

IFORS NEWS

International Federation of Operational Research Societies


Operations Research and Artificial Intelligence

Grazia Speranza <grazia.speranza@unibs.it>

In an interview that recently appeared in a newspaper I said that people should not think that, behind new technological products, there is some kind of magic and that algorithms, central for example in robotics and artificial intelligence, are neither magical nor dangerous. After that interview was published, I was invited to give a lecture on artificial intelligence by an association of medical doctors. At first, I was tempted to decline. I am in operations research not in artificial intelligence. Then, I decided to accept the challenge as the lecture was intended to give an overview of the area and I felt I could do that. In fact, I started my academic career in a computer science department and I have followed the evolution of what has been called artificial intelligence over the years. Only recently times have become mature for a variety of industrial applications. Nowadays, the expression artificial intelligence is used to indicate the ability of computers to learn from experience. This ability is the result of the application of models and algorithms of machine learning. Among the methods that fall under the machine learning umbrella we find neural networks. A parametrized function is associated with each node, called neuron, of a neural network. A neural network must be first trained with (huge amounts of) data and then can be used to predict. To train a network an optimization problem is solved to minimize the prediction error on the training set of data. The variables are the parameters of the functions associated with the neurons and the solution of the optimization problem defines the values of the parameters. The number of variables goes beyond any value that we are used to consider reasonable or even

realistic in our computational experiments but data, models, networks, optimization, these are all words that are familiar to us.

Our community can contribute to the development of artificial intelligence, certainly of machine learning, an area that is receiving great attention in the academic world and, even more, in companies and institutions. Many machine learning methods are already embedded in software and, as such, available to be used in applications, provided one knows how to use them. I believe that in the future we will see more and more talks at our conferences and more and more papers published in our journals linking the traditional OR methods and applications with machine learning methods. We might contribute with new algorithms but also with new models. It would be also worth exploring the combination of machine learning methods and classical OR methods in specific application areas. There are so many decision problems that would benefit from past data.

Machine learning is a growing field and we should be part of this movement. Protecting our discipline is a mission for IFORS but part of the mission is also keeping our discipline lively and, if possible, making it stronger. My lecture on artificial intelligence to physicians was apparently a success, by the way, probably because we, operations researchers, are flexible and can understand models, algorithms, technology and their application. 



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Editorial Box

Editor's note: In name of IFORS I would like to thanks James Bleach for acting as co-editor of IFORS News in the past twelve months. James' kind interaction and work will be missed a lot!

A Fond Farewell **James Bleach**<managingeditor@theobexproject.co.uk>

As my tenure as co-editor finishes with this issue, I'd like to take the opportunity to say how much I have enjoyed my time working on IFORS News – and also to highly recommend to readers that they consider volunteering for one of the editorial roles currently available. If I were to highlight one aspect of the content from the issues of the past twelve months, it would be to celebrate the successful longevity of many of our OR professional institutions. By way of a specific example, my own national society, the UK Operational Research Society, celebrated its 60th anniversary annual conference in September of 2018. Organisational milestones such as this, which are being achieved around the globe, provide real confidence in the ability of operational research to remain pertinent and successful in a constantly evolving world.

Now to the current issue: there are articles regarding the 22nd and 23rd IFORS triennial conferences, with IFORS 2020 being held in Seoul, Korea and IFORS 2023 announced as being in Santiago, Chile. The highly informative IFORS Administrative Committee Reports of 2018 include summaries of the extensive and highly valuable activities of the regional groups, reports from the presidents (current, past and vice) as well as from the publication and conferences committees. The IFORS treasurer also reports a better than budgeted for year for IFORS finances in 2018, albeit noting a need to address the loss of future revenue from the journal *International Abstracts in Operations Research (IAOR)*, given the end of its publication in 2017.

The OR for Development section includes *Sustaining Food Supply by Educating Smallholder Farmers in Developing Economies*, which discusses the unprecedented food supply crisis being faced, how farmers being more productive by adopting sustainable farming techniques can help, and how

this increase in productivity can be facilitated. This section also includes *OR for humanitarian logistics* – with logistics playing a key role in operations after major disasters, this article discusses the real opportunity that exists for OR to provide practical post-disaster support.

In the section OR Impact, we have the article *Placement Optimization in Refugee Resettlement*. With the number of global refugees reaching record levels, and with many refugees considered to be in need of resettlement, this article describes important work that uses machine learning and integer optimization to improve refugee resettlement outcomes. *Decision Making under Deep Uncertainty – From Theory to Practice* is the subject of Hans W. Ittmann's book review, and he concludes that it is a monumental piece of work and a welcome addition to the ever-increasing body of knowledge in this important emerging field.

OR Society in Focus provides information on the Airline Group of the International Federation of Operational Research Societies (AGIFORS), which is a professional society dedicated to the advancement and application of operational research within the airline industry. With regard to conferences, the success of the first EUROYoung Workshop is reported – an event helping to support and develop the next generation of operational researchers.

With great sadness we close the issue with an obituary for Egon Balas, who, as Michael Trick reflects, was an inspiration – surviving incredible challenges in early life to become one of the key pioneers of integer programming, and who remained highly influential in that field for his entire professional life. 🌐



IFORS 2020: Seoul, Korea 21-26 June, 2020

Karla L Hoffman <khoffman@gmu.edu>

The Organizing and Program Committees for IFORS 2020 welcomes all operations researchers to attend the 22nd Conference of the International Federation of Operational Research Societies (IFORS) from June 21 (Sun) - 26 (Fri), 2020 at the COEX, in Seoul, Korea.

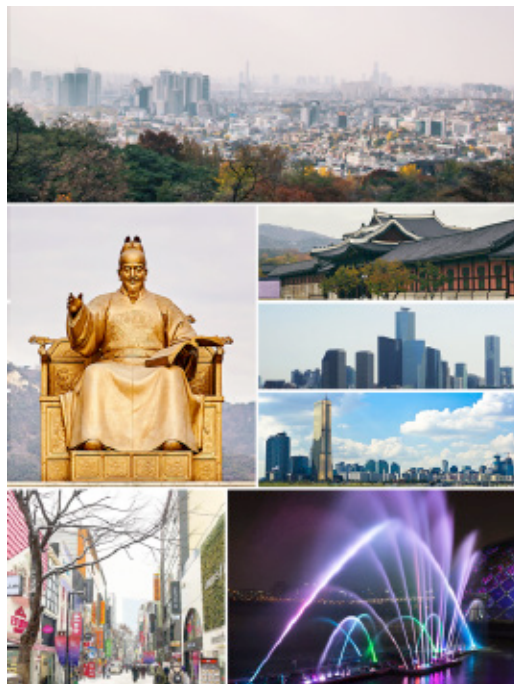
This conference will highlight global developments in operations research and show how the tools of operations research are expanding their impact on society, health, science and industry. The IFORS conferences provide a platform for experts from around the world to showcase the diverse potential

of state-of-the-art operations research techniques and technologies. IFORS 2020 will provide you with a unique opportunity to network and engage with operations research analysts, industrial users of operations research, and academic and industry experts from all parts of the globe.

This is the first IFORS conference to be held in Asia since the 15th conference in China 20 years ago. It is thus an exciting opportunity to bring together operations researchers from the field in Asia, where it has experienced vigorous and rapid growth, with colleagues from all regions of the world.

The Organizing Committee, chaired by Suk-Gwon Chang, has chosen a wonderful convention center, Coex, in the heart of the city for the meeting and the timing of the meeting in late June assures that it will be warm and sunny. There will be high-quality exhibits, talks and a diverse program. The conference includes a Wednesday-afternoon social event where you can choose among a variety of tours, such as the DMZ Tour where you can witness the history of Korea's division, the Industrial Tour to Korea's leading ICT companies as well as various programs that will explore K-POP & Hanllyu, K-Beauty and K-Culture and show you the most historic buildings and markets in the city. These tours will allow you to experience the food, culture and traditions of Korea with friends, both old and new. Both the technical program and the social events assure that all attendees will have a stimulating experience.

The Program Committee, chaired by Natasha Boland, consists of members from all parts of the world. This team will create both invited and contributed sessions that will cover all areas



Seoul, a city of dynamism and hospitality. Both the Organizing Committee and the Program Committee are sincerely looking forward to greeting you in Seoul in 2020.

Abstract submissions will begin on October 1, 2019. Please visit the IFORS 2020 webpage (www.ifors2020.kr) to learn more about how to organize sessions, register for the meeting, see the social program and make accommodation reservations. 🌐

IFORS 2023 will be in Chile!

Karla L Hoffman <khoffman@gmu.edu>

It's official! The IFORS 2023 Conference will be held in Santiago de Chile in early July, 2023. More than 30 years have passed since the last time the conference was held in Latin America and Santiago will provide the perfect stage for the promotion of Operational Research across the region. The Chilean capital reflects the economic and social stability the country has enjoyed for decades. It has superb hotels at reasonable prices, backed up by an excellent public transport system. The event will be hosted by several faculties and universities located in close proximity to each. The main venues for the staging of the event belong to the two main universities in the country (Universidad de Chile and Pontificia Universidad Católica de Chile).

These two universities have facilities that can accommodate all of the needs of the meeting: meeting rooms of various sizes, exhibition halls, and multiple auditoriums. Using university facilities will allow a great meeting at reasonable registration rates. Although the Program Committee has not yet been chosen, it is likely that this event will have somewhere between 1000 and 1500 attendees and sessions that cover the range of theoretical and



applied operations research activities.

As with all IFORS meetings, Wednesday will be set aside for touring and socializing with colleagues and guests. This meeting's tours will include a tour of the city of Santiago, a visit to the wine country of Chile, and as well as other options that will allow you to see the beautiful lakes and mountains of Chile. Additional pre- and post-meeting tours are being planned. The Organizing Committee co-chairs are Dr. Rafael Epstein, Associate Professor in the Department of Industrial Engineering and Provost of the Universidad de Chile and Dr. Jorge Vera, Jorge Vera, Senior Professor and Director Department of Industrial and Systems Engineering, Pontificia Universidad Católica de Chile. 🌐



IFORS ADMINISTRATIVE COMMITTEE REPORTS OF 2018

President's Report Michael Trick <trick@cmu.edu>

The year 2018 was the third and final year of the current Administrative Committee. Over the last three years, I believe the Administrative Committee has moved IFORS forward, making it a stronger organization.

Operation of the AC. Throughout the year, as in previous years, the AC met monthly through video calls. The elected AC was augmented with the Chair of the Publications Committee. Previously the chairs of Developing Countries and the Editor of the Newsletter were also on the AC as non-voting members, but IFORS Vice President Luciana Buriol took on those roles this year, so there were no further additions to the AC. Our physical meeting took place at the EURO Meeting in Valencia in July. Over the past three years, the AC has met in our constituent groupings ALIO (Chile, 2016), NORAM (Quebec City, 2017) and EURO (Valencia, 2018). The AC will meet in an APORS country when it meets in South Korea in 2020.

More Frequent Meetings with Members. The process of regular meetings with Presidents and IFORS Representatives at EURO and INFORMS Conferences continued, with a breakfast discussion of common interests and activities being held regularly.

The Triennial Conference. After the successful Quebec City conference, plans are well underway for IFORS 2020 to be held in Seoul, South Korea. Local Organizing Committee Chair Dean Suk-Gwon Chang and Program Chair Prof. Natashia Boland are very active in ensuring the success of this conference.

Plans for 2023 have also begun, with the membership approving Chile as the location of that conference. Next steps are to do a site visit to determine the specific location of the conference. I am excited to have IFORS return to South America for the first time since 1987.

Other Committee Activities.

International Transactions of Operational Research continues to improve in terms of its impact and the quality of the papers published. The IFORS Newsletter continues to be an excellent source of news and insight into the operational research world. The Developing Countries Committee continues to be very active in supporting societies, workshops, and individuals to increase the influence of operational research in the developing world with a particular emphasis on Africa. IFORS presence in the various regional conferences was assured with its continuing tradition of IFORS Distinguished Lecture and IFORS Tutorial Lecture sponsorship.

Finances. The finances of the organization remain very good, with significant funds in reserve. The year showed a profit, which is unusual for a non-conference year. This is due to the unfortunate winding up of *International Abstracts in Operational Research*, where we had income but no expenses. This will not be a recurring situation, putting IFORS in a situation where there may be continued losses without a new income stream.

