QP Code: RM21BTECH529 | Reg. No | | | | | | | | | | | AY 21

GIET UNIVERSITY, GUNUPUR – 765022

B. Tech (Sixth Semester Regular) Examinations, May – 2024

21BELOE36001 / 21BEEOE36001 – Introduction to Machine Learning

(EE & EEE)

Time: 3 hrs | Maximum: 70 Marks

(The figures in the right hand margin indicate marks)

PART – A **(2 x 5 = 10 Marks)**

Q.1. Answer ***ALL*** questions	CO #	Blooms Level
a. Explain the difference between type I and type II errors.	CO1	K2
b. Contrast linear regression and correlation in the context of statistical analysis.	CO1	K4
c. What is a Perceptron and how does it function in neural networks?	CO2	K1
d. What is the purpose of Tree Pruning in the context of decision trees?	CO3	K1
e. How does the softmax activation function differ from sigmoid in terms of output?	CO4	K2

PART – B **(15 x 4 = 60 Marks)**

Answer ***ALL*** questions	Marks	CO #	Blooms Level
2. a. Calculate the mean and standard deviation for the data set: 3, 5, 7, 9, 11	5	CO1	K3
b. Derive the Simple Linear Regression Equation with an example	10	CO1	K2
(OR)			
c. Calculate the residual sum of squares for the following dataset where the predicted values are already provided: $Actual$= [3,6,8], $Predicted$= [2.5,6.5,7,8] Actual= [3,6,8], Predicted= [2.5,6.5,7.8].	7	CO1	K2
d. Describe the process and calculate the mean squared error (MSE) for the following predictions: $Actual$= [10,20,30], $Predicted$= [12,18,29] Actual= [10,20,30], Predicted= [12,18,29].	8	CO1	K2
3.a. Define the Receiver Operating Characteristic (ROC) curve and its relevance in classification models.	7	CO2	K2
b. Define Logistic Regression and its primary use in statistical modelling.	8	CO2	K2
(OR)			
c. Describe Root Mean Squared Error (RMSE) and its significance in model evaluation.	7	CO2	K2
d. What is a Perceptron and how does it function in neural networks?	8	CO2	K1
4.a. Provide a detailed explanation of how Mean Absolute Percentage Error (MAPE) is calculated with an example using the following data: Actual Sales: 22, 10, 15, 20, 25; Predicted Sales: 23.5, 12, 14.2, 17.3, 24.9.	7	CO3	K2
b. Describe the architecture and learning process of an Artificial Neural Network (ANN) including forward and backward propagation. Include a numerical example of forward propagation using a simple network structure.	8	CO3	K2
(OR)			

c. Provide a detailed example illustrating how decision trees use predictors and the target variable to calculate information gain and Gini Index, specifically using the provided "Buys_Computer" dataset as a reference. 7 CO3 K4

ID	Age	Income	Student	Credit Rating	Buys Computer
1	youth	high	no	fair	no
2	youth	high	no	excellent	no
3	middle-aged	high	no	fair	yes
4	senior	medium	no	fair	yes
5	senior	low	yes	fair	yes
6	senior	low	yes	excellent	no
7	middle-aged	low	yes	excellent	yes
8	youth	medium	no	fair	no
9	youth	low	yes	fair	yes
10	senior	medium	yes	fair	yes
11	youth	medium	yes	excellent	yes
12	middle-aged	medium	no	excellent	yes
13	middle-aged	high	yes	fair	yes
14	senior	medium	no	excellent	no

d. Explain how ensemble learning techniques like bagging and boosting differ in their approach to reducing the variance and bias in predictions. 8 CO3 K2

5.a. Explain how ensemble learning techniques like bagging and boosting differ in their approach to reducing the variance and bias in predictions. 7 CO4 K2

b. Compare and contrast sigmoid and hyperbolic tangent (tanh) activation functions, including their effects on model training 8 CO4 K4

(OR)

c. Discuss the concept of cyclic learning rates and how they can help overcome challenges in training deep learning models. 7 CO4 K2

d. Describe the dropout regularization technique and its effectiveness in preventing overfitting in large neural networks 8 CO4 K2

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