CIM Thematic Term on Optimization

Scientific Report

Workshop on Optimization in Finance (Coimbra, July 5-8, 2005)

The Workshop on Optimization in Finance was the first of four optimization events of the CIM 2005 Thematic Term on Optimization. It took place in the Faculty of Economics of the University of Coimbra, during July 5–8, 2005. The total number of participants was 84 (and among those there were 22 Portuguese).

Optimization is one of the mathematical tools most frequently used by practitioners in Finance. Also, Optimization in Finance is an area of intense academic research. This workshop has covered most of the relevant topics in Optimization in Finance and brought to Coimbra a significant number of the best researchers in the field.

The workshop started with a short course in the first day, consisting of two lectures:

- *Optimization Problems in Pricing and Hedging Options*, by S. Herzel (Univ. Perugia, Italy) — 2h30m,

- *Robust Optimization in Finance*, by R. H. Tütüncü (Carnegie Mellon Univ., USA) — 2h30m.

There were six plenary lectures of 45m given by the following invited speakers:

- J. R. Birge (Northwestern Univ., USA),

- J. M. Mulvey (Princeton Univ., USA),

- R. T. Rockafellar (Univ. of Washington, USA),

- N. Touzi (CREST, France),

- S. Uryasev (Univ. of Florida, USA),

- S. A. Zenios (Univ. of Cyprus, Cyprus).

For a meeting of this type, there was a large number (42) of 30m contributed talks, divided in two streams of parallel sessions. The number of submissions was so high and unexpected that a considerable number of talks had unfortunately to be rejected. Among the overall 14 sessions, 6 were especially organized by A. Consiglio (Univ. Palermo, Italy), R. H. Tütüncü (Carnegie Mellon Univ., USA), H. Pham (Univ. Paris 7, France), M. Pinar (Univ. Bilkent, Turkey), and L. Zuluaga (Univ. New Brunswick, Canada).

The organizing committee was formed by A. M. Monteiro (Fac. de Economia, Univ. Coimbra, Portugal), R. H. Tütüncü (Carnegie Mellon Univ., USA), and L. N. Vicente (Dep. Matemática, Univ. Coimbra, Portugal).

Summer School on Algebraic and Geometric Approaches to Integer Programming (Lisbon, July 11-15, 2005)

The second event of the CIM 2005 Thematic Term on Optimization was the Summer School on Algebraic and Geometric Approaches to Integer Programming, which took place in the campus of the Faculty of Sciences of the University of Lisbon, during July 11–15, 2005.

The school was composed by 5 short courses (reaching a total of 33h), given by the following well-known invited lecturers:

- Alexander Barvinok (Univ. Michigan, USA): *Generating Functions for Lattice Points* (6h).

- Gerard Cornuéjols (Carnegie Mellon Univ., USA): *Geometric Approaches to Cutting Plane Theory* (8h).

- Friedrich Eisenbrand (Max-Planck-Institut, Germany): *Fast Algorithms for Integer Programming in Fixed Dimension* (6h).

- Jesus De Loera (Univ. California, Davis, USA): *Experimenting and Applying the Rational Function Method: A LattE Tutorial* (1,5h) and *Transportation Polytopes: Structure, Algorithms, and Applications to Optimization and Statistics* (4,5h).

- Robert Weismantel (Otto-von-Guericke Univ., Magdeburg, Germany): *The Integral Basis Method and Extensions* (7h).

There were 66 attendees, 17 of them Portuguese and 42 of them PhD students. The school was organized by Miguel Constantino, Luís Gouveia, João Telhada (Fac. de Ciências, Univ. Lisboa, Portugal) and Robert Weismantel (Otto-von-Guericke Univ., Magdeburg, Germany).

Workshop on Optimization in Medicine (Coimbra, July 20-22, 2005)

It took place in the Institute of Biomedical Research in Light and Image of the University of Coimbra, during July 20–22, 2005, the Workshop on Optimization in Medicine, which was the third event of the CIM 2005 Thematic Term on Optimization.

The workshop was jointly organized by C. J. S. Alves (Dep. Matemática, IST), A. L. Custódio (Dep. Matemática, FCT-UNL), P. M. Pardalos (Univ. Florida, USA), and L. N. Vicente (Dep. Matemática, Univ. Coimbra).

The workshop was structured around 7 plenary talks, given by the following invited speakers:

- M. C. Ferris (Univ. of Wisconsin, USA),
- H. W. Hamacher (Univ. of Kaiserslautern, Germany),
- L. D. Iasemidis (Arizona State Univ., USA),
- A. K. Louis (Univ. of Saarbrücken, Germany),
- J. P. Kaipio (Univ. of Kuopio, Finland),
- E. K. Lee (Georgia Institute of Technology, USA), A. Rangarajan (Univ. of Florida, USA).

