

**GIET UNIVERSITY, GUNUPUR - 765022**

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

21BCDPE36001 - Machine Learning

(CSE - DS)

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. How do you interpret the results of ordinary least squares (OLS) regression analysis?	CO1	K1
b. Explain how gradient descent is utilized in logistic regression for model optimization.	CO2	K2
c. Why is hypothesis testing important in machine learning?	CO2	K1
d. The regression coefficient of the regression equation of X on Y is 2.9 and Y on X is 0.7. Are the regression coefficients consistent.	CO2	K3
e. Explain VIF.	CO2	K2

PART – B**(15 x 4=60 Marks)**Answer **ALL** questions

Marks CO # Blooms Level

2. a. Explain the concept of "Learning" in the context of machine learning and discuss the different types of learning paradigms used in machine learning algorithms.	5	CO1	K2
b. X: [1, 2, 3, 4, 5] Y: [3, 5, 7, 9, 11] Apply the least square Regression of the following: - (i) Calculate the mean of the predictor variable X and the response variable Y. (ii) Compute the slope β_1 and the intercept β_0 of the regression line using the least squares method. (iii) Write down the equation of the regression line. (iv) Use the regression line to predict the value of Y for X=16. (v) Calculate the coefficient of determination (R-squared) to assess the goodness of fit of the regression model. (OR)	10	CO1	K3
c. Explain the concepts of Ridge Regression and Lasso Regression, highlighting their differences and applications in machine learning.	5	CO1	K2
d. X: [1, 2, 3, 4, 5] Y: [3, 5, 7, 9, 11] Apply the gradient descent optimization algorithm with linear regression and write the steps neat and cleanly and calculate the following: - (i) Fit a linear regression model to these data points using gradient descent. Using gradient descent, perform one iteration of training to update the model parameters assume a learning rate (α) of 0.01	10	CO1	K3
3.a. Explain briefly how logistic regression works on the below mentioned dataset X: [1, 2, 3, 4, 5] Y: [0, 0, 1, 1, 1] Consider a binary classification problem where you have the following dataset: (i) Fit a logistic regression model to classify the data points into two classes (0 and 1) based on the predictor variable X. (ii) Perform one iteration of gradient descent to update the model parameters (β_0 and β_1) using the logistic regression cost function and a learning rate (α) of 0.01	10	CO2	K3
b. Explain the principles, advantages, and limitations of SVM .Explain briefly	5	CO2	K3

(OR)

- c. What is K-NN? Write an algorithm and Explain briefly how it exactly classify the following dataset: -
X: [1, 2, 3, 4, 5] Y: [0, 0, 0, 1, 1]
classify a new data point $X_{new}=2.5$ using the K-Nearest Neighbors (KNN) algorithm with $K=3$. 5 CO2 K3
- d. Explain Stochastic Gradient Descent (SGD) and mini-batch gradient descent in the context of optimizing machine learning models. Compare and contrast these two optimization techniques, discussing their advantages, disadvantages, and practical considerations in training deep learning models. Additionally, describe how the choice of learning rate and batch size influences the convergence behavior and computational efficiency of these optimization algorithms.. 10 CO2 K2
- 4.a. What is confusion matrix? Explain how to calculate the following: -
(i) Accuracy (ii) Precision (iii) Recall (iv) F1-score (v) Specificity 5 CO2 K2
- b. Actual values: [10, 20, 30, 40, 50] 10 CO2 K3
Predicted values: [12, 18, 28, 42, 48]
Calculate the following regression evaluation metrics: Mean Squared Error (MSE), Root Mean Squared Error (RMSE), Mean Absolute Error (MAE), and Root Mean Squared Logarithmic Error (RMSLE).
- (OR)
- c. To compare the exam scores of students taught using three different teaching methods: A, B, and C. We'll perform a one-way ANOVA test to determine if there is a significant difference in the mean exam scores among these teaching methods.
The exam scores for each group:
Teaching Method A: [80, 85, 88, 90, 92]
Teaching Method B: [75, 82, 85, 88, 90]
Teaching Method C: [70, 75, 80, 82, 85]
Calculate the followings:
Perform one-way ANOVA test of the above under the level of significance $\alpha(0.05)$ is 3.89
1. Calculate the Mean (Average) Exam Score for each Teaching Method.
2. Calculate the Grand Mean (Overall Average Exam Score).
3. Calculate the Sum of Squares Between Groups (SSB).
4. Calculate the Degrees of Freedom Between Groups (dfB).
5. Calculate the Mean Squares Between Groups (MSB).
6. Calculate the Sum of Squares Within Groups (SSW):
7. Calculate the Degrees of Freedom Within Groups (dfW).
8. Calculate the Mean Squares Within Groups (MSW).
9. Calculate the F-Statistic.
10. Compare the F-Statistic with the Critical F-Value. 10 CO3 K3
- d. How do you conduct the hypothesis testing? Write down the flowchart on it 5 CO3 K3
- 5.a. What is ANN? Explain briefly single layer perceptron algorithm with suitable example 10 CO4 K2
- b. Explain the architecture and components of a CNN. 5 CO4 K2
- (OR)
- c. Write an algorithm for Multilayer Perceptrons (Feedforward Neural Network), Explain with a suitable example 10 CO4 K2
- d. How do LSTMs differ from traditional recurrent neural networks (RNNs)? 5 CO4 K2

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