There are certainly challenges ahead. Some of these I identified at my first report in 2016, and they remain to this day. IFORS conferences need to be made more distinctly IFORS if they are to thrive in a highly competitive market; the loss *International Abstracts in Operational Research* has both a financial impact and has decreased the relevance of IFORS; the association's administrative structure and organization needs to be made more formal. In my 2019-2022 as Past President, I look forward to working with President Prof. Grazia Speranza in continuing to move IFORS forward. 🌐



Report of the Immediate Past President

Nelson Maculan <nelson.maculan@gmail.com>

One of the tasks of the Past President is to propose the IDLs and ITLs.

IFORS Distinguished Lecture (IDL)

Through the IFORS Distinguished Lectures (IDL), IFORS sponsors lectures given by distinguished OR scholars and analysts at conferences of members societies and regional groupings. In 2018 one IDL was sponsored for each regional grouping:

EURO – Valencia/Spain July 2018

Cynthia Barnhart, Massachusetts Institute of Technology (MIT), USA

Title: Air Transportation Optimization



APORS – Kathmandu/Nepal August 2018
Leo Liberti, École Polytechnique, France
Title: Random Projections in Mathematical Programming

CLAIO – Lima/Peru October 2018
Edoardo Amaldi, Politecnico di Milano, Italy.
Title: Optimizing Internet routing: a bilevel Approach

INFORMS – Phoenix/USA November 2018
Mario Veiga Ferraz Pereira, PSR – consulting in electrical power, Brazil
Title: Stochastic Optimization, Statistical Modeling and Distributed Processing Applied to Energy Planning

In 2019 IFORS will sponsor two IDL's:

EURO in Dublin/Ireland, June 2019: William Cook, Johns Hopkins University/USA

INFORMS in Seattle/USA, October 2019: Andrew Philpott, University of Auckland/New Zealand

IFORS Tutorial Lecture (ITL)

Given by outstanding scholars, the ITL presents the fundamentals of emerging OR technologies, application areas or teaching approaches to a large

diverse audience. It is intended to inspire and raise interest in pursuing these new ideas.

In 2018 three ITLs were sponsored by IFORS:

EURO – Valencia/Spain July 2018
Andres Medaglia, Universidad de los Andes, Colombia
Title: Solving Hard Shortest Path Problems with the Pulse Framework

APORS – Kathmandu/Nepal August 2018
James MacGregor Smith, University of Massachusetts at Amherst, USA
Title: Evacuation Network Performance Modelling and Optimization

CLAIO – Lima/Peru October 2018
Dohoon Kim, School of Management at Kyung Hee University, Korea
Title: Management Science for Platform Businesses in Industry 4.0

In 2019 there are no ITL's planned to be sponsored by IFORS. 🌐

Report of the IFORS Vice-President

Luciana Salete Buriol <buriol@inf.ufrgs.br>

In the process of giving administrative and executive support to the President, the IFORS Vice President has mainly helped in analyzing and processing the demands and proposed activities received by IFORS in 2018. Among the activities managed by the Vice President are discussions on the conference preparations for the next IFORS Triennial conferences, interacting and discussing details and criteria for the formation of OR groups and OR African societies; discussing concerns of OR societies presented to IFORS; and analyzing and discussing all other activities fostered and promoted by IFORS related to publications and communication with people and professional societies.

The above coordinative activities are made possible through technology, including fortnightly Skype meetings.

DCC Committee: as chair of the Developing Countries Committee (DCC) along 2018, I have been involved in deliberating several pertinent issues concerning the developing countries committee activities. Some of these activities were related to the interaction on the organization of the Operations Research

Techniques and Applications School for Africa (ORTASA) held in Dangbo, Benin, November 20-29 2018. The March issue of IFORS News presents the report of this event. Moreover, along 2018 the DCC committee interacted with the organizers of AFROS 2018 (Sue Merchant attended the event and chaired a session devoted to developing countries issues). The DCC ended 2018 with the following committee: Luciana Buriol (Brazil), Sue Merchant (UK), Adam Ouorou (France/Benin), Yu-Hong Dai (China), Theo Stewart (South Africa), and with administrative support of Mary Magrogan, IFORS secretary.

IFORS News: During 2018 I served as editor in chief of IFORS News, with a lot of help of James Bleach who has served as co-editor. IFORS News also has section editors: Sue Merchant and John Ranyard for the OR Impact section, Gerhard Wilhelm Weber for Conferences section, and Hans Ittmann for the Book Review section. The four annual issues were released in March, June, September and December, sharing OR news from and to all continents. 🌐



Report of the Treasurer

Richard Hartl <richard.hartl@univie.ac.at>

The 2018 budget (approved by the IFORS AC) showed an operating deficit of \$ 115,740. In years without an IFORS triannual conference, we usually observe a deficit and the above number was a very conservative forecast. It turned out that IFORS did financially much better than that. In fact, before accruing (done by the auditor) the unaudited budget does not show a deficit but an unusually high surplus of \$ 72,446. This is however mainly due to the profit share of \$ 79,964 for the International Abstracts in Operations Research which belong to the year 2017, but were paid only in January 2018 by the publisher. If this amount had been received in time (in 2017), IFORS would have made a deficit in 2018, of roughly \$ 7,500.

What follows is a summary of the unaudited results for 2018 (all numbers in \$US). The publication revenues of \$ 73,538 from ITOR were significantly above the budget of \$ 40,000. Publication revenues for IAOR were exceptionally high (\$ 120,112) consisting of the above \$ 79,964 belonging to 2017 (which will not show up in the unaudited numbers) and of about \$ 40,000 as the final profit share from IAOR for 2018.

Members' dues collections at \$ 23,381 were slightly above budget. Interest revenue continued to be positive but negligible due to the global decrease in interest rates. The net effect of these revenue movements was an income of \$ 219,202, much higher than the budget of \$ 114,500. Note, however, that the almost \$ 220,000 contains the IAOR payment of almost \$ 80,000 belonging to 2017, so that the audited statement will show an income of about \$ 140,000.

2018 spending at \$146,756 was much lower than 2017 and also significantly below budget (\$230,240). Only two items were above budget, the expenses for the ITOR editors (that had been increased due to the exceptional success of the journal that led to considerably higher workload), and the expenses for IFORS distinguished lectures (IDL) and IFORS tutorial lectures (ITL), because due to the 2 and 3 years cycles of the regional conferences, in 2018 an unusually high number of IDLs and ITLs were given.

Most other expenses were significantly below budget. In particular, the budget still showed expenses of \$ 34,500 for the IAOR editors, since at that time it was not totally clear that IAOR would indeed stop end of 2017. But in fact, IAOR stopped and no payments to the editors had to be made.

As mentioned, a deficit of \$ 115,740 was budgeted, while at the end of December the actual unaudited surplus was \$ 72,446. The audited statements will be different as a result of the way that the auditors handle accruals. In particular, they will not contain the IAOR profit share of 2017 leading to an audited deficit of roughly \$ 7,500. Note also, that these numbers contain the 2018 profit share for IAOR of roughly \$ 40,000, and that from 2019 on, no further profit share for IAOR will be received. >>



2018 IFORS Financials

			Approved 2018 Budget at Quebec	Unaudited 2018 Actual	Proposed 2019 Budget at Valencia
INCOME					
Member			22,500	23,3813	22,500
Society Dues					
Royalties		IAOR	50,000	120,112	
		ITOR	40,000	73,538	60,000
Interest			1,500	1,512	1,500
Special		ICORD register fees	500		
Conferences:					
Other				659	
TOTAL INCOME			114,500	219,202	84,000
EXPENSES					
Activities	Administrative Committee		18,000	10,837	15,000
	Publications Committee				1,200
		IAOR Editor	34,500	1,250	
		ITOR Editor	23,000	24,042	26,000
	Scientific Activities & External Affairs				
		IDL, ITL, Fellowships, & Grants	13,000	18,974	13,000
		IFORS Website	7,000	5,053	7,000
		Summer/Winter Schools	10,000	6,435	10,000
	Education Committee		7,500		
	Meetings Committee				
		IFORS 2020			7,000
		ICORD Conference	5,000	249	
	IFORS Newsletter		11,000	3,321	11,000
	Developing Countries Committee		27,000	11,098	8,000
General Business Operations					
	Office & Secretary		58,240	57,999	60,840
	Auditor		2,000	1,992	2,000
	Bank Charges		1,500	1,589	1,500
	Contingency		2,500		2,500
	Preparation new legal structure		10,000	3,917	10,000
TOTAL EXPENSES			230,240	146,756	175,040
OPERATING RESULT			(115,740)	72,446	(91,040)

>> Hence, in a scenario where IAOR had already stopped one year earlier, IFORS would have made a deficit of \$ 47,000 in 2018.

The total assets of IFORS consist of checking accounts with the Bank of Ireland and the Bank of America, and Investments with the Bank of Ireland, totaling \$ 1,491,053 by the end of 2018.

The 2019 budget (approved by the IFORS AC in Valencia) shows an operating deficit of about \$ 91,000. If history repeats, the actual deficit

will be much lower than this, since typically most expenses will be below the budget frame.

Summing up, 2018 did not materially change IFORS financial strength. In view of the Federation's financial position and prospects, no change in member society dues is recommended at this time. However, since no payments for IAOR will be received in future, IFORS will have to find additional sources of income in order to make up for this loss of income. 📉

Report of the Vice President representing ALIO

Guillermo Durán <gduran@dm.uba.ar>

The Association of Latin-Iberoamerican Operations Research Societies (ALIO) was created in Rio de Janeiro in November, 1982. ALIO's purpose is to promote the exchange of experience and information among researchers, academics and professionals related to Operations Research in the region, as well as the circulation of techniques and methodologies related to these disciplines. ALIO is also the Latin American Regional Chapter of IFORS.

National societies taking part in ALIO are those from Argentina, Brazil, Chile, Colombia, Cuba, Ecuador, México, Perú, Uruguay, Spain and Portugal. These societies are also part of IFORS with the exceptions of Cuba and Ecuador.

During 2018, important and relevant Operations Research events were organized and carried out by ALIO and Operations Research Societies that are part of ALIO (<http://www-2.dc.uba.ar/alio/eventos.htm>) in the different countries. A brief summary of these events follows.

XIX Latin Iberian American Conference on Operations Research, CLAIO

The main activity of ALIO is its biennial meeting the Latin Iberian American Conference on Operations Research, CLAIO. In 2018 the XIX CLAIO was held between September 24th and 27th in Lima, Perú, jointly organized by the National University of San Marcos UNMSM, the Peruvian Society of Operations Research, SOPIOS, and the Latin Iberian American Association of Operations Research Societies, ALIO. The conference was attended by 427 researchers, students and professionals from several countries, including Argentina, Chile, Brazil, Colombia, Ecuador, Mexico, Perú, Portugal, Spain, United States of America, Uruguay and many others, but also as far away as India. Around 370 contributions were presented in the conference, including 141 short papers that were published in the conference proceedings, ranging from contributions to methods and algorithms to relevant applications in many fields like industrial management, health systems management, natural resources,

logistics and supply chain management, finances and others. CLAIO is the most important event on Operations Research in Latin America and the excellent contributions presented show the important development that the discipline is having in the region.



The inaugural plenary lecture was given by Celso C. Ribeiro, from Fluminense Federal University, who presented advances and extension on GRASP metaheuristic. At the inaugural ceremony, the president of CLAIO and SOPIOS, David Mauricio, together with the co-chairs Nelson Maculan (virtually) and Alex Papa, the president of UNMSM, Orestes Cachay, and the president of ALIO, Jaime Miranda welcomed the attendants. The conference also included plenary lectures by other distinguished researchers like Andrés Weintraub, from University of Chile, Julia Pahl from the University of Southern Denmark and Jesus Velasquez, from Decision Ware & DO Analytics. Paulo Roberto Oliveira, from the Federal University of Rio de Janeiro gave the closing plenary. In addition, several keynote sessions explored the diversity of topics in Operations Research and its implications in areas such as agriculture, supply chain, computational algorithms, and natural resources. The conference also included the EURO Distinguished Lecture, which was given by Luce Brotcorne, from INRIA, who presented "How to integrate customer's behaviour within pricing".

The conference also included the IFORS Distinguished Lecture, which was given by Edoardo Amaldi, from Politecnico de Milano, who presented "A bilevel approach to optimizing Internet routing". In addition, CLAIO also had an IFORS Tutorial Lecture given by Dohoon Kim, from Kyung Hee University, South Korea, who presented to the audience the talk titled "Management science for the businesses platform in Industry 4.0". IFORS presence at CLAIO was significant and important.