The program was complemented by two sessions especially organized by A. Sofer (George Mason Univ., USA) and T. Ha-Duong (Univ. Tech. Compiègne, France) and by three sessions of contributed talks, representing a total of 19 (30m long) talks. There were 13 Portuguese among the 44 participants.

The workshop covered applications of Optimization in Medicine. It was the first international event of its kind and counted with most of the best international researchers in the field. It was possible to treat the role of Optimization in Medicine in a comprehensive way, for a clear benefit of the participants.

Workshop on PDE Constrained Optimization (Tomar, July 26-29, 2005)

The CIM 2005 Thematic Term on Optimization came to an end with the Workshop on PDE Constrained Optimization, which took place in the Hotel dos Templários, Tomar, during July 26–29 2005, with the local support of the Polytechnical Institute of Tomar.

The scientific program started with a short course, with the duration of 5h, titled *Introduction to the Theory and Numerical Solution of PDE Constrained Optimization Problems*. The invited lecturers of this short course were M. Heinkenschloss (Rice Univ., USA) and F. Tröltzsch (Tech. Univ. Berlin, Germany). The next three days of the workshop included seven plenary talks of 60m, given by the following invited speakers:

- M. D. Gunzburger (Florida State Univ., USA),
- R. H. W. Hoppe (Univ. of Augsburg, Germany),
- K. Kunisch (Univ. of Graz, Austria),
- G. Leugering (Univ. of Erlangen-Nuernb., Germany),
- A. T. Patera (MIT, USA),
- R. Rannacher (Univ. of Heidelberg, Germany),
- E. W. Sachs (Univ. of Trier, Germany).

Three sessions were especially organized by B. Mohammadi (Univ. Montpellier, France), E. Casas (Univ. Cantabria, Spain), and M. Hintermueller (Univ. Graz, Austria), yielding a total of 11 talks of 30m. The scientific program included 14 other (20m long) contributed talks scheduled in 4 different sessions.

It was relatively large the spectrum of topics treated in the area of Optimization governed by Partial Differential Equations. Some of the best world experts in finite element methods, optimal control, and nonlinear optimization were present in the workshop.

The members of the organizing committee were L. M. Fernandes (Escola Superior de Tecnologia de Tomar, Portugal), M. Heinkenschloss (Rice Univ., USA), and L. N. Vicente (Dep. Matemática, Univ. Coimbra, Portugal). There was a total of 50 participants (including 11 Portuguese).

Luís Nunes Vicente (University of Coimbra)

International Conference On Semigroups And Languages

Scientific Report

The International Conference on Semigroups and Languages, in honour of the 65th birthday of Donald B. McAlister, was organized within the activities of the International Center for Mathematics (CIM) and of the Center for Algebra of the University of Lisbon (CAUL). The Conference was held at CAUL, Av. Prof. Gama Pinto 2, Lisbon, from July 12 to 15, 2005.

The Conference was a great success and the attendance exceeded the expectations: there were 82 participants from whom 33 were Portuguese and the others were from 15 foreign countries (Canada, Czech Republic, Estonia, Finland, France, Germany, Hungary, Israel, Japan, Latvia, Mozambique, Russia, Spain, United Kingdom, USA).

The scientific programme included 13 invited lectures of 50 minutes presented by J. Almeida (Univ. of Porto), R. Gilman (Stevens Institute of Technology), M. Lawson (Heriot-Watt Univ.), D. McAlister (Northern Illinois Univ.), D. Munn (Univ. of Glasgow), F. Otto (Univ. of Kassel), J.-E. Pin (Univ. Paris 7), P. Silva (Univ. of Porto), B. Steinberg (Carleton Univ.), M. Szendrei (Univ. of Szeged), D. Thérien (McGill Univ.), M. Volkov (Ural State Univ.) and P. Weil (Univ. Bordeaux I) as well as 31 talks of 25 minutes.

The talks were dedicated to a variety of subjects considered of great importance to the study of Semigroups and Languages, two areas intrinsically connected, namely in the finite case through Eilenberg's Theory. Some of the talks were specially dedicated to showing how McAlister's work continues to influence Semigroup Theory.

The proceedings, subjected to a refereeing system, will be published by World Scientific.

The social programme included a visit to Palmela's Castle followed by a dinner, on July 15, on the occasion of D. McAlister's birthday.

The organizers express their thanks to the City Hall of Lisbon, the Center for Algebra of the University of Lisbon, the International Center for Mathematics, the Interdisciplinary Complex of the University of Lisbon, the Portuguese Council of University Rectors, the Faculty of Science of the University of Lisbon, the Foundation of the University of Lisbon, the Luso-American Foundation, the Portuguese Foundation for Science and Technology, the International Relations Unit of the Portuguese Ministry for Science and Higher Education, the Blue Coast Tourism Board.

