

Tárgyleírás

Tárgy neve: Numerical Methods for Optimization

Tárgyfelelős neve: Gergő Lajos

Tárgyfelelős tudományos fokozata: PhD.

Tárgyfelelős MAB szerinti akkreditációs státusza: AT

Az oktatás célja angolul / Aim of the subject:

Knowledge

- Knowledge of major types and classes of optimization problems.
- Knowledge of fundamental algorithms capable of solving specific types of optimization problems, as well as general nonlinear problems.
- Knowledge of mathematical derivations and principal motivations behind modern optimization methods.
- Knowledge of optimization software.

Abilities:

- Ability to formulate simple engineering problems as a mathematical optimization problem.
- Ability to analyze and solve optimization problems; in particular quadratic, least squares and nonlinear programs in both constrained and unconstrained setups.
- Ability to implement, visualize and analyze fundamental optimization algorithms, and to suitably improve their efficiency for a given problem.

Attitude:

- Attitude to learn and engineer algorithms with deep mathematical background.
- Attitude to develop self-criticism and a drive for continuous improvement.
- Attitude to maintain high professional standards, potentially with the aid of computerized analysis.

Autonomy, responsibility:

- Responsibility to work with and respect deadlines.
- Responsibility to individually develop working software solutions.

Az oktatás tartalma angolul / Major topics:

The aim of this course is to introduce some of the most widespread numeric optimization concepts and algorithms, focusing on their modern applications in solving optimization problems related to computer engineering. Major topics include the optimization of a single

parameter, as well as multiple parameters simultaneously, both in constrained and unconstrained setups. Derivative-free and gradient-dependent methods are discussed, coupled with popular approaches to efficiently compute or approximate the derivative. Some of the more specific problem types are also explored, such as quadratic optimization and least squares optimization.

A számonkérés és értékelés rendszere angolul / Requirements and evaluation:

continuous assessment

mixed assessment

practice grade

Assessments on this course include two individual projectworks and two written examinations (tests).

For projectwork, students are assigned several smaller (programming) tasks dealing with various topics in optimization. Tasks have various levels of difficulties – easier ones are solvable by direct application of concepts discussed during laboratory practices, while more difficult ones require some additional investigative efforts.

Examinations assess the knowledge of various concepts and results discussed at the lectures, with additional emphasis on the in-depth understanding of various topics regarding optimization theory.

Irodalom / Literature:

- Jorge Nocedal, Stephen J. Wright, Numerical Optimization, ISBN: 978-0-387-30303-1 (Print) 978-0-387-40065-5 (Online)
 - A. Ben-Tal, A. Nemirovski, Lectures on Modern Convex Optimization - 2000, Book version: MPS-SIAM Series on Optimization, SIAM, Philadelphia, 2001
 - A. Nemirovski, Optimization II: Standard Numerical Methods for Nonlinear Continuous Optimization, Lecture Notes, Israel Institute of Technology Minerva Optimization Center
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