From the Editor:

Keeping Connected

Did you know that the IFORS News first appeared in June 2007? It was an effort to make sure that we keep connected, since I believed then, as now, that constant communication is an important element in strengthening the professional bonds among societies, regional groupings, and IFORS.

On the way to its 7th year, IFORS News requested for IFORS Correspondent volunteers in order to hear from societies on a more regular basis, and not miss important events and developments. The names you see in the **Editorial Box**, henceforth, shall be the OR global community's local eyes and ears in the areas where there are OR Societies. Welcome to our IFORS Correspondents, and I hope to see the family grow some more!

We surely have kept connected in this issue, where we see **accounts of conferences** in Greece, Philippines, South Africa, Senegal, Russia, Ukraine and Germany. In this issue too, we read about OR societies linking up with each other (China and Germany), and OR communities thinking about (Senegal) and re-thinking the format (Russia) of their OR organizations.

We also witness efforts at making sure that the OR talent pipeline is full, as we the cover the **Summer Schools** in Valencia, Spain and Kiev, Ukraine. One just has to go over this issue to find out why the youth would be enamored with the discipline. Our **Tutorial Section** demonstrates the continuing contribution of OR to the field of Biomedicine while the **OR Impact** article shows how it has helped farmers. As if this is not enough, the **Feature** on OR linked to the political decision making in China should convince the reader of how interdisciplinary and broad the discipline is! We are, moreover, at an exciting time, as we find ourselves in the forefront of Analytics **(Book Review)** – with a national society that has incorporated Analytics to its name **(OR Society in Focus)**!

Together with the national, regional and international events as well as recent OR developments and tutorials, IFORS activities form an important part of each IFORS News. In this issue, one sees that **OR for Development** is a key initiative that has seen a lot of activities in the past year. This issue reports on the outreach program to support a speaker to a developing country conference, as well as its sponsorships of the ICORD, the IFORS Prize and on line resources.

If IFORS News was first published in 2007, who was its first editor? Yes, it's trivia time, and we have prepared other questions for you to discover your IFORS Trivia IQ. Don't worry, the answers are in the same issue and in the website as well. As they say, it pays to keep connected! 🌎

**- Elise del Rosario** <elise.del.rosario@stepforward.ph>

With Our Deepest Sympathy

IFORS offers its deepest condolences to the government and people of the Philippines for the tragic loss of lives and property caused by super typhoon Yolanda, also known internationally as super typhoon Haiyan, which struck in November.

November 8 was a significant day for ORSP and it was the time I sent a congratulatory message on the occasion of its Annual National Conference and celebration of its 26th anniversary. I heard that because of the warnings, the conference was not as well attended as in the past. But this does not compare to the tragedy of the loss of thousands of lives.

On behalf of the IFORS community, I would like to convey my sincere sympathy to those adversely affected by this disaster. Our thoughts and prayers are with the Filipinos, especially those who lost their loved ones, homes and livelihoods.

- Nelson Maculan, IFORS President
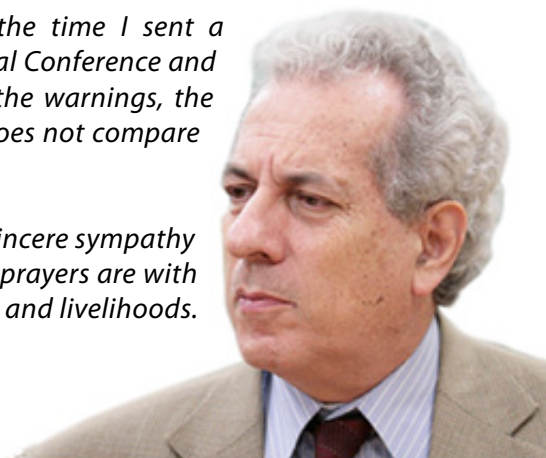
IFORS 2014: An Update from IFORS VP Elena Fernandez, Conference Chair

With half a year left, preparations for the Barcelona IFORS 2014 Conference (www.IFORS2014.com) have reached fever pitch. Registration and abstract submission facilities are now open. Registration fees have been announced at €500 for early bird (until February 28) and €300 for students. The Program Committee is hard at work in preparing a high quality and attractive scientific program. There are already nearly 200 streams distributed in 25 areas. Everyone is encouraged to find the most appropriate stream for their presentations at http://ifors2014.com/program/main-areas.

Not to be overlooked is the social program, which an inspired Organizing Committee is putting together. The welcome reception will take place at the *Museu d'Art Nacional de Catalunya* (http://www.mnac.cat/index.jsp?lan=003), located in Palau Nacional, an emblematic building on the mountain of Montjuïc, from where you can enjoy a magnificent and unique view of the city of Barcelona. Several attractive options have been identified for the Wednesday excursion. You can find this and much more at the conference website, which is being updated by the minute!

The organizing committee will be pleased to guide you in the preparation of your participation in IFORS 2014. Should you need more reasons to come to Barcelona, visit http://www.barcelonaturisme.com/download/popupvideo.htm! 🌐

For your guidance
All attendees, including speakers and session chairs, must register and pay the registration fee. If you need an early confirmation for visa or budgetary reasons, please contact ifors2014@pacifico-meetings.com.

Important dates
Abstract submission facility opened: 1 November 2013
Abstract submission facility closes: 31 January 2014
Early Registration ends: 28 February 2014
Regular Registration: 1 March - 30 April 2014
Late and on-site registration: 1 May - 13 July 2014

Haiyan Hits As Quants Meet

Elise del Rosario <elise.del.rosario@stepforward.ph>

People were getting excited about the theme of the 26th Anniversary conference of the Operations Research of the Philippines (ORSP) – *Keeping Pace with the Business Analytics Revolution*. This was in recognition of the fact that many local companies, which have never heard of OR, are now excited about the prospects of analytics. The organizers thus expected to attract more than the hundred people who usually attend its annual conferences.

The Institute for OR/MS (INFORMS) - the national society of the United States - which had been at the forefront of Analytics, had responded to the ORSP request to send a speaker for the Conference. Thus, the society was fortunate to welcome the INFORMS VP for International Activities Grace Lin. As Director General and VP of the Advanced Research Institute (ARI) of the Taiwan IT think tank, she was to talk about how leading government organizations and private enterprises have started applying and getting results on their Big Data Analytics projects for various public and commercial purposes. She was to present emerging trends, opportunities and challenges and share personal journey in ARI's efforts at addressing Smart Living opportunities in Smart Green Building, Smart Healthcare, Smart Community, and Smart Tourism through Big Data Analytics.

Her talk was a perfect complement to the plenary topics lined up for the day, on: *Improving Customer Service while Preventing Fraud Using Entity Analytics* by Lope Doromal of IBM, *Transform Your Data Into Useful Information* by Oscar Villadolid from SAP, and *High Performance Analytics for Big Data* from Christine Dizon of SAS.

A tutorial on spreadsheets using Excel Solver for Optimization had been scheduled. Acknowledging that presentation skills is key to the success of OR practitioners and is recognized as a major step in the Analytics cycle, a well-known speaker on making effective presentations and using effective visuals had been invited.

Papers submitted for the sessions were carefully reviewed and included applications in the areas of *Marketing and Customer Relations Management*, *Capital/ Financial Management and Economics, and Supply Chain and Operations Management*, with all papers in the applied area.

E. del Rosario, ORSP VP S. Tan, ORSP President F. Miranda, shown with speakers Grace Lin, O. Villadolid, C. Dizon and L. Doromal after the open forum.

Everything was thus set for November 8. As far as the organizers were concerned, all the elements for a successful conference had been taken care of. At the end of the conference, participant feedback was very encouraging especially where it concerned the speakers for the event.

It would have been perfect except for one thing: the small number of participants. In the early morning, some participants sent word that they cannot make it. The ballrooms, which in the previous years were crammed, were only half full. It was the day typhoon Haiyan *(local name: Yolanda)* visited the Philippines. Everyone was advised to stay home, even as schools were closed and attendance in public and private offices was left at the discretion of employers.

At the height of the typhoon, Manila was slightly overcast with gusty winds and scattered showers. The organizers started wondering what the fuss was all about, until news about the devastation in the Visayas region trickled in. For the first few days, the rest of the Philippines was glued to CNN and BBC, as there was very little coverage by the local networks. As of late November, more than 5,000 are dead, 20,000 injured and 1,700 missing, and more than a million houses damaged in the affected islands of Samar, Leyte, Cebu, Iloilo, Capiz, Aklan, and Palawan.

> It was unfortunate that the government was caught flat-footed by this disaster. In this aspect, OR, with its methodologies and applications in the area of humanitarian logistics has a lot to offer.

Help that poured in from all parts of the Philippines and from all over the world significantly hastened relief efforts. However, It was acknowledged that there is no coordinated effort in terms of getting aid to the victims. Extent of damage was slow to be uncovered, as the destruction of power and communication lines hindered the flow of information.

It was unfortunate that the government was caught flat-footed by this disaster. In this aspect, OR, with its methodologies and applications in the area of humanitarian logistics has a lot to offer. This is probably why Haiyan had to come on the day when professionals, who have the skills to share to enable a better response to similar events in the future, had gathered together. 🌐

There were fewer participants, relative to the previous years.

OR Superpowers of the East and West Link Up

Degang Liu <dliu@amt.ac.cn>, **Stefan Pickl Stefan** <pickl@unibw.de>, **Bo Hu** <bo.hu@unibw.de>

The first symposium that brought Chinese and German Operational Researchers together took place at a lakeside resort in Germany's Bavarian Spitzingsee on September 25-27, 2013. This historic event was sponsored jointly by the Natural Science Foundation of China (NSFC) and the Deutsche Forschungsgemeinschaft (German Research Foundation), funded by the Sino-German Science Center, Bayerisches Hochschul-Zentrum für China, and the Universität der Bundeswehr München,

A total of 50 OR professionals attended the joint GOR (Gesellschaft für Operations Research) ORSC (Operations Research Society of China) workshop. The Sino-German Science Center and ORSC provided financial support for the international flights and local accommodation of around 20 Chinese OR professors from the Chinese Academy of Sciences as well as top Chinese universities This first official GOR-ORSC workshop was organized to encourage exchange of ideas on the latest research findings and state-of-the-art modeling, methods and solutions to real-world OR problems and challenges faced by the scientists, researchers and practitioners from the two countries.

The proposal of the joint conference came up soon after the APORS 2012 in Xi'an China when Stefan Pickl, the GOR advisory committee chair, met with ORSC leadership. Then Hu Xudong (Academy of Mathematics and Systems Science, CAS) and Stefan Pickl (Universität der Bundeswehr München) decided to jointly apply for a grant from the Sino-German Science Center, which is sponsored jointly by NSF and DFG.

Listening attentively to the presentation are (first row, l to r): OR News Chair Joachim Minnemann, EURO president Gerhard Wäscher and GOR president Stefan Nickel.

One year of hard work and careful preparation finally brought together, at the beautiful alpine resort of Arabella Alpenhotel Spitzingsee, operational researchers from Germany and China led by GOR president Stefan Nickel, ORSC president Hu Xudong,

EURO President Gerhard Wäscher, Chinese Academy of Sciences member and IFORS VP for APORS Yuan Yaxiang and German Academy of Sciences Leopoldina member Martin Grötschel.

During the opening ceremony, Pickl welcomed the participants and gave the background of the workshop, acknowledging the funding from the Sino-German Center. GOR President Nickel and EURO President Wascher introduced the respective organizations they represent. ORSC President, for his part, thanked GOR and presented a gift to the organizing committee on behalf of the Chinese delegation.

Martin Grötschel gives keynote on Weaknesses and Strengths of OR.

During the three-day symposium, 17 Chinese and 17 German scholars presented their research work along with lessons learned and achievements. Prof. Martin Grötschel delivered his keynote address on the *Weaknesses and Strengths of Operations Research*, where he shared with the delegates some highlights of the development of operations research, future trends and challenges.

During the closing ceremonies, the two societies made plans to meet again in Shanghai come 2015. A Euro-China workshop was also planned in 2014 in Spain just before the IFORS Barcelona conference.

Participants not only enjoyed the academic but the social interactions as well, which included a two-society party where a lot of stories, mugs of beer and songs were shared. Arriving two days before the symposium gave the Chinese delegation a chance to visit the Deutsches Museum, Oktoberfest in Munich, and Neuschwanstein castle and Bavarian countryside.

