MACHINE LERNING

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

Answer : A) 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

Answer : A) 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

Answer : 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

Answer : Regression

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 D) none of these

Answer : C) 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

Answer : B) Predictive model

7. Lasso and Ridge regression techniques belong to_____?
   A) Cross validation
   B) Removing outliers
   C) SMOTE
   D) Regularization

Answer : Regularization

8. To overcome with imbalance dataset which technique can be used?
   A) Cross validation
   B) Regularization
   C) Kernel
   D) SMOTE

Answer : SMOTE

9. The AUC Receiver Operator Characteristic (AUCROC) curve is an evaluation metric for binaryclassification problems. It uses____to make graph?
   A) TPR and FPR
   B) Sensitivity and precision
   C) Sensitivity and Specificity
   D) Recall and precision

Answer : A) TPR and FPR

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

Answer : 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.

Answer : Apply PCA to project high dimensional data

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.

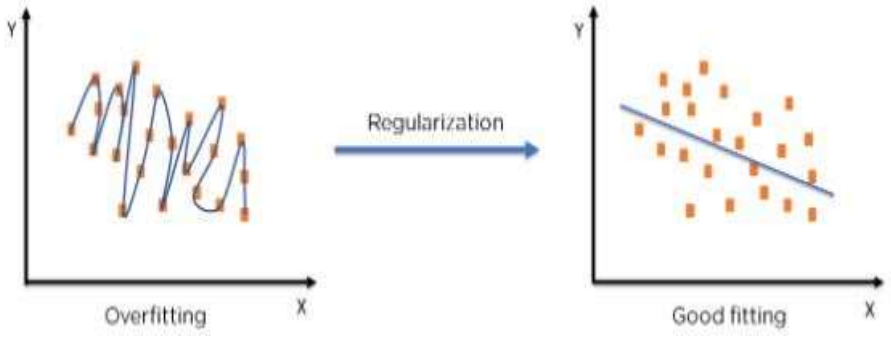
C) We need to iterate.

D) It does not make use of dependent variable.

Answer : A,B,C

13. Explain the term regularization?

Regularization refers to techniques that are used to calibrate machine learning models in order to minimize the adjusted loss function and prevent overfitting or underfitting. Using Regularization, we can fit our machine learning model appropriately on a given test set and hence reduce the errors in it.



The commonly used regularization techniques are :

1. LASSO
2. RIDGE
3. ELASTICNET(less popular)

14. Which particular algorithms are used for regularization?

There are mainly two types of regularization techniques, which are given below:

- **Ridge Regression**
- **Lasso Regression** (Least Absolute Shrinkage and Selection Operator)

Ridge Regression

- Ridge regression is one of the types of linear regression in which a small amount of bias is introduced so that we can get better long-term predictions.
- Ridge regression is a regularization technique, which is used to reduce the complexity of the model. It is also called as **L2 regularization**.
- In this technique, the cost function is altered by adding the penalty term to it. The amount of bias added to the model is called **Ridge Regression penalty**. We can calculate it by multiplying with the lambda to the squared weight of each individual feature.
- The equation for the cost function in ridge regression will be:

$$\sum_{i=1}^{M}\left(y_i - y'_i\right)^2 = \sum_{i=1}^{M}\left(y_i - \sum_{j=0}^{n}\beta_j * x_{ij}\right)^2 + \lambda\sum_{j=0}^{n}{\beta_j}^2$$

- In the above equation, the penalty term regularizes the coefficients of the model, and hence ridge regression reduces the amplitudes of the coefficients that decreases the complexity of the model.
- As we can see from the above equation, if the values of **λ tend to zero, the equation becomes the cost function of the linear regression model.** Hence, for the minimum value of λ, the model will resemble the linear regression model.
- A general linear or polynomial regression will fail if there is high collinearity between the independent variables, so to solve such problems, Ridge regression can be used.
- It helps to solve the problems if we have more parameters than samples.

Lasso Regression:

- Lasso regression is another regularization technique to reduce the complexity of the model. It stands for **Least Absolute and Selection Operator.**
- It is similar to the Ridge Regression except that the penalty term contains only the absolute weights instead of a square of weights.
- Since it takes absolute values, hence, it can shrink the slope to 0, whereas Ridge Regression can only shrink it near to 0.
- It is also called as **L1 regularization.** The equation for the cost function of Lasso regression will be:

$$\sum_{i=1}^{M}(y_i - y'_i)^2 = \sum_{i=1}^{M}\left(y_i - \sum_{j=0}^{n}\beta_j * x_{ij}\right)^2 + \lambda\sum_{j=0}^{n}|\beta_j|^{\square}$$

- Some of the features in this technique are completely neglected for model evaluation.
- Hence, the Lasso regression can help us to reduce the overfitting in the model as well as the feature selection.

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***.