

1051.784 Digital Image Processing: Spatial Pattern Recognition

Course Description: This course develops a fundamental understanding of adaptive pattern recognition and a basic working knowledge of techniques for use in a broad range of applications. Inherent in adaptive pattern recognition is the ability of the system to learn by supervised or unsupervised training, or by competition within a changing environment. The effectiveness of the system depends upon its structure, adaptive properties and specifics of the application. Particular structures developed and analyzed include statistical PR, clustering systems, fuzzy clustering systems, multi-layered perceptrons (with a variety of weight training algorithms), and associative memory systems. The goal is to gain both a fundamental and working knowledge of each kind of system and the ability to make a good system selection when faced with a real application design. Also offered online.

Required Text: "Pattern Classification," by Richard Duda, Peter Hart, and David Stork, Wiley-Interscience, 2001.

Pre-requisites: 1051-716, -718, -726, and 0304-834 or equivalents.

Offering Schedule: Spring Quarter, every year.

Topics:

- Introduction to Pattern Recognition
- Bayesian Decision Theory
- Parameter Estimation
- Nonparametric Techniques
- Linear Discriminant Functions
- Multilayer Neural Networks
- Stochastic Methods
- Nonmetric Methods
- Unsupervised Learning

Learning Outcomes: The students will be able to demonstrate a clear understanding of the various types of pattern recognition and best when to apply each technique. They will also understand parameter estimation techniques as applied to pattern recognition, and techniques for computing error probabilities, error bounds, and accuracy estimates.

Evaluation and Grading: The final course grade will be determined through the following weighting of the various assessment methods.

- 35% – Homework
- 10% – Quizzes
- 25% – Midterm exam
- 30% – Final Exam

Class Regulations: The students are expected to attend and participate in all class sessions and to turn in assignments on the required due date. Extensions may be granted with advance permission by the Instructor.