

IFORS

International Federation of Operational Research Societies

NEWS

FROM THE PRESIDENT

Janny Leung <jannyleung@um.edu.mo>

In a few short weeks, the 23rd triennial IFORS conference will be held in Santiago, Chile. This is only the second time that the IFORS conference is held in South America, after a gap of 36 years since the previous IFORS conference in Buenos Aires in 1987. After enduring all the restrictions due to Covid in the past three years, we are all eager to have the opportunity for in-person exchange of ideas. IFORS Santiago has attracted over 900 submissions and I very much look forward to a most vibrant conference in a most vibrant city!

In addition to the many talks by operational researchers presenting their latest ideas, several awards will also be presented at the conference:

- The IFORS Fellows Award serves to recognize a distinguished individual's contribution to international operational research and its communities. Since 2020, thirty-three Fellows have been appointed. The three new IFORS Fellows of 2023 will be presented with their award at the conference.
- The IFORS Hall of Fame celebrates the significant contributions made by the OR pioneers in the advancement of theory and methodology, in the development of applications, and in dissemination of OR knowledge and understanding. I invite all of you to attend the ceremony on 11th July when three distinguished OR pioneers will be inducted into the IFORS Hall of Fame.
- The Prize for OR in Development Competition aims to promote the practice of OR in development; entries include projects that improve health, wellness, education, public investments in emerging economies. Finalists will present their work during the conference, and the winners will be announced by the judging panel at the closing session.

As the global OR community gathers at the IFORS conference, I think these awards help us appreciate the depth and breadth of our field, the impact OR has made and continues to make in the world. We pay tribute to the IFORS Hall of Famers who have established the solid scientific underpinnings and carved out the broad scope of applications of our discipline. We honour the IFORS Fellows whose efforts have contributed to building new theories, methodologies and spheres of influence of OR, and we celebrate the extension of the practice of OR on global development issues of significance.

Recently, the "godfather of AI", Geoffrey Hinton, sounded a warning about digital intelligence, expressing the concern that the neural network technology that he pioneered might produce a flood of misinformation that may be exploited by "bad actors" and pose a threat. I believe that Operational Research as a discipline does not suffer from the same risks that Hinton fears. Since its early days, each new technology has sparked new developments in OR theory and methodology, but OR has always been grounded in practice, with clear consideration of the objectives and impact of the methodologies and solutions derived.

So I very much look forward to the IFORS Santiago conference, where the global OR community can come together to share experiences and exchange ideas, and develop new ways to use OR to improve lives, as befitting the theme of the conference "Advanced Analytics for a Better World".

Nos vemos en Santiago! 🌐



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FROM THE EDITOR IN CHIEF

Antonio Mauttone <mauttone@fing.edu.uy>

Welcome to the June issue of the IFORS Newsletter!

In this new issue of our publication, we proudly arrive to its second special edition since I assumed the responsibility of Editor in Chief. The June issue is special because it includes the annual reports, where the Administrative Committee of IFORS summarizes its activities and achievements during the last year. The content of that section is very rewarding, since it is a clear sample of the high level of intensity and integration of the global Operational Research (OR) community. The annual reports' section includes articles from the President, the Vice President, the Treasurer, and the Regional Vice Presidents of IFORS. Moreover, this June issue concurs with the 23rd edition of the triennial IFORS Conference, to be held in Santiago, Chile, from July 10 to 14. We hope this to be an opportunity to reach a large readership interested in the content of this publication.

The June issue of the IFORS Newsletter also includes content related to its regular sections. In the *OR and Development* section, colleagues from the University of Chile report on a large and interdisciplinary project aimed at supporting decision making to manage the Covid-19 Pandemic in Chile, using OR and analytics tools. The research team, which was awarded with the 2022 Franz Edelman Award, worked in several project components, namely, mobility, testing and active screening, intensive care unit planning and serology surveillance, to provide information and recommendations to the government. In the Tutorial section, colleagues from Universidad del Valle, Pontificia Universidad Javeriana and Universidad ICESI, Colombia, review the state-of-the-art of the application of OR to healthcare in Latin Iberian-America. By conducting both a literature review and a survey, the authors realize that although OR methodologies have been applied to support decision making in healthcare, including strategic, tactical and operational planning, most studies developed within the region of interest do not fit according to the existing taxonomies of known problems and applications. As a

result, new categories were defined, and a new working group was launched within the ALIO community. In the *OR Impact* section, a team from the non-profit institute Analytics for a Better World discusses the importance of analytics and OR in contributing to reach the Sustainable Development Goals. The authors present several applications, including optimization of the food supply chain, the geospatial accessibility for healthcare in developing countries, the cattle feed for small farmers and the ocean cleaning. While these problems have been approached by using classical methodologies (linear programming, dynamic programming) and models (facility location, diet problem), the organizational implementation and software skills are highlighted as key factors to succeed.



Moreover, the *Conferences* section reports 13 events worldwide on OR and related disciplines, while the Book Review section reports on the volumes "Human Agro-Energy Optimization for Business and Industry" and "Quadratic Unconstrained Binary Optimization Problem - Theory, Algorithms and Applications". In this issue we include an obituary for Prof. Jacob Krarup, a relevant actor of the OR community, who sadly passed away this year. Finally, this June issue includes articles about the IFORS Webinar, the Finalists of the IFORS Prize for OR in Development and the IFORS 2023 Conference.

We thank all authors and section editors for their contributions, and we hope you enjoy the reading! 🌐

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**IFORS Developing Countries
Online Resources**

REPORT OF THE PRESIDENT

Janny Leung < jannyleung@um.edu.mo >

The year 2022 marked the beginning of the term of the current Administrative Committee of IFORS. The previous AC, despite having to work in the difficult COVID19 years, started many important new initiatives. I want to take this opportunity to thank them (President Grazia Speranza, Past-President Mike Trick, Vice-President Chang-Won Lee, Treasurer Richard Hartl, VP-ALIO Rosiane de Freitas, VP-APORS Sunity Shrestha Hada, VP-EURO Stefan Nickel and VP-NORAM Karla Hoffman). Their advice had been very helpful as the new AC learnt the ropes of the IFORS operation and continued the effort to support operational research activities worldwide.

I am glad that Richard Hartl remains as the Treasurer (for two years) and Stefan Nickel continues as VP-EURO and in charge of Publications. Together with Past-President Grazia Speranza, they provide important guidance and continuity in the transition. In addition to myself, the new members of the AC (and their key roles) are: Vice-President Frits Spieksma (Global Webinars), VP-ALIO Antonio Mauttone (Newsletter), VP-APORS Francis Miranda (Developing Countries), VP-NORAM Rina Schneur (Meetings). They will discuss in more detail the various IFORS activities in their reports.

Overall, the year 2022 was quite an eventful one for IFORS.

Just prior to the beginning of the year, the Executive Director of Informs notified us that Informs will no longer provide administrative support for the IFORS Secretariat from January 2023. This came as quite a shock, as Mary Magrogan (recently also assisted by Christy Blevins) has served as IFORS Secretary for more than 20 years since 2001. We will really miss their professionalism, their institutional memory and especially their enthusiasm for IFORS. Fortunately, the Operational Research Society of the United Kingdom agreed to take up the Secretariat role and Mr. Gavin Blackett (former ORS Executive Director) has been working closely with Mary/Christy to effect a smooth transition.

In February, the outbreak of conflict in Ukraine caused a lot of concern among the operational research and other scientific communities. IFORS issued a statement denouncing the military action and calling for a cessation of hostilities (see IFORS website). Four IFORS Member Societies proposed that the Russian OR Society's membership in IFORS be withdrawn. The procedure according to the IFORS Statutes was duly followed and a 6-month ballot on this was put before all the IFORS Member Societies. Upon the closing of the voting in November, the required two-thirds majority was not attained. Therefore, the Russian OR Society remains in IFORS, albeit as a Member Society without any regional affiliation, since EURO decided to exclude it from EURO.

After many years of hard work by Past Presidents Mike Trick and Grazia Speranza, IFORS became a registered organisation in Switzerland in 2021. However, the process of trying to attain non-profit status is still on-going. I wish to express appreciation to Marino Widmer, Treasurer of EURO, who continues to assist

us in this process.

Throughout 2022, the main work of IFORS in promoting operational research worldwide continued. Let me give an overview below.

Publications. IFORS' flagship journal, *ITOR*, continued to go from strength to strength under the leadership of Editor-in-Chief Celso Ribeiro and the international Editorial Board. The open-access journal, *Sustainability Analytics and Modeling (SAM)*, is the second journal of IFORS. Since 2021, the founding Editor-in-Chief, Elise Miller-Hooks, and the 30+ members of the Editorial Board had been working very hard to establish the journal, which began to attract a steady stream of high-quality submissions.

Global webinars. The IFORS global webinars began in 2020 during the Covid19 pandemic. This has proved to be a very good channel to bring relevant topics in operational research to a worldwide audience. Two well-attended webinars were held in 2022. Recordings of all past webinars are available on the IFORS website.

IFORS Distinguished Lectures (IDL). With IFORS' sponsorship, world-renowned operational researchers (typically from a different IFORS region) are invited to give distinguished lectures at regional conferences. In 2022, the IDLs were Andrea Lodi at EURO Espoo in July, Luciana Buriol at Informs Indianapolis in October, Ahti Salo at APORS Manila in November and Anna Nagurney at CLAIO Buenos Aires in December.

Newsletter. This quarterly digital IFORS newsletter reports on conferences and workshops organized by IFORS regions and Member Societies, as well as publishes a variety of articles on theory and practice of OR. Many thanks to Editor-in-Chief Antonio Mauttone! The newsletter is available on the IFORS website, from which one can sign up for a free subscription and receive each new issue via email.

Fellowship for Winter/Summer Schools. To help in their career development, IFORS sponsors PhD students and young researchers to attend summer/winter schools organized by EURO and ALIO. In 2022, utilizing the budget unused from previous years, IFORS was able to support two students each to the EURO summer school and ELAVIO. The IFORS AC also decided to increase the sponsorship budget for future years.

Developing Countries. IFORS strongly supports initiatives to promote the education and practice of OR in developing countries. Several applications for the triennial *IFORS Prize for OR in Development* had been received. The Chair of the Judging Panel is Mario Guajardo. The finalists will present their work, and the winner will be selected, at the IFORS 2023 conference >>



>> **Finances.** With all the activities, IFORS still maintained a healthy financial position, under the stewardship of our Treasurer Richard Hartl.

IFORS Fellows. The IFORS Fellows award was established in 2020 to recognize distinguished contributions to the international operational research community. Seven Fellows were selected in 2022: Hugh Bradley (USA), Jean-Pierre Brans (Belgium), Michel Gendreau (Canada), Hans Ittmann (South Africa), David Schrady (USA) and Roman Slowinski (Poland), also Helle Welling (Denmark) who served as IFORS Secretary from 1979 to 1997. Congratulations and thanks to all of them for their contributions to IFORS!

REPORT OF THE VICE PRESIDENT

Frits Spieksma <f.c.r.spieksma@tue.nl>

IFORS is global. This becomes clear in all of its activities: its member organizations (which are distributed over the 4 regional groupings), the composition of the Administrative Committee, the alternating location of the IFORS conference over the continents, and it also becomes clear in the organization of the global webinars. This latter activity falls into the portfolio of the Vice-President at large, i.e., into my responsibility. Since November 2021, we have organized 5 of these webinars (and if you're interested you can find them back on YouTube).

