MACHINE LEARNING

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. 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

Ans. **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

Ans. B) 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. B) 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 D) none of these

Ans. 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

Ans. B) Predictive model

7. Lasso and Ridge regression techniques belong to _____?

A) Cross validation B) Removing outliers C) SMOTE D) Regularization

Ans. A) Cross validation

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

A) Cross validation B) Regularization C) Kernel D) SMOTE

Ans. 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 B) Sensitivity and precision C) Sensitivity and Specificity D) Recall and precision

Ans. 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 B) False

Ans. B) 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 In

Ans. B) Apply PCA to project high dimensional data

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.

Ans. 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. Are right.

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

13. Explain the term regularization?

Ans. Regularization is a **technique used for tuning the function by adding an additional penalty term in the error function**. The additional term controls the excessively fluctuating function such that the coefficients don't take extreme values. Regularization is a technique used to reduce the errors by fitting the function appropriately on the given training set and avoid overfitting.

To understand regularization, let's consider a simple case of linear regression. Mathematically, linear regression is stated as below:

y = w0 + w1x1 + w2x2 + ….. + wnxn

Ans. There are three main regularization techniques

14. Which particular algorithms are used for regularization?

Ans. There are 3 techniques used in regularization

1. Ridge Regression (L2 Norm)

2. Lasso (L1 Norm)

3. Dropout

1. **Ridge Regression (L2 Norm):** Ridge and Lasso can be used for any algorithms involving weight parameters, including neural nets. Dropout is primarily used in any kind of neural networks e.g. ANN, DNN, CNN or RNN to moderate the learning.

Ridge regression is also called L2 norm or regularization.

When using this technique, we add the sum of weight's square to a loss function and thus create a new loss function which is denoted thus:

$$\text{Loss} = \sum_{j=1}^{m} \left(Yi - Wo - \sum_{i=1}^{n} Wi\, Xji \right)^2 + \lambda \sum_{i=1}^{n}$$

As seen above, the original loss function is modified by adding normalized weights. Here normalized weights are in the form of squares.You may have noticed parameters λ along with normalized weights. λ is the parameter that needs to be tuned using a cross-validation dataset. When you use λ=0, it returns the residual sum of square as loss function which you chose initially. For a very high value of λ, loss will ignore core loss function and minimize weight's square and will end up taking the parameters' value as zero.

Now the parameters are learned using a modified loss function. To minimize the above function, parameters need to be as small as possible. Thus, L2 norm prevents weights from rising too high.

2. Lasso (L1 Norm)- Also called lasso regression and denoted as below:

$$\text{Loss} = \sum_{j=1}^{m} \left(Yi - Wo - \sum_{i=1}^{n} Wi\, Xji \right)^2 + \lambda \sum_{i=1}^{n}$$

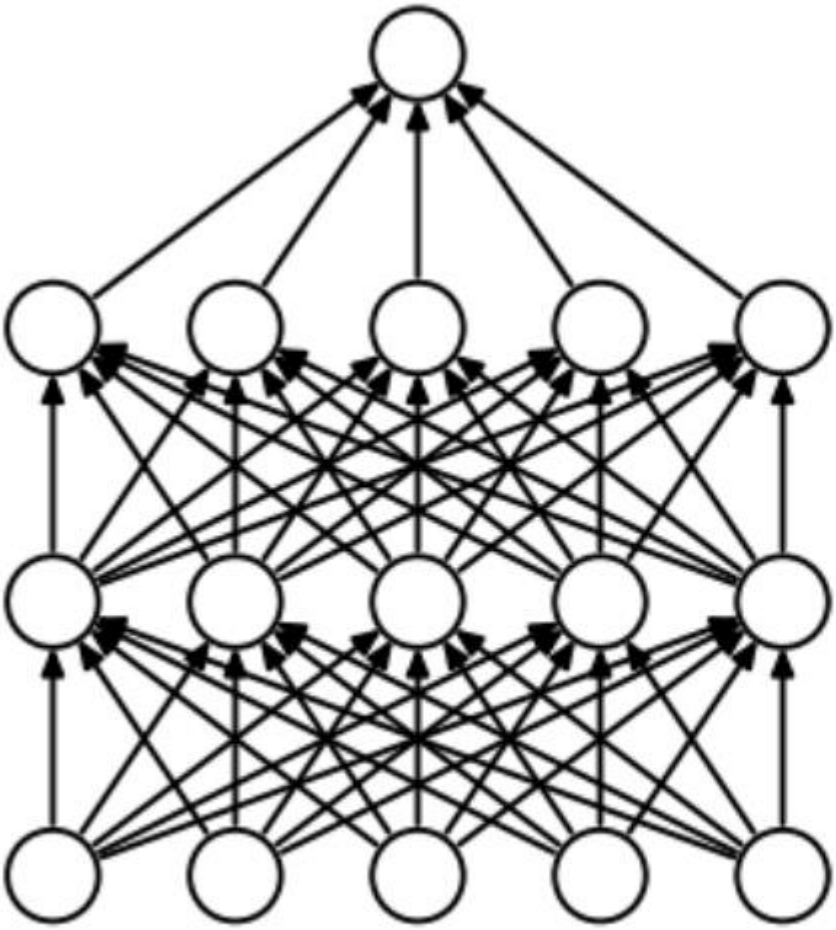
This technique is different from ridge regression as it uses absolute weight values for normalization. λ is again a tuning parameter and behaves in the same as it does when using ridge regression.

As loss function only considers absolute weights, optimization algorithms penalize higher weight values.

In ridge regression, loss function along with the optimization algorithm brings parameters near to zero but not actually zero, while lasso eliminates less important features and sets respective weight values to zero. Thus, lasso also performs feature selection along with regularization.

3. Dropout- Dropout is a regularization technique used in neural networks. It prevents complex co-adaptations from other neurons.

In neural nets, fully connected layers are more prone to overfit on training data. Using dropout, you can drop connections with 1-p probability for each of the specified layers. Where p is called keep probability parameter and which needs to be tuned.



(a) Standard Neural Net

(b) A

With dropout, you are left with a reduced network as dropped out neurons are left out during that training iteration.

Dropout decreases overfitting by avoiding training all the neurons on the complete training data in one go. It also improves training speed and learns more robust internal functions that generalize better on unseen data. However, it is important to note that Dropout takes more epochs to train compared to training without Dropout (If you have 10000 observations in your training data, then using 10000 examples for training is considered as 1 epoch).

Along with Dropout, neural networks can be regularized also using L1 and L2 norms. Apart from that, if you are working on an image dataset, image augmentation can also be used as a regularization method.

For real-world applications, it is a must that a model performs well on unseen data. The techniques we discussed can help you make your model learn rather than just memorize.

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

Ans. Within a linear regression model tracking a stock's price over time, the error term is the difference between the expected price at a particular time and the price that was actually observed. In instances where the price is exactly what was anticipated at a particular time, the price will fall on the trend line and the error term will be zero.

An error term is a residual variable produced by a statistical or mathematical model, which is created when the model does not fully represent the actual relationship between the independent variables and the dependent variables. As a result of this incomplete relationship, the error term is the amount at which the equation may differ during empirical analysis.