1. T-distribution approaches to the specific distribution as the degree of freedoms increases to infinity. Based on the specific distribution, calculate probability density at x=0.19.

2. The data set contains 30 samples and 4 explanatory variables, and its target is numeric. When linear regression is applied on this data set, SST and SSE of the trained model are 10655.70 and 8947.40, respectively. Calculate sum of MSR and MSE.

3. There are some classification algorithms that cannot apply for multi-class classification. For such classifiers, there are two different approaches to obtain multi-class classifiers by combining several binary classifiers. When the number of classes in the target is 5, calculate log2(base is 2) of difference between the number of classifiers by the one-versus-one approach and the number of classifiers by the one-versus-one approach (subtract smaller number from larger number).

4. The data set D consists of independently and identically distributed samples from a normal distribution. When D={1.85,-2.98,2.37,-2.45,1.31}, calculate the estimated variance of the normal distribution by maximum likelihood estimation.

5. The data set contains 22 samples and 7 explanatory variables and its target is numeric. After linear regression is applied on this data set, the significance of the trained model is tested through F-test. Under a significance level of 0.01, select all test statistic values to conclude that the trained model is significant to predict the target.

6. The data set contains 22 samples and 7 explanatory variables and its target is numeric. After linear regression is applied on this data set, SSE and SSR of the trained model are 4195.67 and 5606.85, respectively. Calculate adjusted R^2.

7. The input variable x is binary variable. The data set has 3 classes in the target and for the class 0, values of the variable x are [0,1,0,1,0,1,1]. When a naive Bayes classifier is trained on this data set and the smoothing parameter, alpha is set to 2.54, estimate a parameter for the variable x and the class 0.

8. Calculate inner product (dot product) of the following two vectors. v=[-3,2,-5], w=[3,8,-8]

9. The classifier is trained on a binary classification data by logistic regression. The given data set consists of two input variables, x1 and x2. For the trained model, the intercept, b0 is -0.76 and the coefficients of x1 and x2 are -1.33 and -0.32, respectively. When x1=1.62 and x2=0.33, calculate odds using the trained classifier.

10. The data set contains 39 samples and 4 explanatory variables and its target is numeric. After linear regression is applied on this data set, t-test is conducted to find the significant input variables in predicting the target. Using two-sided t-test with the significance level of 0.10, select all significant variables based on coefficients and standard errors.

11. The classifier is trained on a binary classification data by logistic regression. The given data set consists of two input variables, x1 and x2. For the trained model, the intercept, b0 is 5.10 and the coefficient of x1 is 5.37. In addition, when x1=0.02 and x2=0.03, p(y=1|x) is 0.1763. Based on these results, calculate the coefficient of x2.

12. The given data set contains 4 classes in the target and consists of three binary input variables. When a naive Bayes classifier is trained on this data set, the estimated parameters for the class 1 are 0.49, 0.31, and 0.36, respectively. Based on the trained classifier, calculate the value of likelihood function of sample, x=(0,1,1) for class 1. For this question, round off the answer to fourth decimal point.

13. The data set contains 48 samples and 7 explanatory variables and its target is numeric. When linear regression is applied on this data set, SST and SSR of the trained model are 7137.75 and 1940.26, respectively. Calculate SSE.

14. The input variable x is binary variable. The data set has 6 classes in the target and the values of the variable x are [0,0,0,1,0,1,1,1]. When a naive Bayes classifier is trained on this data set, estimate a parameter for the variable x with respect to the class 0 without the smoothing.

15. The data set D consists of samples independently and identically distributed coming from a normal distribution. When D={-4.99,1.37,2.74,5.84,3.27}, calculate the estimated mean of the normal distribution by maximum likelihood estimation.

16. The measurement unit of the specific input variable is mile. This unit is changed to km. The coefficient of the variable is 9.86 when a linear regression model is trained with the original input(mile). Calculate new coefficient of this variable when a new linear regression model is trained after changing unit of this variable to km (1 mile = 1.6093 km).

17. There are four data sets with 28 samples and 4 explanatory variables. There targets are all numeric. After linear regression is applied on each data set, the validity of the normality assumption is tested through Jarque-Bera test for all data sets. Under a significance level of 0.10, select all data sets that satisfy the normality assumption based on skewness (S) and kurtosis (C) of errors.

18. SSE and SSR of the trained linear regression model are 2807.12 and 8064.71, respectively. Calculate R^2.

19. f(x) is the logit function. Calculate f(-0.11).

20. Select all problems corresponding to supervised learning.

21. There are two discrete random variables, A can take either A1 or A2 and the output of B is one of B1, B2 and B3. When $P(A1|B1)=0.80$, $P(A1|B2)=0.32$, $P(A2|B3)=0.73$, $P(B1)=0.57$, and $P(B2)=0.06$, calculate $P(A1)$.