So here is a question for you: what would you consider to be the optimum moment in the day for the webinar, i.e., at which time should the webinar start? I imagine the word optimum will ring a bell - so let me specify an objective function: maximize the potential number of attendees. And a potential attendee is a person that is at least expected to be awake during the webinar - and clearly, a webinar that starts at, say 9 am Paris time will not attract many attendees from, say Santiago, as 9 am Paris time translates to 3 am in Santiago. So, what is the ideal moment of the day, that is, at which time is a maximum number of OR people awake? You will find the answer at the end of this report.

Of course, while perhaps intriguing, specifying the time when the webinar starts, is definitely not a main activity. Actually, the variance in matters that we, as Administrative Committee

REPORT OF THE TREASURER

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

The 2022 budget (approved by the IFORS AC) projected an operating deficit of \$ 94,350. In years without an IFORS triannual conference, we usually observe a deficit and 2022 was not an exception. While a conservative forecast for 2022 showed a high deficit, it turned out that - as usual - IFORS did financially much better than projected. In short, the reason is that the income mainly from the journals was higher than projected, and some expense items were smaller than expected. Before accruing (which will be done by the auditor) the unaudited budget shows a deficit of \$ 52,923.

What follows is a summary of the unaudited results for 2022 (all numbers in \$US). Membership dues from our member

Conferences

After a careful vetting process, the location for the 2026 triennial conference was selected to be Vienna - to be hosted by the Austrian OR Society and the University of Vienna. Meanwhile, preparations were well underway for the triennial conference in 2023 in Santiago Chile. This would be only the second time that the IFORS conference is held in South America, the previous occasion being the Buenos Aires conference in 1987. We look forward to a wonderful gathering and stimulating interactions among operational researchers from all over the world.

All in all, 2022 was a year full of events and activities. I want to thank everyone for your efforts in promoting and supporting operational research all over the world. 🌐



(need to) discuss is much greater than I expected - we have had to organize a ballot where our members could vote, we have had discussions on the positioning of our two journals ITOR and SAM, there are membership requests, there are policies that relate to the IFORS conference, and many more issues that you will find back in other places of this newsletter. The important aspect here is: there is ample communication on all of these matters. We discuss things. IFORS brings people, organizations, and ideas together, and that is what I see as IFORS strength: to provide cohesive power.

So, when to organize a global webinar? Our answer is: at 9 am Santiago time. This is equivalent to 9 am Washington time, to 2 pm London time, and 3 pm Brussels time, and 9 pm Beijing time, 10 pm Tokyo time and 10 pm Melbourne time. So, assuming an OR person is awake between, say 7 am and 11 pm this moment in time gives us South America, the east coast of North America, Europe, Africa and Asia. My sincere apologies to all those OR professionals in Hawaii, as I can imagine that you are offered a tough choice: attend the webinar at 3 in the morning, or simply sleep. 🌐



societies were below budget since some societies paid their dues late. The publication revenues of \$ 75,519 from ITOR were above the budget of \$ 60,000, and remain the main source of income for IFORS (except for the IFORS conference every third year). While interest in the previous years was positive but negligible, in 2022 it was zero. The effect of these revenue movements was an income of \$ 88,080 which was higher than the budget of \$ 84,500.

On the other hand, 2022 spending at \$ 141,003 was below budget (\$ 178 850). Many items were significantly below budget, such as the travel expenses of the AC at \$ 14,830, the expenses for our scientific publications at \$ 27,533, the Developing Countries activities (\$ 7,824), and the costs related to the IFORS 2021 and 2023 conferences (\$ 3,938). Some expenses were slightly below budget, e.g. the IFORS Newsletter at \$ 1,600, Office & Secretary at \$ 45,000, auditing cost (\$ 2,047), and the costs related to our new legal structure (\$ 9,117). Other projected expenses did not materialize at all, such as the summer/winter schools, or contingency. On the other hand, some items were somewhat above budget, such as expenses for IDL/ITL (\$ 21,663), the website (\$ 5,047), and bank charges (\$ 2,404).

As mentioned, a deficit of \$ 94,350 was budgeted, while in the end, the actual unaudited deficit for 2022 was \$ 52,923.

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 \$ 1.393,050 by the end of 2021. Typically, the audited numbers will be slightly higher mainly because part of the ITOR profit share (for 2022) is paid in the year after (2023) while the auditor does some accruing and will add these to credits in 2022.

The budget for 2023 shows a deficit of \$ 8,500 even though it is a year with a triannual IFORS conference. This is because IFORS conferences outside Europe typically generate only a moderate profit. Furthermore, getting registered in Switzerland creates some extra cost in 2023 and – until we reach NGO status – taxes have to be paid. To date it is not clear how much deficit will materialize in the end. This will mainly depend on the success of the IFORS 2023 conference.

Summing up, 2022 did not materially change IFORS financial strength. In view of the Federation's financial position, no change in member society dues is recommended at this time. However, since the average annual deficits will remain high, IFORS will have to find additional sources of income. 🌐

2022 IFORS Financials (in US Dollars) Approved

		Approved Budget	Unaudited Actual
INCOME			
Member Society Dues		22 500	12 561
Royalties ITOR		60 000	75 519
Interest		2 000	
TOTAL INCOME		84 500	88 080
EXPENSES			
Activities	Administrative Committee	18 000	14 830
	Publications Committee		
	ITOR Editor	26 000	27 488
	ITOR Awards		45
	SAM waivers	10 000	
	Scientific Activities & External Affairs		
	IDL, ITL, Fellowships, & Grants	15 000	21 663
	IFORS Website	5 000	5 047
	Summer/Winter Schools	10 000	
	Meetings Committee		
	Chile 2023	10 000	1 250
	Euro conf system		2 688
	IFORS Newsletter	2 000	1 600
	Developing Countries Committee	20 000	7 824
General Business Operations			
	Office & Secretary	46 350	45 000
	Auditor	2 500	2 047
	Bank Charges	1 500	2 404
	Contingency	2 500	
	Domiciliation, new legal structure	10 000	9 117
TOTAL EXPENSES		178 850	141 003
OPERATING RESULT		(94 350)	(52 923)

REPORT OF THE VICE PRESIDENT REPRESENTING ALIO

Antonio Mauttone <mauttone@fing.edu.uy>

Before starting the report of activities carried out by ALIO, please, allow me to give some introduction. I have been part of the Administrative Committee (AC) of IFORS since January 1st, 2022. This has been possible due to the trust my colleagues from ALIO have put in me. I will be ever thankful to them. Moreover, being part of this AC has brought me the opportunity of sharing lots of knowledge and experience. This has been an intense period of learning, as well as an opportunity to keep a strong link between our regional grouping and the global OR community. Moreover, as part of this AC I took the responsibility of coordinating the edition of this newsletter, which allowed me to know many colleagues from the OR community, including section editors, authors, and, in general, people interested in this publication. I would like to thank all of them.

It follows a summary of activities carried out by ALIO, which were kindly gathered by the Secretary of ALIO, Yasmín Ríos-Solís.

The Association of Latin Iberoamerican Operational Research Societies (ALIO) was created in Rio de Janeiro in November 1982 with the purpose of promoting the exchange of experience and information among researchers, academics, and professionals related to Operational Research (OR) in the Latin Iberoamerican region as well as the circulation of techniques and methodologies related to these disciplines. ALIO is a Regional Grouping of IFORS, including the national OR societies from Argentina, Brazil, Chile, Colombia, Cuba, Ecuador, México, Peru, Uruguay, and the Iberian region, Spain and Portugal. For more information on other OR Latino Iberoamerican events, please visit ALIO's website: <http://www.alio-online.org/>.

Scientific activities and events in Operations Research (OR) in Latin Iberoamerica have been numerous and far-reaching. Here is a summary of the OR scenario in the region in the year 2022 and early 2023, and what is already planned for 2023-2024.

ALIO working groups

ALIO already had a working group, the Ibero-American Network of Evaluation and Multicriteria Decision (Red-M). Nevertheless, this year the ALIO working groups (AWG) were officialized, and the "OR in Health" AWG was born, led by Valentina Gutiérrez. We hope that new groups will join. The aim is similar to the EURO working groups, which is to congregate researchers and practitioners in the subject of the ALIO region, facilitating the development of joint research and spaces for dissemination. Interestingly, after a careful literature review, the OR in health AWG found that in Latin America, the research areas are different than the ones in other parts of the world mainly because of the different social and economic development stages of the countries in the region.

National OR Conferences in Latin Iberoamerican countries

Since mid-2022, most of the national OR events in Latin American countries have moved again to the face-to-face mode, even if some aspects of virtuality have remained, like hybrid plenaries or virtual assemblies.

CLAIO

One of the main activities of ALIO is its biennial meeting, the Latin Iberoamerican Conference on Operational Research - CLAI O. It has occurred biennially since 1982 in different Latin American cities. The main goals of this conference are to further the exchange of experiences, to establish and deepen ties between researchers and practitioners in the region, and to help young undergraduate and graduate students in their professional development.



XXI Latin Iberoamerican Conference on Operational Research (CLAIO) December 12-15, 2022, Buenos Aires, Argentina

CLAIO 2022 was held in Buenos Aires, Argentina, on December 12-15, 2022. It was a special event since we celebrated the contributions of Latin-American legends of OR, including Hugo Scolnik (University of Buenos Aires, Argentina), Nelson Maculan (Universidade Federal do Rio de Janeiro, Brazil), Jayme Szwarzfiter (Universidade Federal do Rio de Janeiro, Brazil), and Andrés Weintraub (Universidad de Chile, Chile). The conference also hosted plenary talks by José Mario Martínez (Universidade Estadual de Campinas, Brazil), Anna Nagurney (University of Massachusetts, USA, acting as IFORS Distinguished Lecturer), Emma Hart (Edinburgh Napier University, UK, acting as EURO Distinguished Lecturer), Antonio Alonso Ayuso (Universidad Rey Juan Carlos, Spain), Valentina Gutiérrez (Universidad del Valle, Colombia), and Ramon Faganello Fachini (Mercado Libre, Argentina + Brazil + Chile). The conference hosted the "X Encuentro de la Red Iberoamericana de Evaluación y Decisión Multicriterio (RED-M)", a special track on "OR in Health and Healthcare Services", and a special track on the Routing and Spectrum Allocation Problem. A total of 420 people attended the conference. For more information about CLAI O 2022, please visit <https://clai o2022.dc.uba.ar/>.

XXII Latin Iberoamerican Conference on Operational Research (CLAIO) October 28- November 1, 2024, Guadalajara, Mexico

The Mexican Operations Research Society will organize the XXII edition of CLAI O, which will take place in Guadalajara, Mexico, from October 28 to November 1, 2024. The conference purposefully coincides with the Mexican "dead festivities". Moreover, Guadalajara is the region of famous Tequila houses. More information on the Mexican OR Society webpage: <http://www.smio.org/>

ELAVIO

The other main activity of ALIO is its Latin-American Summer School in Operational Research (ELAVIO) which is a summer school aimed mainly at young researchers and graduate students (doctorate and master) from Latin Iberian-American countries with exceptional performance and interest in the areas of Operational Research, Systems Engineering, and Applied Mathematics.

XXIV Latin-American Summer School in Operational Research (ELAVIO) June 13 to 17, 2022, Monterrey, Mexico

The XXIV Latin-American Summer School in Operational Research (ELAVIO 2022) was held at the Tecnológico de Monterrey, which is located in Monterrey, Nuevo León, México, from June 13 to 17, 2022. The last ELAVIO was at Lleida, Spain, in 2019, so graduate students were eager to meet their peers in 2022 after the pandemic. The program included plenary lectures given by Rosiane de Freitas (Institute of Computing of the Federal University of Amazonas, Brazil), Antonio Alonso-Ayuso (Universidad Rey Juan Carlos, Spain), Elena Valentina Gutiérrez (School of Industrial Engineering in Universidad del Valle, Colombia), Roberto Wolfler Calvo (Laboratoire d'Informatique de Paris Nord, France), and Juan G. Villegas (Department of Industrial Engineering at Universidad de Antioquia, Colombia). All the students presented their work and had many interactions with the professors at ELAVIO.

