Nonlinear optimization: Derivative free methods

Prof. Giovanni Fasano[1], Prof. Francesco Rinaldi[2]

[1]*Ca' Foscari University, Venice*
Department of Management
Email: fasano@unive.it

[2]*University of Padova*
Department of Mathematics
Email: rinaldi@math.unipd.it

Timetable: 12 hrs. First lecture on March 5, 2013, 11:00 (dates already fixed, see the calendar), Torre Archimede, Room 2BC/30.

Course requirements: Basic knowledge of calculus in R^n, including some introductory elements of optimization methods and numerical analysis.

Examination and grading: Oral exam with a final mark or brief essay on an argument treated during the course.

SSD: MAT/09

Aim: We describe some basics of optimization methods, where of both the objective function and the constraints are possibly unavailable. We compare different approaches from the literature, analyzing their convergence properties.

Course contents:

This course will be divided into three parts, so that it will correspondingly introduce the student to different levels of investigation for Derivative-Free Optimization (DFO). The introductory part will provide some basics of DFO, so that clear motivations and some preliminary results on the subject will be detailed. This part will partially review the literature and emphasize the relation between DFO approaches and exact methods for nonlinear continuous optimization, where derivatives are available. We will also clarify the importance of addressing methods which do not use derivatives, for the solution of nonsmooth real applications. The second part of this course will focus on specific successful DFO approaches from the literature. In particular, Direct-Search methods and Model-based methods will be considered, along with their relation and their impact on the literature. Since the course is entirely devoted to exact techniques, convergence properties for the described schemes will be analyzed.

Finally, in the third part of the course we will try to give an overview on additional current topics for DFO, with a glimpse to constrained real problems and some suggestions on dedicated software.

References:

- Kolda T. G., Lewis R.M. and Torczon V. Optimization by direct search: new perspectives on some classical and modern methods. SIAM Review 45(3), pp. 385-482, 2003.

- Conn A.R., Scheinberg K. and Vicente L.N. Introduction to Derivative-Free Optimization, MPS-SIAM Series on Optimization, SIAM, Philadelphia, 2009.