

COURSE OBJECTIVE

- The subject aims to make the students to understand the mathematical approach for pattern recognition.

COURSE CONTENT

Polynomial curve fitting - The curse of dimensionality - Decision theory - Information theory - The beta distribution - Dirichlet distribution-Gaussian distribution-The exponent family: Maximum likelihood and sufficient statistics -Non-parametric method: kernel-density estimators - Nearest neighbour methods.

Linear models for regression and classification: Linear basis function models for regression - Bias variance decomposition-Bayesian linear regression-Discriminant functions - Fisher's linear discriminant analysis (LDA) - Principal Component Analysis (PCA) - Probabilistic generative model - Probabilistic discriminative model.

Kernel methods: Dual representations-Constructing kernels-Radial basis function networks-Gaussian process-Maximum margin classifier (Support Vector Machine) -Relevance Vector Machines-Kernel-PCA, Kernel-LDA.

Mixture models: K-means clustering - Mixtures of Gaussian - Expectation-Maximization algorithm- Sequential models: Markov model, Hidden-Markov Model (HMM) - Linear Dynamical Systems (LDS).

Neural networks: Feed- forward Network functions-Network training - Error Back propagation - The Hessian Matrix - Regularization in Neural Network - Mixture density networks - Bayesian Neural Networks

Text Books

1. C.M.Bishop, "Pattern recognition and machine learning", Springer, 2006

Reference Books

1. P.A.Devijver & J.Kittler, "Pattern Recognition-A Statistical Approach", Prentice -Hall, 1990.
2. R.Schalkoff, "Pattern Recognition -Statistical, Structural and Neural Approaches", John Wiley, 1992.
3. J.I.Tou & R.C.Gonzalez, "Pattern Recognition Principles", Addition -Wesley, 1977.

COURSE OUTCOMES

Students are able to

- CO1: summarize the various techniques involved in pattern recognition
- CO2: identify the suitable pattern recognition techniques for the particular applications.
- CO3: categorize the various pattern recognition techniques into supervised and unsupervised.
- CO4: summarize the mixture models based pattern recognition techniques
- CO5: summarize the artificial neural network based pattern recognition techniques