Catalog description

Introduction of theory and numerical methods for continuous multivariate optimization (unconstrained and constrained), including: line-search and trust-region strategies; conjugate-gradient, Newton, quasi-Newton and large-scale methods; linear programming; quadratic programming; penalty and augmented Lagrangian methods; sequential quadratic programming; and interior-point methods.

Course web page

The course web page contains all the information about course materials and organization, schedule (classes, office hours, labs, exams, projects), grading policy, etc.:

http://faculty.ucmerced.edu/mcarreira-perpinan/teaching/EECS260

Topics

- Unconstrained optimization:
  - Fundamentals of unconstrained optimization
  - Line search methods
  - Trust-region methods
  - Conjugate gradient methods
  - Quasi-Newton methods
  - Large-scale unconstrained optimization
  - Calculating derivatives
  - Derivative-free optimization
  - Least-squares problems
  - Nonlinear equations
- Constrained optimization:
  - Theory of constrained optimization
  - Linear programming: the simplex method
  - Linear programming: interior-point methods
  - Fundamentals of algorithms for nonlinear constrained optimization
  - Quadratic programming
  - Penalty and augmented Lagrangian methods
  - Sequential quadratic programming
  - Interior-point methods for nonlinear programming

Prerequisites

Prerequisites: MATH 23, MATH 24, MATH 141 or equivalent (undergraduate courses in linear algebra and multivariate calculus).

Course objectives / student learning outcomes

The course introduces theory and numerical methods for continuous multivariate optimization (constrained and unconstrained). The goal is to provide students with solid foundations to deal with a wide variety of optimization problems that arise in multiple areas of science, engineering and business, and to provide a thorough knowledge of the most common algorithms.

Program learning outcomes

By the end of the course through lectures, readings, homeworks, lab assignments and exams, students will demonstrate:

- The abilities (1) to apply knowledge of mathematics and computing to the design and analysis of optimization methods; (2) to analyze a problem and identify the computing requirements appropriate for its solution; (3) to design and conduct experiments and numerical tests of optimization methods, and to analyze and interpret their results.
- An ability to apply design and development principles in the construction and implementation of software systems of varying complexity to meet desired needs.
- An ability to continue to learn and use new techniques, skills, and engineering and scientific tools for research in electrical engineering and computer science.
- A dedication to advance engineering research to discover new knowledge, develop new methodologies, promote innovative thinking and research output in engineering and science.

Disability statement

For accommodations for students with disabilities, see `https://access.ucmerced.edu` → Academic Support Services.

Academic dishonesty statement

a. Each student in this course is expected to abide by the University of California, Merced's Academic Honesty Policy. Any work submitted by a student in this course for academic credit will be the student's own work.

b. You are encouraged to study together and to discuss information and concepts covered in lecture and the sections with other students. You can give "consulting" help to or receive "consulting" help from such students. However, this permissible cooperation should never involve one student having possession of a copy of all or part of work done by someone else, in the form of an e-mail, an e-mail attachment file, a diskette, or a hard copy. Should copying occur, both the student who copied work from another student and the student who gave material to be copied will both automatically receive a zero for the assignment. Penalty for violation of this Policy can also be extended to include failure of the course and University disciplinary action.

c. During examinations, you must do your own work. Talking or discussion is not permitted during the examinations, nor may you compare papers, copy from others, or collaborate in any way. Any collaborative behavior during the examinations will result in failure of the exam, and may lead to failure of the course and University disciplinary action.

Links to policies:

- CSE Department Policy on Academic Honesty
- UC Merced Academic Honesty Policy