

## CS 522: Pattern Recognition (3-0-0: 3)

### **Introduction and mathematical preliminaries:**

Introduction to pattern recognition and learning (supervised, unsupervised), training and test sets, feature selection, Clustering vs. Classification; Applications; Linear Algebra, vector spaces, probability theory, estimation techniques.

### **Classification:**

Bayesian decision rule, Error probability, Minimum distance classifier, Mahalanobis distance, Discriminant functions and decision boundaries; Maximum likelihood classification, K-NN Classifier, Linear and nonlinear Classifier, Parameter estimation, Density estimation.

### **Clustering:**

Different distance functions and similarity measures, Criterion for clustering  
Minimum within cluster distance criterion, Methods of clustering - partitional, hierarchical, graph theoretic, density based..., Cluster validity

### **Feature selection and feature extraction:**

Problem statement and uses, Probabilistic separability based criterion functions, interclass distance based criterion functions, Branch and bound algorithm, sequential forward/backward selection algorithms, (l,r) algorithm, Feature extraction based on PCA, Kernel PCA, LDA.

### **Text Books:**

1. R. O. Duda, P. E. Hart and D. G. Stork, "Pattern Classification and Scene Analysis", Wiley.
2. S.Theodoridis , K.Koutroumbas, "Pattern Recognition", Academic Press.

### **References:**

1. C. M. Bishop, "Pattern Recognition and Machine Learning", Springer.
2. K. Fukunaga, "Statistical pattern Recognition", Academic Press.