The Chinese OR team also visited the campus of the Universität der Bundeswehr München where they were welcomed by University President Merith Niehuss. 🌍

From Russia, With Love for OR: The Seventh Moscow International Conference on Operations Research

Ekaterina Daylova <e.daylova@gmail.com>
Gerhard-Wilhelm Weber <gweber@metu.edu.tr>

Coming from all corners of the globe: Belgium, Brazil, Canada, Finland, Georgia, Montenegro, Portugal, Spain, Sweden, Switzerland, Turkey, Ukraine, USA and all corners of Russia: Chelyabinsk, Chita, Dolgoprudny, Irkutsk, Kazan, Khimki, Krasnoyarsk, Moscow, Nizhny Novgorod, Novosibirsk, Obninsk, Perm, Petrozavodsk, Rostov-na-Donu, Saint Petersburg, Twer, Ufa, Ulan-Ude, Uljanovsk, Vladivostok, Volgograd, Voronezh, and Yekaterinburg, Operational Researchers congregated in Moscow from October 15 to 17 for the *VII Moscow International Conference on Operations Research (ORM 2013)*.

The 200 papers presented were on various theoretical and application aspects in the areas of: economics; optimization methods; military science; new models and methods; multiple objective decision making; medicine, biology, and ecology; game-theoretic models; finance and banking; computer-aided design; analysis of political processes and corruption; insurance and risk-management; analysis and design of markets and auctions; and predictive models for congested traffic.

ORM 2013 featured 13 plenary talks, 13 streams, a round table discussion on *What is Happening with Science and Education?*, a talk on *Russian department of EURO Association* by V.V. Mazalov, and *A Tutorial on Linguistic Geometry* by B. Stilman. The plenary talks were given by: Yu.G. Evtushenko *Effective Methods for Solving of Large-Scale Optimization Problems,* A.A. Vasin *Electricity Markets: Game-Theoretic Analysis of Their Mechanisms*, G.A. Agasandyan *Application of the Continuous Criterion VaR in Financial Markets,* V.V. Podinovsky *Criteria Importance Theory: State-of-the-Art*, B. Stilman *Development of Linguistic Geometry: From Fighting Wars To Computing Them*, Ya.D. Sergeyev *Lipschitz Global Optimization Methods*, M.G. Kreynes *Objectivity or Magic of Quantity*, Yu.E. Nesterov *Stochastic Equilibrium in Congested Transportation Networks*, André de Palma *Individual and Collective Discrete Choice Models,* G.-W. Weber *Advances in Operational Research and Control of Stochastic Dynamics,* F.T. Aleskerov *Choice Procedures for Big Data Analysis,* E.A. Nurminski, N.B. Shamray *A Case Study in the Development of a System of the Regional Transport Models*, Yu.V. Dorn, A.V. Gasnikov, Yu.E. Nesterov, S.V. Shpirko *The Three-Stage Version of Stable Dynamic Model.*

The efforts of the Organizing Committee chaired by *P.S. Krasnoschekov* and composed of *A.A. Vasin (co-chair, MSU), Yu.A. Flerov (co-chair, CC*

▲ E.A. Nurminski delivers his plenary talk.

RAS), A.A. Belolipetskiy, D.V. Denisov, F.I. Ereshko, A.F. Izmailov, A.V. Lotov, Yu.E. Malashenko, E.Z. Mokhonko, V.V. Morozov, N.M. Novikova, I.I. Pospelova, A.A. Shananin, Program Committee Chair I.G. Pospelov and members F.T. Aleskerov, Yu.G. Evtushenko, M. Jacimovic, Yu.E. Nesterov, Yu.N. Pavlovsky, K.V. Rudakov, G.I. Savin, Ya.D. Sergeyev, M.V. Solodov, A.A. Vasin, G.-W. Weber, Yu.I. Zhuravlev, conference secretariat *V.P. Vrzheshch* and *S.A. Vartanov* ensured that ORM 2013 delivered the perfect setting for academic learning and the social interactions among the participants.

> **Among the matters discussed was the establishment of a new Russian Operational Research Society (RuORS) wherein much work has already been done**

The conference was held at the *Dorodnicyn Computing Center of Russian Academy of Sciences (CC RAS), and at Faculty of Computational Mathematics and Cybernetics of Lomonosov Moscow State University (MSU)*. Founded in 1955, CC RAS is a leading research institute of the Russian Academy of Sciences. With 39 faculties and nearly 40,000 students, MSU is the largest of the research universities within the former USSR. The Faculty of Computational Mathematics and Cybernetics, founded in 1970 by *Academician A.N. Tikhonov*, trains specialists in the fields of applied mathematics, computational mathematics, and computer science. The Department of Operations Research is one of the 19 departments within the faculty.

Sponsoring the conference were the MSU, CC RAS, the *Laboratory for Structural Methods of Data Analysis in Predictive Modeling (PreMoLab)* and *Russian Scientific Operations Research Society* with support coming from *"STRADO"* and *Russian Foundation for Basic Research (RFBR)*.

This conference is acknowledged as a traditional core OR event in Russia. *The Russian Scientific Operations Research Society* was established in 1996 during the very first conference. The conference had since taken place every three years. As in the past, this seventh conference provided an opportunity for personal and scientific exchanges as well as strengthening of scientific networks. Among the matters discussed was the establishment of a new *Russian Operational Research Society (RuORS)* wherein much work has already been done, and awaiting further collaboration and support of IFORS and EURO. The conference was also especially inspiring for young researchers who had the opportunity to present and discuss their recent work with experts. Participants, in general, found common research interests and established networks for future collaboration. These memories from Russia have definitely reinforced the participants' love for OR! 🌐

▲ Participants listen intently to a presentation.

HELORS Celebrates 50th Year with an International Symposium

IFORS President Nelson Maculan was on hand to congratulate the Hellenic Operational Research Society (HELORS) as it celebrated its 50th anniversary during the 2nd International Symposium and 24th National Conference on Operational Research held at the Crowne Plaza, Athens City Centre in Greece from September 26 to 28, 2013.

Organized by the three prestigious academic institutes of Greece, namely the National Technical University of Athens, University of Piraeus and the Technical University of Crete, the conference was successful in facilitating the exchange of scientific and technical information and in promoting international co-operation in the field of OR. Close to a hundred high quality papers coming from 17 countries scattered among the 4 continents were presented.

Apart from paper presentations, the well-organized program included fully packed workshops and panel discussions. Lending even greater quality to the conference were distinguished researchers who gave the keynote addresses, which include:

• IFORS President Nelson Maculan who, in his talk *The Problem of Covering Solids by Spheres of Different Diameters* proposed a Mixed-Integer Nonlinear Programming solution for the problem of covering a solid by a finite number of spheres of different radii. He discussed the results of its use to model and study a complex sphere covering problem occurring in the configuration of a gamma ray machine radiotherapy equipment unit.
• Winner of the 2013 EURO Gold Medal Panos Pardalos' talk on *Optimization and Modeling in Energy Systems* showed how to deal with several difficult problems in energy networks, such as hydro-thermal scheduling modeling, electricity network expansion, liquefied natural gas and blackout detection in the smart grid.
• EJOR Coordinating Editor Roman Slowinski, in *How the European Journal of Operational Research (EJOR) Reflects the Evolution of Operational Research* gave advise to young researchers on how to write articles about Operational Research apart from tackling the question posed.
• Former EURO President Alexis Tsoukiàs answered *What is a Decision Problem?* by introducing a general framework through which the whole potential set of decision problems can be described. Emphasising the problem statement dimension, he showed through examples how the framework helps in categorising current decision problems, reformulating decision problems and constructing formal arguments for the decision aiding process.

During the conference, Christodoulos Floudas, Professor at the Department of Chemical and Biological Engineering of the Princeton University was bestowed the National HELORS Award - Gold Medal.

The proceedings of the conference will be published in electronic form (ISBN: 978-618-80361-1-6) in November. Additionally, selected papers will be published, after review, in Special Issues of the International Scientific Journals, namely: Operational Research, An International Journal, International Journal of Decision Support Systems, and Annals of Operations Research. 🌍

A Lot of Firsts for a 42nd Anniversary!

Hans Ittmann <hittmann01@gmail.com>

The 42nd ORSSA conference was held from September 15 to 18 at Stellenbosch in the Western Cape, South Africa in the Protea Hotel surrounded by wine lands. The scenic spot was the perfect venue to celebrate the 70th birthday of one of its most eminent members, Theo Stewart. Affiliated with the University of Cape Town and the Manchester Business School, he was 2004-2006 IFORS Vice President at-large. The opening plenary session, usually given by an invited speaker from overseas, was reserved for Stewart whose birthday fell exactly on September 16. Both his opening plenary talk on *Multicritieria Decision Analysis – An Integrating Framework for Operations Research,* and closing paper entitled *Multicriteria Decision Aid to Operations Research for Development* left the delegates with a lot of food for thought. He was also honoured during one of the parallel streams with an *Anniversary Session Dedicated to Theodor Stewart* where three papers from the latest edition of the ORSSA journal ORiON, were presented.

The ORSSA conferences are an annual showcase of developments in OR in the country. Papers presented this year covered a wide spectrum of topics, with all 74 of very high standard. Mostly by graduate students, the papers were practice-oriented and used a wide spectrum of approaches, tools and techniques to address increasingly messy problems. As in the past, the Society continues to be concerned with the lack of private sector participation and the inability to retain younger members.

Always one of the highlights, the conference banquet featured a lot of "firsts". For the first time, three members, 35 years and below, were recognised for excellence in the practice of OR. For many years, the society also rewarded students for outstanding project work conducted as part of their studies. From this year on, these awards will

be formally known as the *Gerhard Geldenhuys Medal* for honours students and the *Theodor Stewart Medal* for the best master's thesis. Geldenhuys, who had a long and illustrious academic career, is one of the ORSSA founding members. Both Geldenhuys and Stewart were on hand to award the medals.

The most prestigous award of the ORSSA, the *Tom Rozwadowski Medal*, is given to the best paper published in a journal in the previous calendar year. The award was presented to Jonas Stray and Jan van Vuuren (the outgoing President of ORSSA) for their paper titled *An Optimisation Based Seasonal Sugarcane Harvest Scheduling Decision Support System for Commercial Growers in South Africa*, published in Computers and Electronics in Agriculture. (Tom Rozwadowski is Polish who settled in South Africa after World War II. Instrumental in establishing ORSSA, Tom died with his wife and two kids in 1970 while in the USA.)

Many of the 70 to 80 delegates present have become close friends who meet once a year. This year, the meetings were made more memorable with the best wines of the region served during the wine-tasting and the banquet. The meticulous attention to every detail put in by the organising committee made this conference the huge success that it was! 🌐

▲ Gerhard Geldenhuys and Robert Hagspihl winner of the newly instituted Gerhard Geldenhuys Medal for students at honours level.

OR for Development Section

A note from the Developing Countries Committee Chairperson, IFORS VP Sue Merchant

IFORS: Continuing to Pursue Activities in OR for Development

In addition to monitoring progress on ICORD (International Conference on OR for Development) 2014 and the IFORS Prize for OR in Development, the Developing Countries Committee has been busy in the last few months planning a variety of events and supporting others. As you can see in this issue, Hans Ittman from South Africa has been invited and supported by IFORS to give two presentations at a workshop in Senegal.

The DCC Resources website has been updated with new material, thanks to Gerhard Wilhelm Weber for encouraging several of his colleagues and contacts to search out new material and to check the operation of the website; to Prof. Yindong Shen for supplying a copy of her paper on bus transportation and to the publishers Wiley for allowing us to include this until Dec 2014; to our website editor Ruel Tan for adding a section on material recently uploaded to the site, plus a system for rating the papers accessed and a revised counting system for site visits so that these can be monitored more closely.

The committee is also starting to plan for ICORD 2015 and amongst other ideas has been exploring ways of giving developing countries free access to published papers and the possibility of arranging a teachers workshop in the year following the Barcelona conference. 🌐

IFORS Supports Urban Transport Planning Conference in Senegal

Hans Ittmann <hittmann01@gmail.com>

Through its speaker Hans Ittmann, IFORS supported the Operational Research Practice in Africa (ORPA) conference held November 19 and 20 in Dakar Senegal. This workshop-conference on urban and transport planning was part of ORTANS *(Optimisation des Réseaux de TRANSport: analysis des flots et localisation d'activitités)* or Optimisation in Local Transportation, and was held at the *Auditorium of the l'Agence universitaire de la Francophonie* (AUF) located within the campus of the *Université Cheikh Anta Diop* (UCAD).