There will be no ELAVIO in 2023 since there are other important events in the region this year. Hopefully, we will soon be announcing ELAVIO 2024.

Joint Conferences

ALIO interacts with other regions and societies like EURO and INFORMS by organizing joint events that reinforce the links between the researchers of the two regions.

XALIO/EURO International Conference 2021-2022 - Viña del Mar, Chile, April 11-13, 2022

The X ALIO/EURO International Conference 2021-2022 on Applied Combinatorial Optimization was held in Viña del Mar, Chile, April 11-13, 2022. It is a triennial event, with the main purpose of the event being to bring together Latin American and European researchers and to stimulate activities and discussions about methods and applications in combinatorial optimization. Researchers from other parts of the world are also welcome. The ALIO Plenary Speaker was Nicolas Stier-

Moses, Facebook Core Data Science; the EURO Plenary Speaker was Markus Leitner, VU Amsterdam; and the invited Plenary Speaker was Javiera Barrera, Universidad Adolfo Ibáñez. Since the COVID-19 pandemic was still latent, this conference was held in a hybrid format. More information on <https://www.alioeuro2021.cl>.

INFORMS/ALIO/ASOCIO International Conference, June 16-19, 2024, Medellín, Colombia.

The 2024 INFORMS ALIO-ASOCIO International Conference is a leading international conference for operations research and analytics academics and practitioners from around the world. Join INFORMS for a one-of-a-kind experience that combines the latest research, developments, and best practices, with unprecedented networking opportunities, all while enjoying all that Colombia has to offer, from the serenity of its white sand beaches to the lush treetops and soaring mountains of its tropical rainforests and the stunning colonial architecture that line its streets. We look forward to seeing you in 2024! More information is at <https://meetings.informs.org/wordpress/2024international/>.

23rd Conference of the International Federation of Operational Research Societies (IFORS 2023), July 10-14, 2023, Santiago, Chile

IFORS 2023 will feature exciting plenaries and a number of invited keynote talks covering a wide range of Operational Research and Analytics subjects. Also, a number of tutorials on current topics will be offered. Wednesday, during the conference, will be the opportunity to tour around Santiago, and the Organizing Committee has assembled tours of the vineyards near Santiago. Also, we plan to visit the famous port city of Valparaíso and Sewell, an old mining town in the mountains, and the possibility of visiting the ski centers near Santiago. More information is on the webpage, www.ifs2023.com. We look forward to seeing all of you in person in Santiago in July 2023! 🌐

REPORT OF THE VICE PRESIDENT REPRESENTING APORS

Francis Miranda <franzmiranda@yahoo.com>

As the Covid restrictions were mostly lifted in 2022, the OR societies in APORS resumed their various activities. Below is a summary of the activities undertaken by the OR societies within APORS in 2022, and some of the planned activities in 2023:

Operations Research Society of Australia, ASOR held ten online research seminars in 2022 that were open to members and non-members. The seminars covered topics such as scheduling, machine learning for optimization, and applications of operations research. ASOR is also collaborating with the Modelling and Simulation Society of Australia and New Zealand to organize the 25th International Congress on Modelling and Simulation (MODSIM2023), which will be held at the Darwin Convention Centre in July 2023. This event will provide a platform for researchers and practitioners to share their knowledge and experiences on modelling and simulation.

Operations Research Society of China, ORSC held its biennial national congress online in December 2022. In April 2023, some conference programs were conducted in-person in Changsha, a southern city in China. The event included the first-ever award ceremony for ORSC fellows, presentation of ORSC prizes for contributions, young OR forums, and paper presentations. The congress attracted over 1000 participants from across the country, making it the first national meeting after the pandemic. In 2023, several meetings of ORSC special interest groups, such as math programming, combinatorics optimization, scheduling, and behavioral operations management, have been scheduled.



Operational Research Society of Hong Kong, ORSHK organized a successful inaugural Young Researchers Workshop at the University of Hong Kong on November 26, 2022. The event was jointly organized by the Department of Industrial and Manufacturing Systems Engineering, the University of Hong Kong and attracted over 60 participants. Professor Anthony So from the Chinese University of Hong Kong delivered a tutorial on "Operations Research Techniques for Data Science and Machine Learning," followed by 21 oral presentations from young researchers in parallel sessions titled "OR Theory" and "OR Applications."

Operational Research Society of India, ORSI Kolkata Chapter hosted the international conference "Optimization, Learning and Analytics in Business" (OLAB-22) from December 15 to December 17, 2022. The event drew scholars from various universities across India and beyond, who presented 182 papers on topics such as logistics, supply chain management, manufacturing, machine learning, and sustainability. The conference included three keynote speeches, two plenaries with invited talks, and the presentation of 36 technical papers on the first day. The following two days featured notable plenary and invited speakers from India and other countries.

Iranian Operations Research Society, IORS is dedicated to upholding the quality of operations research scientific activities in Iran and beyond, conducting regular meetings, workshops, and seminars. In October 2022, the 15th International Conference of Iranian Operations Research Society (ICORS) was held by Azarbaijan Shahid Madani University, with 252 participants and 112 contributed papers. The conference published a book of abstracts and a CD containing the full papers. The general assembly of IORS is scheduled to take place on May 3, 2023, in Tehran, where the next executive council will be elected.

Operations Research Society of Nepal, ORSN organized its 13th International conference on Operations Research: Sustainable Development on February 1-2, 2022. The conference was held virtually on the Zoom platform and hosted by the School of Management, Tribhuvan University. ORSN also participated in various events such as the First APORS youth forum, where Mr. Phanindra Prasad Bhandari presented a paper on "Network Contraflow Problem with Intermediate Storage Capability: Evacuation planning Perspective."


ORSN representatives also attended the online Global Outbreak Alert and Response Network (GOARN) Partners meeting on International Outbreak Response Capacity in the Asia Pacific Region 2022, and Mr. Shital Bhandary presented a paper entitled "Forecasting Dengue Cases and Deaths for Five Years in Kathmandu and Nepal" in the 13th Triennial International Conference of APORS. ORSN

also held its 14th International conference on OR and Sustainability on February 1-2, 2023, in hybrid mode at the Hetauda School of Management and Social Sciences in Hetauda. The conference featured discussions on the latest developments on OR and sustainability.

Operations Research Society of New Zealand, ORSNZ held its Annual Conference on November 28 and 29. The conference commenced with a Healthcare Modeling cluster organized by the ORSNZ SIG on Healthcare Analytics (OSHA), which featured an excellent plenary address by Dr. Melanie Reuter-Oppermann and a discussion panel with experts from academia and industry. The sessions included presentations by both young and experienced practitioners on a range of topics, including finding missing persons with integer programming and teaching the next generation of OR students. The conference also had two prize highlights: Associate Professor Andrew Mason was awarded the Hans Daellenbach Prize for his contribution to the field, and the Young Practitioners' Prize was awarded for outstanding presentations and papers.

Operations Research Society of the Philippines, ORSP celebrated its 35th anniversary in 2022, conducting a series of activities such as webinars, an online conference, and a hybrid regional conference. The Webinar Series, which ran from March to October, addressed current national issues, cryptocurrencies in the Philippines, and political manipulation through social media. In May, the ORSP Student Federation organized the 5th Industrial Engineering Summit, which focused on digital trends in the research and analytics industry. Also, ORSP hosted the 13th Triennial APORS International Conference on November 9 to 12, 2022, with a hybrid format and the theme "Onwards to Recovery Through Operations Research." Around 290 participants from various Asia-Pacific countries attended the three-day event.

Operational Research Society of Singapore, ORSS, in partnership with various organizations, conducted several events and seminars for its members in 2022. On October 28, Asst. Prof. Asa Palley gave a talk on "Weighted Averaging Based on Peer Predictions." The Institute of Operations Research and Analytics organized "Analytics For X 2022" from September 21-23. Additionally, on June 9, Prof. Terry Taylor discussed "Shared-ride Efficiency of Ride-hailing Platforms," while on April 22, Prof. Chen Ying talked about "A Large Mixed Frequency Spatial Approach."

To promote OR in Singapore, ORSS expanded its reach in 2022 by extending ORSS Prizes to cover seven programs from major institutes of higher learning, including NUS (National University of Singapore), NTU (Nanyang Technological University), and SUSS (Singapore University of Social Science). 

REPORT OF THE VICE PRESIDENT REPRESENTING EURO

Stefan Nickel <stefan.nickel@kit.edu>

The European regional grouping within IFORS, EURO (The Association of European Operational Research Societies), consisting of 32 member societies, has had a very productive year 2022. Its members benefited from many opportunities to meet and discuss face-to-face again. The main highlight was the 32nd European Conference on Operational Research, EURO 2022, which took place in Helsinki, Finland, from the 3rd until the 6th of July.

Approximately 1900 conference delegates from 70 countries had the opportunity to follow about 40 concurrent parallel sessions at Aalto University Campus in Otaniemi in Espoo, about 6km from Helsinki city center. For many participants, this was the first international networking possibility in a long time.

The main program of the conference covered a wide variety of current topics with numerous talks, presentations, and sessions, including three plenary and 12 keynote talks. For example, Andrea Lodi spoke on the concept of fairness over time in his invited plenary, and Christina Pagel gave insights into the effects of the COVID-19 pandemic on interconnected systems.

During the conference, the usual EURO awards were presented. Among the winners were Cathal MacSwiney Brugha, who received the 2022 EURO Distinguished Service Award (EDSA 2022), and Prof. Gilbert Laporte, who was awarded the 2022 EURO Gold Medal (EGM 2022), the highest distinction within OR in Europe. Both accepted the award in person during a short presentation at the opening stream.

Besides plenaries, keynotes, and regular streams, the program contained the EURO Forums Roundtable in which three EURO forums, EUROYoung, the Practitioners' Forum, and WISDOM (Women in Society Doing OR and MS), came together to explore the opportunities and challenges of conducting OR research, focusing in particular on research funding. Forums are groups tasked with progressing a specific initiative that supports the ongoing health and vitality of OR research and practice.

The sponsors of EURO 2022 should be mentioned at this point. Without their support, the conference would not be possible. Finally, a special thank goes to the program committee and to the organizing committee. They did an excellent job reviving face-to-face international conferences as one of the most exciting opportunities for us to connect and exchange ideas during the sessions and the vivid social program.

The 33 working groups associated with EURO also benefited from the renewed possibilities to hold conferences, summer schools, and workshops to promote their fields of research. Members of a working group regularly exchange ideas and results, support each other's research work, publish their findings, and organize seminars or conferences. For example, the Annual Meeting of the EURO Working Group on Operational Research Applied to Health Services (ORAHs) took place from July 16th to July 21st in Bergamo, Italy. Other group meetings included the VeRoLog (Vehicle Routing and Logistics) at Kühne Logistics University in Hamburg, the EWGLA (Working

Group on Locational Analysis) in Aveiro, Portugal, and the HOpe (Humanitarian Operations) mini-conference in Istanbul.

The scientific results of the year 2022 generated by the researchers associated with EURO and its working groups are captured in the four EURO journals, among others: European Journal of Operational Research (EJOR), EURO Journal on Computational Optimization (EJCO), EURO Journal on Decision Processes (EJDP), and EURO Journal on Transportation and Logistics (EJTL). More information on the EURO journals can be found online on the EURO webpage.

