Subject: 21DS602/21CS644

Assignment: 01

Distribution Date: 10-11-2021

Submission Due: 24-11-2021

Notes:

- This assignment is an optional work. It contributes towards the lab component of assessment
- The Max marks for the assignment is 40; this shall be reduced to 8 marks in final scoring
- The assignments are to be solved with writings. No computational work is needed for these assignments.
- You may type the content or alternately write on paper. Submit the Assignment as scanned PDF or DOCX/PDF. Use figures & diagrams to illustrate your point.
- Please submit only a single file for the entire assignment.

Questions:

Q1. Define & explain the Central Limit Theorem. Mention its applicability in machine learning. (1+2+1)

Q2. Mention the similarities and differences between z-score and min-max normalization. (2+2)

Q3. Explain the behavior of resultant accuracy with variation of '*k*' in *k*-NN classifier. (2 marks)

Q4. Compare perceptron learning with back-propagation learning. (4 marks)

Q5. The missing values for a continuous dataset (training) may be replaced with the population mean or the class mean. Explain which is better with justifications. (2 marks)

Q6. Derive the formula for gradient descent algorithm used in perceptron learning. (4 marks)

Q7. Name and explain the curses of dimensionality. (1 mark for each)

Q8. When a biased coin is being tossed alongside a fair one, which shall have more entropy? Why? (1+3)

Q9. Explain role of bias and activation function in a neural network. (2+2)

Q10. Explain the triangle inequality of a distance metric. (2 marks)

Q11. Find the rank of the rank of the below provided matrix (provide the steps). Is the matrix invertible? Explain the reason for your answer. (4 marks)

$$\begin{bmatrix} 11 & 2 & 13 & 7 \\ 2 & 2 & 5 & 19 \\ 2 & 5 & 12 & 15 \\ 20 & 8 & 35 & -13 \end{bmatrix}$$

Q12. Comparing the input and output ranges of sigmoid and step activation functions, explain the behavior of these functions. Explain which one should be preferred over the other with justification. (2 marks)