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**GANDHI INSTITUTE OF ENGINEERING AND TECHNOLOGY UNIVERSITY, ODISHA, GUNUPUR  
(GIET UNIVERSITY)**



Ph.D. (First Semester) Examinations, December – 2024  
**23SPPECS1011/ 23SPPECA1013 – Machine Learning**  
(CSE/CSA)

Time: 3 hrs

Maximum: 70 Marks

**The figures in the right-hand margin indicate marks.**

**Answer ANY FIVE Questions.**

**(14 x 5 = 70 Marks)    Marks**

- 1.a. Differentiate between supervised learning, unsupervised learning, and reinforcement learning with examples. 8
- b. Explain the concept of training data and its importance in machine learning. 6
2. Define entropy and how it is used to calculate information gain in the below decision trees? 14

Outlook	Temperature	Humidity	Windy	Play Tennis
Sunny	Hot	High	False	No
Sunny	Hot	High	True	No
Overcast	Hot	High	False	Yes
Rain	Mild	High	False	Yes
Rain	Cool	Normal	False	Yes
Rain	Cool	Normal	True	No
Overcast	Cool	Normal	True	Yes
Sunny	Mild	High	False	No
Sunny	Cool	Normal	False	Yes
Rain	Mild	Normal	False	Yes
Sunny	Mild	Normal	True	Yes
Overcast	Mild	High	True	Yes
Overcast	Hot	Normal	False	Yes
Rain	Mild	High	True	No

- 3.a. Describe the working principle of AdaBoost. What are weak learners in this context? 7
- b. What are learning curves, and how can they be used to assess the performance of a model? 7
4. Discuss the limitations of perceptrons in solving linearly inseparable problems. What is overfitting in neural networks, and how can it be prevented? 14
- 5.a. Explain the role of kernel functions in SVM for non-linear classification problems. 7
- b. Using parameter smoothing in Bayesian learning, calculate the probability of an unseen event. Give a suitable example and solve it 7
- 6.a. Explain statistical hypothesis testing in the context of machine learning. 7
- b. Explain Naïve Bayes classifier. Predict whether to play tennis if the weather is **Sunny** and the temperature is **Cool** using the Naive Bayes algorithm. 7

Weather	Temp	Play Tennis
Sunny	HOT	NO
SUNNY	MILD	YES
OVERCAST	COOL	YES
RAIN	COOL	NO
SUNNY	COOL	YES

7. Write an algorithm for K-NN algorithm

14

Given the following training data:

Classify the test point (2.5,3.5) using  $k=3$ . Calculate the Euclidean distance for all points.

Input( $X_1, X_2$ )	CLASS( $Y$ )
(1,2)	0
(2,3)	0
(3,4)	1
(4,5)	1

- 8.a. Given the following dataset and initial weights  $w_0=0$ ,  $w_1=0$  calculate the updated weights after one iteration using gradient descent. Assume learning rate  $\eta=0.1$ . Use logistic regression

7

Input( $X$ )	Output( $Y$ )
0.5	0
1.0	1

- b. What is overfitting in neural networks, and how can it be prevented?

7

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