> **...delegates seriously talked about the options of forming an Operations Research Society in Senegal or joining neighboring countries to be part of the IFORS community. The relatively large interest in OR and sufficient number of OR enthusiasts bode well for the plan.**

Thirty participants mainly from UCAD attended the 14 presentations, with topics ranging from Advances in Demand and Network Models for Transportation Planning; Network Transportation and Land Use Problem; Applications of the p-median Problem in School Allocation; A Breakdown Mechanic Location Problem; Numerical Approach of Network Problems in Optimal Mass Transportation; Social Networks and Transport and Scheduling Aircraft Landings at LSS Airport. Though all pesentations, with the exception of the author's, were in French, the universal language of Mathematics made it easy to appreciate the high standard of work done by the PhD students. Ittmann's presentations on *"Freight Transport Planning and Modelling – Application within the Rail Environement"* and *"City Logistics and Urban Freight Transport Challenges in Developing Countries"* were well received. Encouraged by Ittmann's short presentation *"IFORS: The Global OR Community"*, delegates seriously talked about the

options of forming an Operations Research Society in Senegal or joining neighboring countries to be part of the IFORS community. The relatively large interest in OR and sufficient number of OR enthusiasts bode well for the plan.

▲ Babacar Ndiaye, Serigne Gueye, Petra and Hans Ittmann

ORPA is an initiative that started through efforts of OR people in West and North Africa, with the first conference held in 2005 in Ouagadougou, Burkina Faso. This was followed by those held in London, Cape Town, Washington and Dakar. The moving spirit behind this year's conference is Serigne Gueye, who comes from Senegal, but is currently with the University of Avignon, France. Local organiser was Babacar Ndiayne of UCAD.

There was time to visit the impressive Monument of African Renaissance as well as the Gorée Island. The latter is well known as the largest slave-trading centre on the African coast from the 15th and 19th centuries. Traces of the grim slave-quarters are still visible, continuing to serve as a reminder both of human exploitation and sanctuary of reconciliation. The significance of Dakar, where the banned ANC and a South African delegation first met in July, 1987 was not lost on the author. Thus, the challenges of the newly installed online visa application system as well as the high traffic volumes and unceasing traffic jams in the surrounding areas were all worth it! 🌐

IFORS EURO WG-ORD

Call for Participants

International Conference on OR for Development, ICORD 2014
"The Art of Modeling, the Challenges of Implementation"

July 10-11, 2014
University of Lleida, Catalonia, Spain
(Immediately preceding IFORS 2014 July 13-18)

Background

The International Conference on OR for Development (ICORD) used to be sponsored by IFORS (http://ifors.org/web/icord-history) every 3 years but in recent years workshops have also been held in the intervening years: the last two were held in Tunisia and Rome in collaboration with the Euro Working Group on OR for Development*. This conference will be similarly organized. It aims to improve the links among researchers with the view to improving each other's effectiveness at bringing about meaningful changes towards development.

Call for Participants

The International Conference on OR for Development will again be hosted by IFORS in co-operation with the EWG ORD in the days preceding the IFORS Conference in Barcelona. ICORD 2014 will be held at the University of Lleida, Catalonia, accessible by a 1-hour train ride from Barcelona or 2-hours from Madrid.

Operations Researchers who have done work in the area of OR for Development are invited to participate. To qualify, participants are required to submit a full paper on their work which has used Operations Research to help decision-making processes in the area of education, health, and other basic services, water, technology, resource use (physical or financial), infrastructure, agricultural/industrialization, or environmental sustainability. The work should have helped optimize development in view of constraints and limited resources. A stress on developmental issues will be an important factor; papers of a purely technical nature, or those that have no relevance in the developmental context, will not be considered.

Extended abstracts (no less than 1,500 words) will be accepted, though full papers (needed for a meaningful review) are preferred.

Conference Format

The conference will be limited to a small number of participants who will each present their paper to others in their group and will benefit from a critique of their work by the other participants and invited experts.

All participants will be given all the papers of accepted participants in advance, which will give them time to study the other papers in detail. Ample time will be given for a discussion of each of the papers presented. There will also be plenary session/s for invited speakers and participants will be given the opportunity to attend a workshop on techniques especially relevant to developing countries.

Researchers who have participated in previous ICORDs and who have brought their work forward are encouraged to attend to report on developments on their previously presented work.

Papers submitted for IFORS Prize for Development are also welcome. Competition finalists will find it beneficial to present their work in this forum and gather feedback.

Important Dates

Paper Submission: January 31, 2014
Notification of Acceptance : February 15, 2014

Subsidized Conference Registration Fee
US $200, inclusive of materials, snacks & lunch

Accommodation

Student accommodation starts @ €30/day, available also for non-students participants; hotels from €50-100/day.

Conference Chairs

Youssef Masmoudi (youssef.masmoudi@gmail.com)
Lluís Miquel Pla Aragonés (lmpla@matematica.udl.cat)

Program Committee

Elise del Rosario (elise@jgdelrosario.com)
Honora Smith (honora.smith@soton.ac.uk)
Gerhard-Wilhelm Weber (gweber@metu.edu.tr)

Support for Participants

A limited number of slots for accommodation and registration support will be available, and will depend on the quality of material submitted.

Updates will follow in the next few weeks.

URL: http://ifors.org/web/icord-2014/

*The EURO Working Group on Operational Research for Development (EWG ORD) (http://www.euro-online.org/web/ewg/29/or-for-development-ewg-ord) aims to promote and facilitate communication links among European (and other) researchers working in areas of operational research for development. EWG ORD actively organized / co-organized workshops or streams on operational research for development in all of: EURO 2006, EURO 2007, IFORS 2008, EURO 2009, EURO 2010, IFORS 2011 and EURO 2012. These activities have been successful in promoting the importance of operational research and its related techniques to improving living conditions in developing and developed countries.

IFORS

INTERNATIONAL FEDERATION OF OPERATIONAL RESEARCH SOCIETIES

Prize for OR in Development

Fourth Call for Papers

Submission Deadline Extended to December 20, 2013!

IFORS is pleased to announce that the Prize will be awarded during the 20th Triennial conference on "The Art of Modeling" to be held in Barcelona, Spain from 13-18 July 2014.

This competition has been held for over 25 years, and recognizes outstanding and relevant OR work carried out in developing countries.

- **Awarded at the close of the IFORS Triennial Conference and carries with it a grand prize of US$ 4,000.00 and a runner-up prize of US$ 2,000.00**

- **The finalist papers are automatically considered for publication in the IFORS Publication, International Transactions in Operational Research (ITOR). Publication is contingent upon the usual refereeing process. Authors of these papers agree that the first right to publish their papers lies with ITOR; as such, they will not publish the same until and unless they receive permission to do so by the ITOR editor.**

Important details about the competition follow:

Topic of paper
- The paper should describe a practical OR application in a developing country, conducted to assist a specific organization in its decision-making process with regard to education, health, and other basic services, water, technology, resource use (physical or financial), infrastructure, agricultural/industrialization, natural resources, or environmental sustainability. It should also contain original features in methodology and/or implementation in developing countries.
- The paper should include some description of: the application's social context, how the project succeeded despite constraints and limited resources, and particularly its impact on the decision making process or on the organization for which it was conducted. Where appropriate, the relevance of the country's state of development to the study should be addressed. A stress on developmental issues will be an important factor in the judging.
- Papers of a purely technical nature, or those, which have no relevance in the developmental context, will not be considered.

Judging Criteria
- Qualifying papers will be evaluated on the following criteria: problem definition, creativity and appropriateness of approach, MS/OR content, stress on developmental issues, innovative methodology, impact of the study, paper organization and structure, and quality of written and (if selected as finalist) oral presentation. Participation of local researchers will also be a judging criterion.

Other Information
- Principal authors and presenters of any nationality are welcome. If selected to be among the finalists, the entry must be presented by one of the principal authors during the IFORS Triennial Conference to be held in Barcelona, Spain from 13-18 July 2014.
- Finalists' registration fees will be sponsored by IFORS. For finalists who are nationals of developing countries, a grant for living expenses may be requested but cannot be guaranteed.
- Entry must be submitted using the submission site for the IFORS journal, International Transactions on Operations Research (ITOR) http://mc.manuscriptcentral.com/itor, indicating in the cover letter that it is intended for this competition. At this point, authors warrant that their paper submissions have not or will be published in another journal. ITOR Editor Celso Ribeiro will forward the papers submitted to the Chair. When the finalists are announced, only finalist papers will be considered as formal submissions to ITOR.
- An international panel of judges chaired by Andres Weintraub ,Chile, has been formed and will be announced at the same time as the selection of finalists. 🌐

Last date of submission of the full paper: December 20, 2013

Finalists will be notified by: February 28, 2014

Date of presentation: July 14, 2014

OR IMPACT

Articles demonstrating direct benefits from implementing OR studies

Section Editors: Sue Merchant <suemerchant@hotmail.com>, **John Ranyard** <jranyard@cix.co.uk>

Mathematics In Agriculture: Geometric Clustering For Land Consolidation

Andreas Brieden (Universität der Bundeswehr München), Steffen Borgwardt (Technische Universität München), and Peter Gritzmann (Technische Universität München)

Background

In many agricultural regions, farmers cultivate a large number of small-sized lots that are scattered widely. In a typical farming area in Bavaria, Germany, about 7 to 20 farmers till between 300 and 1000 lots. Figure 1 shows a typical region.
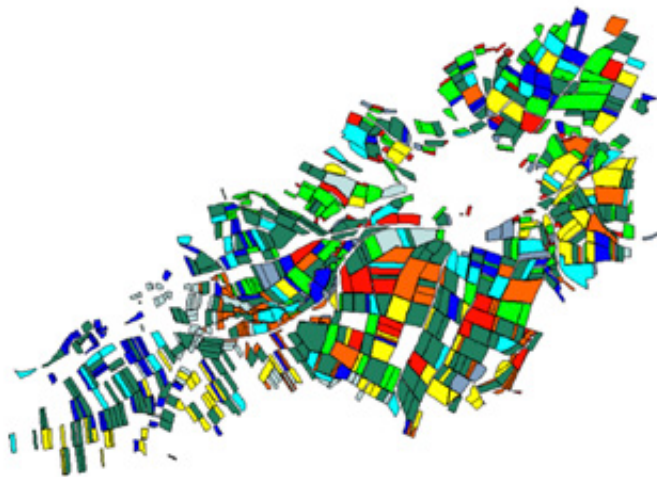

Figure 1. An agricultural region with 9 farmers and 979 lots. Different colors represent different farmers who cultivate the lots.

This situation makes production overly cost intensive. With individual lots scattered over a large region, considerable overhead costs are needed to transport machinery great distances between lots. This often reduces the farmers' net income from agricultural production by more than 30%. Also since the single lots of the highly fragmented farms are rather small, modern heavy machinery cannot be used profitably. Private forest regions face similar challenges.

In its classical form, land consolidation consists of a complete restructuring of the agricultural area. This process involves extended surveying and new legal assignments of property, and is hence costly, lengthy and inflexible. A typical classical land consolidation process lasts more than a decade and costs about 2,500 Euro per hectare.

A conceptually much simpler alternative employs voluntary lend-lease agreements. Here the right to till fields is swapped between participating farmers in order to create large connected pieces of land for each farmer. Naturally, certain balancing constraints need to be satisfied. For instance, in the course of redistribution, the total size of each farmer's land, quality of soil and the EU subsidies attached to his lots should not change too much. Ecological constraints must also be considered.

Left to right: Steffen Borgwardt, Andreas Brieden, Peter Gritzmann, Gautier Stauffer (chairman of the jury), Eleni Pratsini (IBM) Pratsini is Director of Optimization Research Business Analytics and Mathematical Sciences at IBM T.J. Watson Research Center, Yorktown Heights; IBM sponsored the award.)

Quality of soil is typically different in different parts of a region. This means that in practice, the assigned lots of each farmer will form a certain number of connected patches. The lend-lease agreements are completely voluntary up to the degree that farmers are allowed to keep ('fixed') some of their lots and make only a subset available for redistribution. The reassigned lots should then be adjacent to the fixed ones.

The number of possible reassignments is typically very large: in fact, for k farmers with m lots, this is km. Thus, even for the moderate example depicted in Fig 1, the number of possibilities is $9^{979} \approx 10^{934}$, which excludes 'trial and error' approaches. For this reason, the farming community first regarded the land-lease initiative as impractical.

