Course Outline

Continuous Optimisation

Oxford University Computing Laboratory, HT 2006

Dr Nick Gould (n.gould@rl.ac.uk)

Outline of Lectures

Chapter I: Unconstrained Optimisation

Lecture 1: introduction and preliminaries.

Lecture 2: the descent method and line searches.

Lecture 3: steepest descent and Newton methods.

Lecture 4: quasi-Newton methods.

Lecture 5: conjugate gradients and the Fletcher-Reeves method.

Lecture 6: trust region methods.

Lecture 7: the dogleg and Steihaug methods.

Chapter II: Constrained Optimisation

Lecture 8: the fundamental theorem of linear inequalities

Lecture 9: first order necessary optimality conditions (KKT)

Lecture 10: second order optimality conditions

Lecture 11: the method of Lagrange multipliers, examples

Lecture 12: Lagrangian Duality and Convex Programming

Lecture 13: the penalty function method

Lecture 14: the augmented Lagrangian method

Lecture 15: the barrier method for nonlinear programming

Lecture 16: primal-dual path-following for linear programming

What we don't have the time to cover:

- Sequential quadratic programming.

- Exploiting structure in large-scale problems.

- Heuristics for global optimisation.

Lectures

- Mondays 2–3pm, Comlab 147.

- Wednesdays 2–3pm, Comlab 147.

Materials

- Course website:
  `www.numerical.rl.ac.uk/nimg/oupartc/`

- Self-contained lecture notes for lectures 1–16 posted on web page.

- Slides of lectures 1-16 can be downloaded from web page.

- Problem sets 1-7 in weeks 2-8, posted on web page.

Further Reading:

- J.Nocedal and S.Wright "Numerical Optimization", Springer 1999, ISBN 0-387-98793-2. Available in most college libraries and at OUCL library.

- R.Fletcher "Practical Methods of Optimization", second edition, Wiley 1987, ISBN 0-471-91547-5. Available in most college libraries.

Classes

- Tutor: Denis Zuev (zuev@maths.ox.ac.uk)

- Marker: ?? (??)

- Time, place: Weeks 2–8, Tue 4-5pm Comlab 147?

- Handing in solutions: noon on the day before the class. To be handed in at Comlab reception marked "for ??".

Exam

- 2 questions each on two different parts of the paper, i.e., 4 questions in total.

- Two practice exams will be made available in TT05.

- Two revision classes in TT05.

Questions about course organisation?