MACHINE LEARNING WORKSHEET

Question NO	Answers
01	A
02	A
03	B
04	C
05	C
06	B
07	D
08	D
09	A
10	B
11	A, B,C
12	A,B,C

13. Explain the term regularization

Ans - When we use regression models to train some data, there is good chance that model will overfit the given dataset. Model may behave good with the training data but not with test data, it means our model is not being able to predict the correct labels or outcomes this is called overfitting, these problems are solved with regularization techniques. Regularization is the process of bringing uniformity into data so model will not miss-behave. It reduces the error by fitting function appropriately on the given training set.

14 . Which particular algorithms are used for regularization?

Ans – Following are the various regularization algorithms used in Machine Learning –

- Ridge Regression
- LASSO (Least Absolute Shrinkage and selector operator) Regression

Ridge Regression –

Ridge Regression is a technique for analysing multiple regression data that suffer from multicollinearity. When multicollinearity occurs, least squares estimates are unbiased, but their variances are large so they may be far from the true value. By adding a degree of bias to the regression estimates, ridge regression reduces the standard errors. Multicollinearity, or collinearity, is the existence of near-linear relationships among the independent variables.

Following the usual notation, suppose our regression equation is written in matrix form as

Y = XB + e

where Y is the dependent variable, X represents the independent variables, B is the regression coefficients to be estimated, and e represents the errors are residuals.

LASSO (Least Absolute Shrinkage and selector operator) Regression –

Lasso regression is a regularization technique. It is used over regression methods for a more accurate prediction. This model uses shrinkage. Shrinkage is where data values are shrunk towards a central point as the mean. The lasso procedure encourages simple, sparse models (i.e. models with fewer parameters). This particular type of regression is well-suited for models showing high levels of multicollinearity or when you want to automate certain parts of model selection, like variable selection/parameter elimination.

Lasso Regression uses L1 regularization technique (will be discussed later in this article). It is used when we have a greater number of features because it automatically performs feature selection.

Mathematical equation of Lasso Regression -

Residual Sum of Squares + λ * (Sum of the absolute value of the magnitude of coefficients)

$$\sum_{i=1}^{n}(y_i - \sum_{j}x_{ij}\beta_j)^2 + \lambda\sum_{j=1}^{p}|\beta_j|$$

Where,

- λ denotes the amount of shrinkage.
- λ = 0 implies all features are considered and it is equivalent to the linear regression where only the residual sum of squares is considered to build a predictive model
- λ = ∞ implies no feature is considered i.e, as λ closes to infinity it eliminates more and more features
- The bias increases with increase in λ
- variance increases with decrease in λ

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

Ans – In simple words error in regression analysis is the difference between actual value and predicted value. The error term of a regression equation represents all of the variation in the dependent variable not explained by the weighted independent variables.

Graphically if the if the actual and predicted values are exactly equal then best fit line should consider the actual values line. The graphical distance calculated in this case can be called as error.