Solution Approach

These were key considerations in the development of the solution approach:

   o mathematically, even simple instances of the problem are NP-hard;

   o standard graph-theoretical methods of redistribution have problems with the balancing constraints; and

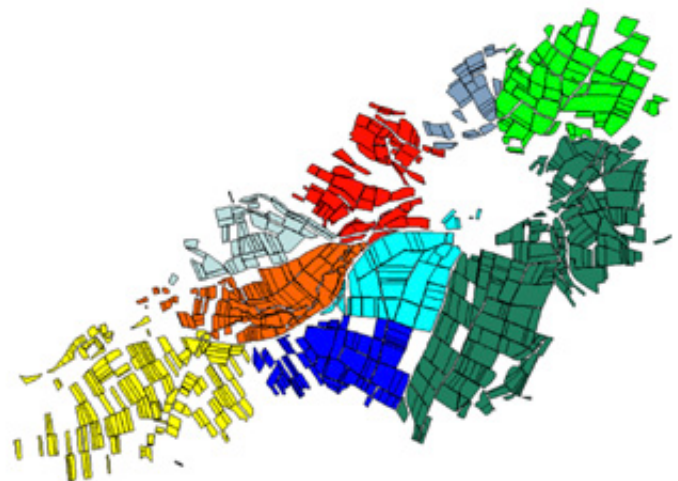   o proper visualisation and evaluation tools help greatly in getting acceptance for the solution.

Figure 2. An improved redistribution of lots for the agricultural region of Figure 1.

The solution approach evolved as follows:

1. Develop a new mathematical model that is capable of handling the task.

2. Prove that the model captures the concept of good clusterings by showing its intimate relation to feasible power diagrams. In fact, optimal clusterings are associated with certain cell-decompositions of space into polyhedra.

3. Develop efficient algorithms based on approximations of related clustering bodies by polyhedra. In particular, polynomial-time approximation algorithms with worst-case error bounds that are independent of the number of lots were given.

4. Implement the algorithms to run on a standard laptop (see Figure 2 for an optimal redistribution of the lots of Figure 1).

5. Develop a visualisation tool to allow the farmers to assess the quality of the generated solutions (see Figure 3).

6. With inputs from the *Bavarian State Institute for Agriculture,* develop a tool for the economic evaluation of the redistribution.

7. Build a tool for experimental manual redistribution, which the farmers can use themselves (see Figure 3). This was effective in convincing the farmers to release most of their lots for possible redistribution.

8. In co-operation with the *Bavarian Institute of Farmers and the Bavarian Forest Administration*, run several practical lend-lease exercises. This confirmed the potential for significant cost savings for Northern Bavaria.

9. Prepare appropriate tools for licensing of solution through a start up company.

Mathematical Model

The details of the mathematics are given in scientific publications (ref 1). Essentially, the aim is to try to move the centres of gravity of the clusters i.e., the centres of mass of the lots in each cluster, as far apart as possible. To achieve this, the problem is treated as a non-linear maximisation over a polytope (ref 2).

The model construction involves two norms, a norm $\| \cdot \|$ on $\mathbf{R}^d$ (where $d = 2$ for the consolidation of farmland) and some other norm $\| \cdot \|_\diamond$ on $\mathbf{R}^{k(k-1)/2}$ where k is the number of clusters (i.e. farmers). $\| \cdot \|_\diamond$ is required to be *monotone* i.e. $\|\mathbf{x}\|_\diamond \leq \|\mathbf{y}\|_\diamond$ whenever $\mathbf{x,y} \in \mathbf{R}^{k(k-1)/2}$ with $\mathbf{0} \leq \mathbf{x} \leq \mathbf{y}$.

The objective function then encodes the difference between any pair of centres of gravities $\mathbf{c}_i$ of the cluster and is of the form:

$$\max \left\| (\|\mathbf{c}_1 - \mathbf{c}_2\|, \|\mathbf{c}_1 - \mathbf{c}_3\|, \ldots, \|\mathbf{c}_k - 1 \cdot \mathbf{c}_k\|)^T \right\|_\diamond,$$

The balancing constraints then lead to linear equalities and inequalities.

Practical Issues

With the support of the *Bavarian Association of Farmers*, these tools helped moderate lend-lease actions in Northern Bavaria. They have been included in the curriculum of farmers' training and applied to various private forest regions.

Since the algorithms run on a laptop and yield solutions within a few seconds to half a minute for the problem sizes commonly
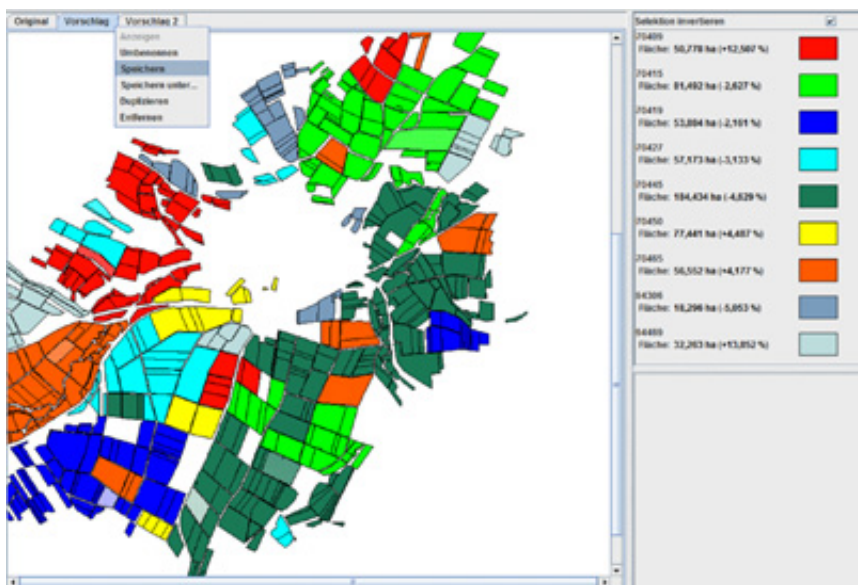

Figure 3. A manual tool for drag and drop redistribution and assessment.

encountered, farmers found them handy during workshops. Farmers were allowed to incorporate changes into the tools, based on their needs. Additional functionalities requested include a tool for economic evaluation that takes the specific structure of the region into account.

It was also necessary to complement the optimisation tool by a feature that can accept a farmer's input as a solution for redistribution (see Figure 3). This feature allowed farmers to explore possibilities, made them more familiar with the impact of redistribution, and increased their confidence in the self-determined and controlled character of the procedure. After overcoming initial apprehensions, the farmers gained confidence in the fairness of the method and appropriateness of the economic assessments. Hence, most of them put their lots in the 'shared pool', available for redistribution. Ludwig Geis, a farmer who participated in one of the first lend-lease procedures confirms that the consequences of the implementation are enormous, both economically and ecologically, in that the lower cost of cultivation came with less need for pesticides, a higher yield, and less `trouble among neighbours'. 🌍

References

1. Borgwardt, S., Brieden, A., and Gritzmann, P. (2014) Geometric clustering for the consolidation of farm- and woodland. Math Intelligencer (forthcoming paper).

2. Brieden, A. and Gritzmann, P. (2004). A quadratic optimization model for the consolidation of farmland by means of lend-lease agreements. Oper Research Proc 2003: selected papers of the International Conference on Operations Research (OR 2003), editors Ahr, D., Fabrion, R., Oswald,M. and Reinelt, G., Springer, Heidelberg pp 324-331.

...a farmer who participated in one of the first lend-lease procedures confirms that the consequences of the implementation are enormous, both economically and ecologically, in that the lower cost of cultivation came with less need for pesticides, a higher yield, and less `trouble among neighbours'.

Thanks to IFORS for the ELAVIO Experience!

Rafael Durbano Lobato <lobato@ime.usp.br>

The XVII ELAVIO (Latin American Summer School on Operations Research) was held in Valencia, Spain, from September 8 to 12, 2013. The conference venue was the Universitat Politècnica de València (UPV). Students were lodged at the nearby University Residence Ausias March (www.cm-ausiasmarch.com/). The research group ROGLE from the Operations Management Dept. of UPV (www.upv.es) organized the School. The event brought together students, professors and researchers from several countries. The scientific program was divided into 12 tutorials and 16 parallel sessions.

Covering advanced topics in Operations Research, tutorials were led by young and senior researchers alike. Ramón Alvarez-Valdés presented an introduction to bidimensional packing problems where he pointed out challenges and research opportunities. Marcus Ritt gave an informative talk on how to design and analyze heuristic algorithms. Rosiane de Freitas' tutorial covered models and algorithms for the optimization of channel assignment in wireless networks. Elena Fernández presented an introduction to arc routing problems, discussed difficulties in modeling problems of this type and showed applications.

Tutorials covered topics other than optimization and algorithms. Juan A. Marin-Garcia gave advice on how to find and select appropriate journals for our papers. Speaking on *Ethics and Operations Research,* Cristóbal Miralles discussed the existence and absence of ethical concerns in decision models. Robyn Moore presented an application on water reform for the community of Kapiti, New Zealand where a debate on water issues

had been going on for some years. She showed how the theory of constraints with a stakeholder typology helped the community to reach consensus on key factors of the water reform among dissimilar stakeholders.

In the parallel sessions, students had the chance to present their own research works. A 5-minute debate followed each presentation, when one could ask questions about the talk just delivered. In order to stimulate and encourage the debates, each student was assigned to give constructive comments and ask questions on an assigned presentation. I presented my work about the packing of ellipsoids and was responsible for commenting on the work of Luís Felipe Cunha on genome rearrangement by transpositions and transposition diameter.

Complementing the scientific program was a social program, which enabled the participants to get to know one another. At the end of the first day, a bike tour through the main sites of Valencia was a great first opportunity to meet others in an informal setting. The social program also included sport activities, dinner, and even a karaoke contest!

The XVII ELAVIO was nothing short of wonderful. It was a great opportunity for developing contact and exchanging information with the other participants. I have not only made friends, but also met potential research collaborators. I would like to thank IFORS for making it possible for me to attend ELAVIO this year, and the ELAVIO organizing committee, especially Cristóbal Miralles, for the hospitality lavished on the participants. 🌐

At the end of the first day, a bike tour through the main sites of Valencia was a great first opportunity to meet others in an informal setting.

ELAVIO: Innovations Keep Making It Better

Luciana Salete Buriol <buriol@inf.ufrgs.br>, **ALIO President**

ELAVIO 2013 was an enormous success. Credit goes to the Chair Cristóbal Miralles and his team, who left no stones unturned to produce a memorable School that achieved all its objectives, and more. The talks and tutorials were perfectly chosen, and provided an opportunity for students to learn more than the technical aspects. The talks covered classical optimization problems, such as scheduling, graph coloring, arc routing, packing, location, stochastic and analytic hierarchy processes. A discussion about a methodology for the design and analysis of heuristics, as well as for problem solving, were presented. Finally, it was an innovative idea to include a talk about scientific publications.

Interaction and networking among students were as carefully planned. After the last session of the first day, groups of 10 people rode on their bikes for a 3-hour guided tour, all meeting up in a nice picnic area for dinner. The students, organized in groups, also prepared numbers for the culminating dinner. They composed

▲ Shining through: the exuberance and dynamism of everyone involved in ELAVIO 2013.

and sang songs, many of which were summer hits bearing new lyrics, with such words as "maximize", "optimize", and others. Indeed, the school brimmed with creativity both in the technical and the fun aspects! 🌐

IFORS Announces Search for A Scholar
to the ALIO Summer School (ELAVIO 2014)

IFORS is pleased to announce that it is sponsoring a scholar to the ELAVIO.

Under the auspices of the Latin American Association of Operations Research Societies (ALIO), the XVIII ELAVIO Summer School will be held in PARAIBA (BRASIL) from February 14 to 21, 2014. It is sponsored by CNPQ (Brazil), CAPES (Brazil) and FAPESQ (Fundação de Apoio à Pesquisa do Estado da Paraíba), ALIO, and the International Federation of Operational Research Societies (IFORS). The XVII School will be organized by Centro de Informatics, University Federal da Paraíba and as in the past, will include mini-courses, tutorials, discussion panels, and conferences on advanced topics of research interest. The participants will have the opportunity of presenting their work in the areas of: combinatorial optimization, multicriteria optimization, heuristics, metaheuristics, mathematical programming, and algorithms.

Additional information may be found at: www.ci.ufpb.br/eventos/elavio2014

IFORS will cover the participant's airfare from his/her country (subject to a maximum limit) while ELAVIO organizers will provide living expenses during the school.

To be considered, the applicant must:

• have done work in any of these topics: Optimization, Multiobjective and multicriteria, Heuristics and Metaheuristics, Mathematical Programming, Fuzzy Logic, Decision Support Systems, Artificial Intelligence, Simulation, Networks, Logistics;
• be at the early stage of his/her career;
• be able to present his/her unpublished work and answer questions in English;
• be highly recommended by the adviser/supervisor of the work;
• agree to submit a report on the outcome of the activity and its benefits.

