MACHINE LEARNING

In Q1 to Q11, only one option is correct, choose the correct option: (I have given only answers)

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

2. Which of the following statement is true about outliers in linear regression?
A) Linear regression is sensitive to outliers

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

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

5. Which of the following is the reason for over fitting condition?
C) Low bias and high variance

6. If output involves label then that model is called as:
B) Predictive modal

7. Lasso and Ridge regression techniques belong to _____?
D) Regularization

8. To overcome with imbalance dataset which technique can be used?
A) Cross validation

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

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

11. Pick the feature extraction from below:
A) Construction bag of words from a email

In Q12, more than one options are correct, choose all the correct options:

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

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?

In simple words, **"In the Regularization technique, we reduce the magnitude of the independent variables by keeping the same number of variables".** It maintains accuracy as well as a generalization of the model.

It is one of the most important concepts of machine learning. This technique prevents the model from overfitting by adding **extra information** to it.

It is a form of regression that shrinks the coefficient estimates towards zero. In other words, this technique forces us not to learn a more complex or flexible model, to avoid the problem of overfitting. Types of Regularization.

1) Ridge Regression

2) Lasso Regression

14. Which particular algorithms are used for regularization?

There are Mainly 3 types of algorithums are used for regularization, they are

1) Ridge Regression

2) LASSO (Least Absolute Shrinkage and Selection Operator) Regression

3) Elastic-Net Regression

1) **Ridge Regression :**
- Ridge regression is a method for analyzing data that suffer from multi-collinearity.
- Ridge regression adds a penalty *(L2 penalty)* to the loss function that is equivalent to the square of the magnitude of the coefficients.
- The regularization parameter *(λ)* regularizes the coefficients such that if the coefficients take large values, the loss function is penalized.

- $\lambda \rightarrow 0$, the penalty term has no effect, and the estimates produced by ridge regression will be equal to least-squares i.e. the loss function resembles the loss function of the Linear Regression algorithm. Hence, a lower value of λ will resemble a model close to the Linear regression model.

- $\lambda \rightarrow \infty$, the impact of the shrinkage penalty grows, and the ridge regression coefficient estimates will **approach zero** (coefficients are close to zero, but not zero).

*Note: Ridge regression is also known as the **L2 Regularization.***

To sum up, **Ridge regression shrinks the coefficients as it helps to reduce the model complexity and multi-collinearity.**

2) LASSO (Least Absolute Shrinkage and Selection Operator) Regression
- LASSO is a regression analysis method that performs both feature selection and regularization in order to enhance the prediction accuracy of the model.
- LASSO regression adds a penalty *(L1 penalty)* to the loss function that is equivalent to the magnitude of the coefficients.
- In LASSO regression, the penalty has the effect of forcing some of the coefficient estimates to be **exactly equal to zero** when the regularization parameter λ is sufficiently large.

*Note: LASSO regression is also known as the **L1 Regularization (L1 penalty).***

To sum up, **LASSO regression converts coefficients of less important features to zero, which indeed helps in feature selection, and it shrinks the coefficients of remaining features to reduce the model complexity, hence avoiding overfitting.**

3) Elastic-Net Regression

- Elastic-Net is a regularized regression method that linearly combines the L1 and L2 penalties of the LASSO and Ridge methods respectively**.**

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

- The **linear regression** model contains an **error term** that is represented by ε.

- The **error term** is used to account for the variability in y that cannot be **explained** by the linear relationship between x and y. If ε were not **present**, that would mean that knowing x would provide enough information to determine the value of y.