PhD Opportunities

Optimization/Operational Research

School of Mathematics

http://www.maths.ed.ac.uk/ERGO

Optimization and Scientific Computing
are at the heart of many areas of applied mathematics, computer science and engineering.

For example optimization helps to:

- detect crucial features in huge data bases
- deblure partly destroyed images
- design bridges which withstand winds/waves
- design secure electricity transmission networks
- select optimal portfolios which maximize return and minimize risk
- choose best animal diet

and in many other real-world applications.

Optimization/OR Group: **Permanent Staff:**

- Dr Buke: queueing theory, stochastic optimization, simulation, revenue management
- Dr Garcia Quiles: p-median problems, clustering in networks/surveys
- Prof Gondzio: interior point methods for linear, quadratic and nonlinear optimization
- Dr Grothey: interior point methods, stochastic optimization, applications in energy
- Dr Hall: simplex method and sparse matrices
- Dr Kalcsics: facility location, service scheduling
- Prof McKinnon: integer and global optimization
- Dr Richtárik: first-order optimization methods

Example past PhD projects:

- Kristian Woodsend (2005-2009): used IPMs to solve Support Vector Machine (SVM) problems
- Pablo González-Brevis (2009-2013): used IPMs to solve combinatorial (integer) optimization problems
- Kimon Fountoulakis (2011-2015): used modern 2nd-order optimization methods in machine learning and signal/image processing
  $\rightarrow$ solved a problem with 10^{12} variables on ARCHER

Current PhD projects:

- Lukas Schork (2015-): develops new linear algebra techniques for optimization

Possible PhD project themes:

- linear algebra methods for huge scale optimization
- optimization-based machine learning techniques and their applications
- optimization methods in signal/image processing
- optimization governed by PDE constraints
- combinatorial and integer optimization

If you are interested in developing new techniques for optimization with me, then please read about IPMs:

J. Gondzio, Interior Point Methods 25 Years Later, *European J. of Operational Research*, vol. 218 (2012) 587–601.

and get in touch with me:

Prof Jacek Gondzio
J.Gondzio@ed.ac.uk
http://www.maths.ed.ac.uk/~gondzio/

The following course running in Semester 2 is a good introduction to Interior Point Methods (and to doing a PhD with me):

Large Scale Optimization for Data Science (MATH11147)