Those satisfying the above requirements are enjoined to submit the following:
• curriculum vitae
• a two-page abstract of his/her work to be presented, and
• a recommendation by his/her adviser

to: IFORS Vice President for ALIO Lorena Pradenas, lpradena@udec.cl

Please note that candidates from developing countries will have an advantage in the selection.
Important dates:
Last day of submitting requirements: December 20, 2013
Notification of selected candidate: January 10, 2014

Operational Research Stream: Better and Bigger at the 8th Annual Kiev Summer School

Bohdan Pukalskyi <bogdanpukalskyy@gmail.com>, **Sandra Yaremchuk** <sandra.yaremchuk@gmail.com>
Kate Pereverza <pereverza.kate@gmail.com>, **Gerhard-Wilhelm Weber** <gweber@metu.edu.tr>

The 8th annual summer school *"Achievements and Applications of Contemporary Informatics Mathematics and Physics"* http://summerschool.ssa.org.ua/ organized by volunteers from Student Science Association of National Technical University of Ukraine took place from August 1 to 17 this year. Participating were 73 students from 20 countries and 28 tutors in courses that were divided into 3 streams: *Operational Research, Neuroscience and Applied Computer Science.*

Benefiting from the lessons of the past, the 2013 Operational Research stream evolved into the strongest part of program. The program included various topics on the application of OR for financial markets, logistics, supply chain and other fundamental areas. This year also saw most of the courses including hands on sessions.

The stream was opened by *Financial Mathematics and Related Topics in Economics and Development* course delivered by Gerhard-Wilhelm Weber from Middle East University (Ankara, Turkey). The close contact and constant interaction between the teacher and students helped the students explore the complexities of the topic.

Erik Kropat from Bundeswehr University (Munich, Germany) skillfully handled his course on *Decision Support for Crisis and Disaster Operations* by complementing the lecture part with several exercises that the students solved in class. Real-world problems of product designers were analyzed and their solutions discussed in *Multi-Response Optimization Approaches and their Applications in Parameter Design for Robust Products* handled by Gülser Koksal from Middle East University (Ankara, Turkey). Exercises using Minitab were included in the course.

Linear programming: Theory and Applications delivered by Ivan Arzhantsev from Lomonosov Moscow State University (Moscow, Russia) tackled basic linear optimization problems. *Anticipation: Phenomenon, Modeling, and Occurrence in Operational Research* was delivered by Alexander Makarenko from National Technical University of Ukraine "Kyiv Polytechnic Institute" (Kyiv, Ukraine). Yoshio Matsuki from the same university explained the mathematical models behind modern portfolio theory in *Portfolio Investment Theory and Market Data Analysis*. Introduction to Lean Manufacturing by Francisco Jose Ferriols Martinez from Catholic University of Valencia (Valencia, Spain) explained ways to improve productivity of manufacturing companies. Advanced logistics systems was the topic of *Mathematical Programming Modeling for Supply Chain Management* handled by David Perez Peralez from Polytechnic University of Valencia (Valencia, Spain). Advanced mathematical approaches to financial investment were analysed by Oleksii Mostovyi from University of Texas (Austin, USA) in *Optimal Investment in Incomplete Markets*.

Dmytro Matsypura from the University of Sydney (Sydney, Australia) presented the modeling aspects of classical network flow models in the *Network Flow Programming: Models and Applications*. Finally, applications of stochastic processes were described in *Lévy Processes* by Illia Simonov from University of Leoben (Leoben, Austria).

Getting together for the plenary lectures with participants of the other two streams allowed researchers to get together and exchange ideas, finding links between the disciplines and encouraging openness to interesting new solutions. The diverse cultural backgrounds – e.g., tutors and students from Germany, Pakistan, France, Russia, USA, Australia, Poland, and Spain - further enhanced learning and social experience for the participants.

Participants had these to say:
"I had a unique opportunity of meeting a wide range of people from all over the world with whom I shared many academic and social ideas and events.

▲ Gerhard-Wilhelm Weber presents the OR stream.

On top of the quality of the participants who attended the organization to broaden their mathematical perspectives like me, the instructors were also from reputable universities of the world, who made the classes more attractive and enjoyable. I will benefit from what I've learned in the classes, and will be in touch with the instructors for potential future academic work. My friends were so motivated and driven, which kept me challenged in a very positive way." - shares Burcu Aydoğan from Turkey.

"The close interaction among the participants was most valuable, and I found it inspiring to share and discuss ideas with others. In fact, these discussions would often continue during tea and coffee breaks." - from Jeremy Goldstein of the USA.

The Summer School has thus proved for the eighth time that concentrated work of student volunteers could result in an educational activity that people from around the world will find worthwhile! 🌍

Account of a First Timer in A Kiev Summer School

David Pérez Perales <dapepe@omp.upv.es>, **Gerhard-Wilhelm Weber** <gweber@metu.edu.tr>

VIII Summer School AACIMP 2013 participants: all eager to learn from one another.

Again, as in the previous seven editions, the ancient city of *Kiev* hosted the *VIII Summer School organized by Student Science Association and the National Technical University of Ukraine.*

As in the past, the Summer School welcomed students from all academic backgrounds and degrees (Bachelor's, Master's or PhD, young scientists under 35 and professionals) with all courses taught in English.

Highly qualified lecturers and scientists from Ukraine, Germany, Turkey, Spain, the Netherlands, Belgium, Sweden, Poland, Russia and other countries employed a variety of teaching methods and techniques - lectures, workshops, round tables and presentations - which were all effective.

Joining the Summer School for the first time, *David Pérez Perales* decided to experience the event fully, both as a student and a lecturer. As a student, David had 5 hours of daily classes with 10-minute breaks in between for coffee. This was an opportunity to get to meet those who were not at the *OR* stream. The mid-day break to have lunch in a typical Ukrainian restaurant is longer, with delicious food and great company.

David the student, understood some courses very well and didn't quite get some others, owing to the wide range of subjects covered in the OR stream. The wide range, too, in the backgrounds and ages of the participants did not get in the way of learning and sharing. Some

▲ **David Pérez Perales gives a "Spanish toast" at the Welcome Reception.**

May this account inspire the youth to link up with their national OR societies and engage in similar activities.

students taught classmates who needed assistance.

David the instructor, taught a 5-hour course on *Mathematical Programming for Supply Chain Management*. Since this was scheduled one week after he had been attending classes as a student, David was able to revise some of his materials to fit the backgrounds and expectations of his classmates for the past week.

Each day's educational program finished at 6:00 in the afternoon, signaling the start of such exciting leisure activities as excursions to the historical places of the old city of Kyiv, debates and quest, cinema club, soccer matches and parties. These activities really helped to strengthen the multicultural understanding and links among all the participants.
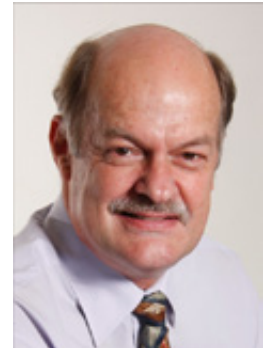
David the tourist enjoyed the boat city tour during one of the last days. Apart from the views (orthodox churches, landscapes, beaches…), songs from all over the world sung during the trip opened to him vast vistas. An unforgettable Summer School, it greatly contributed to the dissemination of OR knowledge among the youth in a fun and vibrant atmosphere.

May this account inspire the youth to link up with their national OR societies and engage in similar activities. The whole OR community of IFORS and EURO can surely be counted on! 🌍

Book Review

A Great Choice for the Growing Analytics Audience

Hans Ittmann <hittmann01@gmail.com>

In the current state where: data captured from the Internet or social media alone has been unprecedented in volume and quality; improvements in analytic tools and methodologies have never grown as fast; and exponential increase in computing power has enabled the upsurge in the use of analytical approaches in businesses, it is not surprising to find a slew of publications and textbooks on the topic. Essentials of Business Analytics, with its target market of undergraduate and graduate students, is a good companion for anyone aspiring to venture into this field. The very first paragraph in the book which goes: *"You apply for a loan for the first time. How does the bank assess the riskiness of the loan it might make to you? How does Amazon.com know which books and other products to recommend to you when you log into their Web site? How do airlines determine what prices to quote to you when you are shopping for a plane ticket? How can doctors better diagnose and treat you when you are ill or injured?"* introduces the rest of the book and the way to decision making that is data-driven and powered by analytical approaches.

Chapter 1 establishes the context for the entire book, defining business analytics as the *"the scientific process of transforming data into insight for making better decisions"* and its utility as *"for data-driven or fact-based decision making which is often seen as more objective than other alternatives for decision making".* The three broad categories of techniques that comprise analytics, namely: descriptive, predictive and prescriptive are defined and described in sufficient detail. Big data is briefly outlined and a couple of pages explain how business analytics works in practice. This introductory chapter is critical to the understanding of the rest of the topics.

The next eleven chapters cover methodologies which belong to categories as follows: **Descriptive** Statistics (Chapter 2), Data Visualisation (Chapter 3), Linear Regression (Chapter 4), Data Mining (Chapter 6) and Spreadsheet Models (Chapter 7) **Predictive** Linear Regression (Chapter 4), Time Series Analysis & Forecasting (Chapter 5), Data Mining (Chapter 6) and Monte Carlo Simulation (Chapter 11) **Prescriptive** Linear Optimization Models (Chapter 8), Integer Linear Optimization Models

All the above chapters start with a short "analytics in action" or a case study that uses the methodology presented in the chapter. It is effective in capturing the interest of the reader who is presented the practical use of the methodology before going into the theory. Each chapter also features the use of Excel in handling, managing, and analysing data. Along with the step by step process are explanations of various Excel functionalities. Proper data management and dealing with large amounts of data on a daily basis call for a knowledge of the basic tools that can get the work done efficiently. Thus, even "data scientists" who are not familiar with Excel could benefit hugely from this textbook.

The basics of the topic covered by each chapter is presented clearly and comprehensively. For example in Chapter 2 Descriptive Statistics, the content covers: overview of using data; the types of data; how to modify data in Excel; creating distributions from data; measures of location; measures of variability; analysing distributions and measures of association between two variables.

The book includes a discussion of two very powerful Excel add-ins, the Analytics Solver Platform and XLMiner. This allows for familiarisation with analytic tools in optimization and simulation while XLMiner provides tools for data visualisation and exploration. With this, the authors clearly communicate the importance of data management starting from checking data integrity and understanding the data. Other additional valuable features throughout the book include two appendices on (i) the basics of Excel and (ii) Data Management and Microsoft Access.

All seven authors of the book are seasoned educators with impressive track records. They include proven materials from classic textbooks they have written. The logical flow of material makes the book easy to understand, follow and read. It is a complete material for students and a comprehensive book for practitioners who want to keep up with developments in analytics. 🌍

> **In the current state where: data captured from the Internet or social media alone has been unprecedented in volume and quality; improvements in analytic tools and methodologies have never grown as fast; and exponential increase in computing power has enabled the upsurge in the use of analytical approaches in businesses, it is not surprising to find a slew of publications and textbooks on the topic.**

Political Decision Making Processes in China and OR Support

Ulrike Reisach <Ulrike.Reisach@hs-neu-ulm.de>
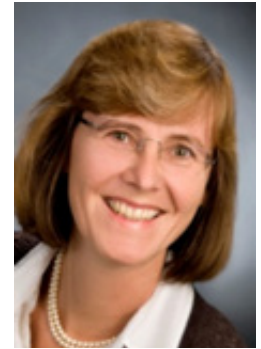
Preface

In his preface for the newly launched Journal of the Operations Research Society of China (ORSC), Yuan says: "Problems and difficulties crop up in optimization and decision making when we try to do dynamic reformations… In solution of the complicated problems, traditional theories and methodologies of operations research and management science prove to be less useful. We have to find way out. We need to better understand the backgrounds and nature of the intrinsic system. We endeavor to develop new theories, methodologies and modeling approaches ". This article explains the political decision making processes in China, which differ from those in the West, and gives initial hints on how OR methodologies and approaches could be used to foster a sustainable development path, long-term thinking and planning.

The most powerful institution within China's political decision process is the State Council, dominated by the Chinese Communist Party (CCP). It "exercises unified leadership over local state administrative organs at various levels throughout the country, regulates the specific division of power and functions of the state administrative organs at the central level and the provincial, autonomous regional and municipal level" (CIIC).

In the tradition of Communist Central Planning, China uses Five-Year Plans as an instrument for political guidance. After 20 years of high growth (rates of 10-17% p.a.), the economy has reached the decade of optimization and sustainability. The current 12th Five-Year-Plan for 2011 to 2015 focuses on economic restructuring with environmental and social goals playing a major role. The government no longer plans production volumes and economic aggregates but gives companies of non-strategic sectors far-reaching freedom to decide how to act on the markets (Reisach 2007:pp.209). As a consequence, most OR scientists in China are now engaged in the optimization of corporate processes. However, there is still room for OR in complex political decision processes.

even when formulations sound unfamiliar and vague for Westerners.

