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Question Paper Code:U2511

M.E. DEGREE EXAMINATION, MAY 2024

Electives

Communication Systems

21PCM511- PATTERN RECOGNITION AND APPLICATION

(Regulations 2021)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART - A (5 x 20 = 100 Marks)

1. (a) Analyze the role of linear algebra in pattern recognition. How concepts such as vectors, matrices, and eigenvalues/eigenvectors are utilized in pattern recognition algorithms? Provide mathematical explanations and practical examples to illustrate the significance of linear algebra in pattern recognition. CO4- Ana (20)
Or
(b) Analyze the concept of adaptation in pattern recognition approaches. How does adaptation enhance the performance of pattern recognition systems? Provide examples to illustrate the importance of adaptation in real-world applications. CO4- Ana (20)
2. (a) Explain in detail about Bayesian parameter learning and its applications in various aspects. CO1- U (20)
Or
(b) Illustrate statistical Pattern recognition with an example. CO1- U (20)
3. (a) Suppose we have a large number of symbol sequences emitted from an HMM that has a particular transition probability a_{ij} , $a_{ij} = 0$ for some single value of i and j . We use such sequences to train a new HMM, one that happens also to start with its $a_{ij} = 0$. Prove that this parameter will remain 0 throughout training by the Forward-backward algorithm. In other words, if the topology of the trained model (pattern of non-zero connections) matches that of the generating HMM, it will remain so after training. CO3- App (20)

Or

- (b) For the following random samples, find the likelihood function: CO3- App (20)
 $X_i \sim \text{Binomial}(3, \theta)$, and we have observed $(x_1, x_2, x_3, x_4) = (1, 3, 2, 2)$.
 $X_i \sim \text{Exponential}(\theta)$ and we have observed
 $(x_1, x_2, x_3, x_4) = (1.23, 3.32, 1.98, 2.12)$.

4. (a) Apply the various density estimation methods to design K – nearest neighbor estimation. CO3- App (20)

Or

- (b) Apply the various methods to determining the number of clusters. CO3- App (20)

5. (a) Discuss in detail about clustering and illustrate how it is different from classification. CO1- U (20)

Or

- (b) How do you validate clustering performance in pattern recognition? CO1- U (20)