The Organizing Committee: Jorge M. André (FCTUNL/CAUL), Mário Branco (FCUL/CAUL), Vitor Hugo Fernandes (FCTUNL/CAUL), John Fountain (University of York), Gracinda M.S. Gomes (FCUL/CAUL), John Meakin (University of Nebraska)

Workshop on Statistics in Genomics and Proteomics

Scientific Report

The *Workshop on Statistics in Genomics and Proteomics* took place in Monte Estoril, Portugal, from 5-8 October 2005.

Genomics and proteomics aim to identify biomarkers that can answer specific clinical questions. The most obvious are markers that can be used for diagnosis and prognosis. Another important issue is to predict a patient's response to a specific drug. Diagnostic markers can themselves be candidates for drug targets. Therefore Pharmaceutical companies pursue genomics and proteomics to identify markers that predict toxicity of candidate drugs. They also investigate biological interactions between all small organic molecules and construct metabolomic networks using multivariate approaches. Researchers from several areas are involved in this process, from the identification of the problems, realization of adequate experiments, collection of data, interpretation of results, etc. The analysis of such amount of data offer real challenges to statisticians. By joining their efforts with geneticists, biologists, and computer scientists, statisticians can be of great help in all this process.

There has been in Portugal a growing interest among statisticians to cooperate with researchers in these areas. The organization of this event brought fruitful discussions among statisticians and non-statisticians and we hope that will have a great impact for future collaboration and joint research.

The workshop, organized under the auspices of CIM and the *Center of Statistics and its Applications* (CEAUL, `www.ceaul.fc.ul.pt`), brought together leading researchers in the areas of statistics in genomics and proteomics, who described the state of the art and

presented several challenging problems for researchers in Biostatistics and Bioinformatics.

This workshop, organized by Wolfgang Urfer, Antónia Amaral Turkman, Lisete Sousa , Luzia Gonçalves and Feridun Turkman, had the participation of 7 keynote speakers and 5 invited speakers, covering the following topics

- Ruedi Aebersold - *Challenges in Data Analysis and Statistical Validation*

- Chris Cannings - *Random Networks in Genetics*

- Dirk Husmeier - *Detecting Mosaic Structures in DNA Sequence Alignments*

- Sophie Schbath - *Statistical Problems Arising in Physical Mapping*

- Terry Speed - *Probabilistic Modelling of Tandem Mass Spectrometry Data*

- Korbinian Strimmer - *Small Sample Statistical Modeling and Inference of Genetic Networks*

- Simon Tavaré - *Statistical Issues for Expression Analysis of Illumina Bead-Based Microarrays*

- Margarida Amaral - *Genomic and Proteomics Approaches to Study the Genetic Disease Cystic Fibrosis*

- Pedro Fernandes - *Systems Biology Approaches Based on Biological Information*

- Mário Silva - *Information Integration Of Biological Data Sources*

- Rogério Tenreiro - *Phylogenies, Genome Organization and Taxonomy in Prokaryotes: Dream or Reality?*

- Libia Zé-Zé - *Physical and Genetic Mapping in Whole Genome Sequencing Era: an Overview*

The idea of calling two speakers to approach the same problem, one from the statistical point of view and the other from the biological point of view, was quite appreciated and was very successful, particularly in themes such as "Microarray Data Analysis" (Simon Tavaré versus Margarida Amaral), "Physical Mapping" (Sophie Schbath versus Libia Zé-Zé) and "Modelling Mass Spectrometry Data" (Terry Speed versus Ruedi Aebersold).

The first Keynote Speaker, Simon Tavaré.

Apart from the invited talks there were also 12 contributed papers and 17 posters.

A selection of papers (5) will appear in a special issue of REVSTAT - *Statistical Review* and another selection of refereed papers (8) will appear in an edition of CIM in the form of Proceedings.

There were altogether 70 participants falling in the categories such as

- Young researchers, at the M.Sc. and Ph.D. levels, in the areas of Mathematics, Probability and Statistics, Genetics, Biology, Health Sciences, Bioinformatics. The organization offered several grants for research students to participate.

- Applied Statisticians who were interested in facing new challenges in the field of applications.

- Researchers inside and outside the academic life, related to the research fields of the workshop, who were interested in evaluating how Statisticians can help them providing answers to problems in their field.

The organizing committee would like to express their deep gratitude to all the invited speakers for their contribution to the high scientific standards of the *Workshop on Statistics in Genomics and Proteomics*.

Antónia Turkman (on behalf of the Organizing Committee)