The decision process is better understood by referring to Chinese history, thinking styles and culture. Von Senger refers to the ancient military tradition of "Moulüe", "supraplanning", which goes beyond Western strategic planning level, and has very long time dimensions (von Senger 2009:2, 2013:66). This view is supported by the official political thinking that China is in the primary stage of socialism and will remain so for a long time, for more than a hundred years.

For decision-making, China uses a complex method of **gathering opinions** and **experimentation.**

Political top leaders, as a kind of basic research and visible representation of their proximity to ordinary citizens, conduct annual field trips and inspections across the nation to **gather insights and opinions**. But it has to be considered that in the presence of authorities, normal citizens might not say what they really think. Therefore, more insights can be gained if their opinion is gathered by people they trust and who know how to interpret, formulate and channel those views to the decision makers.

One of the important institutions in the opinion gathering and channeling for internal policies is the Chinese People's Political Consultative Conference (CPPCC). Its significance has been widely underestimated in American research on Chinese political decision making processes since those studies mainly focus on military and foreign affairs issues (see Cabestan, Dumbaugh and Martin, Sun). CPPCC is "an important institution of multi-party cooperation and political consultation under the leadership of the Communist Party of China, a major form for carrying forward socialist democracy in the political life of the country" (NC CPPCC).

The Political and Administrative System of the PR China
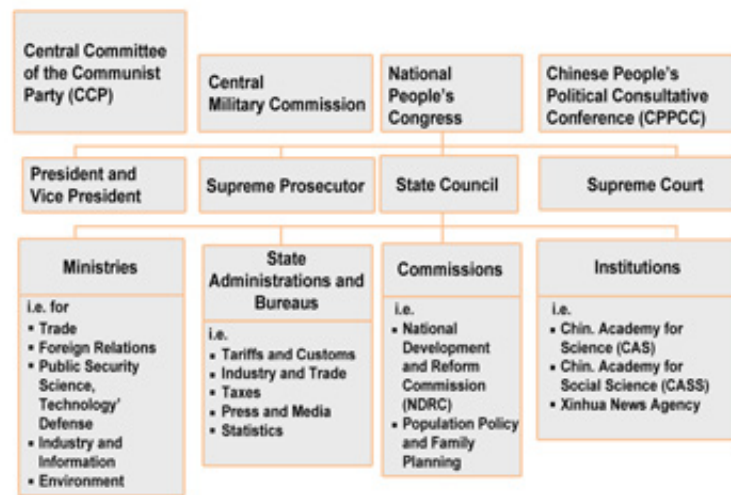
and source: Reisach, U., updated from Reisach et al.: China - Wirtschaftspartner zwischen Wunsch und Wirklichkeit, 4th. ed. Heidelberg 2007, p. 204

For significant decision-making, the CCP often starts a first initiative through its powerful party schools where every high ranking official has to undergo regular training. But contrary to common assumptions in the West, decision making does not take place in an authoritarian way, but in a rather complex process of consensus building and collective decision making (Dumbaugh and Martin:2, Sun:9,26).

This helps to "maintain social order through a harmony-within-hierarchy arrangement" (Martinsons: 8). The more important the issue, the broader the discussion (Sun: 6). This also explains why the right wording, i.e., "non-state" sector instead of "private" sector, plays a major role in gaining consensus, and why progress can be reached

The CPPCC is pooling "wisdom from various sources" in order to "accelerate the process of putting major state decision-making on a more scientific and democratic basis" (NC CPPCC, Art. 2). Its members are tasked with "proactively offering constructive opinions to leading organs of the Party and government", they are invited to "free airing of views" (NC CPPCC, Art. 5). They collect opinions, suggestions and channel these back to the official discussion process. In Western terms, this method could be interpreted as a kind of indirect stakeholder research. It follows the tradition of holistic thinking in Chinese culture which connects different factors and perspectives (Reisach et al. 2007: pp.344).

Mao Zedong's picture at the entrance gate of the former emperor's palace in Beijing

Even decisions which sound like contradictions in Western ears, such as "the decisive role of the market", combined with the "leading role of state owned enterprises", as communicated in the Communist Party Committees reforms decision of November 9-12, 2013, are quite typical for yin-yang thinking and progress through overcoming antipodes in communism.

Experimentation is another important feature of China's decision-making. Chinese like to see new things work in practice and rely on their experience rather than on theories (Norenzayan et al.: pp. 653-684; Reisach et al. 2007:pp.197). They consider the context of every decision to be taken and see their development as unique. In order to avoid bigger risks, new models are implemented only after the successful completion of pilot projects in selected sectors and locations. Since there is no reliable information on contextual facts and future development available (Volz and Gigerenzer :1), it makes sense to apply this kind of strategy as a "learning by doing" tool.

This method has been successfully used in trade liberalization and will again be used to further open up the capital market, start up and innovation financing, as announced mid 2013 for the new free trade zone to be established in Pudong, Shanghai. At the same time, China does not depend on one nation, partner or technology but always keeps alternative paths open. On going projects with different partners (Reisach et al. 2007:pp.91) and under various circumstances help decision makers develop an adaptive toolbox of heuristics and make decisions based on ecological rationality (Reisach 2008:110; Volz and Gigerenzer:2, Gigerenzer and Gaissmaier: 457).

Decisions under uncertainty and lack of reliable data

The decision processes explained above are typical for decisions under uncertainty. Framework conditions in China are complex and rapidly changing. Assumptions would be based on aggregated data from provincial and local authorities, which might not always reflect reality. The successful adherence to predefined performance goals is linked to promotion of the reporting bodies. Therefore officials involved are inclined to report (over) fulfillment of duties rather than deficiencies (Reisach et al. 2007:39, Sun:23). This reinforces the common pattern in Chinese culture that knowledge transferred through a trustworthy person is more reliable than information in official documents (Reisach et al.: pp. 369).

Governmental think tanks such as the Chinese Academy of Sciences (CAS) and the Chinese Academy of Social Sciences (CASS) as well as semi-government think tanks, professional scholars and experts provide suggestions and policy consultancy in their research and

reports. But during several rounds of screening and review at the party committees and senior leader's offices, their precious findings and recommendations sometimes do not get the deserved attention. Sun (15) quotes the representative of a prominent Chinese think tank: "I am a producer of information. The senior leaders are my customers, and their written comments/instructions are the purpose of my existence." With this deep deference to superiors (Reisach et al. 2007:pp. 352, pp. 404), researchers will rarely come up with innovative ideas. This is where independent research institutions and agencies, independent funding and/or a cooperation of local institutions with international partners could strengthen the quality of data and the impact of their research.

Implementation of political decisions: Current status and suggestions

In most fields, China has well-formulated laws and a sufficient (sometimes very high) number of regulations in place. But they are weakly monitored or reinforced (Wacker and Kaiser: 14). Due to the lack of independent NGOs, failures are seldom brought to light. Governmental agencies and local administrations draft documents rather than launch initiatives or investigations. They often suffer from lack of personnel (Wacker and Kaiser: 14) and desperately need backing from local authorities if they want plans implemented successfully. The OECD therefore suggests better coordination of national, provincial and local authorities to implement planned policies (OECD:85). Additionally, openness and credibility of reports could be encouraged through incentivizing a critical review of data and initiatives instead of mere plan fulfillment. When problems, such as air and water pollution that bring immediate health consequences become public, public demands intensify and are multiplied through social media. Therefore, decision making needs an increasingly cautious and scientific approach to avoid mistakes (Lü).

> **OR instruments ...are mainly applied for business and technical optimization. But OR offers a broad variety of approaches like MCDA, project management and scheduling, OR and Ethics, OR for Development, OR and Methods of Societal Complexity which can support political decision making, problem structuring and process optimization.**

OR instruments are known in China since the early sixties, when mathematical methods were applied to production and quantitative planning problems. Today, they are mainly applied for business and technical optimization. But OR offers a broad variety of approaches like MCDA, project management and scheduling, OR and Ethics, OR for Development, OR and Methods of Societal Complexity which can support political decision making, problem structuring and process optimization. The CASS already studied methods of societal complexity research like the Compram model (DeTombe) in the 90s. A broader stakeholder dialogue and active involvement in the process of problem structuring and gathering of ideas might improve learning effects and outcomes. It would make people aware that good citizenship is not only dutiful obedience to rules and orders from above, but rather a collective and effective effort in the process of problem definition and change which is essential for their long-term societal wellbeing. Qualitative methods, aiming at large and uncertain societal developments, should be adapted to Chinese culture (thinking patterns, communication and leadership style, problem-solving strategies, values) and local circumstances. Colleagues from ORSC are welcome to further discuss such issues in the session "Intercultural Aspects of OR" in the forthcoming IFORS Conference in Barcelona. 🌐

Bibliography
Cabestan, J-P: China's foreign- and security-policy decision-making processes under Hu Jintao, Jour-nal of current Chinese affairs, Vol 38, No 3 (2009), URL: http://journals.sub.uni-hamburg.de/giga/jcca/article/view/61, date of inquiry: Nov. 11th, 2013
China Internet Information Center (CIIC 2012): China's Political System. Central Administrative Sys-tem, URL: http://www.china.org.cn/english/MATERIAL/28847.htm, date of inquiry: Nov. 11th, 2013

China Internet Information Center (CIC 2013): Report on China's economic and social development plan, March 18, 2013, URL: http://china.org.cn/china/NPC_CPPCC_2013/2013-13-3/18/content, date of inquiry: Nov. 11th, 2013

Chinese People's Political Consultative Conference (CPPCC): History and regulations, URL: http://www.cppcc.gov.cn/zxww/2012/07/03/ARTI1341301655671103.shtml, date of inquiry: Nov 10th, 2013

DeTombe, DJ (2002) Complex societal problems in operational research. Eur J Oper Res 140: 232-249

Dumbaugh, K and Martin, M F (2009) Understanding China's Political System, Congressional research Service, Washington D.C., December 31, 2009

Gigerenzer, G and Gaissmaier, W (2011): Heuristic decision making, Ann. Rev. Psychol. 62: 451-482

Lü Xiaobo: Efficient decision-making key to China model, Global Times June 07, 2012, URL: http://www.globaltimes.cn/NEWS/tabid/99/ID/713675/Efficient-decision-making-key-to-China-model.aspx, date of inquiry: Nov. 11th, 2013

Martinsons, M G Comparing the decision styles of American, Japanese and Chinese business leaders, Eight Investment Partners Asia, URL: http://www.8ip.asia/wp-content/uploads/2013/05/Comparing-the-Decision-Styles-of-American-Japanese-and-Chinese-Business-Leaders.pdf, date of inquiry: Nov. 11th, 2013

Norenzayan A, Smith, EE, Beom, JK, Nisbett, RE. (Norenzayan et al 2002): Cultural preferences for formal versus intuitive reasoning, in: Cognitive Science 26, Elsevier Organization for Economic Cooperation and Development (OECD), Urbanisation and Green Growth in China, OECD Regional Development Working Papers, 2013/07, OECD Publishing, URL: http://www.oecd-ili-brary.org/docserver/download/5k49dv68n7jf.pdf?expires=1384436443&id=id&accname=guest&checksum=E01D7D1D46467274495BEBA597DA4201, date of inquiry: Nov. 11th, 2013

Reisach, U (2008) Kulturelle Unterschiede im Umgang mit Wissen – Beispiele aus der Wirtschaftspra-xis in Deutschland, China und den USA (Cultural differences in dealing with knowledge. Business examples from Germany, China and the USA), in: Gronau, N, Umgang mit Wissen im interkulturellen Vergleich (Dealing with knowledge, interculturally compared), Academy for Technical Sciences, acatech diskutiert, vol. 2: Wissensmanagement (Knowledge management),

Potsdam:97-125

Reisach, U, Tauber, T, Yuan, X (Reisach et al. 2007): China - Wirtschaftspartner zwischen Wunsch und Wirklichkeit (China – Business Partner between Wish and Reality). 4th ed., Redline Wirtschaft, Hei-delberg

Sun, Y (2013) Chinese national security decision-making: processes and challenges, The Brookings Institution, Center for Northeast Asian Policy Studies, CNAPS visiting fellow working paper, Washing-ton D.C. May 2013, URL: http://www.brookings.edu/research/papers/2013/05/chinese-national-security-decision-making-sun, date of inquiry: Nov. 14th, 2013

The National Committee of the Chinese People's Political Consultative Conference (NC CPPCC): CPPCC Charter, URL: http://www.cppcc.gov.cn/zxww/2012/07/03/ARTI1341300912828101.shtml, date of inquiry: Nov. 11th, 2013

Volz, KG and Gigerenzer, G (2012): Cognitive processes in decisions under risk are not the same as in decisions under uncertainty, Frontiers in neuroscience, Vol. 6, Article 106.

