Scientific Computing

Faculty

Farzan Aminian, Ph.D., Professor, Engineering Science
Saber N. Elaydi, Ph.D., Murchison Term Professor of Mathematics; Director
Julio Roberto Hasfura-Buenaga, Ph.D., Associate Professor, Mathematics
Mark C. Lewis, Ph.D., Professor, Computer Science
Kevin Livingstone, Ph.D., Associate Professor, Biology
Natasa Macura, Ph.D., Associate Professor, Mathematics
David Ribble, Ph.D., Professor, Biology
Dennis Ugolini, Ph.D., Professor, Physics and Astronomy
Adam R. Urbach, Ph.D., Professor, Chemistry

Overview

Scientific Computing is a multi-disciplinary program designed for science majors who wish to explore the application of computing within the natural sciences. It is intended primarily for students majoring in one of the natural sciences or engineering. The program of study brings together courses from Computer Science, Mathematics, and disciplines in the natural sciences. Each student takes the required core courses in computer science and calculus. After the core, two advanced-level courses selected from five options further hone quantitative skills needed for scientific computing. Students should work with their advisers to identify courses that are most appropriate for their backgrounds and goals. Finally, students bring their computation skills to their major by selecting one upper-level course from a list of approved disciplinary courses that make use of computation. Concurrent with this course, students enroll in SCOM 3199—Scientific Computing Project. Note: These disciplinary courses have several prerequisites that are not listed among the requirements for a minor in Scientific Computing—students majoring in a discipline among the natural sciences will have already fulfilled these prerequisites as part of their major.

Students interested in a Scientific Computing minor will submit an application to the chair of the Committee, who will assign a faculty adviser to the student. Completion of this program will be indicated on the student’s transcript with the notation “Minor in Scientific Computing.”
Requirements

A minor in Scientific Computing will consist of a total of 19 to 20 credit hours, depending on the upper-level course selected in the major. The minor must include at least nine hours of upper-division courses in mathematics or science. The requirements for a minor in Scientific Computing are as follows:

The Core (9 hours)

I. Computation
   - CSCI 1320  Principles of Algorithm Design
   - CSCI 2323  Scientific Computing

II. Calculus
   - MATH 1311  Calculus 1

III. Advanced Quantitative Skills (6 hours) Take two of the following five courses:
   - CSCI 3352  Simulation Theory
   - MATH 3311  Probabilistic Models in Life Sciences
   - MATH 3320  Probability and Statistics for Engineers and Scientists
   - MATH 3328  Mathematical Models in Life Sciences
   - MATH 3338  Mathematical Modeling

IV. Disciplinary Practice (4-5 hours depending on the chosen elective)
   A. SCOM 3199—Scientific Computing Project [Must be taken in conjunction with one of the courses listed below.]
   B. And one of the following courses:
      - BIOL 3420  Animal Behavior
      - BIOL 3434  Ecology
      - BIOL 3464  Molecular Biology
      - CHEM 3334  Physical Chemistry (includes lab CHEM 3135)
      - MATH 4394* Senior Project
      - PHYS 3321  Statistical Physics and Thermodynamics
      - PHYS 3322  Classical Mechanics and Nonlinear Dynamics
PHYS 3325  Optical Physics
PHYS 3336  Advanced Theoretical Physics
PHYS 4343  Quantum Physics II
PHYS 4346  Advanced Modern Physics
PSYC 3311  Sensation and Perception
PSYC 3431  Memory and Cognition
PSYC 3333  Simulation of Neural and Cognitive Processes

* This course requires completion of a 3000-level course in Biology or Psychology.

Courses

SCOM-3199 Scientific Computing Project
The course involves undertaking a project that expands one of the laboratory or classroom exercises to make significant use of computers as a research tool. Students must work with a faculty mentor to develop an appropriate project (usually the instructor in the course). Co-requisite: Concurrent enrollment in one of the disciplinary practice courses approved for Section C of the requirements for this minor.