A new event was the ORPHES (ORPHES), the Winter School of OR in Public Health Emergencies, which took place from January 10th until February 25th. EURO, WHO-SEARO, South-East Asia Regional Office of the World Health Organization, and GOARN, the Global Outbreak Alert and Response Network, brought together a mix of public health officials and OR experts to learn how public health emergency preparedness and response can benefit from the application of OR methodologies.

The EURO association continued supporting especially young researchers with various education and sponsoring programs in 2022. The EURO PhD School, for example, is an initiative established for post-graduate education for PhD students under a school format. In 2022, 3 PhD schools deferred from 2020 took place in Seville, Spain, (EURO PhD School on Data Driven Decision Making and Optimization), Marienheide, Germany, (EURO PhD School on Reinforcement Learning Applied to Operations Research), and Ankara, Turkey, (EURO PhD School on MCDA/MCDM). For example, in Seville, 26 PhD students from 16 different European countries were selected from 120 applicants approximately 20 talks given by senior researchers on recent advances in data driven decision-making. EURO further supports PhD students interested in participating in the National Taught Course Centre in Operational Research (NATCOR), which delivers taught courses in the UK (EURO PhD Schools).

Another EURO education initiative is the EURO Summer and Winter Institutes (ES/WI). They are meant to give early-stage researchers an opportunity for scientific exchange with other researchers of their field. In June 2022, the ESI on Location Science took place in Edinburgh, UK. For two weeks, 27 PhD students and early career researchers benefited from fruitful discussions on their works, lectures from 11 senior researchers in location science, and a vivid social program. To instigate collaboration, participants worked in small groups on a case study on the fictional Scottish company Whiskey & Haggis, for which they had to re-design their food supply chain. For more information, visit the event's website (ESI Location Science).

In conclusion, 2022 was a very successful and productive year for the entire EURO association and all its members. >>



>> Now, we summarize the events of the beginning of 2023 and provide an outlook on activities planned for the rest of the year.. Anita Schöbel is the new president of EURO and replaces Marc Sevaux, the past president. Furthermore, Ana Póvoa is the new Vice President (VP) 2 and replaces Julia Bennell. Joanna Jozefowska continues to serve as VP 1, just as VP 3 Juan José Salazar González, Secretary Jesper Larsen, Treasurer Marino Widmer, and IFORS Vice-President Stefan Nickel continue their service (EURO Executive Committee).

EURO is supported by additional Officers who have specific responsibilities and administrative roles: Manager Dr. Sarah

Fores, Executive Assistant and Website Editor Diane Wilson, Information Technologies Manager Prof. Bernard Fortz, and Advisor to EURO-k Conferences Prof. Gerhard-Wilhelm Weber (EURO Officers).

Second, there will be a lot of events in 2023.

We are looking forward to the 23rd IFORS 2023, which will be placed in Santiago, Chile, from the 10th until the 14th of July (IFORS-2023), and the 4 EURO PhD schools, one of whom still is deferred from 2020. 🌐

REPORT OF THE VICE PRESIDENT REPRESENTING NORAM **Rina Schneur** <rinarsg@gmail.com>

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 2022 as well as planned events for 2023 are reported below. Both societies have been extremely active. A key challenge last year was the transitioning back to in-person meeting. For CORS and INFORMS that included a including a joint meeting in Vancouver in June 2022.

CORS activities and Leadership

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 publishes the Bulletin, a newsletter of the Society and related activities. It is administered by a Council of eleven members: President Peter VanBerkel (Dalhousie University), Vice President Samira Abbasgholizadeh-Rahimi (McGill University), Secretary Marco Bijvank (University of Calgary) Treasurer Gregory Paradis (University of British Columbia) Immediate Past President Jules Comeau (Université de Moncton), Councillors: Sibel Alumur Alev (University of Waterloo), Masoud Chitsaz (Kinaxis), Nadia Lahrichi (École Polytechnique de Montréal) and Houra Mahmoudzadeh (University of Waterloo). In addition, CORS has a few standing committees: Awards, Education, Membership, Program, Public Relations, Publications, Special Interest Groups as well as various ad-hoc committees.

Meetings

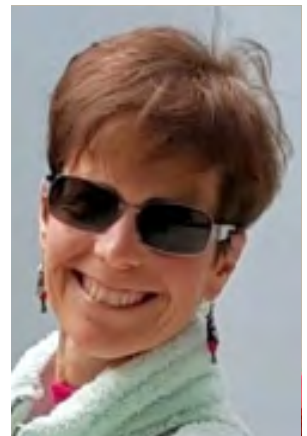
In 2022 CORS and Informs held a joint international meeting chaired by Taraneh Sowlati Professor, University of British Columbia. The Plenary speakers included: Hau Lee, Stanford University, Elise Miller-Hooks, George Mason University, Renata Konrad, Worcester Polytechnic Institute, Bistra Dilkina, University of Southern California, as well Ravi Ahuja (Optym) who gave the Harold Lardner Memorial. This year the CORS annual conference, jointly with Optimization Day, was just held in Montréal, QC in May 29. The conference chairs were Nadia Lahrichi (Polytechnique Montreal) and Nadia Lehoux (Université Laval). Plenary speakers included: Christian Blum (, Spanish National Research Council), Sophie D'amours (Université Laval, Canada)-winner of the Harold Lardner prize, Valerie Botta-Genoulaz, (INSA Lyon, France), Amelia Regan

(University of California, USA), and Louis-Martin Rousseau (Polytechnique Montréal, Canada).

Awards

The Awards presented in 2022 include:

- The annual Harold Larnder Prize to an individual who has achieved international distinction in operational research was awarded to Ravi Ahuja.
- The Omond Solandt Award, given to an organization that has made an outstanding contribution to operational research in Canada, was awarded to HALCO Software Systems Ltd.
- CORS Award of Merit winner was Louis-Martin Rousseau. The award is given for significant contributions of a current or past member of CORS to the profession of operational research.
- The Eldon Gunn Service Award, presented to members of the Society who have made outstanding contributions of time and service to the Society, was given to Fatma Gzara and Timothy Chan.
- CORS Practice Prize winners were: Srinivas S. Tamvada (Pennsylvania State University), Bahareh Mansouri (Saint Mary's University), Ramy Abdallah (McMaster University), Elkafi Hassini (McMaster University), Brian Bellino (Purolator International), and Khelil Khelil (Purolator Inc.) for "Gateway Consolidation for Purolator International".
- CORS Student Paper Competition Open Category winner was Ian Yihang Zhu (University of Toronto).
- CORS Student Paper Competition Undergraduate Category winner was Ethan Baron (University of Toronto).
- CORS Forestry SIG winners were Sahar Ahmadvand and Taraneh Sowlati (University of British Columbia).
- CORS Health Care Operational Research SIG winners were: Negar Ganjoughighi (University of Calgary) and Adam Lebrigui (Polytechnique Montréal).



Publications

CORS publishes the journal INFOR, a quarterly journal on Information Systems and Operational Research (Joe Naoum-Sawaya, Ivey Business School, Canada Editors in Chief) whose goal is to publish research at the intersection of data analytics, Operations Research, computational intelligence and optimization. It also publishes the CORS Bulletin (Andrea Friars, Editor).

INFORMS Activities and Leadership

INFORMS (www.INFORMS.org) 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.

2023 The Board of Directors for President, Laura Albert; President-Elect, Julie Swann; Past President Radhika Kulkarni; Secretary, Mark Lewis; Treasurer, Susan Martonosi; Vice President International Activities, Miguel Anjos; Vice President Technology Strategy, Warren Hearnese; Vice President Education, Illya Hicks; Vice President Practice, Robin Lougee; Vice President Membership and Professional Recognition, Pelin Pekgun; Vice President Meetings, Ariela Sofer; Vice President Sections and Societies, Mark Squillante; Vice President Publications, Chris Tang; Vice President Marketing, Communications & Outreach, Beril Toktay; and Vice President Chapters & Fora, Kathryn Walter.

Meetings

In 2022, INFORMS organized entirely in-person meetings, which consisted of the Business Analytics Conference, which took place in Houston TX from April 3-5, 2022, the CORS/INFORMS International meeting held in Vancouver from June 5-8, 2022, the INFORMS Security conference held in Arlington, Virginia from August 29-30, 2022, and the INFORMS Annual Meeting, which was held in Indianapolis, Indiana from October 16-19, 2022. The INFORMS meetings for 2023 include the Business Analytics Conference, which was held in Aurora, Colorado April 16-18, 2023, the INFORMS Healthcare Conference, which will be held in Toronto, Canada from July 26-28, 2023, and the INFORMS Annual Meeting, scheduled to take place in Phoenix, Arizona from October 15-18, 2023.

Publications

INFORMS offers a wide array of content and information about Operations Research and Analytics to meet the needs and interests of researchers, practitioners, students, business leaders, policy-makers, and the public.

INFORMS publishes 17 journals: *Decision Analysis*, *Information Systems Research*, *INFORMS Journal on Applied Analytics*, *INFORMS Journal on Computing*, *INFORMS Journal on Data Science*, *INFORMS Journal on Optimization*, *INFORMS Transactions on Education*, *Management Science*, *Manufacturing & Service Operations*, *Marketing Science*, *Mathematics of Operations Research*, *Organizational Science*, *Operations Research*, *Service Science*, *Stochastic Systems*, *Strategy Science* and *Transportation Science*. It also publishes three magazines (*OR/MS Today*, *Analytics* and student-run *OR/MS Tomorrow*) as well as two serial publications (*INFORMS Analytics Collections* and *Tutorials in Operations Research*). View them all at <https://pubsonline.informs.org>.


Subdivisions

In addition, INFORMS has various subdivisions directed at members of the OR/MS community including 13 Societies, 22 Sections and 6 Forums, two of them – Pride and Military Veterans just added in the past year. There are also 65 geographic and student chapters.

Awards

The following prize winners for fall 2022/spring 2023 include:

- The Daniel H. Wagner Prize for Excellence in Operations Research Practice was awarded to Luis Costa, Massachusetts Institute of Technology, Vivek Farias, Massachusetts Institute of Technology, Patricio Foncea, Massachusetts Institute of Technology, Jingyuan (Donna) Gan, Massachusetts Institute of Technology, Tianyi Peng, Massachusetts Institute of Technology, Ayush Garg, Anheuser-Busch InBev, Ivo Rosa Montenegro, Anheuser-Busch InBev, Kumarjit Pathak, Anheuser-Busch InBev, Dusan Popovic, Anheuser-Busch InBev.
- The Doing Good with Good OR - Student Paper Competition was awarded to Bonn Kilford-Seranilla, University of Luxembourg.
- The Don P. Gaver Junior Early Career Award was presented to Yao Xie, Georgia Tech.
- The Franz Edelman Winner for 2023 was Walmart.
- The Frederick W. Lanchester Prize was awarded to Daniel Russo and Benjamin van Roy, Stanford and Yurii Nesterov, CORE/UCL.
- The George B. Dantzig Dissertation Prize was given to Su Jia, Carnegie Mellon University.
- The George E. Kimball Medal was given to Michael Fu, University of Maryland and Ranganath Nuggehalli, UPS.
- The George Nicholson Student Paper Prize was awarded to Ziv Scully, University of California, Berkeley and Isaac Grosf, Carnegie Mellon University.
- The Impact Prize was given to Yu Ding, Texas A&M University, Jianhua Huang, Chinese University of Hong Kong, Shenzhen, Hoon Hwangbo, University of Tennessee, Knoxville, Giwhyun Lee, Korea Army Academy at Yeong-Cheon, Abhinav Prakash, Walmart Labs, Rui Tuo, Texas A&M University.
- The INFORMS Case Competition was awarded to Timothy Chan, University of Toronto, Craig Fernandes, University of Toronto, Alvert Loa, University of Toronto, Nathan Sandholtz, Brigham Young University.
- The INFORMS President's Award was given to Candace Yano, University of California, Berkeley.
- The INFORMS Prize was awarded to Walmart.
- The John von Neumann Theory Prize was awarded to Vijay Vazirani, University of California, Irvine.
- The Judith Liebman Prize was awarded to Lauren L. Czerniak, University of Michigan; Christian Zamiela, Mississippi State University; and Sajjad Amrollahi Biyouki, University of Tennessee, Knoxville.
- The Prize for Teaching of the OR/MS Practice was awarded to Burcu Keskin, University of Alabama, Junmin (Jim) Shi, New Jersey Institute of Technology.
- The Saul Gass Expository Writing Prize was awarded to Warren Powell, Princeton University.
- The Volunteer Service Prize was awarded to: Yael Grushka-Cockayne, University of Virginia, Anahita Khojandi, University of Tennessee, Knoxville, Abdullah Konak, Pennsylvania State University, Tarun Mohan Lal, Atrium Health, Daniel Reich, Navel Postgraduate School, Jay Simon, American University.
- The Undergraduate Operations Research Prize was awarded to Matthew Brun, Rice University.
- The UPS George D. Smith Prize was presented to the Purdue University, Mitchell E. Daniels, Jr. School of Business, Business Analytics and Information Management.