Von Senger, H (2009) Moulüe – Supraplanning. An unknown Chinese planning concept besides the game theory, special edition of the Albert-Ludwigs-University Freiburg, original version published in The Bridge 20 (2009), S. 49-51, URL: http://www.freidok.uni-freiburg.de/volltexte/7173/pdf/Senger_Mouluee_supraplanning.pdf, date of inquiry: Nov. 11th, 2013

Von Senger, H (2013): Die Klaviatur der 36 Strategeme (The claviature of the 36 strategems), Hanser, Munich

Wacker, G and Kaiser M (2008) Nachhaltigkeit auf chinesische Art (Sustainability the Chinese way), SWP Berlin, URL: http://www.ssoar.info/ssoar/bitstream/handle/document/24887/ssoar-2008-kaiser_et_al nachhaltig-keit_auf_chinesische_art.pdf?sequence=1, date of inquiry: Nov 14th, 2013

Yuan, YX (2013) Preface to the Journal of the Operations Research Society of China, JORC (2013) 1:1–2, DOI 10.1007/s40305-013-0011-1.

Ulrike Reisach, Information Management Faculty, Neu-Ulm University of Applied Sciences
www.hs-neu-ulm.de/en/ulrike-reisach; www.ulrike-reisach.eu/en

TUTORIAL

Optimization and Data Analysis Algorithms in Biomedicine

Panos Pardalos <pardalos@ise.ufl.edu>

Introduction. Biomedicine is a field that has profited greatly from advances in engineering and analytics tools such as optimization and data analysis algorithms. In the last few years, interdisciplinary efforts of scientists from diverse fields such as medicine, engineering, operations research and statistics have resulted in significant scientific medical achievements such as production and analysis of genome data, new drugs, and modern medical devices such as fMRI tomography, laser surgery, and brain-machine interfaces.

Network optimization has been used in studying brain dynamics, maximum clique algorithms for drug design, optimization algorithms to define cancer treatment by radiation, and data mining algorithms to discover biomarkers. These are but a few instances of biomedical sciences and operations research working together, bringing forth the new disciplines of Bioinformatics and Medical Informatics.

This report briefly describes our recent work on Raman spectroscopy and data mining for cancer research and network tools in studying the Parkinson brain. More details can be found in the references cited.

Raman spectroscopy and cancer research. Recent advances in Raman spectroscopy have attracted interest in biomedical applications of the technology, particularly in the field of oncology. Raman spectroscopy has demonstrated the potential to significantly aid in the research, diagnosis and treatment of various cancers. Raman spectroscopic analysis of biological specimens is advantageous as it provides a spectral fingerprint rich in molecular compositional information without disrupting the biological environment, thus allowing in-situ biochemical observations. The focus of this research is to develop a robust data analysis framework for evaluating and characterizing five commonly used breast cell lines for therapy development and breast cancer research. The framework must be able to classify cell types based on cell-line specific spectral features, which may ultimately allow for the potential discovery of Raman-based spectral biomarkers for identifying cancer and tumor sub-types.

Data Collection. Raman spectra of five breast cell lines MCF7, BT474, MDA-MB-231 (cancer cell lines) and MCF10A, MCF12A (non-cancer cell lines) are collected by Renishaw 2000 InVia Spectrometer System coupled to a Leica Microscope with a 63x water-immersion objective (N.A. 0.90). 25-40 spectra were collected from each cell line and the average spectra for all the cell lines are shown in Fig. 1.
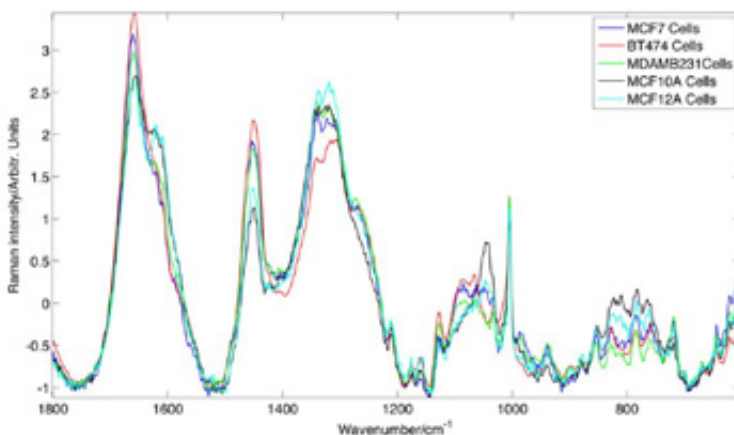

Figure 1: The average spectra of all five cell lines

Fisher-based Feature Selection consists of:

1. Peak Finding In addition to building a classification model for the identification of cell lines, it is also important to understand and analyze the biological relevance of the selected features that contribute most significantly to the classification. Generally, in a Raman spectrum, most wavenumbers correspond to peaks that are assigned to molecular vibrational modes and represent biologically relevant molecular species. Hence, prior to ranking the features, the features are selected by considering the peaks of the average spectrum in each cell line. The set of peaks S for a specific cell line is defined as local maxima given by:

$$S = \{x \mid f(x^*) \geq f(x) \forall x \in N_\varepsilon(x^*)\},$$

where x^* represents the peak location, $f(x^*)$ is the corresponding intensity value of the average spectrum and N_ε represents an ε-neighborhood around x^*.

2. Peak Coalescing. Peaks corresponding to the same biomolecular bonds may still be reported with slightly varying wavenumbers when comparing different biological samples. To account for this variance and therefore create a common wavenumber reference vector for feature selection and classification tasks, peak coalescing using hierarchical clustering is used. The peak locations from different cell lines are clustered depending on their inter-distance values, while number of clusters is chosen such that the total variance of all clusters is below a given threshold. In particular, the number of clusters N_c is defined as:

$$N_c = \min\{c \mid \sum_{i=1}^{c} s_i < \lambda_{th}\}$$

where,

$$s_i = \sum_{j \in C_i} (x_{ij} - \mu_i)^2$$

C_i represents the cluster i, μ_i and s_i are the mean and variance of cluster i, x_{ij} is the peak j assigned to cluster i and λ_{th} is a pre-defined variance threshold.

3. Feature Ranking. After obtaining a common wavenumber reference vector from peak-finding and peak-coalescing, the features are ranked based on Fisher Criterion. For a given feature i, the fisher score is defined as:

$$J_i = \frac{(\mu_1^i - \mu_2^i)^2}{\frac{(s_1^i)^2}{(n_1)} + \frac{(s_2^i)^2}{(n_2)}} , \forall i \in S$$

where, μ_j^i, $(s_j^i)^2$ and n_j are the sample mean, variance and the number of data samples in class j and S is the set of selected peaks. Intuitively, a Fisher score would be high for a feature having high mean inter-class separation while the total within-class variance is small. Hence, features with high Fisher scores are included among the maximally discriminating features.

4. Classification. The datasets formed from features obtained from FFS are used to train a classification algorithm. One of the popular binary classification techniques called C-Support Vector Machines (C-SVMs) is employed on features thus obtained from FFS to classify different cell lines. SVMs are primarily linear classifiers that perform binary classification by constructing a maximum margin hyperplane between the two classes of data. C-SVMs are extended to multiclass classification by incorporating hierarchical clustering. The pairwise distance matrix between the average spectra of cell lines are first computed and an agglomerative hierarchical cluster tree is generated from the distance matrix. A dendrogram plot of the binary cluster tree is shown in Fig. 2. This has produced the expected results where the largest difference occurs between the group of cancer cells and the group of non-cancer cells. Based on Fig. 2, a classification framework is constructed from four binary classification tasks: Cancer versus Non-Cancer, MCF7 versus rest-of-cancer, MDA-MB231 versus BT474 and MCF10A versus MCF12A. This classification framework reduces the computational complexity by building four cytologically relevant binary classification models for determining class membership.
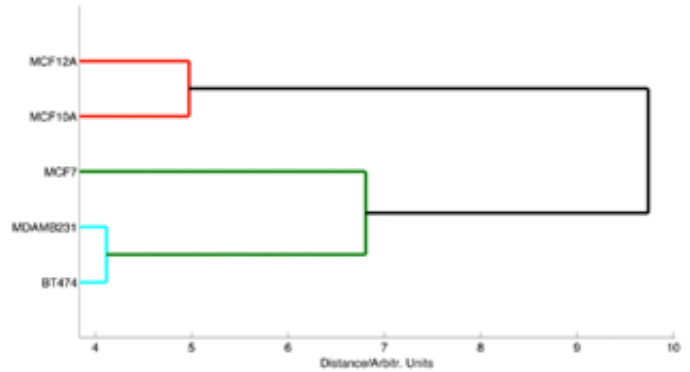

Figure 2 shows similarity in the mean spectra of the five cell lines. The dendrogram is constructed by performing hierarchical clustering on mean spectra of five cell lines. The spectral dissimilarity (increasing from left to right) is shown on the abscissa.

Numerical Results. Table 1 presents the results obtained from our FFS-SVM classification framework when applied to our training datasets. The classification accuracies along with specificity, sensitivity and the number of extracted features for the four binary classification tasks are shown in Table 1. Results show that the FFS-SVM framework, combining feature selection with C-SVM, yields highly accurate classification of the cell types.

Classification Task	Extracted features	Accuracy (%)	Sensitivity (%)	Specificity (%)
Cancer Vs. Non-Cancer	38	99.5	99.8	98.6
MCF7 Vs. Rest-Cancer	32	99.3	96.6	100
BT474 Vs. MDA-MB231	42	97.4	91.7	100
MCF10A Vs. MCF12A	42	91	97.1	62

Table 1: Sensitivity, Specificity and average classification accuracy for the four binary classification tasks obtained from C-SVM and validated using random sub-sampling (100 repetitions).

Other areas- Brain networks. Network modeling can be a powerful tool to study complex systems. In particular, we utilize statistically dependent neural activity patterns in distinct brain region. In our research we considered brain networks where the nodes represent brain regions and the edges represent functional interactions. In one of our studies we considered the Parkinson brain (fMRI data) where the connectivity networks are based on wavelet correlations.

Based on a measure of global efficiency, we have found that individuals with Parkinson's disease had a marked decrease in nodal and global efficiency compared to healthy age-matched controls. This study suggests that algorithmic approach and graph features might be used to identify and track neurodegenerative diseases. 🌐
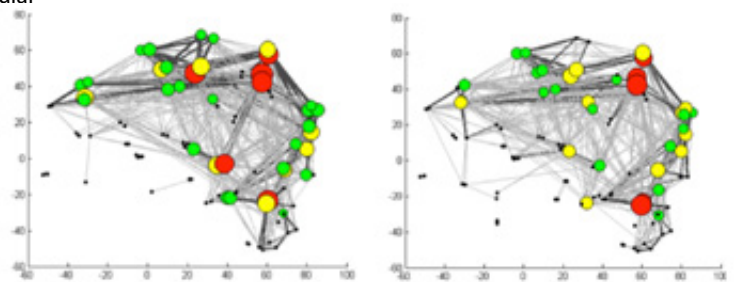

Figure 3: Weighted brain networks of healthy individuals and individuals with Parkinson's disease
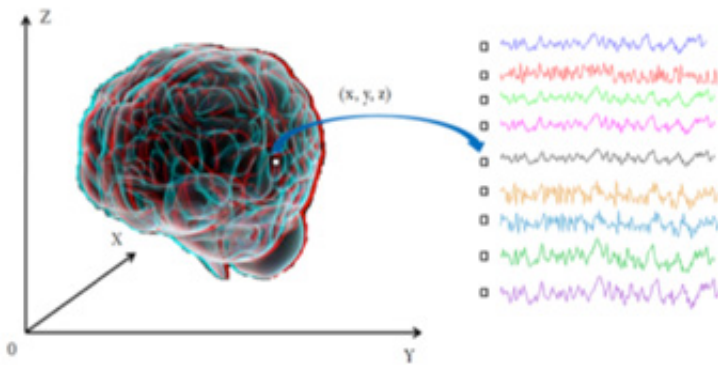
Figure 4: Brain activity recorded as a time series

References:
Pyrgiotakis, G., Kundakcioglu, O. E., Finton, K., Pardalos, P. M., Powers, K., & Moudgil, B. M. (2009). Cell death discrimination with Raman spectroscopy and support vector machines. Annals of biomedical engineering, 37 (7), 1464-1473.

