CMSC 828X: Nature-Inspired Artificial Intelligence - Spring 2010

Time and Place: Mondays, 3 pm to 5:30 pm, CSI 3118

Instructor: James Reggia, AVW Bldg., Rm. 3233, 405-2686, reggia@cs.umd.edu
Office Hours: Mon. 1:30 - 3:00 pm or by appointment

Prerequisites: graduate standing and an introductory course on AI (such as CMSC 421), or permission of instructor

Content:

This course examines computing methods inspired by natural phenomena, with an emphasis on understanding the basic computational principles involved.

There will initially be six **tutorial reviews** (two per week) given by the instructor:

nature-inspired computing
cellular automata: emergence and self-organization
self-replicating machines
multi-agent artificial life systems
neural computation
evolutionary computation

There will subsequently be weekly **research seminars**, each focused on recent advances made concerning a separate specific topic in nature-inspired computing. Each seminar will begin with a formal presentation about the research topic, followed by a discussion of two or three key papers that have been read by all participants, and finally briefer summaries and discussions of other recent research results. The following are examples of topics that we will cover, although we will adjust these depending on student interests, and other topics can be considered:

artificial life: self-replicating machines, self-assembly, developmental systems, swarm intelligence, ant colony optimization

neural computation: language acquisition, coupled oscillator networks, self-organizing maps, neurocognitive systems, short-term memory models, binding problem, artificial consciousness, models of attention, biologically plausible supervised learning

evolutionary computation: network representations and genetic operations, evolving communication systems, creative evolutionary systems, co-evolution, speciation

other areas: DNA/biomolecular computing, nanotechnology, quantum computing, immune-inspired computing, developmental encoding, L systems

Class web page: http://www.cs.umd.edu/class/spring2010/cmsc828x/

Workload

- reading and presenting papers
- formal presentation of and reporting on a seminar topic

This course is a seminar, and thus does not count as a core qualifying course for the Computer Science Dept. PhD. It can however be used as an elective or as an MS course.

Source materials:

1. Textbook: *Computational Intelligence*, Second Edition, Andries Engelbrecht, Wiley, 2007.
2. Papers from the recent literature; links will be available from the class web site.