

2054

M.E. (Computer Science and Engineering - Cyber Security)

Second Semester

CSN-8204: Pattern Recognition and Machine Learning

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Section.

Q-1 Write short note on the following:

- Compare human and computer intelligence
- Explain the loss functions for regression
- Explain any one non-parametric methods
- What is the significance of Hidden Markov Models in classifier design?
- How is non-separability of data handled in SVM learning? (2x5)

SECTION- A

Q-2 a) Given n i.i.d samples from $\text{Unif}[0, c]$, $0 < c < \infty$, calculate an ML estimate for c .
 b) Given 7 two dimensional patterns $A=(1,1)$, $B=(1,2)$, $C=(2,2)$, $D=(6,2)$, $E=(7,2)$, $F=(6,6)$, $G=(7,6)$. Using k-means algorithm obtains 3 clusters. [5, 5]

Q-3a) What is meant by Principle Component Analysis (PCA). Explain the methods used in PCA.

b) Illustrate the silhouette coefficient as a measure of cluster validity. Discuss its interpretation and significance in assessing clustering quality. [5, 5]

Q-4 a) Why is an ensemble of classifiers better than a single classifier?

b) Explain the various stages involved in designing a learning system. [5,5]

SECTION- B

Q-5a) Describe K-nearest Neighbour learning Algorithm for continuous valued target function.

b) How can we identify the decision planes using support vector machine? [5,5]

Q-6 a) Discuss the challenges of training recurrent neural networks, such as the vanishing gradient. Explain possible solutions to overcome these challenges. (4)

b) Define the terms: weights, bias, activations with respect to neural networks. (3)

c) Briefly explain Karhunen-Loeve transformation? (3)

Q-7 a) Explain sum product algorithm for the HMM (Hidden Markov Model)

b) Explain the discriminant function for the normal density for all three special cases. [5,5]