Pyrgiotakis, G., Kundakcioglu, O. E., Pardalos, P. M., & Moudgil, B. M. (2011). Raman spectroscopy and support vector machines for quick toxicological evaluation of titania nanoparticles. Journal of Raman Spectroscopy, 42 (6), 1222-1231.

Fenn, M. B., Xanthopoulos, P., Pyrgiotakis, G., Grobmyer, S. R., Pardalos, P. M., & Hench, L. L. (2011). Raman spectroscopy for clinical oncology. Advances in Optical Technologies, 2011.

Fenn, M. B., Pappu, V., Georgeiv, P. G., & Pardalos, P. M. (2013). Raman spectroscopy utilizing Fisher-based feature selection combined with Support Vector Machines for the characterization of breast cell lines. Journal of Raman Spectroscopy 44, 939-948.

Skidmore, F., Korenkevych, D., Liu, Y., He, G., Bullmore, E., & Pardalos, P. M. (2011). Connectivity brain networks based on wavelet correlation analysis in Parkinson fMRI data. Neuroscience letters, 499 (1), 47-51.

Korenkevych, D., Chien, J. H., Zhang, J., Shiau, D. S., Sackellares, C., & Pardalos, P. M. (2013). Small World Networks in Computational Neuroscience. In Handbook of Combinatorial Optimization (pp. 3057-3088). Springer.

Pardalos, P. P. M., Xanthopoulos, P., & Zervakis, M. (Eds.). (2012). Data mining for biomarker discovery , Springer.

IFORS President Receives Mercosur Konex Award

▲ **N. Maculan, holding trophy, shown with (l to r): Konex Foundation Vice President Aldo Ferrer, Knoex Foundation President Luis Ovsejevich, Chair of Judges Mario A. J. Mariscotti.**

IFORS President Nelson Maculan accepted the Konex Award given last November 12 in Argentina. He received the **Mercosur Konex Award** along with Jorge E. Allende (Natural Sciences, Chile) and Ricardo Ehrlich (Biochemistry, Uruguay). From Brazil, Maculan was recognized for his outstanding contributions in the areas of mathematical programming, operations research, combinatorial optimization and global optimization.

Instituted 1980 in Argentina, the annual Konex Awards are granted to living individuals and contemporary institutions, whose achievements in the fields composing the cultural spectrum of the nation are worthy of emulation by the youth. Awards for each field are given in 10-year cycles, starting with Sports in 1980, followed by Entertainment, Visual Arts, Science and Technology, Literature, Popular Music, Humanities, Communication-Journalism, Institutions –Community/Companies, and ending with Classical Music the cycle of which started in 1989. Thus 2013 is the year for the Science and Technology awards.

Starting 2002, the **Mercosur Konex Awards** were given to people outside of Argentina, within the Mercosur, which means the inclusion of individuals and institutions from Brazil, Paraguay, Uruguay, Venezuela, Bolivia, Chile, Columbia, Ecuador, Guyana, Peru, Suriname.

How well do you know the Federation?
Answers on page 22

1. Which 3 countries decided that the OR societies of the world should band together?
2. Erhan Erkut delivered the first of this lecture series. Which lecture series is it?
3. There are 23 names inducted into the OR Hall of Fame. Who are they and what are their stories?
4. Which Asian country was the very first to join the IFORS?
5. Which 2 areas were cited by practitioners as the most popular area of OR application?
6. China and Chile are the only two countries that have bagged the First Prize twice for which competition?
7. Which conference celebrated the 70th Birthdays of which 3 IFORS ex- and current officers?
8. It was resolved in an IFORS conference in 1992 that this OR methodology is very relevant for developing countries.
9. How many regions comprise the OR world of IFORS?
10. Of the 19 Triennial Conferences, only 3 had been held in the Asia Pacific region. Which 3 countries are these?
11. Two regional groups represent the most number of member countries and the least – which are they?
12. How do you submit your manuscript to ITOR?
13. Where will the 2014 IFORS Triennial conference take place?
14. Up to how many societies within a country can apply for IFORS membership?
15. These 2 countries hold the distinction of belonging to two IFORS regions.
16. What is common between a student looking for a scholarship and a professional looking for job opportunities?
17. What issues had been submitted to membership for decision in recent years?
18. To which regional grouping does the Operational Research Society of South Africa belong?
19. How does the search for articles using Google Scholar compare with results from searching the IAOR?
20. More than 25,000 have visited these sites.

OR SOCIETY IN FOCUS

The Irish Journey from OR to Analytics

Cathal Brugha <cathal.brugha@ucd.ie>

Our society was founded in 1964 as the Operations Research Society of Ireland (ORSI). In 1972 ORSI hosted in Trinity College Dublin (TCD) one of the first IFORS conferences to be held in Europe. At this conference it was decided to set up the Association of European Operational Research Societies (EURO). One of our members, Harry Harrison, was an early winner of the Edelman Award for an application in pharmacy distribution.

Early on, there was concern to keep the society relevant to a growing hi-tech service economy that has little heavy industry. This led in 1985 to the name becoming the Operations Research and Management Science Society of Ireland. The inclusion of Systems Science and Decision Science led to another name change to the Management Science Society of Ireland (MSSI). In 2011 the MSSI was finally re-cast as the Analytics Society of Ireland, reflecting that its members perceive their work to be about providing analytical solutions to all kinds of management problems.

The demand to run conferences, meetings and produce newsletters reduced over the years and it came to serve mainly academics in UCD, TCD, Dublin Institute of Technology (DIT), University College Cork (UCC), and University of Limerick (UL). It is now an e-network connecting members, especially with events involving EURO and IFORS. This reflects a change in the nature of the communication and culture of members. It is more immediate, because of the availability of e-mail, and more international, because of the Internet, and because there is a wide selection of specialist and general conferences. It also reflects a change in the orientation of members towards a "small world" perspective. Many of the applications members work on are very advanced and specialised, and find little overlap with others.

Meetings focus on providing a forum for members to test their ideas before presenting at international conferences. The society is now a key node of a network linking alumni and academics with IFORS, EURO, OR Society conferences, extending to others including Systems Science (ISSS, IFSR, etc.). The Society supports early career OR practitioners and academics. Since 1991, the Society has had continual representation at IFORS and EURO conferences, and participated in the annual council meetings of both. From 2000 to 2006, Brugha was Editor of the IFORS journal International Transactions in Operational Research (ITOR).

With the change to Analytics, the Society now networks with people using scientific methodologies and tools in management, and builders and users of applications of many different techniques and approaches. It is developing more links to companies, and connections between alumni, business, academic institutions and the state. Recently, Brugha helped to found an Analytics Institute along with representatives of other universities, companies and state organisations.

The Society has links with UCD's School of Business, which in 2008 re-launched its Master of Management Science (MMS) as an MSc in Business Analytics. Here, students carry out research projects in a company / organisation; part-time students do this in their own company over the two years, thus enhancing the transfer of technology, skills and latest management theory into companies. This MSc and courses in other colleges throughout Ireland are filling a rapidly growing need for Analytics skills in the smart economy labour market in Ireland.

> The most significant impact of the change towards Analytics is the rapid growth in the number of part-time students, and the extension of the scope of dissertations, crossing the full spectrum of economic activity, breaking out of the traditional OR model and becoming more mainstream management.

The most significant impact of the change towards Analytics is the rapid growth in the number of part-time students, and the extension of the scope of dissertations, crossing the full spectrum of economic activity, breaking out of the traditional OR model and becoming more mainstream management. The focus is now more general, on technical approaches to the analysis of any kind of problem, using very broad and powerful tools and methodologies.

Whereas OR tended to focus on quantitative solutions, Analytics also includes the analysis of qualitative structures. Analytics is sometimes presented as "Big Data". Qualitative structures show that Data Analytics is one of many streams. Others include Descriptive Analytics, Forecasting Analytics, Decision Analytics (including health care), Marketing Analytics, Logistics Analytics, Strategy Analytics (including sport), and Management Analytics (including fraud). Decision Analytics is the key to the breakthrough of Analytics into general management and strategy. It helps to analyse the structure of any management decision, and thus incorporate into an integrated model all of management high level concerns. These include strategy, uncertainty, risk, costs, benefits, quality, ethics and environmental concerns.

The rapid growth of Analytics in Ireland has led to major funding by ICON, a global provider of outsourced development services to the pharmaceutical, biotechnology and medical device industries and partners of UCD Smurfit Business School. This will fund a UCD Chair in Business Analytics and other support for PhDs and research.

The evidence from Ireland appears to suggest that we are at the start of a new era where Analytics will be at the centre of decision-making. 🌐

Answers to How well do you know IFORS? (from page 20)

All answers are available at the IFORS website, answers and specific links are given below:

1. UK, USA and France http://ifors.org/web/history/

2. IFORS Tutorial Lecture (ITL) http://ifors.org/web/ifors-tutorial-lecture/

3. Please go to http://ifors.org/web/ifors-hall-of-fame/

4. India, in 1960 http://ifors.org/web/history/

5. Strategic planning and logistics http://ifors.org/OR_Practice_Survey/

6. IFORS Prize for OR in Development http://ifors.org/web/ifors-prize-for-or-in-development/

7. 16th CLAIO congress celebrated the 70th birthdays of three OR stalwarts in ALIO: Hugo Scolnik (Argentina), Nelson Maculan (Brazil) and Andres Weintraub (Chile). http://ifors.org/web/december-2012-newsletter/

8. Methods for ill-structured problems, such as 'soft' problem structuring methods http://ifors.org/web/icord-history/

9. Four (4) http://ifors.org/web/

10. Japan (1975), China (1999) and Australia (2011) http://ifors.org/web/ifors-triennial-conferences/

11. Click on EURO and NORAM to see the number and list of member countries. http://ifors.org

12. By going to manuscript central http://ifors.org/web/itor/

13. Barcelona http://ifors.org/web/ifors-triennial-conferences/

14. One (1) http://ifors.org/web/application-for-membership/

15. Spain and Portugal http://ifors.org/web/ Click on ALIO and EURO to see list of member countries.

16. Both of them have resources waiting for them in the IFORS website. http://ifors.org/web/careers/ and http://ifors.org/web/scholarships/

17. See list at http://ifors.org/web/cast-your-vote/

18. Click on EURO http://ifors.org

19. Complementary! -See study results at http://ifors.org/web/impact-factor-for-iaor-vs-google-scholar/

20. Education http://educationresources.ifors.org/ and DC On Line Resources http://dc.ifors.org/

IFORS NEWS

International Federation of Operational Research Societies

Regional Correspondents

ALIO	Latin American Ibero Association on Operations Research	Annibal Parracho
APORS	Association of Asia Pacific Operations Research Societies	Degang Liu
EURO	Association of European Operational Research Societies	Gerhard Wilhelm Weber
NORAM	North American Operations Research Societies	Grace Lin

Section Editors

OR Impact	Sue Merchant/John Ranyard
OR for Development	Arabinda Tripathy
Book Review	Hans Ittmann

Country Correspondents

	Austrian Society of Operations Research (OGOR)	Raimund Kovacevic
	Canadian Operational Research Society (CORS/SCRO)	Dionne Aleman
	OR Society of China (ORSC)	Degang Liu
	Croatian Operational Research Society	Snjezana Pivac
	Czech Operational Research Society (CSOR)	Jaroslav Ramik
	The French Operations Research and Decision-Aid Society /ROADEF (Société Française de Recherche Opérationnelle et d'Aide à la Décision)	Luce Brotcorne
	German Society of Operations Research (GOR)	Brita Rohrbeck
	Hellenic Operational Research Society (HELORS)	Evangelos Grigoroudis
	The Iranian Operations Research Society (IORS)	Nezam Mahdavi-Amiri
	Management Science Society of Ireland (ORMSI)	Cathal Brugha
	Lithuanian Operational Research Society (LitORS)	Leonidas Sakalauskas
	Management Science/Operations Research Society of Malaysia (MSORSM)	Ilias Mamat
	Operational Research Society of Nepal (ORSN)	Sunity Shrestha Hada
	Operatiions Research Society of the Philippines (ORSP)	Malu de Guzman U
	The Association of Polish Operational Research Societies (ASPORS)	Jan W. Owsiński
	Operations Research Society of South Africa (ORSSA)	Martin Kidd
	Korean Operations Research and Management Science Society (KORMS)	Chang Won Lee
	Spanish Society of Statistics and Operations Research (SEIO)	Juan-José Salazar-González
	The Swedish Operations Research Society (SOAF/SORA)	Tomas Gustafsson
	INFORMS	Grace Lin
	Asociación Uruguaya de Informática e Investigación Operativa (AUDIIO)	María E. Urquhart