The conference allowed for many interactions among attendants. Participants at the conference banquet enjoyed Peruvian food, traditional music and a show of Peruvian Paso horse, and had the opportunity to explore Lima and its museums.

ALIO, the Latin America Association also held its meeting at CLAIO, where the new Executive Committee was presented and the place for the next CLAIO was confirmed: CLAIO 2020 will be held in Madrid, Spain, during September 2020.

XXII Latin-American Summer School in Operations Research - ELAVIO

The first ELAVIO was held in Chile in 1994. Since then, the School has run the event every summer to promote education in Operations Research among young researchers and graduate students (PhD and Master's degree levels), mainly from Latin America.

The purpose of ELAVIO is to stimulate new collaborations and encourage the involvement of young people in OR by bringing them up to date on research topics through short courses and plenary conferences. Participants also have the opportunity to present and discuss their work. At every School a strong sense of camaraderie has developed, solidifying contacts between the members of research groups from different countries.

Professors from Latin-America and Europe participated in this new ELAVIO, presenting recent work on applications of Operations Research for solving problems in sustainability, healthcare, logistics, sports, agro-industry, engineering, communications, finance, and big data.

The 22nd edition of ELAVIO was held in Marbella, Maitencillo, Chile, from March 4th to March 9th, 2018. This school was organized by the "Departamento de Control de Gestión y Sistemas de Información" (DCS) from the "Facultad de Economía y Negocios" of the University of Chile, together with the Chilean Institute on Operations Research (ICHIO) and the "Instituto Milenio Sistemas Complejos de Ingeniería" (ISCI) from the University of Chile.

Jaime Miranda, president of ALIO and chair of this event mentioned that "the purpose of the ELAVIO is to stimulate new collaborations and foster the participation of young researchers in

Operations Research, while keeping them updated on research topics with short courses and plenary conferences". He added that this meeting was a complete success, due to the high interest among students. More than 50 students took part in this edition.

In this ELAVIO, professors from Chile, Argentina, Uruguay, and Spain presented their recent work on Operations Research and its applications. **Guillermo Durán** gave a short course on "Applications of OR to Real Problems in Argentina and Chile over the last 15 years"; **Mario Guajardo** gave a course on "Collaborative Logistics and Cooperative Game Theory"; **Maya Jakobine Stein** presented an "Introduction to Extremal Graph Theory"; **Javier Marengo** gave a course on "Polyhedral Techniques for Combinatorial Optimization Problems"; **Antonio Mauttone** presented "Models and Algorithms for Public Transportation Network Design"; **Marcelo Olivares** talked on "Empirical Methods in Management Science"; and **Lluís Miquel Plà** gave a short course entitled "OR in Agriculture: Pitfalls and Critical Success Factors".

Also, Prof. Celina de Figueiredo from the Universidade Federal do Rio de Janeiro (Brasil) gave the plenary talk "Complexity-Separating Graph Classes for Vertex, Edge and Total Colouring".

The next ELAVIO, number XXIII, will be organized in Lleida, Spain in July of 2019.

47 JAIIO

JAIIO (Argentine Conference on Informatics) is the annual event of the Argentine OR Society (SADIO), which has been expanded in recent decades to include all branches of computer science and informatics. The 47 JAIIO was co-organized by SADIO and the Universidad de Palermo. It took place on September 3-7, 2018, in Buenos Aires City. More information can be found at <http://47jaiio.sadio.org.ar>.

L Simpósio Brasileiro de Pesquisa Operacional

The "Simposio Brasileiro de Pesquisa Operacional" is the annual event of SOBRAPO (the Brazilian OR Society), and the L Symposium organized by SOBRAPO took place in Rio de Janeiro, from August 6th to August 9th, 2018. The LI Symposium will be held in September 2019, in Campinas. 🌐

Report of the Vice President representing APORS

David Chang Won Lee <leecw@hanyang.ac.kr>

In 1984 during the 10th IFORS meeting in Washington, Prof. Masao Iri, then International Federation of Operational Research Societies (IFORS) Vice President, called a meeting of Asian Pacific OR society representatives to discuss on possible launching of a society group in Asian Pacific region.



Through effective communication among these societies, a formal discussion was later called in March 1985 during ORSJ national meeting in Japan's Tsukuba on preparing the Association of Asian Pacific Operational Research Societies (APORS), attended by IFORS national society representatives of Japan, China, Australia, New Zealand, Korea, India, Singapore, and Hong Kong. This meeting announced the APORS with mission of encouraging OR society exchanges in the region.

Currently, APORS aims to promote the cause of Operational Research and its applications in the Asia Pacific region with a number of countries. The APORS Council includes one representative from each of its 12 member countries. It organizes the triennial APORS Conference. The first conference was held in Seoul in 1988.

Operational Research Society of Nepal (**ORSN**) had the APORS 11th Triennial meeting was held in Kathmandu, Nepal (Aug. 6 – 9, 2018). Operational Research Society of Nepal (ORSN) prepared to host the 11th Triennial Conference of Association of Asia Pacific Operational Research Societies (APORS). ORSN and the organizing team welcomed all the delegates from all APORS member countries and other OR Societies from IFORS and other OR scientific

communities in the conference. Prof. Sunity Shrestha Hada served as a conference chair and Prof. Chang Won Lee served as a program chair.

There are several conferences in each member countries. Among them, here are some unique events as follows: Operations Research Society of China (**ORSC**) conducted some conferences such as a Seminar on OR for young teachers in the western provinces during the summer in 2018. Financial engineering & financial risk management group 8th annual conference during August 25 and 26. Australia (**ASOR**) 2018 / DORS 2018 was the 26th National Conference of the Australian Society of Operations Research. It was held in Melbourne from 4 to 6 December 2018. The ASOR / DORS 2018 conference brought together 260 delegates. Management Science/ Operations Research Society of Malaysia (**MSORMS**) had Second council meeting on March in Universiti Teknologi MARA, Shah Alam. Korean Operations Research and Management Science Society (**KORMS**) had two annual conferences: Spring joint conference with a theme of Business analytics and Smart management on April in Gyeongju and the Fall conference with a theme of Block chain and business analytics on October in Seoul. KORMS prepares IFORS 2020 Seoul Meeting. 🌐

Report of the Vice President representing EURO

Jacek Blazewicz <jacek.blazewicz@cs.put.poznan.pl>

EURO, The Association of European Operational Research Societies, www.euro-online.org, is a regional grouping within IFORS. At present it has 32 member societies. EURO is regulated by a Council consisting of representatives of all its members and an Executive Committee which constitutes its board of directors. The 2018 Executive Committee of EURO was composed of President Richard Eglese (United Kingdom), President Elect Immanuel Bomze (Austria), VP1 Albert Wagelmans (The Netherlands), VP2 Kenneth Sörensen (Belgium), VP3 Claudia Archetti (Italy), Secretary Jesper Larsen (Denmark), and the treasurer Marino Widmer (Switzerland). The Manager is Sarah Fores (United Kingdom), the Webmaster Bernard Fortz (Belgium) and the Website Editor and Administrator was Marie-France Rogge (Belgium). In addition, IFORS Vice-President for EURO – Jacek Blazewicz (Poland) was responsible for the links between EURO and IFORS.

During 2018 several elections for positions in the Executive Committee took place. As a result in 2019 Julia Bennell (UK) will replace Kenneth Sörensen and Stefan Nickel (Germany) will replace Jacek Blazewicz. Since the retirement of Marie-France Rogge EURO appointed Diane Wilson (UK) to assist the Manager.

The 29th European Conference on Operational Research, EURO 2018, was held in Valencia, Spain

from July 8th till 11th, 2018. The Conference attracted more than 2300 participants from 54 countries.

As usually the EURO Awards were delivered during the Opening and Closing Sessions. This year the EURO Gold Medal was assigned to the outstanding researcher – Silvano Martello. The EURO Distinguished Service Medal was awarded to Jan Weglarz. The EURO Doctoral Dissertation Award went to Margarida Carvalho. The EURO Excellence in Practice Award was obtained by a group of researchers - Martin Bichler (Technical University of Munich), Douglas Ferrell (Department of Primary Industries, Fisheries Analysis), Vladimir Fux (TUM), and Jacob Goeree (Business School, University of New South Wales), who were involved in "A combinatorial exchange for fishery access rights".

Douglas Alem, Alistair Clark, and Alfred Moreno were the winners of the EURO Award for the Best EJOR Paper in the category Innovative Applications of OR; the award of the category Review went to Michael J. Mortenson, Neil F. Doherty, and Stewart Robinson; and that for the Theory and Methodology category was awarded to Dominik Goeke and Michael Schneider.



The scientific program prepared by the Program Committee chaired by Greet Vanden Berghe from Belgium offered excellent plenary and keynote lectures and included more than 2000 presentations organized in 547 sessions. The central plenary lecture was the IFORS Distinguished Lecture delivered by Prof. Cynthia Barnhart. The lecture entitled Air Transportation Optimization took place in the beautiful Opera House and got the attention of the whole community of the conference. Professor Roger Z. Rios (Mexico) delivered the Plenary entitled The Discrete Charm of Districting, and the Closing Plenary Lecture, Theory can Sometimes be Useful, was made by Gerhard Woeginger of Germany. Plenary and keynote sessions and many of the special sessions mentioned here are available at: <http://euro2018valencia.com/plenaries-and-keynotes/> and will be included in the resources of the EURO website.

The conference venue – the campus of the University of Valencia, with modern facilities and a friendly atmosphere, turned out to be a perfect choice for hosting the conference in a comfortable and efficient environment, complemented with excellent services and social activities provided by the Organizing Committee chaired by Ramón Álvarez-Valdés and Rubén Ruiz.

In addition, a pretty high number of smaller workshops took place, associated with the activity of various EURO working groups.

The year 2018 also witnessed significant developments in the EURO journals. The European Journal of Operational Research (EJOR) kept being ranked among the best OR journals in the Clarivate JCR list. The three new EURO journals: EURO Journal on Computational Optimization (EJCO), EURO Journal on Decision Processes (EJDP), and EURO Journal on Transportation and Logistics (EJTL), were published regularly and received an increasing number of submissions. The EURO e-newsletter continues to be a success.

There are 33 working groups in EURO (EWGs) which cover different areas within OR. The EWGs meet regularly during the EURO-k Conferences

and, possibly, during other events, where thematic streams are organized. These meetings are all supported by EURO. EURO also continues to roll out new webpages for the Working Groups as part of the overall improvement to the EURO branding.

The EURO PhD School (EPS) is an educational instrument created by EURO in 2013 to encourage the organization of post-graduate education initiatives for PhD students under a school format. The 2018 EURO PhD School, devoted to Multicriteria Decision Making (MCDA/MCDM) was organized in Chania, Crete, Greece (July 23 – August 3).

EURO continues to offer scholarships to PhD students who wish to attend NATCOR courses held in the UK. In 2018 nine scholarships were funded.

The series of EURO Summer and Winter Institutes (ESWIs) was launched in 1984. The basic idea is that about 25 early stage researchers can meet for about two weeks, present their material, discuss it with others and with a handful of specially invited senior experts in the field, and finally prepare a paper to be considered for inclusion in a feature issue of an OR publication. In 2018 the following EWI was organized: the 2018 EURO Winter Institute on “Lot-Sizing and Related Topics”, at the University Viadrina, Frankfurt/Oder.

EURO supports the attendance of young European scholars in ELAVIO (Escuela Latinoamericana de Verano en Investigación Operativa) conferences. The 2018 ELAVIO was held in Chile; two students whose trip was supported by EURO were: Diana L. Huerta Munoz (Universitat Politècnica de Catalunya, supervisor - Prof. Elena Fernandez) and Sandra Zajac (Ruhr Universität Bochum, supervisor - Prof. Brigitte Werner).

In order to promote and further develop international cooperation, EURO will co-organize and support joint conferences with national OR Societies outside Europe and other regional bodies within IFORS. Significant financial support can be made available for the organization of such events (other than EURO-k Conferences). 🌐

Report of the Vice President representing NORAM

Karla Hoffman <khoffman@gmu.edu>

The North American Research Societies (NORAM) is made up of two societies: The Canadian Operations Research Society (CORS) and the Institute for Operations Research and the Management Sciences (INFORMS). Activities of the two societies for 2018 are reported below.

CORS ACTIVITIES.

