

Computer Science Department
New Course Offerings – Fall 2009

CSc 59955 Satellite Image Processing

Professor: Gladkova
Times: Tu,Th 3:30-4:45pm

Course Description:

This course will deal with concepts and methods that are involved in appropriately defining and analyzing the information content of various kinds of data. We will introduce and discuss concepts from Shannon's treatment of information theory: the basic notions of entropy, relative entropy, and mutual information, and show how they arise as natural answers to questions of data compression, channel capacity, rate distortion and hypothesis testing. The subject of information, and various ways in which it can be represented, is of course closely linked to the study of data compression. As the semester progresses, we will increasingly stress the compression aspects of the subject, and the course will conclude with a detailed study and analysis of data representing observations of the Earth from space.

Pre-requisites: [Math 34600 or 39200] and [CSc 21700 or EE 31100]

For computer science students this course counts in elective group B: Computational Techniques for Science and Engineering. It can also count as a technical elective.

CSc 59905 Natural Computing

Professor: Lucci
Times: M, W 2:00-3:15pm

Course Overview: Mother Nature as inspiration, focus and substrate of computation.

Preliminary Concepts: Agents, adaptation, feedback, complexity, self-organization, and emergence.

Computing Inspired by Nature:

- 1) *Evolutionary Computation* – What does Darwinism have to contribute to computation?
- 2) *Neural Computing* – How does the human nervous system influence computer architecture?
- 3) *Swarm Intelligence* – The intelligence of the solitary ant is rather unremarkable, yet ant colonies solve difficult combinatorial problems.

The Simulation of Natural Phenomena in Computer:

- 1) *Fractals* – If you were to zoom in on the coastline of the eastern United States, you discover that complexity never diminishes. How can we model this characteristic of nature in software?
- 2) *Artificial Life* – How do birds maintain the same distance from their cohorts as they migrate over large distances? We design boids to emulate this behavior. What traits do computer viruses borrow from their animal counterparts?

Computing with New Materials:

- 1) *DNA Computing* – Human cells replicate correctly in spite of many errors that are present in their DNA (for the most part). How can we design computers with the same robustness?
- 2) *Quantum Computing* – Will quantum computers conquer NP-Completeness?

Pre-requisites: CSc 22000, CSc 22100, and CSc 30400
(CSc 44800 would be helpful but is *not* required)

For computer science students this course counts in elective group A: Theoretical Aspect of Computer Science. It can also count as a technical elective.