In addition, the following people were inducted as INFORMS Fellows in 2022: Rajan Batta (University of Buffalo), William J. Browning (Applied Mathematics, Inc.), Richard Church (University of California, Santa Barbara), Elsayed A. Elsayed (Rutgers University), Julie Simmons Ivy (North Carolina State University), Daniel Kuhn (EPFL), Anne Robinson (Kinaxis), Andrew Schaefer (Rice University), Katya Scheinberg (Cornell University), Karen Smilowitz (Northwestern University), Julie Swann (North Carolina State University), Enver Yücesan (INSEAD Business School). 

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OR AND DATA ANALYTICS BATTLE THE COVID-19 PANDEMIC IN CHILE

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In representation of the Chile team awarded the 2022 Franz Edelman Award

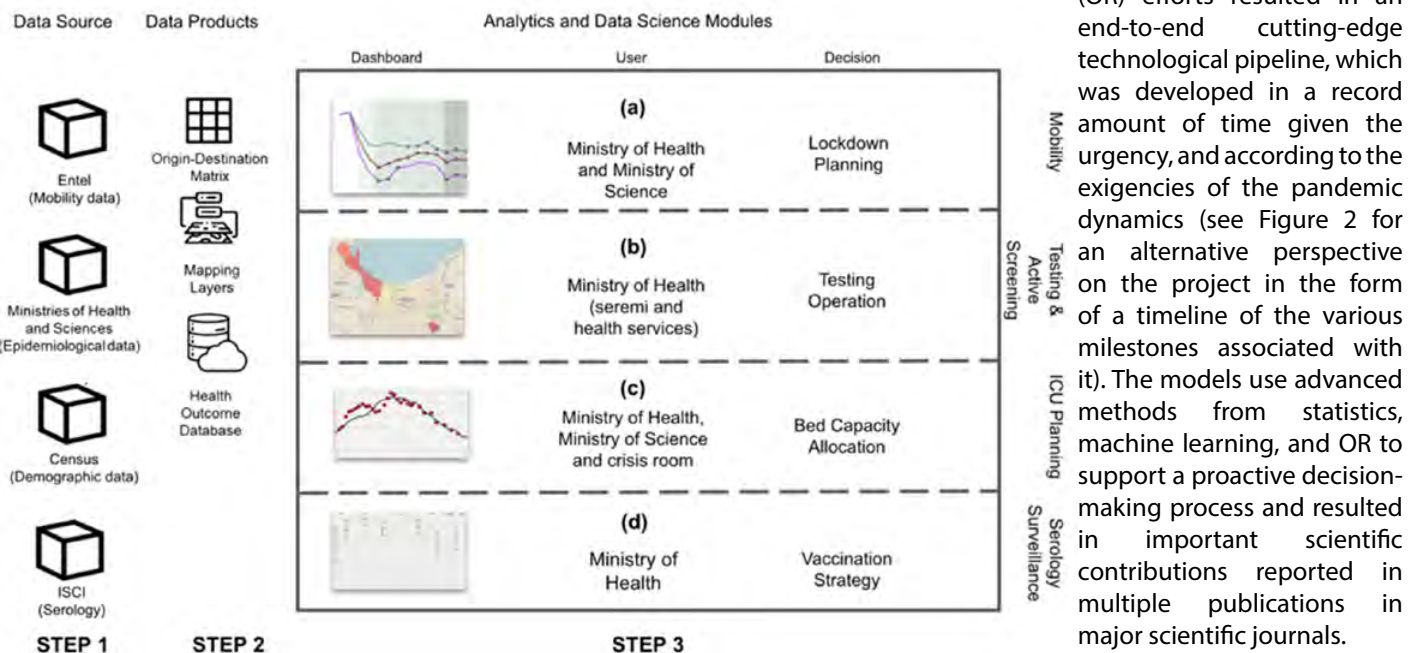
During the COVID-19 crisis, the Chilean Ministry of Health and the Ministry of Sciences, Technology, Knowledge and Innovation partnered with the Instituto Sistemas Complejos de Ingeniería (ISCI) and the telecommunications company ENTEL, to develop innovative methodologies and tools that placed Operations Research (OR) and analytics at the forefront of the battle against the pandemic. Chile's strategy to contain the pandemic consisted of a multilayered approach based on: contagion prevention (via lockdowns, testing, and tracing strategies aimed at preventing infections); nationwide centralized management of critical beds; strategic vaccine rollout, designed to optimize its effectiveness based on a limited supply of a diversified pool of vaccines, using different technologies with uncertainty as to their effectiveness.

The innovations developed in the context of our project, which were awarded with the 2022 Franz Edelman Award, were used in key decision aspects that helped shape a comprehensive strategy against the virus, including tools that: shed light on the actual effects of lockdowns in different municipalities and over time; help allocating limited intensive care capacity; significantly increase the testing capacity and provide on-the-ground strategies for active screening of asymptomatic cases; and implement a nation-wide serology surveillance program that significantly influenced Chile's (and the world's)



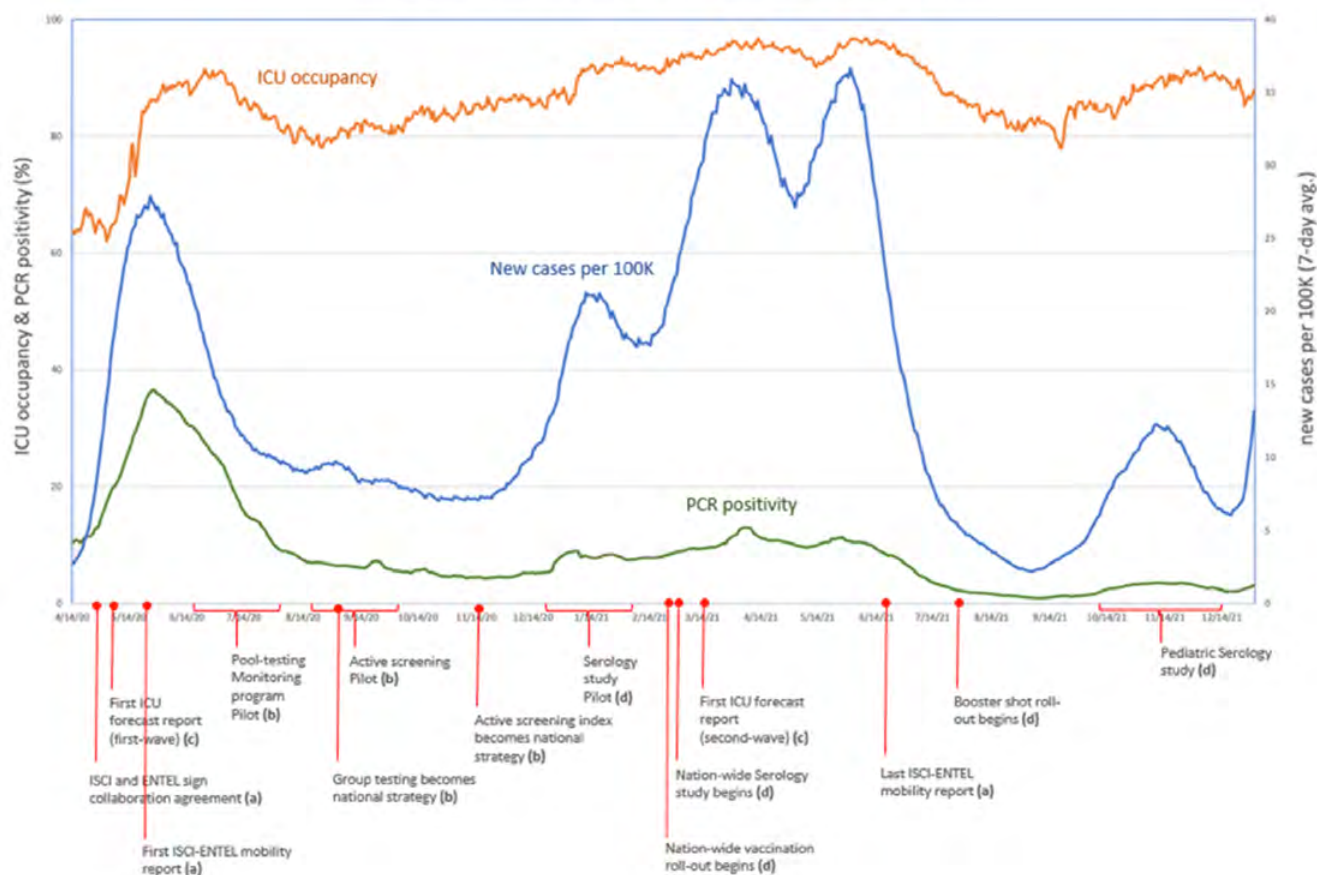
decision regarding vaccine booster doses. An estimate of impact suggests that these efforts prevented between tens of thousands of infections, hospitalizations and deaths [1].

At its core, the collaboration was supported by the collection, processing, and analysis of massive amounts of critical data, which were used to feed various models and then to develop decision-support tools using different dashboards, allowing decision makers to have ready access to them, see Figure 1. Our models used data on mobility patterns built from granular anonymous mobile phone data provided by ENTEL, which we combined with other key data sources such as the COVID-19 data repository [2], a fundamental and strategic initiative of the Ministry of Science which contains open aggregated data on confirmed cases, ICU occupancy, deaths, and the vaccination, among other relevant information. We cleaned and processed these data to produce several data products, which we fed into different analytics and data science modules (including dashboards and models) that allowed a set of decision makers and users to act regarding contagion prevention, management of hospital resources, and vaccination rollout. These data science, analytics, and operations research



▲ Figure 1. The graphic shows the data and analytics pipeline of the project

Project Timeline relative to Covid Pandemic In Chile (2020-2021)



▲ Figure 2. The graph displays key pandemic indicators and the project timeline during 2020 and 2021

Mobility. Regarding contagion prevention, we used granular mobility data to create public dashboards, which showed the impact of lockdowns and voluntary shelter-at-home decisions across the country. In particular, our econometric models showed that the impact of social distancing measures and lockdowns was highly heterogeneous and dependent on socioeconomic levels, and that the reduction in mobility correlated significantly with the reduction in infections [3]. We produced 36 publicly available mobility reports describing these data and results, which provided key input to the government's lockdown strategy throughout the country, and its plan to support lower-income populations with complementary measures to increase compliance.

