

CS424 - PATTERN RECOGNITION (ELECTIVE - III)

Course Description & Objectives:

This course will introduce the fundamentals of pattern recognition. First, we will focus on Introduction, decision and distance functions. Next, we will focus on probability and statistical decision making. Later concentrated on decision making and feature selection. It also covered the syntactic pattern recognition.

Course Outcomes:

Upon successful completion of the course, students will

- a. Understand the vision technology in conjunction with real world applications.*
- b. Learn the principles and commonly used paradigms and techniques of computer vision.*
- c. Be able to identify the limitations of vision systems.*
- d. Be able to demonstrate successful applications to process and analyze images, and to make automatic decisions based on extracted feature information.*

UNIT I : INTRODUCTION - Basic concepts, Applications, Fundamental problems in pattern Recognition system design, Design concepts and methodologies, Examples of Automatic Pattern recognition systems, Simple pattern recognition model

DECISION AND DISTANCE FUNCTIONS - Linear and generalized decision functions, Pattern space and weight space, Geometrical properties, implementations of decision functions, Minimum-distance pattern classifications.

UNIT II: PROBABILITY :

Probability of events: Random variables, Joint distributions and densities, Movements of random variables, Estimation of parameter from samples. STATISTICAL DECISION MAKING - Introduction, Baye's theorem, Multiple features, Conditionally independent features, Decision boundaries, Unequal cost of error, estimation of error rates, the leaving-one-out-techniques, characteristic curves, estimating the composition of populations. Baye's classifier for normal patterns.

UNIT III: NON PARAMETRIC DECISION MAKING :

Introduction, histogram, kernel and window estimation, nearest neighbour classification techniques. Adaptive decision boundaries, adaptive discriminant functions, Minimum squared error discriminant functions, choosing a decision making techniques.

CLUSTERING AND PARTITIONING - Hierarchical Clustering: Introduction, agglomerative clustering algorithm, the single-linkage, complete-linkage and average-linkage algorithm. Ward's method Partition clustering-Forg's algorithm, K-means's algorithm, Isodata algorithm.

UNIT IV: PATTERN PREPROCESSING AND FEATURE SELECTION :

Introduction, distance measures, clustering transformation and feature ordering, clustering in feature selection through entropy minimization, features selection through orthogonal expansion, binary feature selection.

UNIT V: SYNTACTIC PATTERN RECOGNITION & APPLICATION OF PATTERN RECOGNITION :

Introduction, concepts from formal language theory, formulation of syntactic pattern recognition problem, syntactic pattern description, recognition grammars, automata as pattern recognizers, Application of pattern recognition techniques in bio-metric, facial recognition, IRIS scon, Finger prints, etc.,

TEXT BOOKS :

1. Gose. Johnsonbaugh. Jost. " Pattern recognition and Image Analysis", PHI.
2. Tou. Rafael. Gonzalez. "Pattern Recognition Principle", Pearson Education

REFERENCES BOOK :

1. Richard duda, Hart., David Strok, "Pattern Classification", John Wiley.