MACHINE LEARNING

In Q1 to Q11, only one option is correct, choose the correct option:

1. Which of the following methods do we use to find the best fit line for data in Linear Regression?

A) Least Square Error

B) Maximum Likelihood

C) Logarithmic Loss

D) Both A and B

Ans - Least Square Error

2. Which of the following statement is true about outliers in linear regression?

A) Linear regression is sensitive to outliers

B) linear regression is not sensitive to outliers

C) Can't say

D) none of these

Ans -Linear regression is sensitive to outliers

3. A line falls from left to right if a slope is _____?

A) Positive

B) Negative

C) Zero

D) Undefined

Ans – Negative

4. Which of the following will have symmetric relation between dependent variable and independent variable?

A) Regression

B) Correlation

C) Both of them

D) None of these

Ans – Correlation

5. Which of the following is the reason for over fitting condition?

A) High bias and high variance

B) Low bias and low variance

C) Low bias and high variance

Ans - Low bias and high variance

6. If output involves label then that model is called as:

A) Descriptive model

B) Predictive modal

C) Reinforcement learning

D) All of the above

Ans - Predictive modal

7. Lasso and Ridge regression techniques belong to _____?

A) Cross validation

B) Removing outliers

C) SMOTE

D) Regularization

Ans -) Regularization

8. To overcome with imbalance dataset which technique can be used?

A) Cross validation

B) Regularization

C) Kernel

D) SMOTE

Ans – Smote

9. The AUC Receiver Operator Characteristic (AUCROC) curve is an evaluation metric for binary classification problems. It uses _____ to make graph?

A) TPR and FPR

B) Sensitivity and precision

C) Sensitivity and Specificity

D) Recall and precision

Ans – TRP and FPR

10. In AUC Receiver Operator Characteristic (AUCROC) curve for the better model area under the curve should be less.

A) True

B) False

Ans – False

11. Pick the feature extraction from below:

A) Construction bag of words from a email

B) Apply PCA to project high dimensional data

C) Removing stop words

D) Forward selection

Ans - Apply PCA to project high dimensional data

12. Which of the following is true about Normal Equation used to compute the coefficient of the Linear

Regression?

Ans -

A) We don't have to choose the learning rate.

B) It becomes slow when number of features is very large.

Q13 and Q15 are subjective answer type questions, Answer them briefly.

13. Explain the term regularization?

Ans - Regularization is a crucial concept in machine learning that helps prevent overfitting and improves the generalization performance of models.

- Regularization is a technique used to add a penalty term to the loss function during model training.
- It discourages the model from fitting the training data too closely, which can lead to overfitting.

Types of Regularization

L1 Regularization (Lasso)

L2 Regularization (Ridge)

Elastic Net:

Benefits of Regularization:

Reduces model complexity.

- Reduces model complexity.
- Improves model generalization to unseen data.
- Helps handle multicollinearity.
- Works well when dealing with high-dimensional data.

14. Which particular algorithms are used for regularization?

Ans - Regularization means restricting a model to avoid overfitting by shrinking the coefficient estimates to zero. When a model suffers from overfitting, we should control the model's complexity. Technically, regularization avoids overfitting by adding a penalty to the model's loss function:

Regularization = Loss Function + Penalty

There are three commonly used regularization techniques to control the complexity of machine learning models, as follows:

- L2 regularization
- L1 regularization
- Elastic Net

Let’s discuss these standard techniques in detail.

L2 Regularization (Ridge Regression):

- Ridge regression adds an L2 penalty term to the cost function of linear regression.
- The goal is to keep the magnitude of the model’s weights (coefficients) as small as possible.
- It helps control overfitting by reducing model complexity

L1 Regularization (Lasso Regression):

- Lasso regression adds an L1 penalty term to the cost function.
- Encourages sparsity by driving some coefficients to exactly zero.
- Useful for feature selection.
- Also helps prevent overfitting

15. Explain the term error present in linear regression equation?

Ans - In the context of linear regression, the term error refers to the difference between the actual observed values and the predicted values generated by the linear regression model.

1. **Observed Values (Actual Data):**
    - When we collect data, we have a set of observations (data points) for the independent variable(s) (features) and the dependent variable (target).
    - These observed values are denoted as (y_i) (where (i) represents the index of each data point).

Predicted Values (Model Output):

- Linear regression aims to find a linear relationship between the features and the target variable.
- The model predicts the target variable using the linear equation: [\hat{y}i = \beta_0 + \beta_1 x{i1} + \beta_2 x_{i2} + \dots + \beta x_{Ip}] where:

Error (Residual):

- The error (residual) for each data point is calculated as: [\text{Error}_i = y_i - \hat{y}_i]
- It represents how far off the model’s prediction is from the actual observed value.
- Ideally, we want the errors to be as small as possible.

Objective of Linear Regression:

The goal of linear regression is to minimize the sum of squared errors (SSE) across all data points: [\text{SSE} = \sum_{i=1}^{n} (\text{Error}_i)^2]

The model adjusts the coefficients to find the best-fitting line that minimizes this error.

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Abstract

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