20CS019   PATTERN RECOGNITION

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	-	-	15	30	-	5	5	-

Course Description and Objectives:

This course deals with classification and clustering methods to identify the unknown objects. The objective of this course is to enable the student to understand the data predictions in various fields.

Course Outcomes:

Upon the Completion of the course, students will be able to:

✓ Understand the basic principles and mathematical structures involved in pattern recognition.
✓ Understand the concepts and applications of Pattern Recognition
✓ Apply important pattern recognition algorithms.
✓ Developing new applications with the various Pattern Recognition algorithms.

SKILLS:

✓ Labelling the data objects by using different classification techniques.

✓ Combining the data objects by applying various clustering algorithms.

✓ Identify the data objects by using different feature selection approaches.

✓ Reduce the data objects by applying dimensionality reduction techniques.

UNIT I

INTRODUCTION AND MATHEMATICAL PRELIMINARIES:-

Pattern recognition system, Design principles of pattern recognition systems, Types of Learning and Adaptation. Mathematical representations: probability theory, Decision theory, features, feature vector and classifier, vector space and linear algebra.

UNIT II

Bayes Learning: Frequency-Based Estimation of Probabilities, Gaussian probability density function, maximum likelihood parameter estimation, maximum a posteriori probability estimation, Estimation techniques.

Linear Classification: discriminant functions, and probabilistic generative and discriminative models, Preprocessing, ROC curves.

UNIT III

Nonlinear Classifiers: Multilayer Perceptron's, Back Propagation Algorithm, Polynomial classifier, Probabilistic neural networks, Decision Trees, Combinations of Classifiers, Boosting, Support Vector machine.

UNIT IV

Clustering: Proximity measures, sequential clustering, partitioning clustering, agglomerative algorithms, Divisive algorithm, clustering algorithm based on graph theory, Fuzzy Clustering.

UNIT V

FEATURE SELECTION, GENERATION AND DIMENSIONALITY REDUCTION:-

Class Separability Measure, Subset Selection,Principal Component Analysis, Random Forest, Forward and Backward Selection, Regional Features, Features for Shape and size Characterization.

TEXT BOOKS:

1. S Theodoridis and K Koutroumbas, "Pattern Recognition", 4th edition, AcademicPress, 2009.
2. K Fukunaga, "Statistical pattern Recognition", 1st edition, Academic Press, 2000.
3. R O Duda, P E Hart and D G Stork, "Pattern Classification", 2nd edition, John Wiley, Reprint 2010.
4. Christopher M.Bishop, "Pattern Recognition and Machine Learning", Springer, 2007.
5. M.NarasimhaMurty and Der V Susheela Devi, "Introduction to Pattern Recognition and Machine Learning" IISC Press.