UNIVERSITÀ DI PISA

THEORY AND METHODS OF OPTIMIZATION

GIANCARLO BIGI

Academic year	2016/17
Course	MATHEMATICS
Code	577AA
Credits	6

Modules	Area	Type	Hours	Teacher(s)
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Learning outcomes

Knowledge

Students are expected to acquire: knowledge of the theories of nonlinear optimization, with particular reference to convex optimization knowledge of the main methods for the solution of nonlinear optimization problems; tools for modeling specific problems through optimization from the following areas: regression and parameter estimation in statistics, approximation and data fitting, machine learning, computer graphics, logistics, transportation, economic equilibria and finance.

Assessment criteria of knowledge

The student will be assessed on his/her demonstrated ability to discuss the main course contents using the appropriate terminology. During the oral report and exam the student must be able to demonstrate his/her knowledge of the course material together with adequate language and methods terminology. Critical awareness of the topics will be also evaluated.

Methods:

- Final oral exam
- Oral report
- Written report

Further information:
Oral report and final oral exam 70%, written report 30%

Teaching methods

Delivery: face to face
Learning activities:

- attending lectures
- participation in seminar
- preparation of oral/written report

Attendance: Not mandatory
Teaching methods:

- Lectures
- Seminar

Syllabus

Classification of optimization problems. Nonlinear optimization: convex analysis, local and global minima, optimality conditions, duality theory, algorithms for unconstrained optimization (gradient, Newton, derivative-free methods) and constrained optimization (conditional and projected gradient, penalization, interior point methods). Nonlinear least-squares. Equilibria in noncooperative games. Applications.

Bibliography

Lectures are not baes on a unique textbook. Lecture notes by the instructor will be provided, and a precise reference for each topic will be given as well. Recommended general reading includes: N M.S. Bazaraa, H.D. Sherali, C.M. Shetty, Nonlinear Programming: Theory and Algorithms, Wiley, 1993 D. Bertsekas, Nonlinear Programming, Athena, 2004 J.-B. Hiriart-Urruty, C. Lemarechal, Convex Analysis and Minimization Algorithms, Springer, 1996.

Work placement

Yes

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