Testing and Active Screening. With respect to contagion prevention through testing and contact tracing, our team developed and implemented pilots on group-testing techniques [4], which shaped key aspects of the national testing strategy, significantly increasing testing capacity by more than 28% and leading to savings of more than 236 million USD [1]. In addition, using the mobility and granular geo-referenced epidemiological data, we developed index-based nationwide heat maps to guide surveillance testing efforts to detect asymptomatic cases in public, which were adopted as integral components of the national testing strategy. These heat maps were adopted by all regional Undersecretaries of Public Health and Health Services which form the front line of the Chilean public healthcare system.

ICU Planning. To support the centralized management of critical beds, our team used predictive machine learning models to produce short-term demand forecasts of ICU

beds at the regional level throughout the country [5]. These forecasts were key inputs to inform the coordinated efforts to adapt and augment the supply of this scarce resource, and reallocate patients across regions as needed. Notably, the ICUs were never over demanded in Chile.

Serology Surveillance. As the pandemic advanced, vaccines became a key instrument to prevent infections, severe illnesses, and deaths. Chile decided very early on that it would follow a multiplatform approach, favoring availability over the choice of a specific vaccine technology. This presented the challenge of generating information about the results of different vaccines, which would not be readily available elsewhere. In the context of vaccine rollout, we designed and implemented a centralized surveillance system that monitored the presence of Immunoglobulin G antibodies (IgG) in adults and children, inoculated with different types of vaccines [6]. The information provided by this system, which uses the mobility data and Integer Programming to design the sampling mechanism in the general population and was entered into a statistical model of IgG waning dynamics, was instrumental to the government's decision to implement heterologous booster shots. Chile became one of the world pioneers in booster shots and, arguably, such boosters avoided a significant third wave in 2021.

We faced significant challenges during the execution of the project. First, solutions were needed urgently. Second, we needed to communicate and coordinate the efforts of a quite diverse group of people, from engineers, MDs and researchers, to political authorities and hundreds of health care workers on the ground, >>

>> who were facing huge amounts of stress and were dispersed across the country. And, third, as we dealt with very delicate information, results had to be communicated with care; media coverage for the project was vast. Our reflection today about this is that our team was able to move from multidisciplinary work to a truly Interdisciplinary. The initiatives generated significant press coverage and, by providing scientific evidence supporting the decision making behind the Chilean strategy to address the pandemic, they helped provide transparency and objectivity to decision makers and the general population.

[1] L. Basso, M. Goic, M. Olivares, D. Sauré, C. Thraves, A. Carranza, G. Weintraub, J. Covarrubias, C. Escobedo, N. Jara, A. Moreno, D. Arancibia, M. Fuenzalida, J. Uribe, F. Zuniga, M. Zuniga, M. O’Ryan, E. Santelices, J. Torres, M. Badal, M. Bozanic, S. Cancino, E. Lara, I. Neira (2023), *Analytics Saves Lives During the Covid Crisis in Chile*, INFORMS Journal of Applied Analytics, 53(1), 9-31, 2023


[2] Ministry of Science Minciencia/data-covid19. Accessed

May 3, 2023, <https://github.com/MinCiencia/Datos-Covid19>

[3] A. Carranza A, M. Goic, E. Lara, M. Olivares, G. Weintraub, J. Covarrubia, C. Escobedo, N. Jara, L. Basso (2022), *The Social Divide of Social Distancing: Shelter-in-Place Behavior in Santiago during the Covid-19 Pandemic*, Management Sci. 68(3):2016–2027.

[4] L. Basso, V. Salinas, D. Sauré, C. Thraves, N. Yankovic (2021), *The Effect of Correlation and False Negatives in Pool Testing Strategies for COVID-19*, Health Care Management Sci. 25(1):146–165.

[5] M. Goic, M. Bozanic-Leal, M. Badal, L. Basso (2021), *COVID-19: Short-term forecast of ICU beds in times of crisis*, PloS one 16.1 e0245272

[6] D. Sauré, M. O’Ryan, JP. Torres, M. Zuniga, E. Santelices, L. Basso (2022), *Dynamic IgG Seropositivity in Chile following rollout of an inactivated SARS-CoV-2 vaccine (CoronaVac) and an mRNA vaccine (BTN162b2): a sentinel surveillance study*. The Lancet Infectious Diseases, 22(1), 56-63 

OR TUTORIAL

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OR IN HEALTHCARE IN LATIN IBERO-AMERICA

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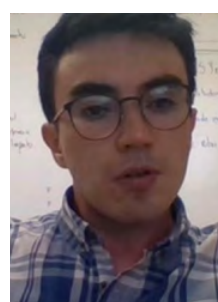
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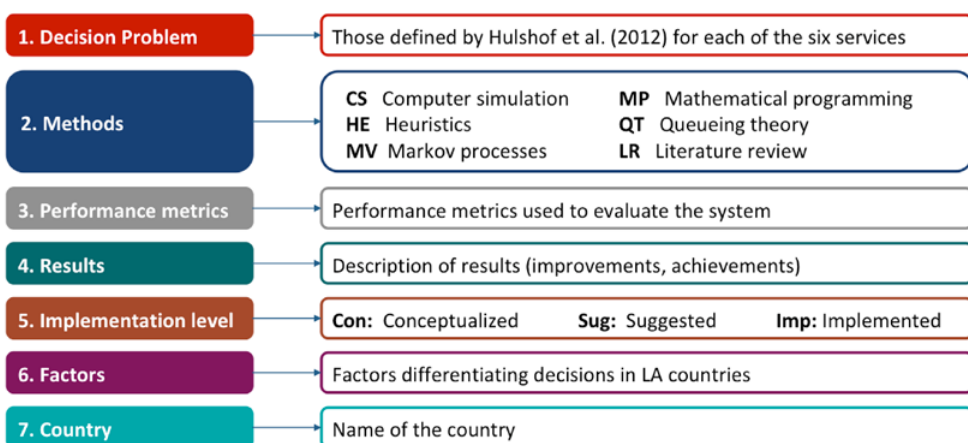


Operations Research (OR) applications have been developed in a wide range of planning decisions in healthcare. Since the work of Boldy (1981) and Fries (1981), who present a review of more than 300 OR applications in strategic, tactical and operational problems, the global OR community has worked on methods and techniques to support planning decisions in healthcare. Applications include demand forecasting, hospital location and occupancy, blood banks, medicines inventory supply, among many other problems in healthcare. The Latin-American community has worked on OR applications in healthcare since the beginnings of the 80’s but much of that work is unknown or not published in international journals.

To identify and characterize works dedicated to the use of OR to support planning decisions in healthcare in Latin Ibero-America, we provide a comprehensive overview of works completed by researchers in ALIO (*Asociación Latino Iberoamericana de Investigación Operativa*). Based on the taxonomic classification developed by Hulshof et al. (2012), we complete a structured literature review using a scientific data base and apply a semi-structured survey with the ALIO community. Both the review and the survey were completed before and

after the pandemic due to COVID-19. We obtained a sample of 149 records, 69 of them following the search criteria defined in the taxonomic classification used, and 80 which research problems did not fit in the six categories of health services proposed by Hulshof et al. (2012). The sample of records was analyzed using the seven criteria illustrated in Fig.1.

Decision problems studied in the sample of the 69 records included: six works for Ambulatory Care Services (ACS), 27 for Emergency Care Services (ECS), 18 for Surgical Care Services (SCS), 11 for Impatient Care Services (ICS), seven for Home Care Services (HCS), and none for Residential Care Services (RCS).>>



▲ Figure 1. Analysis of the sample of works of OR in healthcare in the ALIO community.

Most works use mathematical programming (42%), computer simulation (38%), heuristics (30%), Markov processes and queuing theory (13%). From the six categories of services, only ECS, SCS and HCS have two, one and two works implemented, respectively (7% of the sample), and SCS have the largest proportion of suggested works with a 61%.

A variety of factors differentiate planning decisions in healthcare in Latin America. Most countries in the region have a segmented healthcare system, in which low-income population receive subsidized healthcare through public institutions, and high-income population attend private healthcare institutions. Four works in the sample report the use of OR to support healthcare decisions with such segmented systems (in Brazil, Chile, Colombia, and Mexico), for location of health centers and patients' assignments in ACS and ICS, and for districting decisions in HCS. Other differentiating factors include administrative criteria to admit and refer patients into health systems, rapid-growing cities context, ethical, epidemiological, cultural, and organizational issues.

The 80 registers that could not be classified into the six categories were obtained from both the review and the survey. Given the increasing body of literature published on OR applied to healthcare, and the rapidly structural changes in healthcare systems worldwide, we consider that a natural evolution of the taxonomic classification presented in 2012 is to be extended to include the dynamics of OR works in healthcare. Consequently, based on the registers found, we proposed eight new categories illustrated in Fig.2. From the 80 registers, 59 were classified in the proposed categories, and 21 corresponded to works dedicated to COVID-19.

With the taxonomy by Hulshof et al. (2012) in the core of the extension, in Fig.2(a) we present eight new categories: Medical Diagnostic Services (MDS), Medical Treatment Services (MTS), Medical Staff Management (MSM), Medical Equipment Management (MEM), Blood Services (BLS), Healthcare Supply Chain (HSC), Healthcare Performance Evaluation (HPE), and Public Health Policy (PHP). In Fig.2(b) we identify, for each new category, the number of works and the countries where they have been undertaken. The 21 works of MDS include the use descriptive and predictive analytics, metaheuristics, artificial intelligence, and mixed methods approaches to diagnose different types of cancer, gestational diabetes, and birth weight. The 17 works of MTS, MSM, MEM and BLS use hybrid simulation-optimization models and descriptive analytics. Besides to techniques from mathematical programming like data envelopment analysis, the 17 works dedicated to HSC and HPE use predictive methods, process mining, multi criteria decision analysis to support evaluation performance and supply chain decisions. The four works of PHP focus kidney procurement systems, gender equality and gestational care using high level simulation paradigms such as system dynamics.

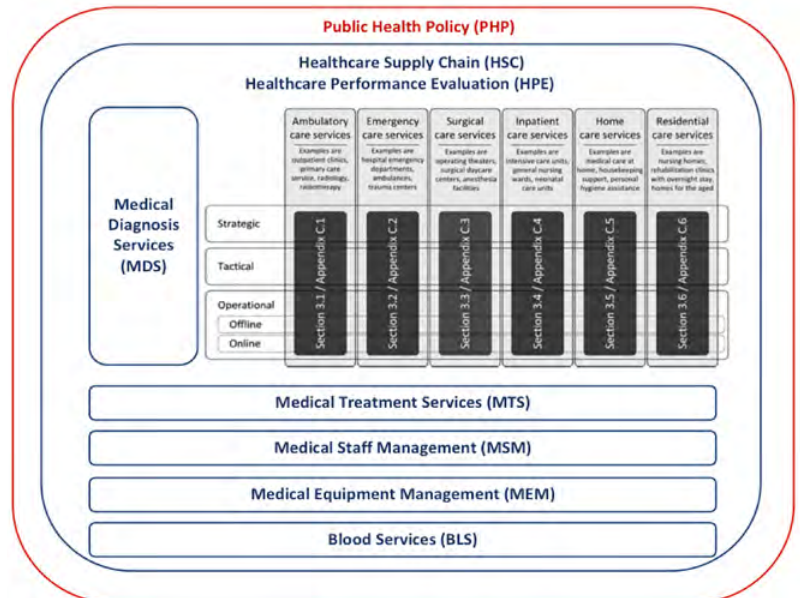
The comprehensive review shows the evolution of OR applications for planning decisions in healthcare in Latin Ibero-America. The diagnosis and treatment of new diseases, as well as the design of more and diverse health services, have generated new research problems and motivated the development and application of

more OR methods. The use of business analytics techniques, artificial intelligence and the mix of quantitative and qualitative methods seems promising to shorten the gap between research and real healthcare systems, considering factors differentiating such systems in Latin America.

