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Faculty of Science and Technology

School of Computational Sciences

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Assignment 1
Pattern Recognition
M-Tech (DSAI)
Semester III
Course Code:230GCSM18_03
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Unit I: Basics of Pattern Recognition

1. Define Pattern Recognition. List any three real-life applications.

2. Differentiate between **Clustering and Classification** with suitable examples.

3. Explain the difference between **Supervised and Unsupervised Learning** in the context of pattern recognition.

4. A vector space is given by V={(x,y)|x,y∈R}V = \{(x,y) | x,y \in \mathbb{R}\}V={(x,y)|x,y∈R}. Show whether (3,4)(3,4)(3,4) and (6,8)(6,8)(6,8) belong to the same vector subspace.

5. What are the basic axioms of probability? Give one example from pattern recognition.

6. Explain the concept of **estimation theory** and its role in pattern recognition.

7. Discuss the role of **metric spaces and distances** in defining decision regions. Illustrate using **Euclidean and Mahalanobis distance**.

Unit II: Classification

8. State the **Bayes Decision Rule** and explain its importance in classification.

9. Suppose two classes have normal distributions with equal covariance matrices. Derive the **linear discriminant function**.

10. Explain with an example how **error probability** is calculated in classification.

11. Compare **linear decision boundaries** and **non-linear decision boundaries** with diagrams/examples.

12. Discuss the strengths and limitations of the **K-Nearest Neighbor (K-NN)** classifier compared to **Fisher's LDA**.

13. A single-layer perceptron is trained to classify binary data. Show how decision boundaries are formed.

14. Explain how dividing a dataset into **training and testing sets** helps in evaluating classifier performance.

15. How do **standardization and normalization** of features impact the performance of a **multi-layer perceptron classifier**?