Department of Data Science
IIT Palakkad
DS5006 : Machine Learning

0800-0850   Test 1 (02 Sep 2024)   Marks : 20

1. The solutions of a linear regression problem obtained through normal equations and the least squares iterative gradient descent approach can be different. True or False? Briefly explain.

2. What are the benefits of the *exchangeability* assumption? Give an example where the assumption is not valid.

3. What is the impact on the bias and variance of a LASSO model, when the regularizing coefficient value is increased? Briefly explain.

4. List down the assumptions we made while using linear regression to make predictions. Describe a real-life scenario where some of the assumptions are violated.

5. Derive an analytical solution for Ridge Regression

6. Solve the following constrained optimization problem:

$$\text{maximize } f = -\sum_{i=1}^{N} P(x) log P(x)$$

$$\text{subject to } \sum_{i=1}^{N} P(x) = 1$$

7. Construct or plot a set of data $(x; y)_i$; $i = 1$ to n, for which the least squares and least absolute deviation estimates of $(c; m)$ in the fit, $y = c + mx$, are much different. What did you have to do to make this happen?[1]

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[1]Source: *Regression and Other Stories* by Andrew Gelman, Jennifer Hill, and Aki Vehtari, Published by Cambridge University Press in 2020.