Regression algorithm.	8	L2	1	1
9	Explain the Find S Algorithm with an example.	8	L2	1	1
10	Compare and Contrast the Minibatches and Stochastic Gradient Descent.	4	L4	1	2
11	Explain in detail about Back-Propagation of Error	4	L2	1	2
12	Explain the Requirements of an Activation Function.	4	L2	1	2
13	Explain the Interpolation and basis functions	4	L2	1	2
14	Analyze the concept of the RBF network?	4	L4	1	2
15	Discuss the basic structure of a Support Vector Machine (SVM). How does it separate classes, and what are the key parameters that influence its performance?	4	L6	1	2
16	Explain in detail the architecture of a Multi-layer Perceptron (MLP). Discuss how the forward and backward passes work, including the role of weights, biases, and activation functions. Provide an example to illustrate the entire process.	8	L2	1	2
17	Provide a comprehensive overview of Support Vector Machines (SVM). Discuss the mathematical formulation of SVMs, the concept of the hyperplane, margin maximization, and how SVMs handle non-linearly separable data. Include examples to illustrate your points.	8	L2	1	2
18	Apply the concept of Radial Basis Functions in machine learning and How are they used in practice.	8	L3	1	2
19	Explain the role of entropy and information gain in constructing decision trees. How do these measures influence the splitting of nodes during the tree-building process.	4	L2	3	3

20	Explain the Mixture of Experts Algorithm	4	L2	3	3
21	Explain the Expectation-Maximisation (EM) Algorithm	4	L2	3	3
22	Explain the key differences between bagging and boosting in ensemble learning, and discuss how each method enhances model accuracy with examples.	4	L2	3	3
23	Explain the concept of Gaussian Mixture Models (GMMs) and how they are applied in clustering tasks. How does a GMM differ from other clustering algorithms like K-means.	4	L2	3	3
MID-II Questions					
24	Justify the use of the K-means algorithm in clustering applications where centroids evolve dynamically.	4	L5	3	3
25	Explain how the K-means algorithm handles the assignment of data points to clusters. What criteria does it use, and how does it update centroids?	4	L2	3	3
26	Describe the K-means algorithm used in unsupervised learning. Explain the steps involved in the algorithm, how the number of clusters is determined, and discuss the limitations and advantages of K-means in practical applications.	4	L3	3	3
27	Compare and contrast bagging, boosting, and stacking	4	L4	3	3
28	Classify the distance measures in nearest neighbour methods	4	L4	3	3
29	Compare and contrast Principal Component Analysis (PCA) and Independent Component Analysis (ICA). Discuss their objectives and the types of problems each technique is best suited for.	4	L4	4	4
30	Describe the process of Independent Component Analysis (ICA) and its applications.	4	L3	4	4
31	Explain the concept of Locally Linear Embedding (LLE) in detail. How does LLE perform dimensionality reduction, and in what scenarios is it more advantageous compared to PCA and LDA?	4	L2	4	4
32	Discuss the key components of genetic algorithms. How do genetic operators like crossover and mutation contribute to the optimization process?	4	L6	4	4
33	Explain the role of fitness functions in genetic algorithms?	4	L2	4	4
34	Explain the Isomap algorithm and how it is used for non-linear dimensionality reduction. Compare Isomap with other non-linear techniques like Locally Linear Embedding (LLE).	4	L2	4	4
35	Provide a comprehensive explanation of Principal Component Analysis (PCA), including its mathematical derivation, steps involved in the algorithm, and how it reduces dimensionality. Discuss its advantages, limitations, and real-world	8	L2	4	4

	applications.				
36	Compare and contrast PCA and Factor Analysis for dimensionality reduction.	8	L4	4	4
37	Illustrate the trade-offs between preserving local structure (LLE) and global structure (Isomap) for visualization tasks.	8	L2	4	4
38	Explain the basic principle of reinforcement learning and how it differs from supervised and unsupervised learning.	4	L2	5	5
39	Discuss the importance of Markov Chains in the context of Markov Chain Monte Carlo (MCMC) methods. How do they ensure proper sampling?	4	L6	5	5
40	Describe how Bayesian Networks can be used to model complex probabilistic relationships. Provide an example of a real-world application.	4	L3	5	5
41	Explain how Hidden Markov Models (HMMs) can be used in speech recognition. What are the key components of an HMM that enable it to handle sequential data.	4	L2	5	5
42	Compare the roles of exploration and exploitation in reinforcement learning.	4	L4	5	5
43	Explain the Tracking methods in graphical models.	4	L2	5	5
44	Compare the strengths and limitations of Bayesian Networks versus Markov Random Fields in representing dependencies.	8	L4	5	5
45	Compare MCMC methods with deterministic optimization methods in probabilistic modeling.	8	L2	5	5
46	Analyse the role of Markov Random Fields in applications such as image processing.	8	L4	5	5