



*XXX MEC*

EURO mini-Conference  
on Optimization in the Natural Sciences

Aveiro, 5th-9th February, 2014





## EURO Mini-conference on Optimization in the Natural Sciences

University of Aveiro, February 5-9, 2014

### Final Report

#### General information

The XXX EURO mini conference in "Optimization in the Natural Sciences" (MEC XXX) was hosted by the University of Aveiro, Portugal.

XXX EURO mini conference in "Optimization in the Natural Sciences" (MEC XXX) is the 30th event in the series initiated in 1984 by EURO, Association of European Operations Research Societies. Among the latest editions of EURO mini-conferences we can mention MEC XXIX - Graz-2013, Austria,(October 17-19, 2013), MEC XXVIII - Herceg Novi, Montenegro 2012, (October 4-7, 2012), MEC XXVII - Nottingham, UK 2012 (September 13-15, 2012), MEC XXVI- Poznan, Poland 2011 (September 6-9, 2011), and one more mini-conference in Portugal, MEC XXV - Coimbra, Portugal 2010 (April 15-17, 2010).

The XXX EURO mini conference in "Optimization in the Natural Sciences" started registration on February 5, followed by three working days, February 6-9.

The topics of MEC XXX were the following: Analysis of micro array data or next generation sequencing, Applications of modeling and optimization in physics, biology, chemistry, and medicine, Billiard theory and applications, Biomedical engineering, Design optimization, Data visualization for optimal decisions, Image processing, Infinite and semi-infinite optimization with applications, Inverse problems, Linear and nonlinear optimization and applications, Multi-criteria optimization with applications, Multi-scale optimization with applications, Optimal control applied to biological models, Optimal mass transfer, Optimization in bioinformatics and computational biology, Shape optimization, Solution of optimization problems using statistical methods, Statistics in high-dimensional data, Statistical methods and visualization, Statistical and probabilistic modeling, and Wave scattering.



## Committees

During the conference, the organizational duties were distributed between an International **Program Committee** and the local **Organizing Committee** and three conference co-chairs, Adelaide Freitas, Alexander Plakhov and Tatiana Tchemisova.

The **Program Committee** was composed by Adelaide Freitas (University of Aveiro, Portugal), Adil Bagirov (University of Ballarat, Australia), Adilson Elias Xavier (Federal University of Rio de Janeiro, Brazil), Alexander Plakhov (University of Aveiro, Portugal), Anna Guerman (Universidade Beira Interior, Portugal), Andreia Hall (University of Aveiro, Portugal), Boris T. Polyak (Institute of Control Problems, Moscow, Russia), Delfim F. M. Torres (University of Aveiro, Portugal), Domingos M. Cardoso (University of Aveiro, Portugal), Gerhard-Wilhelm Weber (Middle East Technical University Institute of Applied Mathematics, Turkey), János D. Pintér (Proprietor & Research Scientist Pintér Consulting Services, Inc., Canada), Joaquim Júdice (University of Coimbra, Portugal), José Fernando Mendes (University of Aveiro, Portugal), Julius Žilinskas (Vilnius University, Lithuania), Kathrin Klamroth (University of Wuppertal, Germany), Leonidas Sakalauskas (Institute of Mathematics, Vilnius University, Lithuania), Lisete de Sousa (University of Lisbon, Portugal), Luís Nunes Vicente (University of Coimbra, Portugal), Luzia Gonçalves (IHMT, Portugal), Mourad Elloumi (University of Tunis-El Manar, Tunísia), Olga Kostyukova (Institute of Mathematics, Belarusian Academy of Sciences, Belarus), Oliver Stein (Karlsruhe Institute of Technology, Germany), Purificación Galindo (University of Salamanca, Spain), Tatiana Tchemisova (University of Aveiro, Portugal), Vera Rostschina (University of Ballarat, Australia), and Vladimir Bushenkov (University of Evora, Portugal).

The **Organizing Committee** (University of Aveiro) was composed by António Pereira, João Pedro Cruz, Jorge Sá Esteves, Paula Carvalho, Paula Rama, Pedro Macedo, Vera Afreixo, Ricardo Pereira, and Izabel Bráz. The secretary of the conference was Neusa Lagarto.



## Conference Program

The conference started on February 5, at the Science Center with an Opening and Plenary sessions followed by the Welcome Reception and the guided visit to the expositions of the Science Center "Fabrica". The Opening session, was chaired by the conference chairs. During this session the participants of the conference were welcomed by João Manuel Santos, the Director of the Mathematics Department of the University of Aveiro, Luis Filipe Castro, the Coordinator of CIDMA, and Pedro Pombo, the Director of the Science Center "Fabrica".