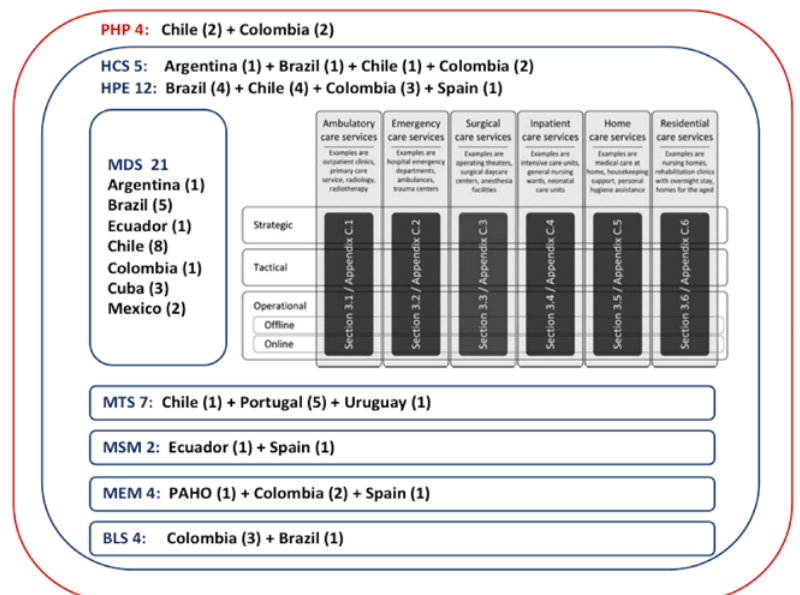
Based on the review findings, new collaboration paths are being established within the Latin Ibero-American community, and the proposal to create the ALIO Working Group on Healthcare was approved during the last ALIO Board Members meeting to promote joint works aiming at improving healthcare systems in the region.

References

Boldy, D. (1981). *Operational research applied to health services*. Croom Helm.
 Fries, B. E. (1981). *Applications of operations research to health care delivery systems*. Springer-Verlag.
 Hulshof, P. J. H., Kortbeek, N., Boucherie, R. J., Hans, E. W., & Bakker, P. J. M. (2012). Taxonomic classification of planning decisions in health care: a structured review of the state of the art in OR/MS. *Health Systems*, 1(2), 129–175. 🌐



(a) Proposed categories to classify OR applications in healthcare



(b) Number of works and countries for each proposed category

▲ Figure 2. Proposed categories to classify OR works in healthcare in the ALIO community.

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HOW ANALYTICS AND OR ARE HELPING TO ACHIEVE SUSTAINABLE DEVELOPMENT GOALS

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Robert Monné, *Managing Director Analytics for a Better World* <robert@analyticsbetterworld.org>



One of the strengths of Analytics and Operational Research is that they enable analysts to solve highly diverse problems by mathematically identical models. The message of this article is that there is so much value to be created from such models, not only to businesses across the world but also in particular from applying analytics to the **Sustainable Development Goals**, (SDGs), which are “a call to action to end poverty and inequality, protect the planet and ensure that all people enjoy health, justice and prosperity”. To help meet these goals, we initiated, with the University of Amsterdam and ORTEC (the non-profit institute “[Analytics for a Better World](#)”, ABW) in 2022.

in purpose and meaning in their job instead of high salaries, and are becoming ever more

enthusiastic to contribute to a better world.

Analytics for a Better World (ABW)

The first author coined the term ABW about five years ago when he was reading the book “Weapons of Math Destruction” (2016). This book discusses analytics and data science and its perilous dangers. In our view it is a very important book that had to be written, but its one-sidedness does let it down, failing to discuss the positive aspects of data science until the last chapter. As a counter to WMD, the term ABW was coined. Analytics have proven their worth in creating value for

It is all about impact

Many scientific papers have been written about analytics and its role in boosting humanitarian endeavours, but it is rarely applied in practice. We see several reasons for this. First, academics, after all, are judged solely on their publications, and that is the reason that for most academics the final goal is a publication and not real impact. Second, unfortunately many academics have no experience in turning theory into practice. Third, to build something real that has a sustainable impact, you need organizational implementation and software skills: you have to create user-friendly software and maintain it too. That is why at ABW we collaborate with professional Analytics companies who support us by bringing the added value of analytics to the users within nonprofit organisations.



business, and the brightest minds are now harnessed to make more profit. There is nothing inherently wrong with that, but there is so much value to be created by applying analytics to the SDGs. Companies have already cottoned on to the value of data, investing heavily in analytics. Not for profit and Non-Government Organisations (NGOs) have not reached that point yet, due in part to the high salaries that experts can earn in the private sector. That is a shame. In a recent report (data.org 2022) it is estimated that in the coming 10 years around 3.5 million data experts are needed in the low- and middle-income countries. Fortunately, we see a positive trend that, especially young people, are more and more interested

Yes, we can...

When faced with all the misery in the world, there are two ways to respond. One way is to say: why do anything when nothing will really help, and many people tend to take this view. Still, it is a clear fact that we have made major strides in, e.g., combating world hunger over the past 50 years (pre-corona figures). In our opinion, it is a proof that all our efforts have not been in vain, which fills us with energy and inspires us to continue. Our contributions may be small, but the World Food Programme affects millions of people. In this respect we very much like the book and much-viewed

TED talks of physician Hans Rosling, in which he uses statistics to show how much progress we have made, as opposed to most people’s expectations. Let us not squander our Analytics gifts and talents on, e.g., selling more products, but use them to benefit mankind. Below we briefly describe four of our impactful projects.

Optimizing food supply chain for the World Food Programme

Some 820 million people worldwide go hungry, and the World Food Programme helps 10% of them with meals. But what should a daily meal for, e.g., people in Syria look like. >>

You have to consider nutritional values and put together a comprehensive package while minimizing overall costs - ingredients, transport, etc. - to help as many people as possible. It's a tricky puzzle that the human mind can't solve on its own, which is why Tilburg's Zero Hunger Lab developed a mixed linear optimization model (Peters et al., 2021,2022). This model is used in every new operation of the World Food Programme, and due to that model millions more people can be fed. By the way, it costs less than 40 US cents for WFP to feed someone for a day.



Optimizing geospatial accessibility for healthcare in developing countries

The World Bank provides loans to developing countries to improve their infrastructure. Timor-Leste for instance, has been granted loans to improve medical care. The UN's target is for 95% of the world's population to have access to a primary healthcare centre. The first question is: How many people have access to medical help now? And how many healthcare centres should be added and where? In Vietnam, there is a similar demand for so-called stroke illness centres. For these types of problems a lot of data is needed: population, roads, existing and potential locations of healthcare centres. We modelled this problem as a classical Facility Location model (Krishnan, 2021). We implemented new heuristics to be able to solve the resulting huge-scale problems. The results are included in a World Bank report (World Bank, 2021) for the Timor-Leste government. That government recently asked for several alternative optimization scenarios to be run. The examples above deal with hospitals and stroke centres, but the same principles apply to schools, ambulances, fire stations and so on. There are lots of real-world situations in which our model can have great value.



Optimizing cattle feed for small farmers

One project we have been involved in on a small scale is the Feed Calculator: a mobile phone app for smallholder farmers

in Asia and Africa to optimize their livestock feed blends. The farmer enters which ingredients she/he can purchase, for which price. The app then minimizes the cost such that all kinds of nutritional requirements for the cattle are satisfied. This is a direct application of the classical diet problem, and in the app a linear optimization solver is implemented to solve this problem. It is now used by thousands of farmers and has garnered testimonials such as: "Since we started using this formula, our costs have gone down, our cattle has gotten healthier and we have been able to send our daughter to school."



Faster cleaning of the ocean by Optimization

There are five hotspots in the world with a high density of plastic. The Ocean Cleanup (Rotterdam, The Netherlands) tries to remove the plastic in the Great Pacific Garbage Patch by applying a system as in the picture below. Given predictions of the plastic densities at many points in the hotspot, the question is how to steer the system such that in a given amount of time, the maximal amount of plastic is collected.

Besides plastic density predictions, also weather predictions, and predictions on the current and waves are used. We have developed a dynamic programming technique (Pauphilet, 2023) to solve this problem and the results show 30-90% more yield than the method currently used by The Ocean Cleanup. The software for this new technique is now being embedded in The Ocean Cleanup's software, and will be used for the daily operations of the cleaning system.



Reflections

Nowadays Analytics significantly contributes to the success of companies. Analytics has the same potential to contribute to humanitarian and societal challenges. The applications discussed in this article demonstrate that analytics can significantly contribute to the Sustainable Development Goals.

References

Data.org, 2022, *Workforce Wanted: Data Talent for Social Impact* - data.org.
P. Krishnan, 2021, *DT4PAG Geospatial Planning and Budgeting Platform - Timor Leste* (vimeo.com), *Geospatial Planning and Budgeting Platform - Where Next* (vimeo.com).

K. Peters, S. Silva, T.S. Wolter, L. Anjos, N. van Ettehoven, E. Combette, A. Melchiori, H. Fleuren, D. den Hertog, O. Ergun, 2022, *UN world food programme: Toward zero hunger with analytics*, *INFORMS Journal on Applied Analytics*, 52, 8-26.
K. Peters, H. Fleuren, D. den Hertog, M. Kavelj, S. Silva, R. Goncalves, 2021, *The nutritious supply chain: Optimizing humanitarian food assistance*, *INFORMS Journal on Optimization*, 3(2), 200-226.
J. Pauphilet, 2023, *Research meetup 13 - Cleaning Up Oceans from Plastic Faster with Optimization - Analytics for a Better World* (analyticsbetterworld.org).
World Bank (2021), *Timor-Leste Public Expenditure Review, Timor-Leste - Public Expenditure Review: Changing Course - Towards Better and More Sustainable Spending* (worldbank.org) 🌐



CONFERENCES

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TAKEAWAYS FROM THE 2023 INFORMS BUSINESS ANALYTICS CONFERENCE

Kara Tucker <ktucker@informs.org>

* This article originally appeared in *Analytics* magazine and is being reprinted with the permission of *INFORMS*.

The [2023 INFORMS Business Analytics Conference](#) in Aurora, Colorado, brought together hundreds of leading analytics, AI, ML and data science professionals and industry experts to discover new mathematical solutions to problems, networking strategies for career advancement, and recognized individual and team efforts with the most prestigious awards in analytics and operations research.

The insight gained and connections made at the *2023 conference* will continue to grow in the months and years ahead and *INFORMS* looks forward to seeing the attendees again – and new attendees! – at the [2024 INFORMS Business Analytics Conference](#) in Orlando.

Here's what you may have missed in Colorado: [Meeting coverage](#). Check out recaps of the two keynote speakers, [Hilary Mason](#), co-founder and CEO of Hidden Door, and [Chris Tonas](#), chief technology officer, Pluralsight, as well as the reprise session of this year's [Franz Edelman Award](#) winner - Walmart!