The Canadian Operational Research Society (CORS), a.k.a. Société Canadienne de Recherche Opérationnelle (SCRO) (www.cors.ca) is the leading Canadian professional society for operational researchers. >>



>> Established in 1958, CORS brings together OR professionals with annual conferences held across Canada, special interest groups, traveling speakers' programs, and student support. CORS sponsors the INFOR journal and also publishes the Bulletin, a newsletter of the Society and related activities. It is administered by a Council of eleven members.

Meetings.

The CORS 2019 meeting will be held in Saskatoon, Saskatchewan May 27-29, 2019. CORS welcomes everyone to this lively urban hub on the banks of the South Saskatchewan river. The Plenary speakers will include **Terry Rockafellar** (University of Washington) who will give the Harold Larnder Memorial Lecture on: *Risk and Reliability in Optimization Under Uncertainty*, **Michael Trick** (Carnegie Mellon Qatar) whose lecture is titled *Impacting Business by Combining Predictive and Prescriptive Analytics* and **Ed Kaplan** whose talk will be on *Adventures in Policy Modeling*. For more about this meeting, please visit <https://www.cors2019.ca/>. In 2018, CORS held its 60th Annual Conference in Halifax, June 4-June 6, 2018. Its two plenary speakers were **John Birge** (University of Chicago) who gave the Harold Larnder Memorial Lecture titled: *Can big OR be bigger than big data?* and **David Martell** (Professor Emeritus at the University of Toronto) whose talk was *Operational research applications in forest fire management: lessons learned, important open problems and emerging challenges*. The 60th anniversary of CORS was celebrated at the banquet associated with this event.

Awards.

The 2018 Harold Lardner Prize was awarded to **David Martell** (Professor Emeritus at the University of Toronto). The 2018 recipient of the **Omond Solandt Award** was **Canadian Blood Services** (providing technologies for the delivery of blood to all parts of Canada). The **Award of Merit** recipient was **Mahmut Parlar** (McMaster University); and the **Eldon Gunn Service Award** went to **Anjali Awashthi** (Concordia University) and **Fredrik Odegaard** (Ivey Business School). Finally, the **2018 CORS Practice Prize** was awarded to **Florian Grenouilleau, Antoine Legrain, Nadia Lahrichi, Louis-Martin Rousseau** (Polytechnique Montréal) for "A Set Partitioning Heuristic for the Home Health Care Routing and Scheduling Problem".

Publications. CORS publishes the journal INFOR, a quarterly journal on Information Systems and Operational Research, published by Taylor & Francis Publishing.

INFORMS ACTIVITIES.

INFORMS (www.INFORMS.org) represents operations research professionals in the US. It promotes best practices and advances in operations research, management science, and analytics through an array of highly-cited publications, conferences, competitions,

networking communities, and professional development services.

Meetings.

INFORMS holds two major conferences each year: The Annual Meeting in the fall (held in Phoenix, Arizona from Nov-7, 2018), which is mainly oriented towards academics, and the Analytics Conference in the spring for practitioners (held April 15-17, 2018 in Baltimore MD). In addition, INFORMS held an International Meeting June 17-20, 2018 in Taipei, Taiwan. It also holds multiple special interest meetings. During 2018, INFORMS held meetings on the following topics: Organizational Science (March 1-3, Park City, Utah), Optimization (Mar 23-25, Denver, Colorado), Telecommunications (May 23-25, Germany), Marketing Science (June 14-16, Philadelphia, PA), Revenue Management and Pricing (June 21-22, Toronto, Canada), Manufacturing and Service Operations Management (July 1-3 in Dallas, TX), Winter Simulation Conference (Dec 9-12, 2018, Sweden), and two regional analytics conferences: One in Seattle, Washington (Sep 14, 2018) and the other in Chicago, Illinois (Oct 11, 2018);

Awards.

The following Society prizes were awarded in 2018: **The Edelman Award** was awarded to **The Federal Communications Commission**, Washington D.C.. **The Daniel H. Wagner Prize for Excellence in Operations Research Practice** was awarded to **Daniel Freund, Shane G. Henderson, David B Shmoys, and Eoin O'Mahony**, all of Cornell University.; **The Doing Good with Good OR - Student Paper Competition** was awarded to **Ignacio Rios**, Stanford University; **The George B. Dantzig Dissertation Prize** was given to **Daniel Freund**, Cornell University; **The George E. Kimball Medal** had two recipients: **Bruce L. Golden**, University of Maryland and **Candace Yano**, University of California, Berkeley; **The George Nicholson Student Paper Prize** was awarded to **Viet Anh Nguyen**, École Polytechnique Fédérale de Lausanne; **The INFORMS Prize** was awarded jointly to **Booze Allen Hamilton**; **The John von Neumann Theory Prize** was awarded to **Dimitri P. Bertsekas**, and **John N. Tsitsiklis**, both of Massachusetts Institute of Technology; **The Judith Liebman Prize** was awarded to **Neda Mirzaeian** of Carnegie Mellon, **Lauren Steimle** of University of Michigan, and **Carlos Zetina**, Concordia University; **The Saul Gass Expository Writing Prize** was awarded to **Richard Cottle**, Stanford University; **The Undergraduate Operations Research Prize** was awarded to **Kayla Cummings**, Pomona College; The **UPS George D. Smith Prize** was given to the University of Tennessee MS Program in Business Analytics Program; and the **Volunteer Service Award** was given to **Mark Eisner**, Cornell University, **Grace Lin**, IBM T.J. Watson Research Center, **Cameron MacKenzie**, Iowa State University, **Paul Maglio**, University of California – Merced, **Aly Megahed**, IBM Research, **Pratik Parikh**, Wright State University, **Matthew Saltzman**, Clemson University, **Jun Zhuang**, University of Buffalo.

In addition, those inducted as INFORMS Fellows in 2017 included: **Andrew Armacost**, U.S. Air Force Academy; **Vicki M. Bier**, University of Wisconsin; **Robert M. Freund**, MIT Sloan School of Management; **Garud Iyengar**, Columbia University; **R. John Milne**, Clarkson University; **Jonathan H. Owen**, General Motors; **Kavita Ramanan**, Brown University; **Ramesh Sharda**, Oklahoma State University; **Zuo-Jun (Max) Shen**, University of California; **Martin Shubik**; **Jayashankar M. Swaminathan**, University of North Carolina; and **Luk N. Van Wassenhove**, INSEAD.


Publications.

INFORMS publishes 16 journals: Decision Analysis, Information Systems Research, INFORMS Journal on Computing, INFORMS Journal on Optimization, INFORMS Transactions on Education, INFORMS Journal on Applied Analytics (formerly Interfaces), Management Science, Manufacturing and Service Operations Research (MSOM), Marketing Science,

Mathematics of Operations Research, Operations Research, Organizational Science, Service Science, Stochastic Systems, Strategy Science and Transportation Science. In addition, it publishes two magazines; *OR/MS Today* and *Analytics*; and *Tutorials in Operations Research*, published annually.

Communities.

In addition, INFORMS has various subdivisions directed at members of the OR/MS community including 13 Societies, 21 sections directed at technical and application areas, 31 regional chapters, and 32 student chapters. Many also provide awards but the list is too long to provide here.

For more about INFORMS and its communities, publications, awards and conferences, please go to its website at: www.informs.org 

Report of the Chair, Publications Committee

Graham Rand <g.rand@lancaster.ac.uk>

2018 was the first year since 1993 that IFORS published only one journal, as 2017 was the last year that International Abstracts in Operations Research (IAOR) was published. The 97029 entries in the IAOR database are available on our website and can be freely searched at <http://iaor.ifors.org>. Please have a look. I expect that there are some glitches and things we can improve, and if you spot anything, please let me know. Subscribers have been told by the publishers, Palgrave, to refer any queries to me, so IFORS is still looking after that journal despite it having ceased publication.


International Transactions in Operations Research (ITOR)

Our remaining journal, ITOR, is published by Wiley-Blackwell. We have signed a new 5-year agreement with them. Celso Ribeiro continues to do an excellent job as editor. ITOR truly is an international journal, with an editorial board of 62 editors from 21 countries. The impact factor for 2017, reported in 2018, continues to improve, having moved significantly to 2.400 from 1.745. This placed ITOR 21st (up from 30th) out of 83 Operations Research and Management Science journals. This sustains a remarkable achievement by Celso.

The number of submissions continues to increase dramatically: at the start of the decade there were just over 100 annually, now there are about 550. The

average acceptance ratio has been decreasing slowly and is now at about 18%. The journal size, in terms of page numbers, increased significantly in 2018, and will continue to do so. Papers published by year have increased from 25 (2006) to 85 (2018), and pages printed by year from 584 (2006) to 2060 (2018). The 2018 volume, number 25, was the last to appear in print, as the journal is now online only. Downloads on the Wiley Online Library were at record levels in every month of last year, with a total of 91.13K, up 56.8% on 2017.

The 2018 volume included special issues on Improving Healthcare: New Challenges, New Approaches and Multiple Criteria Decision Making: Current Challenges and Future Trends. Wiley Triennial Awards for the Best ITOR Paper in each of two categories, reviews and methodology & applications, have been created. They will be awarded every three years, to tie in with our conferences. Thus, the first awards will be for articles published in the years 2017-19, and be presented at the conference in Korea. It is expected that each prize should be \$1000.

One of the challenges in 2019 will be to address the impact of Plan S, proposed by coalition S, concerning Open Access. To this end, Wiley believe that the agreement signed with Projekt DEAL in Germany at the start of 2019 will have a significant positive effect and makes ITOR an attractive home for German research. 



Report of the Chair, Conferences Committee

Karla Hoffman <khoffman@gmu.edu>

Intensive preparations for the 2020 IFORS triennial meeting to be held in Seoul, Korea 21-26, 2020 are taking place. You will be seeing requests for session organization and abstract submission later this summer. Please see the article about the exciting events already scheduled for the meeting. This is The Meeting to attend in 2020! And, although it might seem a long way off, the planning for the 23rd IFORS meeting has already begun. The location will be in Santiago Chile in 2023. Again, please see a separate article for more information on this meeting.

In terms of other regional meetings: APORS (The Association of Asia-Pacific Operations Research Societies) held its 2018 meeting in Kathmandu, Nepal (6-9 August, 2018). EURO (The Association of European Operations Research Societies) held its 29th meeting in Valencia Spain (8-11 July 2018)

and will hold its 30th meeting in Dublin Ireland (June 23-26, 2019). ALIO (The Association of Latin-Iberoamerican Operational Research Societies) will hold a joint meeting with INFORMS in Cancun (June 9-12, 2019) and held a Joint EURO/ALIO conference on combinatorial optimization in Bologna, Italy (25-27, June 2018). The CLAIO meeting (Conference of Latin-Iberoamerican Operational Research Organizations) was held in Lima, Peru (September 24-27, 2018) and a ELAVIO, Latin American Summer School of Operations Research, was held in Marbella Chile (March 5-9, 2018).

On a less exciting, but administratively important note, the Conference Manual for IFORS has been finalized and is available upon request. We welcome any comments, additions and corrections to this important document. 🌐

OR for DEVELOPMENT SECTION

Call for Submissions to the IFORS Prize for OR in Development 2020

Mario Guajardo <Mario.Guajardo@nhh.no>

The competition aims at promoting the practice of OR in developing countries. Past winners and finalists include works that have improved health, wellness, education, public investments and other issues in Africa, Asia and Latin America.

The Prize will be awarded during the 22nd Triennial conference to be held in Seoul, Korea, June 21-26, 2020. The winner will receive a grand prize of US\$4,000 and the runner-up a prize of US\$2,000. One person from each finalist team will be given free registration to the conference.

Entries must describe an OR application implemented in practice in a developing country, to assist one or more specific organizations in its decision-making process, and should demonstrate original features in methodology or implementation. The entries must include some description of the application's social context and its impact on the decision-making process or on the organization(s) 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. Works of a purely technical nature, or those which have no relevance in the developmental context, will not be considered.

The submission process has been simplified with respect to previous years. It will consist of two stages, where the first requires a short summary describing the application (maximum five pages) including context/problem description, methodology/solution approach, results/impact, timeline, and involvement of local researchers. In the second stage, a selection of entries will be invited to submit a full-length

manuscript (maximum 25 pages). It will consist of two stages, where the first requires a short summary describing the application (maximum five pages) including context/problem description, methodology/solution approach, results/impact, timeline, and involvement of local researchers. In the second stage, a selection of entries will be invited to submit a full-length manuscript (maximum 25 pages). This may be based upon other reports or articles previously submitted or published. If selected to be among the finalists, the entry should be presented by at least one of the authors during the 2020 IFORS Triennial Conference.

