

EURO Summer Institute 2006 in Wittenberg, Germany

ESI XXIV - Optimization Challenges in Engineering: Methods, Software, and Applications

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EURO institutes are organized on an annual basis by EURO, the Association of European Operational Research Societies. They take place in different countries and focus on varying topics. For two weeks, they bring together 20 to 30 carefully selected junior scientists and give them the opportunity of joint discussions, of forming networks with international colleagues, and of meeting renowned researchers in their field. This is accomplished by a combination of an inspiring scientific program with interesting social activities.

This year's ESI was carried out by the German Operations Research Society (GOR) and the EURO Working Group on Continuous Optimization (EUROPT). It was organized by Mirjam Dür, Petra Huhn, Kathrin Klamroth and Christiane Tammer. It was initiated, however, by Gerhard-Wilhelm Weber, the chair of EUROPT, and Tamás Terlaky, whom we wish to thank for their continuing support. Additional valuable support was provided by Gerhard Wäscher, the head of the GOR, which we appreciated very much.



The topic of this year's ESI was modern optimization methods and their applications in engineering science. This is reflected by the composition of the Scientific Committee which had the following members: Mirjam Dür (Darmstadt, Germany), Horst Hamacher (Kaiserslautern, Germany), Petra Huhn (Clausthal, Germany), Florian Jarre (Düsseldorf, Germany), Kathrin Klamroth (Erlangen, Germany), Michal Kocvara (Prague, Czech Republic), Claude Lemarechal (INRIA, France), Yurii Nesterov (Louvain, Belgium), and Tamas Terlaky (Hamilton, Canada).

Location



ESI took place in the buildings of the LEUCOREA foundation in the city of Wittenberg, Germany. Founded in the year 1994, the LEUCOREA foundation aims at bringing new international scientific and cultural life to Wittenberg, at the same place where 500 years ago one of the most renowned universities of Germany was established. The old university, the LEUCOREA, was founded in 1502, and only a few years later it was proud to have Martin Luther and Philipp Melanchthon among its

professors.

During the following centuries the university moved to Halle, however, the buildings remained and now accommodate nicely renovated lecture rooms, computer labs, a cafeteria and several guest rooms. The pleasant atmosphere, the excellent working conditions and the hospitality and enthusiasm of the employees of the LEUCOREA foundation were highly appreciated by all participants of ESI and contributed to its success.



Participants

The participants of ESI were doctoral and post-doctoral students from EURO-countries and from associated organizations. They had to apply for participation by submitting an original and unpublished paper to their national OR-societies, and the selection process was based on the quality of this work. Cooperations with IFORS (International Federation of Operational Research Societies) and ALIO (Asociación Latinoamericana de Investigación Operativa) broadened the national variety of the participants, and in the end all five continents were represented at this years ESI: We had participants from Austria, Belgium, Brazil, Canada, Germany, Hungary, India, Iran, Ireland, Israel, Italy, Lithuania, New Zealand, South Africa, Spain, Switzerland and Turkey. The international atmosphere of ESI added to its success and was positively mentioned by all of its participants.

Scientific Program

The scientific program combined short courses by nine invited, internationally renowned scientists in the field with contributions by the participating students who presented their work in 30 minute talks. Annick Sartenaer (FUNDP Namur, Belgium) made the start and gave the first of the nine lectures of approximately five hours each. She gave an introduction into trust region methods in nonlinear optimization. Andrew Conn (IBM, USA) continued the following day with an introduction to derivative free optimization. After that, Andrea Walther (TU Dresden, Germany) and Andreas Griewank (HU Berlin, Germany) jointly taught automatic differentiation. Their presentations were accompanied by practical computer exercises. The second week began with an introduction to semidefinite programming and interior point methods given by Tamás Terlaky (McMaster



University, Canada). Conic quadratic and convex optimization were the topic of Erling Andersen (MOSEK, Denmark). The practical applications of convex optimization were discussed in detail by Lieven Vandenbergh (UCLA, USA), who focussed, among others, on modelling issues and engineering applications. Michal Kočvara (Academy of Sciences Prague, Hungary) presented recent developments in structural optimization and the relations to semidefinite programming. The final talk of the week and of the ESI was given by Hans-Georg Bock (University of Heidelberg, Germany) on dynamical processes and optimal control problems and their applications.



The short courses of the invited speakers were complemented by 30 minute presentations of the participating students. Each of them had the opportunity to present his/her research and to discuss it with the other participants and with the invited speakers. The research topics were relatively widespread and ranged from theoretically oriented topics as, for example, nonsmooth Newton methods, to multicriteria optimization, and to various applications, for example, in engineering design, data mining, telecommunication, routing problems and structural optimization. The presentations initiated many interesting discussions, ideas were exchanged, and some of the participants even started to work on joint projects and papers.

Social Program

To emphasize also the social and cultural aspects of the summer institute and to show the participants some of Germany's beauty, the scientific program was complemented by an extensive social program. This included a guided tour through Wittenberg and the participation in the "Wittenberg Night", trips

to Dresden (with a city tour and visits of the Semper Opera and the reconstructed Church of our Lady) and to Berlin (with a city tour and visits of the parliament building (Reichstag) and the “Night of Open Museums”), as well as a local trip to the renaturated coal mining area Goitzsche near Bitterfeld. Joint barbecues, visits to the local bars in Wittenberg and a party evening organized by the participants completed the program.

For the organisation of the excursions, for the local support in Wittenberg and also preceding the ESI, a special thank is given to the “ESI Crew” consisting of Stefan Bundfuss, Jochen Gorski, Andreas Löhne, Sylke Sauter and Alexander Thekale from Darmstadt, Erlangen and Halle.



Special Journal Issue

As explained in the “Guidelines for EURO Institutes”, it is the intention of EURO to have a special issue of their journal EJOR devoted to the Institute. This is the reason behind the rather complicated application procedure (applicants were expected to submit an unpublished paper in order to be considered). Although all previous EURO Institutes had their special issue, it turned out that this was not possible for our ESI (and presumably the same will be true for future Institutes). The reason is that EJOR has a huge backlog of papers, and has therefore stopped to accept proposals for special issues. As our participants had already run through the application procedure, we were still planning to bring out a special issue, and we are happy that the journal *Mathematical Methods of Operations Research (MMOR)* has accepted to publish it. For future Institutes, we strongly encourage EURO to change the guidelines for the application procedure and to develop a concept for EURO Institutes without a possibility to publish the results thereof. In our understanding, introducing young people to the process of writing papers and brushing the papers up such that they can be published has always been a central element of these schools and has definitely been an important incentive in the past for young researchers to apply and attend. If this possibility is not given any more, suitable alternatives should be provided.

Conclusion

For all participants of the ESI, the summer school was an excellent opportunity to get a broader knowledge of their own field of research, to learn about new methodologies and techniques, and to build up a network of connections with young researchers from all parts of the world, as well as renowned professionals. Because of the relatively long duration of 15 days, the atmosphere was relaxed and there was plenty of time for extensive discussions and scientific exchange. Several participants used the opportunity to continue on to the annual meeting of the German OR Society which took place in the week right after ESI in Karlsruhe, Germany.

As mentioned above, EURO summer or winter institutes take place on an annual basis. The next event in this series will be a EURO winter institute in Estoril from January 27th until February 10th, Portugal. The topic of this winter institute is *Location and Logistics*; further information can be found at <http://ewi2007.fc.ul.pt/>

Sponsors

Last but not least, we would like to thank our sponsors for their generous support which made this event possible:



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