Machine Learning Mid Sem Spring 2021 Set-2

Instructions

1. This is a **closed book online proctored** exam.
   a. You should not refer to books, notes or online resources.
   b. You should not discuss questions or answers with anyone (including outsiders)
   c. You should have your camera and microphone **ON** at all times and no headphones.
2. Write the solutions clearly and legibly in A4 sheets, using pen (NOT pencil) and at the end of the exam you should submit the scanned copy of your solutions as explained by the faculty
3. **Write your name, roll no. and question set (e.g. Set-2) on each page.**
4. Follow all other instructions given by the faculty during the exam.

Descriptive Questions (10 Marks each)

1. Explain different generalization ideas of the Bayes Theorem. A test for Celiac disease is 60% accurate when a person has the disease and 99% accurate when a person does not have the disease. In the global population, 0.01% of the population has Celiac disease. What is the probability that a person chosen randomly from the population who test positive for the disease actually has the disease? (3+7)

2. (a) Define maximum-likelihood estimation for linear regression with an example. (2)
   (b) What is the difference between MLE and MAP? (2)
   (c) What is the tradeoff between bias and variance? Give an example. (2)
   (d) The Poisson distribution has the form
   $$P(x|\theta) = \frac{\theta^x}{x!} e^{-\theta},$$

where $x = 0, 1, 2....$ and $\theta > 0$ is an unknown parameter. Find the maximum likelihood estimate for θ. (4)