

PATTERN RECOGNITION (ELECTIVE-IV)

Course Code:13CS1112

| L | T | P | C |
|---|---|---|---|
| 4 | 0 | 0 | 3 |

Course Educational Objectives:

To provide the basic skill in methods of design and analysis to identify patterns across engineering areas. Student will know about different aspects of machine learning using concepts of pattern recognition.

Course Outcomes:

- ❖ The students will be able to understand the methods and processes that shall be adopted to identify hidden patterns in the large volumes of data.
- ❖ The students will be able to comprehend the theory and methods for learning from data with an emphasis on pattern classification.

UNIT-I

(12 Lectures)

INTRODUCTION:

Machine perception, pattern recognition example, pattern recognition systems, the design cycle, learning and adaptation.

BAYESIAN DECISION THEORY:

Introduction, continuous features– two categories classifications, minimum error-rate classification- zero–one loss function, classifiers, discriminant functions, and decision surfaces.

UNIT-II

(12 Lectures)

NORMAL DENSITY :

Univariate and multivariate density, discriminant functions for the normal density different cases, Bayes decision theory –discrete features, compound Bayesian decision theory and context.

MAXIMUM LIKELIHOOD AND BAYESIAN PARAMETER ESTIMATION :

Introduction, maximum likelihood estimation, Bayesian estimation, Bayesian parameter estimation–Gaussian case.

UNIT-III**(12 Lectures)****UN-SUPERVISED LEARNING AND CLUSTERING :**

Introduction, mixture densities and identifiability, maximum likelihood estimates,

application to normal mixtures, K-means clustering. Data description and clustering – similarity measures, criteria functions for clustering.

UNIT-IV**(12 Lectures)****LINEAR DISCRIMINANT FUNCTIONS :**

Introduction, Linear Discriminant Functions and Decision Surfaces, Generalized Linear Discriminant Functions, The Two-category Linearly Separable Case, Minimizing the Perceptron Criterion Function, Relaxation Procedures, Nonseparable Behavior, Minimum Squared-Error Procedures

COMPONENT ANALYSES :

Principal component analysis, non-linear component analysis; Low dimensional representations and multi dimensional scaling.

UNIT-V**(12 Lectures)****DISCRETE HIDDEN MARKOV MODELS :**

Introduction, Discrete–time markov process, extensions to hidden Markov models, three basic problems for HMMs.

CONTINUOUS HIDDEN MARKOV MODELS :

Observation densities, training and testing with continuous HMMs, types of HMMs.

TEXT BOOKS:

1. Richard O. Duda, Peter E. Hart, David G. Strok, *Pattern classification*, 2nd Edition Wiley Student Edition, 2010.
2. Lawrence Rabiner, Biing, *Fundamentals of speech Recognition*, 1st Edition, Hwang Juang Pearson Education, 2009.

REFERENCES:

1. Earl Gose, Richard John baugh, “*Pattern Recognition and Image Analysis*”, 1st Edition, PHI, 2004.
2. Sergios Theodoridis, Konstantinos Koutroumbas, “*Pattern Recognition*”, 4th Edition, Academic Press, 2008
3. Narasimha Murthy, Susheeela Devi, “*Pattern Recognition*”, University Press

WEB REFERENCES:

<https://www.coursera.org/course/ml>