Entries describing novel contributions will be encouraged to submit a full-length manuscript to the IFORS' journal International Transactions in Operational Research (ITOR), although this will not be a requirement to participate in the competition

For judging criteria and other submission details, please visit the IFORS website. Other inquiries should be sent directly to the Prize Chair:

Mario Guajardo (e-mail: mario.guajardo@nhh.no), Associate Professor, Department of Business and Management Science, NHH Norwegian School of Economics, Bergen, Norway.

Important Dates

Submission deadline summary (first stage): October 1, 2019

Submission deadline full paper (second stage): December 18, 2019

Finalists will be notified by: January 31, 2020

Date of oral presentation: June 22, 2020 🌐

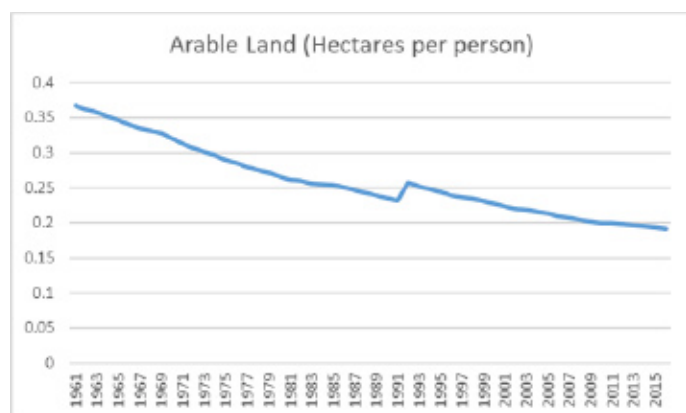


Sustaining Food Supply by Educating Smallholder Farmers in Developing Economies

Ying-Ju Chen <imchen@ust.hk>, **Christopher Tang** <chris.tang@anderson.ucla.edu> and **Shihong Xiao** <xiaosh@umn.edu>

We are facing an unprecedented food supply crisis. The world's population is projected to grow from 7.5 billion in 2018 to over 9 billion by 2050, thanks to improved healthcare and medical services. However, due to population growth, longevity resulting from better health care, and increasing consumption caused by economic development in developing countries, the demand for Earth's resources is expected to continue to grow and exceed the capacity of natural resources. Consequently, the Earth Overshoot Day has moved from late September in 1997 to August 1 in 2018, the earliest date since the world first went into overshoot in the early 1970s. In other words, humanity is currently using nature 1.7 times faster than ecosystems can regenerate.

The unprecedented consumption demand creates an urgent need to produce more food with limited resources (land, water, etc.). However, the development of infrastructure and housing to support population growth has depleted the amount of arable land for cultivation. Based on data obtained from the World Bank, the arable land per person has declined gradually over time (Figure 1).



▲ Figure 1. Arable Land (Hectares per person) from 1961 to 2016. (Data source: World Bank)

The reduction of arable land has put billions of smallholders in a challenging situation. According to the Food and Agriculture Organization of the United States (FAO), 98 percent of the world's agricultural holdings are 10 hectares or less and almost all of these small farms are in developing countries, supporting around 2 billion people. To create more farmland and produce more food, many smallholders are clearing forests via slash-and-burn or logging, causing higher carbon emissions and great impacts on climate change. Rainforest Alliance, an independent international nonprofit dedicated to conservation and sustainable living, reports that agriculture is responsible for 90 percent of tropical deforestation. To curb the alarming rate of deforestation and to secure the sustainable supply of food, the world



needs to improve smallholder productivity (to produce food in a more effective manner) without wasting or damaging natural resources.

Sustainable agriculture is a plausible remedy for this challenging situation as it can increase crop yield by as much as 79%, according to FAO. But to help smallholders in developing countries develop sustainable farming practice, one needs to establish a system to disseminate information about farming techniques by overcoming many challenges including: (1) Accessibility – many farmers in developing countries do not have internet access; (2) Affordability – many farmers cannot afford to pay for the information especially when they are not sure about the value of the information; (3) Relevance – different farmers have different needs because they grow different crops under different conditions; and (4) Understandability – many farmers in developing countries are illiterate.

The first challenge, accessibility, could be addressed by taking advantage of the wide subscription of feature mobile phones in developing countries. According to the World Bank, by 2017, the number of mobile phone subscriptions (mainly feature phones) per 100 people is: Bhutan (90%), Brazil (113%), Cambodia (116%), Cameroon (82%), China (105%), Congo Republic (96%), Ghana (127%), Indonesia (174%), Myanmar (90%), Nigeria (76%), Peru (121%), and Rwanda (72%).

Given the widely accessible feature mobile phones, governments and NGOs have developed various “peer-to-peer” (P2P) knowledge-sharing programs, such as WeFarm and Rainforest Alliance's Supply Chain Network Project (SCN), to assist knowledge exchange among smallholders free of charge. By leveraging the shared knowledge from a peer group, a P2P sharing platform can ensure the shared knowledge is relevant and understandable. Consider WeFarm, the largest digital network for farmers. Founded in 2015, WeFarm facilitates users to ask and answer farming questions and share farming tips, via SMS or online, enabling farmers in rural areas without internet access to share information (Figure 2).



▲ Figure 2. WeFarm P2P Knowledge Sharing Platform for Farmers. (Source: WeFarm)

In a similar vein, Rainforest Alliance launched its Farmer Training App in 2015 for farmers to share tips, videos, and photos with others about best practices in sustainable agriculture. It conducted a pilot study with a cooperative of coffee farmers in Guatemala by training farmers how to operate this app on a tablet or smartphone so that they can watch videos on sustainable farming techniques. Also, this app allows farmers to post questions and share tips (Figure 3).



▲ Figure 3. Rainforest Alliance's Farmer Training App. (Source: Rainforest Alliance)

These peer-to-peer knowledge sharing platforms can overcome the four aforementioned challenges and have great potential for augmenting the knowledge of farmers; enhancing farmers' productivity and willingness to adopt sustainable farming techniques. However, there is one snag: putting altruism aside,

what is the incentive for knowledgeable farmers to share their expertise voluntarily and truthfully?

This nagging question motivated us to develop an economic model to examine the rational knowledge sharing behaviors of farmers with different knowledge levels (Xiao, Chen and Tang, 2019). We first examine whether and when a farmer shares his knowledge with others. Our analysis reveals that, left

to their own devices, farmers with high knowledge levels are not willing to share their knowledge with other farmers due to self-interest. This result implies that a reward mechanism is needed to entice farmers to share the right amount of knowledge. In our paper, we show that a quota-based reward mechanism can entice farmers with high knowledge levels to share knowledge voluntarily and truthfully with others and maximize farmer welfare. As it turns out, this quota-based reward mechanism resembles Rainforest Alliance's SCN project in Guatemala which offers a small number of free phone minutes as a reward to farmers who share effective management practices for irrigation, composting tips, etc.

By leveraging communication technology and meticulously designed mechanisms, farmers are enticed to share relevant knowledge with others. This way, farmers can be more productive by adopting sustainable farming techniques. Hopefully, this will sustain our food supply for the growing population.

Reference

Xiao, S.H., Chen, Y.J., and Tang, C.S. 2019. "Knowledge Sharing and Learning Among Smallholders in Developing Economies: Implications, Incentives, and Reward Mechanisms," forthcoming, **Operations Research** (an INFORMS journal). Manuscript is available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2750337)

OR for Humanitarian Logistics

Andréa Cynthia Santos <andrea.duhamel@utt.fr >

Logistics play a key role in operations after major disasters. In particular, it allows us to attenuate the effects of a disaster on the population, environment, and local economy, avoiding massive migration, amongst other possible outcomes. The International Disaster Database (EM-DAT) reported 281 natural disasters in 2018. These affected over 60 million people in the world, with 10,733 deaths, while, in 2017, 335 natural disasters were reported, impacting over 95.6 million people, with 9,697 deaths and costing about US \$335 billion. The number and effects of catastrophes, together with 3.4 billion people worldwide living in cities, require special attention to logistics for disaster relief.

Humanitarians and organizations combine their expertise in a collective worldwide effort

to improve post disaster operations. The EM-DAT and the International Charter Space and Major Disaster (ICSMD) are examples of such efforts. On the other hand, the OR scientific community has done a lot of work on the different phases of disasters (Preparedness, Response and Recovery). Nevertheless, as mentioned in Kunz, et al. (2017), the use of results in practical applications is not proportional to the number of published studies. Three main drawbacks contribute to that: (i) lack of contextualization, (ii) the numerous superfluous aspects added to the models, and (iii) access to data. Issues (i) and (ii) imply that the core of the optimization problems is not clearly identified.

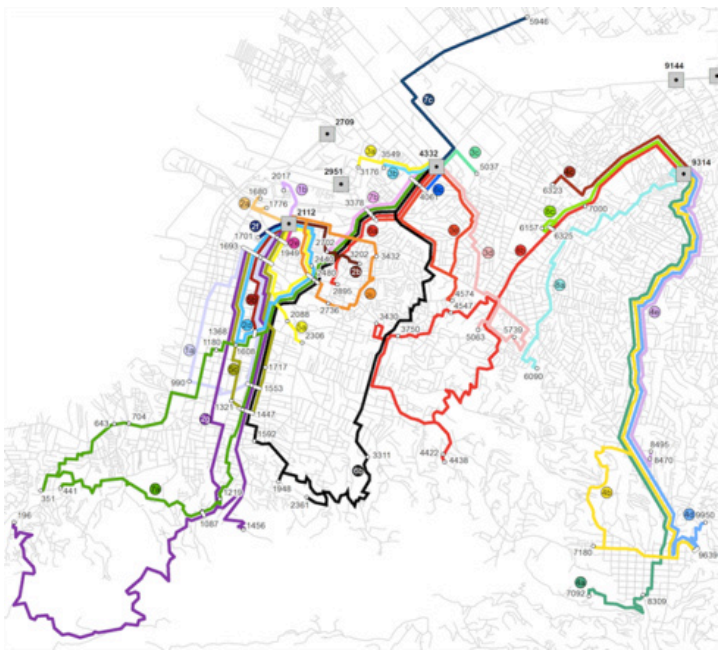


I have been working to overcome these drawbacks, with a bottom-up approach, by analyzing the situation on the ground with members of the ICSMD. The contextualization has been done with our partners, for a class of scheduling, distribution and location problems, based on their expertise of more than 20 years in the data treatment of satellite images to produce maps of the impacts. In particular, the focus is on large-scale earthquakes, and on considering the response and recovery disaster phases. An effort has also been made to produce results (outputs) that could easily be read and interpreted by relief teams. This has been translated into maps with decision-support information for the aforementioned class of problems.

Several interesting data aspects have been identified. For instance, the existing graphs of urban networks that can be obtained in normal time from databases like Openstreetmap and GoogleEarth are unusable after a quake, since debris will block roads, and as a consequence accessibility is compromised (i.e. in graph theory, the network strong connectivity is no longer ensured). Moreover, population distribution is no longer valid since people move or migrate. In addition, in emergencies, the situation on the ground evolves quickly, with strong influence from social and local culture, among other aspects. To summarize, the collaboration with ICSMD allowed us to build input data according to the context, modeling the problems including the main aspects they seek to answer in such contexts, and producing maps with decision-support information. Last but not least, some problems require fine graph granularity, characterizing a large-scale optimization problem. This is the case of The Road Network Accessibility Problem (RNAP) and The Work Troops Scheduling Problem (WSP), Sakuraba,



▲ Figure 1 - Graph of Port-au-Prince, including hubs (e.g. Port, Airport, etc represented by black circles), spontaneous grouping points of inhabitants (gray triangles), and blocked roads (bold lines).



▲ Figure 2 - Last-mile distribution map for Port-au-Prince, Haïti.

et al. (2016a); Sakuraba et al. (2016b), where the data treatment for the earthquake that struck Port-au-Prince in Haïti results in a graph with 16,660 vertices, 19,866 routes, and more than 500 blocked roads (a big scheduling problem!) as shown in Figure 1.

Using past disasters, the scheduling problems were investigated in the context of rehabilitating road network accessibility, followed by two distribution problems: macro distribution and last-mile distribution. Macro distribution consists of defining routes to deliver supplies from big hubs (e.g. port and airport) to intermediate depots close to the population, while last-mile distribution corresponds to the chaotic stage of distribution, and consists of delivering supplies from those intermediate depots to the affected population. Both problems are modeled as rich Vehicle Routing problems (VRP) and the developed models and methods have been compared with the best methods found in the literature for classical VRP, Penna, et al. (2018). Figure 2 depicts an example of map with support-decision information for the last-mile distribution, inspired by metro maps. It is noticeable that routes are not as in normal days (usually petal shaped). They make use of the same paths to deliver and to return to depots, and one reason for that is blocked roads.