The **Scientific Program** included six plenary talks: "*Multi-dimensional Markov chains with special structures of generators and their applications in Natural Sciences*" by Alexander Dudin (Belarusian State University), "*Optimal potentials for Schrödinger operators*" by Giuseppe Buttazzo (University of Pisa, Italy), "*Variational Problems of Plastic Surgery*" by Georgi Smirnov (University of Minho, Portugal), "*The tracks geometry, Menzin's conjecture, continuous and discrete bicycle transformation and complete integrability*" by Sergei Tabachnikov (Pennsylvania State University, USA), "*Some new problems in Optimization Theory*" by Leonid Bunimovich (Georgia Institute of Technology, USA), and "*Compositional data analysis, correspondence analysis, and the log-ratio connection*" by Michael Greenacre (Universitat Pompeu Fabra, Spain). Two tutorial lectures, "*Deterministic Lipschitz global optimization*" and "*Infinity Computer and numerical computations with infinities and infinitesimals*" were given by Yaroslav Sergeyev (University of Calabria, Italy).



More than 70 contributed talks were divided into 3 streams: I-*Optimization and Applications*, II-*Dynamical systems*, and III- *Statistics, Bioinformatics and Health Sciences*, that in total contained 22 sessions. Due to the main theme of the conference, Optimization in the Natural Sciences, the diversity of topics discussed during the Conference was quite large. The list of the most popular keywords that appeared in the abstracts is presented in the following table:

Topic keywords Top 10	1st keyword	2nd keyword	3rd keyword
Mathematical programming and applications	9	6	7
Modeling and optimization in biology and medicine	6	5	1
Dynamical systems and their applications in physics	6	4	1
Multi-objective optimization with applications	6	2	0
Global and nonconvex optimization	3	3	1
Modeling and optimization in physics and chemistry	3	3	1
Variational problems	4	0	3
Optimal control applied to biological models	4	1	1
Data visualization	3	2	0
Design optimization	2	2	1

About 90 authors have presented their results or just attended the conference, and the total attendance number was 100 participants from 21 countries of four continents.





**Social Program.** The Organizing Committee composed of our colleagues from the Mathematics Department of the University of Aveiro has made its best to offer to the participants an interesting social program during the meeting, present the University of Aveiro and the beautiful region of Portugal where it is situated. The social program of the conference included a visit to the house-museum of Egas Moniz. Egas Moniz, the outstanding Portuguese neurologist, researcher, teacher and writer, the Nobel Prize winner of 1949, still today is considered to be the forerunner of modern brain imaging techniques and psychosurgery, not only because his research is also connected with the Natural Sciences. The house designed by the famous Portuguese architect Korrody in 1915 as well as the neighboring Quinta do Marinheiro are the places of interest for the visitants of the house-museum. We also offered to our participants an excursion to RAIZ, a private non-profit institute of forestry research situated in a beautiful Quinta de São Francisco.



On occasion of 30th EURO mini conference a small festive ceremony was organized during the Conference Dinner in the Hotel Eurosol in Estarreja. During this ceremony Willy,(Prof. Gerhard-Wilhelm Weber) has made a brief presentation of EURO, EUROPT, the EURO Working Group on continuous optimization and a history of EURO mini conferences. The participants celebrated the thirtieth conference with the anniversary cake and a glass of champagne accompanied by songs performed by out invites speaker Michael Greenacre.



The pictures of the Conference are available in <http://minieuro2014.web.ua.pt/index.php>.



## Special issues

- On the occasion of the EURO Mini-conference on Optimization in the Natural Sciences (EURO-mini 2014), Aveiro, Portugal, February 5-9, 2014, the journal **Optimization** has dedicated a special issue (Vol 64 (2015), Issue 5) to papers presented, or related to presentations at XXX MEC.
- On the occasion of the EURO Mini-conference on Optimization in the Natural Sciences (EURO-mini 2014), Aveiro, Portugal, February 5-9, 2014, Springer Communications in Computer and Information Science has dedicated a Proceedings Volume to papers presented, or related to presentations at XXX MEC.

## Supports

The meeting was supported by EURO (the Association of European Operational Research Societies), EUROPT (the Continuous Optimization Working Group of EURO), the Mathematics Department of the University of Aveiro (DMat of UA), by Portuguese funds through the CIDMA-Center for Research and Development in Mathematics and Applications (University of Aveiro) and the Portuguese Foundation for Science and Technology "FCT- Fundação para a Ciência e a Tecnologia", APDIO (the Portuguese Operational Research Society), INE (National Institute of Statistics), SPE (Portuguese Statistic's Society), FLAD (the Luso-American Development Foundation). The support was offered also by the Municipality of Estarreja, Science Center "Fabrica", and Raíz, the research institute of forest and paper. Due to support of EURO and EUROPT, the Organizing Committee managed to give a financial help to a few participants from weak currency countries in the form of fee waiving and partial support of travel and accommodation. 13 PhD and Post Doc students who presented their research were fee waived.



## Next EURO mini conference

During the Closing Session of the Workshop it was announced that the next EURO mini conference “*Improving Healthcare: new challenges, new approaches*” will be held in Coimbra, Portugal on 30 March – 1 April 2015. More information can be found in <http://www.minieuro2015.com/>

The organizers of the XXX MEC pass the baton to the organizers of the XXXI MEC, wishing them a fruitful work and successful conference.



**On behalf of the Organizing Committee**

*Tatiana Tchemisova, Adelaide Freitas*

Aveiro, Portugal, 27 of February 2014