

# CMSC 726 - MACHINE LEARNING - FALL 2007

**Time and Place:** Tu Th 11 - 12:15; CSI 1122

**Instructor:** James Reggia, AVW 3233, 405-2686, reggia@cs.umd.edu

Office Hours: Thursdays, 12:15 - 2 pm or by appointment

**Teach Asst:** Grecia Lapizco-Encinas, AVW 1112, x52775, glapizco@cs.umd.edu

Office Hours: Mondays, 9:00 - 10:30 am or by appointment

**Prerequisites:** CMSC 421 (Introduction to AI) or comparable background on AI search methods and logic, or permission of instructor; knowledge of basic probability theory, linear algebra and calculus are assumed.

**Goals:** This course provides a broad overview of existing methods for machine learning and an introduction to self-organizing systems in general. By the end of the semester you should be familiar with the central concepts and most commonly used methods in this field.

## **Content:**

*Conceptual Framework:* definitions, terminology, intro. to different paradigms, history, overview

### *AI Symbol Processing Methods*

- Supervised Learning: inductive learning, exemplar-based learning, version spaces, candidate elimination algorithm, decision trees, rule acquisition, PAC Learning, VC dimension, ensembles, comparative studies, boosting
- Unsupervised Learning: cluster formation, automated discovery
- Analytical Learning: explanation-based learning, skill acquisition

### *Numerically-Oriented Methods*

- Statistical methods: Bayesian classification and networks, support vector machines, clustering
- Markov decision processes: Monte Carlo, TD and Q learning
- Supervised learning in neural networks: linear networks, perceptrons, error backpropagation
- Unsupervised learning in neural networks: Hebbian, competitive learning, self-organizing maps

### *Evolutionary/Genetic Methods*

- early evolutionary models
- genetic algorithms
- classifier and other rule-based systems
- genetic programming
- evolving neural nets
- implementation and applications

*Issues in Machine Learning:* hybrid systems, performance measurement, comparative studies, resources, self-organizing systems in general, boosting, artificial life, applications

**Class web page:** <http://www.cs.umd.edu/class/fall2007/cmsc726/>

## **Workload (Grading):**

midterm (30%), assignments, class participation, & term project (20%), final exam (50%)

**Texts:** 1. T. Mitchell, *Machine Learning*, McGraw Hill, 1997.

2. Research papers from relevant conferences/journals.