This collaboration has also allowed us to access data in real-time during a disaster, as was the case of the Kathmandu earthquake in 2015, where location problems were investigated only 48h after the event. To conclude, we realized the relevance of studying models that progressively approach the situation on the ground, which permits the identification of difficult aspects of the problems, while remaining pragmatic enough to solve real issues. Moreover, all the aforementioned efforts - in data treatment to produce inputs for the algorithms and suitable outputs for the relief teams, and to model the optimization problems - highlights a collective effort and a real opportunity to use the results of OR practically for humanitarian logistics.

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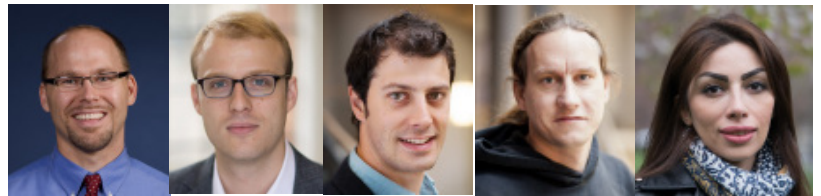
OR IMPACT

Placement Optimization in Refugee Resettlement

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"Why are we not using data to inform this decision making?"

- Mike Mitchell, HIAS's Associate Vice President



The Problem

In 2017, there were 19.9 million refugees - the highest number ever recorded - under the mandate of the United Nations High Commission for Refugees, with 1.2 million considered to be in need of resettlement, that is permanent relocation from their asylum country to a third country. These refugees are particularly vulnerable: a quarter are survivors of torture and a third face persecution in their country of origin. Currently, most refugees departing for resettlement are Syrians who seek asylum in Jordan and Lebanon, but there are also thousands of resettled refugees from the Democratic Republic of the Congo, Iraq, Somalia, and Myanmar. In 2016, the number of resettlement submissions reached 165,000 (a twenty-year high) and 102,800 people departed for resettlement. Dozens of countries, including the United States (US), Canada, the United Kingdom (UK), Australia, France, Norway and Sweden resettle refugees.

There is ample empirical evidence that the initial placement of refugees within the host countries determines their and their children's lifetime employment, health, and education outcomes. Therefore, ensuring the optimality of the initial match between the refugee family and the community is crucial for social, economic, and humanitarian perspectives. However, resettlement capacity offered by communities is rarely being used to maximize either the welfare of refugees or of the host population.

This article describes how a multi-national team incorporated integer optimisation and machine learning into an interactive decision support system (called Annie™ MOORE, after Annie Moore, the first immigrant to be processed at Ellis Island, US, around

1892) to enable improvements to the outcomes from refugee placement in the US. Annie™ was developed in close collaboration with representatives from all levels of the Hebrew Immigrant Aid Society (HIAS), one of 9 not-for-profit organisations in the US responsible for resettlement, where a first version was deployed in May 2018.

Current Process

Resettlement agencies, including HIAS, set up networks of "affiliates" i.e. local offices that work with communities to welcome refugees and help them to integrate into a new life. The matching of refugees to affiliates in the US is carried out largely by hand from a pool of cleared for arrival families, around half of whom have no relatives or other ties in the US. Agency staff assess the feasibility and fit of families to locations in their network of affiliates, taking account of family characteristics and available community characteristics such as housing availability, school places, and English language instruction. The agencies are assessed by the Department of State on how well they help refugees secure employment within three months of arrival. However, resettlement agencies typically match refugee to affiliate manually which means that they do not systemically learn from patterns found in past resettlement data.

Introduction to Annie™

The development team were convinced that part of the matching process could be improved with the use of integer optimisation and machine learning. The objective of the optimisation process is to allocate refugee families to a set of affiliates (localities) into which families are resettled. >>

>> Each family requires a set of capacitated services, such as school places and housing, from a set of availabilities at affiliates. There are also integration services that are modelled as binary feasibility constraints e.g. support for single parents or for large families, language support etc. The value of each refugee-affiliate match is called the *quality score*: the *employment outcome* of a match is of specific interest in this study and can be estimated from data using observable affiliate and family characteristics. An integer optimisation problem that maximises an objective function (e.g. expected number of employed refugees) over all matched refugees was then formulated and tested.

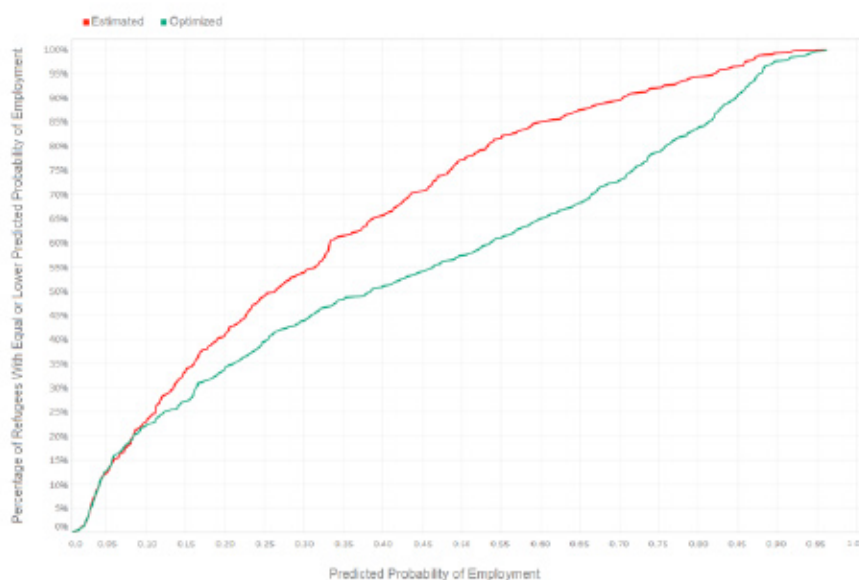
In addition, two standard machine learning approaches were evaluated, with the aim of enabling continuous improvement to matching allocations as data on outcomes becomes available, e.g. job status of refugees at successive periods after resettlement. The LASSO approach (least absolute shrinkage and selection operator), added to the interacted logit constraint, proved to be the better approach and was incorporated into *Annie™*.

The researchers then used their employment model to derive counterfactual prediction of employment probabilities for previous resettled refugees and then used the integer optimization model to figure out the optimal counterfactual placement i.e. the placement of refugees that would have maximized employment while ensuring that constraints are satisfied. Fig 1 shows that the probability of employment increases for almost every refugee. Distributional constraints, such as keep average *family sizes* with affiliates similar, were also tested. Two optimised alternatives were also evaluated, demonstrating the greater potential for improvement of the *Annie™*-based approach.

A raft of open source technologies were used in the creation of *Annie™* and are documented in reference 1.

Experience of Using *Annie™* to Date

The key to the successful development, implementation and use of the interactive decision support system *Annie™*, was to involve all of the stakeholders from the very beginning, not only the managers but also the resettlement staff (users) who use the new approach. From the start, the researchers emphasised that *Annie™* only makes matching suggestions and HIAS remains completely in control for final matches. Naturally the users were initially concerned that the system was designed to replace them but over time they were persuaded that they would remain in



▲ Figure 1 Cumulative distribution of employment probabilities. Red: estimated probabilities under HIAS placement. Green: optimized probabilities for {observed capacity, service constraints on, no minimum average case size} scenario.

complete control but be better informed about their matching decisions. Moreover, the staff's time could be freed up to deal with more complicated refugee cases, such as those with complex medical conditions. Finally, regular meetings enabled operational challenges faced by staff in using *Annie™* to be identified and resolved.

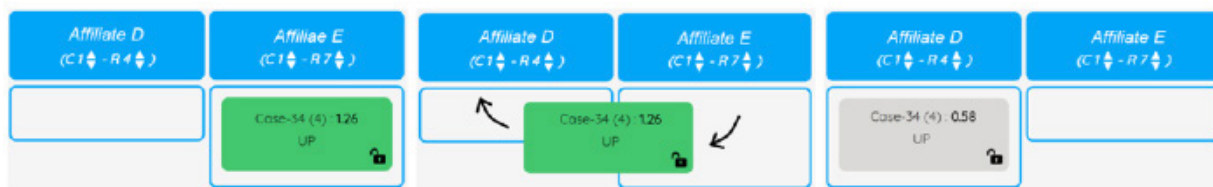
The user *interface* of *Annie™* is shown in Figure 2.



▲ Figure 2: *Annie™* Interface

The input data is shown at the top left and the results of the matching process are shown at the front right, depicted in user friendly *tiles*. *Family tiles* show language, nationality of the family etc. and *affiliate tiles* show integration support features available in the affiliate.

Users can import data instantly from the centralised refugee resettlement data and then run *Annie™* to produce an initial optimal allocation of families to affiliates. They then check and fine tune the allocations according to their expertise and local knowledge. This is done by moving individual *case tiles* to alternative *affiliate tiles* until they are satisfied that the best *practical allocation* has been achieved, as shown in Fig 3. Consequently, HIAS staff remain fully in control and responsible for the final decisions that are made.



▲ Figure 3 Case tiles can be moved by dragging to an alternate affiliate tile. Upon moving, the match scores dynamically update. The background of the case tile changes to grey to indicate a non-optimized state.

Outcome

The first version of *Annie*[™] was delivered to HIAS in early May 2018 for initial testing. Updates and new features were regularly added until August 2018 when it was presented to the US State Department and all staff at HIAS. Throughout the development process, the development team have firmly maintained that *Annie*[™] is a tool that augments the perspective of resettlement staff at HIAS, who have complete discretion to match and rematch cases according to their expert judgment and local knowledge. This enables the best of both worlds: leveraging the strengths of modern computational technology - machine learning and integer optimization - while arming human decision-makers with all available information to facilitate the decision-making process. **HIAS staff report that the allocation process that used to take half a day now takes around an hour.**

Annie[™] has been in regular use by HIAS since August 2018 and it is believed, by both the users and managers involved, that significant improvements are being made, although it is too early to quantify these improvements. (Initial back-testing indicated that *Annie*[™] can improve short-run employment outcomes by 22%–37%). The predictive models within *Annie*[™] are automatically updated as more data, e.g. on 90-day employment rates, becomes available, so that, in effect, the system is self-improving.

Further Development and Applications

Several additional improvements are under

consideration and will be incorporated according to client priorities. These include: incorporating multiple objectives from additional integration outcomes, dealing with equity concerns (e.g. ensuring an even distribution of family sizes across affiliates), evaluating potential new locations for resettlement, managing quota in a dynamic fashion and eliciting refugee preferences.

There are several regions around the world where *Annie*[™] could be used to help improve refugee resettlement, including in the Syrian Vulnerable Persons Resettlement Scheme, currently operated by the British government and in Sweden where some 50,000 refugees were relocated in 2017. The Swedish Migration Board and several other American resettlement agencies have indicated an interest in improved methods of allocation and the development team have offered support.

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Editor's note: an earlier version of this work appeared in the April 2019 issue of OR/MS Today 🌐

BOOK REVIEW

Decision Making under Deep Uncertainty

Hans W. Ittmann <hittmann01@gmail.com>

Decision Making under Deep Uncertainty – From Theory to Practice by Vincent A. W. J. Marchau, Warren E. Walker, Pieter J. T. M. Bloemen and Steven W. Popper (Editors), 2019, Springer, pp. 405, ISBN 978-3-030-05251-5, ISBN 978-3-030-05252-2 (eBook), 49.99 Euro (Hardcover); the book is also an Open Access book available from <https://doi.org/10.1007/978-3-030-05252-2> both as a pdf or as an epub book.,

Decision making for the future depends on anticipating change. Climate change and everything that goes with it is an excellent example of this. Today most people believe climate change is a reality but there is considerable uncertainty about aspects such as the magnitude of climate

change, the speed of climate change, the implications for specific geographical areas and regions and then, most importantly, the policies that should be implemented to mitigate and/or hedge against the adverse consequences of climate change. This is an example characterized by “deep uncertainty”. In a deep uncertainty situation, there is typically a lack of knowledge or disagreement about “(i) the external context of the system, (ii) how the system works and its boundaries, and/or (iii) the outcomes of interest from the system and/or their relative importance”.



Uncertainty may be defined simply as limited knowledge about future, past, or current events. Uncertainty refers to the gap between available knowledge and the knowledge decision makers would need in order to make the best policy choice.

