CS669   Pattern Recognition

Credits: 3-0-0-3   Approval: Approved in 3rd Senate

Students intended for: B.Tech

Elective or Core: Elective   Semester: Even or Odd

Course content:

- ***Basics of Probability, Random Processes and Linear Algebra***: Probability: independence of events, conditional and joint probability, Bayes' theorem; Random Processes: Stationary and nonstationary processes, Expectation, Autocorrelation, Cross-Correlation, spectra; Linear Algebra: Inner product, outer product, inverses, eigen values, eigen vectors; Bayes Decision Theory

- ***Bayes Decision Theory***: Minimum-error-rate classification, Classifiers, Discriminant functions, Decision surfaces, Normal density and discriminant functions, discrete features

- ***Parameter Estimation Methods***: Maximum-Likelihood estimation: Gaussian case; Maximum a Posteriori estimation; Bayesian estimation: Gaussian case

- ***Unsupervised learning and clustering***: Criterion functions for clustering; Algorithms for clustering: K-Means, Hierarchical and other methods; Cluster validation; Gaussian mixture models; Expectation-Maximization method for parameter estimation; Maximum entropy estimation

- ***Sequential Pattern Recognition***: Hidden Markov Models (HMMs); Discrete HMMs; Continuous HMMs

- ***Nonparametric techniques for density estimation***: Parzen-window method; K-Nearest Neighbour method

- ***Dimensionality reduction***: Fisher discriminant analysis; Principal component analysis; Factor Analysis

- ***Linear discriminant functions***: Gradient descent procedures; Perceptron; Support vector machines

- ***Non-metric methods for pattern classification***: Non-numeric data or nominal data; Decision trees: CART

Text Books:

R.O.Duda, P.E.Hart and D.G.Stork, Pattern Classification, John Wiley, 2001

S.Theodoridis and K.Koutroumbas, Pattern Recognition, 4th Ed., Academic Press, 2009

C.M.Bishop, Pattern Recognition and Machine Learning, Springer, 2006