According to the editors, *Decision Making under Deep Uncertainty*, provides a unified and comprehensive treatment of the approaches and tools for developing policies under deep uncertainty, and their application. It contains state of the art material, both in terms of the theory and practice, and of the approaches and tools that has been developed for assisting decision making under deep uncertainty. This volume was produced under the aegis of the Society for Decision Making under Deep Uncertainty and is available as an Open Access book. This indicates how important this society values the topic as well as their willingness to share it with the broadest possible decision maker and analyst communities.

There are four main parts in the book, each containing a few chapters. In Part I an outline is presented of each of the five main Decision Making under Deep Uncertainty (DMDU) approaches while Part II contains an application of each of the five approaches. Three implementations, where some of the DMDU approaches and tools used in real-world applications, are illustrated in Part III. In Part IV, one of the chapters is devoted to a taxonomy of DMDU approaches and tools and a second chapter provides a reflection on the connection between theory and applications of DMDU and how this contributes to the emerging needs of public policy decision making processes.

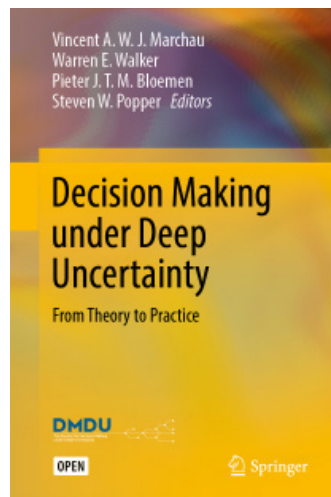
In the introductory chapter the entire spectrum of uncertainty is discussed. Donald Rumsfeld (Former US Secretary of State) with his famous quote acknowledges this:

“As we know, there are known knowns – these are things we know we know. We also know there are known unknowns – that is to say we know there are some things we do not know; but there are also unknown unknowns – the ones we don’t know we don’t know.... It is the latter category that tends to be the difficult one”.

Uncertainty stretches from total certainty across a spectrum of uncertainty levels to total ignorance. There are four uncertainty levels discussed, namely: Level 1 – no absolute certainty; Level 2 – can describe inputs probabilistically; Level 3 - limited set of plausible futures; and Level 4 - the deepest level of recognized uncertainty. Given this a brief outline is presented of decision making under deep uncertainty. What is required is a paradigm that is not based on predictions of the future but that aims to prepare and adapt by monitoring how the future evolves and allowing adaptations over time as knowledge is gained.

The five different DMDU approaches are outlined

in Part I. Each approach consists of the following elements and steps: frame the analysis; perform exploratory uncertainty analysis; choose initial actions and contingent actions; and iterate and re-examine. In each case the approach is discussed in detail and in some cases the approach is illustrated through an example. These five DMDU approaches are outlined in Chapters 2 to 6, respectively:



- *Robust Decision Making (RDM)*: RDM is a set of concepts, processes, and enabling tools that use computation, not to make better predictions, but to yield better decisions under conditions of deep uncertainty. The example used to illustrate this approach is to determine the most robust combination of carbon prices and technology subsidies, to reduce climate-altering greenhouse gas emissions;
- *Dynamic Adaptive Planning (DAP)*: DAP focuses on implementation of an initial plan prior to the resolution of all major uncertainties, with the plan being adapted over time based on new knowledge. DAP is a relative new approach, but an interesting illustration is provided where DAP was used for the long-term development and strategic planning of Schiphol airport in the Netherlands;
- *Dynamic Adaptive Policy Pathways (DAPP)*: DAPP considers the timing of actions explicitly in its approach. It produces an overview of alternative routes into the future;
- *Info-Gap Decision Theory (IG)*: An information gap is defined as the disparity between what is known and what needs to be known in order to make a reliable and responsible decision; and
- *Engineering Options Analysis (EOA)*: EOA refers to the process of assigning economic value to technical flexibility.

These are all very new concepts for those not familiar with this field.

Applications for each of the approaches are covered in Chapters 7 to 11, while Chapters 12 to 14 each contain a detailed outline of an DMDU implementation process. The problem description of each applications is presented, and then the reader is taken step by step through the process of developing the application. In each application a different approach is used which is useful since it gives practical exposure to each approach. Anticipated future change, deep uncertainty and long-term decisions are common characteristics in these applications. Two case studies demonstrate how RDM can help develop robust long-term strategies. In the first case study RDM was used for the 2012 Colorado River Basin Study—a landmark 50-year climate change adaptation study. The second case study outlines how RDM is used to define the key vulnerabilities of global climate policies and regimes for technology transfer.

To develop and test the DAP approach the implementation of a type of innovative traffic safety technology in the Netherlands was used. Flood risk managers at a regional level in New Zealand applied the DAPP approach to managing deep uncertainty around flood frequency associated with changing climate. For the application in Chapter 10, the IG robustness approach is used to manage uncertainty in the early-stage design of a latch mechanism and how robustness functions may be exploited to support decision making.

Chapter 11 illustrates the use and value of EOA using two case studies, namely, the Liquid Natural Gas case that involves the development of a liquid natural gas plant in Australia and the second one is the IJmuiden case as it relates to water management and flood control facilities in the Netherlands.

As this is a new field, generic rules are lacking how to implement the new approaches and tools into practice, however, lesson can be drawn from the ADM approach used in the Dutch Delta programme on flood risk management, freshwater availability, and spatial adaptation as outlined in Chapter 14.

In the development and description of the different applications and implementations, the focus and objective of the different DMDU approaches is to facilitate the development of policies that are robust and/or adaptive, meaning that they perform satisfactorily under a wide variety of futures and can be adapted over time to unforeseen future conditions.

There are several remaining challenges in the DMDU field listed, as well as future work, that require more attention and research. These are: (i) the improvement of the existing DMDU approaches; (ii) further guidance on when and how to apply a specific DMDU approach and the tools; (iii) broadening the scope of DMDU applications; and (iv) striving towards “monitor and adapt” as the more preferable strategy, as against “predict then act”, for long-term decision making in the face of deep uncertainty. As in so many research areas there is still much to do and here it is no different!

In conclusion **Decision Making under Deep Uncertainty** is a monumental piece of work and a welcome addition to the ever-increasing body of knowledge in this important emerging field. What is presented and covered in the book is refreshing but admittedly it requires focussed attention as it does not make for “bedtime” reading. Nevertheless, the various DMDU approaches, comprehensively outlined, represent an evolving capacity to deal with the challenge of the future, and all its associated uncertainties, by providing a technology of complexity, especially in the analysis of problems in public policy. This book presents major advances in tackling and addressing the “black swan” events, namely those problems, decision makers are faced with, that does not fit within the realm of regular expectations, with huge impact and that can only be explained retrospectively. The editors, authors and other contributors need to take a lot of credit for this comprehensive source of material contained in the book! 🌍



CONFERENCES

The First EUROYoung Workshop

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The First EUROYoung workshop took place during May 2-3, 2019, at the Institute of Mathematics of the University of Seville, in the lovely city of Seville, Spain. This is the first of a series of workshops supported by EURO, the European association of Operational Research societies, and organised by the newborn EUROYoung group.

One of the objectives of the group is the organisation of research events targeted at students and young scholars to promote the creation of a bond between researchers going through a delicate phase of their career and preparing to be the faculty and practitioners of tomorrow. The workshop was characterised by a friendly environment where the participants shared their knowledge and exchanged ideas on their research activity.

The group also wants to promote peer-education and give young researchers the opportunity to teach their colleagues something unique they



▲ The workshop organisers. From left to right: Lavinia Amorosi, Martina Fischetti, Marina Leal, Alberto Santini, and Moises Rodriguez.

have learnt, which happened in Seville during two *Tutorial Sessions*. The first was given by *Lavinia Amorosi*, on solving multi-objective optimisation problems with Polyscip; the second, by *Mercedes Pelegrín*, gave practical tips on how to break symmetry in integer programmes.



▲ The workshop participants in front of the Real Alcazar of Seville.

EUROYoung wants to facilitate sharing knowledge from established excellent O.R. “seniors” to the new generations. To this end, two renowned scientists, *Ana Viana* from INESC-TEC and *Federico Perea* from the Polytechnical University of Valencia, participated with invited plenaries and in networking and mentoring activities. The plenaries were not technical in nature; instead, the focus was on being inspirational for the new generation of operational research scientist.



▲ Prof. Ana Viana, plenary speaker at the First *EUROYoung* Workshop.

Prof. Viana discussed the importance of O.R. to help achieve important social goals, such as implementing an organ exchange programme for kidneys or reducing the carbon footprint of last-mile logistics, in a talk titled “2OR V \rightarrow 2OR” (read: to OR or not to OR).

In his plenary talk “*Exact methods for hard problems*”, *Prof. Perea* discussed the importance of going against the flow when establishing one’s research direction: research direction: for example, tackling hard problems in combinatorial optimisation and game theory with exact methods when almost everyone else is using heuristics!

One of the unique characteristics of the workshop was the absence of enrollment fees. Thanks to

generous contributions from EURO and local university institutions, the organisers could also offer free accommodation and meals to all participants. This policy aligns with the philosophy of *EUROYoung*: to provide affordable opportunities to young researchers to present their work, learn, and network, in events to which they might otherwise not have access due to budget constraints.

The two-day event included 40 talks in parallel sessions given by PhD students, post-docs and young researchers covering topics in Operational Research, Machine Learning and Data Science. The nine sessions ranged from “*Routing and logistics*” to “*Optimisation under uncertainty*” and from “*Insights on solvers*” to “*Machine learning*”, to name a few.



▲ Prof. Federico Perea, plenary speaker at the First *EUROYoung* Workshop.

With more than 50 participants affiliated to institutions in 13 different European countries, the event has been a promising debut, in particular thanks to the efforts of the local organisers *Marina Leal* and *Moises Rodriguez*. The *EUROYoung* founders (*Alberto Santini*, *Lavinia Amorosi*, *Martina Fischetti*, *Veronica Dal Sasso*) are confident that this success can be replicated in future editions, and the call is open to award the organisation of the second workshop, in 2020. 🌍

ASSOCIATION GOVERNANCE AND MANAGEMENT

Editor's Note: Since IFORS is an Association of Associations, IFORS News features articles about association governance and management. In this issue, we feature an article from the Business Mirror column (businessmirror.com.ph/2019/05/17/the-beyond-tourism-benefits-of-association-events) of Octavio Peralta who is concurrently the secretary general of the Association of Development Financing Institutions in Asia and the Pacific (ADFIAP), Founder & CEO of the Philippine Council of Associations and Association Executives (PCAAE) and President of the Asia-Pacific Federation of Association Organizations (APFAO). The purpose of PCAA – the “association of associations” – is to advance the association management profession and to make associations well-governed and sustainable. PCAA – enjoys the support of ADFIAP, the Tourism Promotions Board (TPB), and the Philippine International Convention Center (PICC).

The ‘Beyond Tourism’ Benefits of Association Events

Octavio B. Peralta <obp@adfiap.org>

Associations hold events and related activities in their own country, and in some cases, bid for or host international events for their affiliated overseas associations or federations. These events are collectively referred to as MICE (for meetings, incentives, conferences and exhibitions).

Traditionally, these association events are taken within the context of tourism, e.g., tourist arrivals, hotel room bookings, shopping and restaurant receipts. Current discussions in the association community, however, cover “beyond tourism” aspects which consist of knowledge/technology transfer, sustainable development and other related benefits.

Such shift in thinking on the long-term contribution of association events to the local venue destination is a good thing. For one, this increases the significance and benefits of association events to both the destination and to the organizing association. Second, this also elevates the discussion and builds up the support system for the country’s policy-makers to include education, investment, and economic portfolios, aside from tourism. By expanding the support ecosystem for MICE, key stakeholders can reap the benefits that association events have long been contributing to the country’s economic development.

It has been a long-held belief that business meetings are a major source of revenue for the destination. Economic impact studies released have proven to governments that these events were indeed key revenue generators. However, these reports are very much anchored on travel expenditures, reinforcing the concept that these meetings were primarily about tourism spending.

A scoping study on events that covered beyond-tourism benefits was published by Business Events



Octavio Peralta

Sydney in May 2010, which cited the long-term economic and societal benefits and legacies of such events. The study mentioned, among others, collaborative learning, social interaction, workplace and industry policy improvement, which have provided a positive impact on the destination’s importance and reputation.

Last year, the International Congress and Convention Association (ICCA), in conjunction with Best Cities Global Alliance, launched the “Incredible Impacts Programme” which aims to celebrate the beyond tourism value of international association meetings and to create a powerful platform to advocate their positive societal impact.

The “Global Economic Impact of Exhibitions, 2019 Edition,” a just-released report from UFI, the Global Association of the Exhibition Industry, finds that exhibitions the world over are responsible for the creation of \$325 billion in total economic output, 3.2 million jobs, and \$197.5 billion in gross domestic product in 2018 alone.

It’s high time for associations as well as economic policy-makers to go beyond the traditional “tourism-focused approach”—that association events are more than tourism-related activities and that they contribute to the country’s broader overall sustainable development. 🌐

AGIFORS – the Airline Industry's OR Society

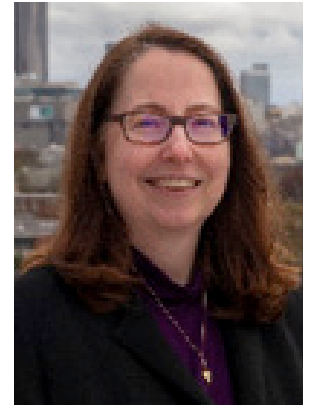
Laurie Garrow<laurie.garrow@agifors.org>

The Airline Group of the International Federation of Operational Research Societies (AGIFORS) is a professional society dedicated to the advancement and application of Operational Research within the airline industry and is a member of IFORS. The membership consists of Operational Research professionals employed by recognized civil airlines and related industries and correspondents keenly interested in the application of Operational Research to aviation problems.



AGIFORS is the outcome of informal discussions between six airline Operational Research workers (from Air France, BEA, KLM, Sabena, Swissair and Trans Canada) who were present at the second international conference in Operational Research at Aix en Provence, France, in 1960. These informal discussions led to the formation of a committee, which organized a Symposium on the use of Operational Research within the airline industry, at Spring Valley, New York in October 1961. This Symposium was deemed successful and resulted in the formation of AGIFORS as a professional society dedicated to the free exchange of ideas and new advances in Operations Research within the airline industry.

According to David Foster, President of AGIFORS, "throughout almost 60 years of history AGIFORS grew into a vibrant society that provides a platform for presenting new ideas. The majority of advances in applying operations research in the airline industry made over this period were at some point discussed at an AGIFORS meeting. Today the AGIFORS membership exceeds more than 2,000 individuals from airlines, industry, academia and other aviation related companies and associations." About 55% of members are from airlines, 30% from the airline industry, 10% from academia and 5% from other aviation related companies and associations.



AGIFORS organizes four conferences a year. Specialized conferences (called study group meetings) target analysts working in the areas of crew management, revenue management, and airline operations and strategic planning and scheduling are held in the spring.

A general conference, targeting managers working in aviation, is held in the fall. The study group meetings and annual symposium rotate throughout the world. In 2018, these meetings were held in Tokyo, New Delhi, Hong Kong, and Honolulu. In 2019, these meetings will be held in France, Mexico, Panama, and the United States.

The annual symposium is a great opportunity to see the best innovations coming out of aviation. Each spring, the study groups give out best presentation awards and the authors of these innovations are invited to present at the annual symposium. We also select the finalists for the Anna Valicek student paper competition and honour fellows at the annual symposium.

The Anna Valicek award recognizes original and innovative research in the application of operations research to airline and/or airline related business problems. The award honours the late Anna Valicek who served for many years as a member of the AGIFORS council. Up to two finalists are selected and receive air transportation, accommodation, and registration fees to attend the Annual Symposium. The winner is awarded a silver medal and a U.S. \$2,500 prize.

The other finalist is awarded a bronze medal and a U.S. \$1,000 prize. "The Anna Valicek award is one of the premier student paper awards in aviation," - Richard Cléaz, Chair of the Anna Valicek committee explains. "Last year, we received 17 entries from six countries. A total of 18 reviewers from airlines, consulting companies, and academia selected the two finalists among the very high quality entries. The two finalists presented their work at the annual symposium and the Council then voted to select the winner.

In 2018, Nuno Antunes Ribeiro of the University of Coimbra Pólo II in Coimbra, Portugal won the Silver Medal for his paper "An optimization approach for airport slot allocation under IATA guidelines". "Reviewers were impressed by the quality of Nuno's work, the scope and potential of his contribution in an understudied area where processes are lengthy, manual and clearly suboptimal," Cléaz noted.

This year's annual symposium will be held in Seattle, Washington, USA. "We have several exciting workshops planned for this year's symposium," Rodrigo Acuna-Agost, the Symposium Technical Co-Chair explains. "The main novelty for this year

is that we will be more explicit in encouraging submissions on artificial intelligence and machine learning to enrich our technical program. We are aiming to grow the AGIFORS community with new members creating synergies on complementary fields. As a consequence, we will better serve the new challenges and emerging use cases originated by the increasing amount of data generated by the airline industry."

Membership in AGIFORS is free. The past several years, AGIFORS invested in an effort to create an online database that members can use to access all historic presentations (which AGIFORS received permission from authors to post).

More information about AGIFORS is available online at www.agifors.org.

Editor's note: IFORS Kindred Societies are those which do not meet the conditions for national societies but nevertheless represent OR workers in more than one country. They have no voting power but may be represented at meetings of the Board of Representatives. 🌐

OBITUARY: EGON BALAS, A PERSONAL REFLECTION

Michael Trick < trick@cmu.edu >



Egon Balas, a pioneer in integer programming, University Professor of Industrial Administration and The Thomas Lord Professor of Operations Research at Carnegie Mellon University, member of the IFORS Hall of Fame, died at age 96 on March 18, 2019.

I first met Egon when I was a postdoctoral fellow in Minneapolis in 1987. I was interviewing at the business school of Carnegie Mellon, then called the Graduate School of Industrial Administration (GSIA) and now the Tepper School, for a faculty position, but I had no intention of taking any offer from CMU. My background was in industrial engineering, and I was convinced that was where my future lay. But Egon himself had called me up to invite me to interview, and I was eager to meet a person who I only knew through his foundational publications on integer programming. Little did I know how persuasive Egon could be when he put his mind to it.

During the interview, it was very clear that Egon's enthusiasm for integer programming and discrete optimization was, to use a technical term, unbounded. He showed me what he was working on and eagerly got my rather uninformed views on his own direction, and he had some extremely insightful commentary on what I was doing.

It was a time when business schools were jettisoning operations research faculty, changing curricula to decrease mathematics and increase inspirational stories from then-top CEOs, seemingly ignoring the selection bias involved. But Egon used the force of his personality to show the leaders at GSIA the value of operations research and he had brought together a top-notch faculty, including people like Gerard Cornuejols and John Hooker. And, while I resisted for a short period, I joined that group, and have been at GSIA/Tepper ever since.

Watching Egon work was a master class in being a world-class researcher and doctoral supervisor. Egon would spend countless hours with his doctoral students and postdoctoral visitors, drawing on his chalkboard and enthusiastically arguing with his colleagues on proofs and conjectures. The work that he so enthusiastically talked about when I interviewed was the nucleus of an idea that came into full bloom as “lift-and-project cuts”, a form of cutting plane for integer programs whose variations helped revolutionize computational integer programming.

Egon led a life both fascinating and horrifying. He suffered in ways no one should suffer, and came out of it with a strong will and firm sense of right and wrong. His experiences were detailed in his autobiography “Will to Freedom: A Perilous Journey Through Fascism and Communism,” published in 2000 by Syracuse University Press and available in six languages. His obituary from the Tepper School outlined his life, and I quote that here:

“Balas was born into a Hungarian-Jewish family in Cluj, Romania, in 1922. He studied math and physics in the well-known Jewish lyceum of Cluj, learning from top minds, who, because they were Jewish, were excluded from higher academic posts.

After high school, Balas wanted to continue studies in physics but was blocked by anti-Semitic laws. Determined to fight Nazism, he joined the underground Hungarian Communist Party, distributing leaflets and helping to organize a strike. He was arrested by Fascist Hungarian authorities in 1944, tortured, and thought he would be killed.

Sentenced to 14 years of hard labor, he escaped during transport to Germany and made his way home, where he learned that all of his immediate family had been killed along with most of the 18,000 Jews who had lived in Cluj before the war. Fewer than 2,000 returned after it ended. In 1948, Balas married his wife, Edith, herself a Holocaust survivor who returned home to Romania after being released from Auschwitz at the end of the war. They celebrated their 70th anniversary this year.


Still in the Communist Party, Balas taught himself economics and changed his birth name, Blatt, a common Jewish surname, to Balas in order to serve in the Romanian government as economics director in the Ministry of Foreign Affairs. During a power struggle in 1952, he was arrested by party leaders and put in solitary confinement for more than two years, again suffering torture.

Released from prison in 1954, Balas became disenchanted with Communism, especially after a trip with his wife to the Soviet Union exposed economic conditions much worse than depicted in the state press. In a 2016 interview, available on Institute for Operations Research and the Management Sciences (INFORMS) website, Balas describes the difficulty of his transition after spending decades trying to make economic sense of Marxism and Socialism. But he also says this disillusionment helped spur his turn to mathematics.

In 1959, at the age of 37, Balas immersed himself in the then-emerging field of linear programming, gaining recognition with a novel solution to a timber-harvesting problem. He called his solution the Additive Algorithm, similar to what is known as implicit numeration or constraint propagation today. He later earned Ph.D. degrees in economics (University of Brussels, 1967) and mathematics (University of Paris, 1968).

Balas circulated his findings at several conferences, publishing them in 1965 in the journal *Operations Research*. It became one of the most oft-cited optimization papers of its day. William Cooper, the associate editor who worked with Balas on the article, later helped bring Balas to Carnegie Mellon in 1967. (Cooper is a founding faculty member of the Graduate School of Industrial Administration, forerunner to the Tepper School of Business at Carnegie Mellon.) Egon was recognized for his work by receiving most awards possible in the field (EURO Gold Medal, John von Neumann Prize from INFORMS, election to the US National Academy of Engineering, and IFORS Hall of Fame, among many) and he received honorary doctorates University of Waterloo and Miguel Hernandez University in Elche, Spain. He was also inducted into the Hungarian Academy of Science and received the Humboldt Research Award for U.S. Senior Scientists from the Alexander von Humboldt Foundation.

Egon had the energy of a 30-year-old, right up until the end. He played tennis through his 95th year. Just two weeks before his passing, he was sending emails organizing the teaching of his beloved integer programming course for the latter half of the spring semester.

Balas is survived by his wife of 70 years, Edith, an Emeritus Professor of Art History at the College of Humanities & Social Sciences at Carnegie Mellon University; two children, Anna Balas and Vera Balas Koutsoyannis; three grandchildren, John Koutsoyannis, Robert (Bob) Koutsoyannis, and Alexander (Alex) Waldron; and four great-grandchildren. 

Call for an editor-in-chief and associate editors for IFORS News

The International Federation of Operational Research Societies (IFORS), which was formed in the 1950s and is currently composed of 50 national societies, has the following purposes: the development of operational research as a unified science and its advancement in all nations of the world.

IFORS News is the quarterly newsletter published by IFORS, and communicates ideas, interesting developments, conferences, and major OR events from OR groups and societies from all over the world. The format of the newsletter is electronic and it is published on the IFORS website. Past issues of IFORS News are available here:

<http://ifors.org/category/newsletter/>

IFORS are currently seeking to recruit a number of new volunteer editors from the global OR community to help in the production of this publication:


Four associate editors

- IFORS plan to have associate editors for each section of the newsletter. For most sections, the work would only involve finding an appropriate article every three months. The sections that IFORS need associate editors for are: Tutorial, Association Governance and Management, Book Review and OR Society in Focus.

An editor-in-chief

- The editor-in-chief is primarily responsible for collecting finalised articles from associate editors, defining the order in which the articles will be presented, and reviewing the layout of a draft issue. The current lead editor-in-chief is willing to continue to help with the newsletter, or alternatively to be replaced by a new editor-in-chief.

Please consider whether you could be part of this team! Please contact Luciana Buriol <buriol@inf.ufrgs.br> and Mary Magrogan <secretary@ifors.org> to register your interest in one of these roles.

Please note that these are volunteer roles. 



Let's all meet in Korea!

The 22nd Conference of
the International Federation of Operational Research Societies

IFORS 2020

Coex, Seoul, Korea

June 21 (Sun) - **26** (Fri), 2020

<http://www.ifors2020.kr>



IFORS

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