▲ Congratulations to all the winners recognized at the *2023 Edelman Gala*, including the *Franz Edelman Award* winners from Walmart.

[Edelman Gala](#). The *Edelman Gala* awards four *INFORMS*-level prizes over the course of an elegant evening: The [Franz Edelman Award](#), emphasizing beneficial impact; *INFORMS Prize*, emphasizing long-term, multi-project success; *Daniel H. Wagner Prize*, emphasizing innovative methods and clear exposition; and *UPS George D. Smith Prize*, emphasizing effective academic preparation.

[INFORMS Mobile App](#). Even though the *2023 conference* has ended, don't delete the *INFORMS* app! This is a great tool to access your *INFORMS* membership, keep in touch with all the new connections you made at the conference, and receive important updates from *INFORMS* throughout the year! If you don't have the *INFORMS* app yet - [download it now!](#)



▲ Participants in the *INFORMS Meeting of Analytics Program Directors (MAPD)* make lasting connections during the event.

ECPN and MAPD. In a one-day event, the [Early Career Professionals' Network \(ECPN\)](#) provided real-world career guidance to practice-oriented early-career professionals. The [INFORMS Meeting of Analytics Program Directors \(MAPD\)](#) is the premier event for Analytics Program Directors from around the globe to connect and collaborate with colleagues in the field to tackle the issues that impact their programs.



▲ The 2023 *INFORMS Business Analytics Conference* speaker agenda kicked off with Monday's keynote speaker, *Hilary Mason*.



▲ Keynote speaker *Chris Tonas* kicked off the final day of the 2023 *INFORMS Business Analytics Conference*.

Networking. Remember to connect with *INFORMS* on social media and continue to interact with all other attendees on the [2023 INFORMS Business Analytics Conference](#) group on *INFORMS Connect*. Tag @INFORMS in all conference photos and any data science and analytics social posts throughout the year. Take a look at all the conference action on [INFORMS Flickr!](#)

and data science can do. [Join us April 14-16, 2024, in Orlando, Florida](#), for fun, sand and data.



▲ *Kara Tucker* is the editor of *INFORMS OR/MS Today* and *Analytics* magazines.

Attendees will experience a conference schedule featuring three full days of more than 150 presentations and panels across more than a dozen tracks by leading analytics professionals from around the world, as well as the opportunity to enjoy "The City Beautiful." Don't forget your sunscreen!

Cordially thanks to dear *Ashley Kilgore*, for communication and help to make this particular reprint possible. - G.-W. Weber 🌐



▲ Attendees listening to one of several speakers at the *Early Career Professionals' Network (ECPN)* event.

Join us in 2024

Designed for analytics professionals and data scientists who want to empower organizations to make data-driven decisions, the *INFORMS Business Analytics Conference* provides access to more than 100 presentations and numerous networking opportunities with other leaders and experts who are using analytics, data science, AI, machine learning, mathematics and other decision sciences to *save lives, save money and solve problems*.

Unlike other conferences that focus on specific industries or software, the *INFORMS Business Analytics Conference* brings together insights and perspectives from a broad spectrum of organizations and *celebrates the tremendous economic and social impacts of analytics through global competitions*.

Don't miss out on this unique event to network with "your people" and celebrate all that analytics



▲ Attendees gathered from across the globe for the 2023 *INFORMS Business Analytics Conference* in Colorado.

4TH CONFERENCE OF THE EURO PRACTITIONERS' FORUM: OR AS A RESILIENT TECHNOLOGY - HOW OR REACTS AND ADAPTS TO DISRUPTIVE CHANGES AND FUTURE CHALLENGES

Susanne Heipcke <SusanneHeipcke@fico.com>

The 4th Conference of the EURO Practitioners' Forum (<https://www.euro-online.org/websites/or-in-practice/epf-conference-2023>) was held at Zuse Institute Berlin (ZIB), Germany, on 20-21 April, 2023. This was the first physical meeting organized by this EURO Forum after the COVID-induced travel restrictions. Indeed, the previous edition of this conference series, originally scheduled to take place on 19-20 March 2020 at ZIB, was hit by the very beginning of the first lockdown period, requiring some extremely quick decisions and adaptation of plans by the organizing committee. As a first step we re-scheduled the event to 28-29 September, 2020, later switching to a fully online setting with a main event on these days, followed by a webinar series of contributed talks spread over the following two months. After this online event, the organization team, composed of *Thorsten Koch* and *Inci Yüksel-Ergün* from ZIB, *Andrew Harrison*, *Inawisdom*, and *Timo Berthold* and *Susanne Heipcke* (chair) from FICO, has continued to meet on a regular basis during the following two years, with the hope of finally being able to organize a physical event. A great thanks to my co-organizers for staying on board all through this 4-years long adventure!



The first physical conference of the *Practitioners' Forum* was held in Paris in February 2018 on the theme '*Measuring the impact of OR projects - challenges and experiences*', followed by a meeting in Bologna in March 2019 under the title '*Operations Research meets Machine Learning - How to get the most of both worlds to achieve excellent Decision Support Systems*', and our online conference in 2020 with the theme '*Challenges in the deployment of OR projects*'. The Forum has

continued its activities with two online workshops respectively in November 2021 and 2022.



▲ 4th Conference of the EURO Practitioners' Forum: Group picture with conference participants in front of the Zuse Institute.

The *EURO Practitioners' Forum* (website: <https://www.euro-online.org/websites/or-in-practice>) was publicly launched at the 2016 *EURO Conference* in Poznan, Poland, initially under the name of 'EURO Working Group on the Practice of OR'. The *Practitioners' Forum* aims to enable O.R. professionals to have more impact on the outside world, by helping them find solutions to typical practical challenges, gain understanding of tools/techniques they have not used before, build their networks, and learn from others in order to inspire and expand their own practice. Among the main activities of the *Practitioners' Forum* figure the organization of the 'Making an Impact' stream at all recent *EURO-k* conferences and the monthly '*First Friday Webinar Series*' that has been running for several years (recordings of past presentations can be found here: <https://practicefor.wordpress.com/home/>).

For this year's conference we were able to win five keynote speakers originating from different European countries and covering a wide range of industry sectors: The event opened with a talk by *Klaus Spreckelsen* (OGE, Germany) on '*How to cope with the recent new challenges in gas transport*', following up with a contribution by *Sandrine Charousset-Brignol* (EDF, France) on '*OR challenges related to the electricity system transition: a glance at some latest modelling and solving advances*'. On the second day we heard about an award-winning use case, '*Using airline planning software to schedule nurses when COVID hit Sweden*' from *Daniel Roth* (Jeppesen Systems, Sweden), then moving to '*Managing uncertainty and preparing for disruptive changes in financial services industry*' by *Antti Korhonen* (Detech Decision Technologies, Finland), and finally closing with a talk on '*Optimal Pricing under macroeconomic shock and unstable customer behavior in e-commerce*' by *Vladimir Fux* (Zalando SE, Germany). *Thorsten Koch* (ZIB, Germany) led a panel discussion about Quantum Computing with the panelists *Stefan Wörner* (IBM, Switzerland) and *Martin Grötschel* (Germany), starting with a replay of a 25-years old interview with *Martin Grötschel* on this topic. The overview of the current state of technology and the discussion of its possible impact on OR found quite lively interest from the audience.

In addition, we received a large number of contributed submissions. The final selection made by the program committee included a wide range of applications areas, ranging from earthquake response operations in Turkey to dynamic pricing and sustainable investment planning in the energy sector, to flexible planning of airline ground operations, and travel time estimates in large evolving networks.

Following the tradition established by previous *Practitioners' Forum* events, this year's conference also included a round of parallel discussion groups where all participants were invited to share their experiences on the topics:

- How will transportation and logistics change over the next three decades, and how can *OR* help?
- Challenges in planning, investing, and operating resilient energy systems,



▲ Panelists *Martin Grötschel* and *Stefan Wörner* in discussion about quantum computing and *OR*.

- The *OR/Analytics* Supply Chain - finding the right people or the right software,
- Delivering value with *OR* products in a practical context.



▲ Conference dinner at Ethnological Museum Berlin; coffee break chat in front of the ZIB building.



▲ Keynote by *Sandrine Charousset-Brignol*.



▲ Keynote by *Vladimir Fux*.

This programme attracted over 130 registrants from more than 20 countries. If you weren't able to attend but would like to know more about some of the topics discussed, the full abstracts are available on the event webpage (<https://www.euro-online.org/websites/or-in-practice/epf-conference-2023/>) and the speakers will be pleased to hear from you if you would like to follow up.

The *EURO Practitioners' Forum* committee is looking forward to meet you at future events of the *EURO Practitioners' Forum*. See the Forum's webpage <https://www.euro-online.org/websites/or-in-practice> on upcoming events, webinar recordings, or to sign up to become a member of the *EURO Practitioners' Forum* (free of charge).

Susanne Heipcke leads the team 'Modeling and APIs' of Xpress Optimization development at FICO. Her research interests include all aspects of modelling, most notably the design of the language Mosel, the evolution of modeling tools, combining constraint programming and mixed integer programming approaches, and applying optimization in various industry sectors through consulting projects. She has held teaching engagements at different universities and also organized specialist training events and conference workshops. 🌐



INTERNATIONAL CONFERENCE ON BUSINESS RESILIENCE, CONTINUITY AND REGENERATION SUCCESSFULLY HELD IN DURBAN, SOUTH AFRICA

Nina Kajiji <nina@nkd-group.com> Gordon Dash <ghdash@uri.edu>

The 2023 International Conference on Business Resilience, Continuity and Regeneration (ICBRCR), held at Southern Sun Elangeni Maharani Hotel, Durban, South Africa, March 22-24, 2023, promoted the theme: "Rethinking Business Resilience, Continuity and Regeneration during and after the COVID-19 Pandemic". The conference's goal was to promote research and knowledge sharing in business rescue, financial distress prediction, insolvency rehabilitation, and turnaround management of companies. Representing the [European Working Group on Operational Research for Development \(EWG-ORD\)](#), Co-Chair Dr. Gordon Dash of the University of Rhode Island, USA, presented a keynote address to the conference titled: "Ethical Neuro A.I.: The 'Unseen' Driver of SMME Resilience and Continuity". Dr. Dash reviewed contemporary literature on managing small, medium, and micro enterprises in South Africa. A vital component of the socio-economic platform of the country's plan for growth, employment, and sustainable progress, Dr. Dash asked the research community to become more nonlinear and interdisciplinary in its model-building approaches. His talk focused on building new machine-learning models using artificial neural networks. The talk also challenged the South African research community to delve deeper into the unseen driver of SMME resilience – the



▲ Dr. Dash receiving his thanks for the keynote address from Kajal Ramnanum.

cognitive biases of owner-entrepreneurs. Dr. Dash related the importance of cognitive competency to the SMME model-building process by presenting components of his prosocial research based on experiments using Long Evans rats. The conclusion of his talk demonstrated how to administer an index of emotional stability as a component of the survey method of data collection among the KZN SMME community. As new networked-based models on SMME performance and resilience evolve in the post-COVID-19 era, the case was made to ensure these models incorporate a cognitive feature.

Supporting her role as Co-Chair of EWG-ORD, Dr. Nina Kajiji also delivered a talk at the conference. Representing co-authors Helper Zhou, Gerhard-Wilhelm Weber, and Domenic Vonella, she delivered research utilizing a unique high-frequency U.S.



▲ At ICBRCR 2023 (left to right): Prof. M. Sibanda (Dean and Head of UKZN School of Accounting, Economics, and Finance); Guest Speaker Mr. S. F. Nomvalo (CEO, South African Inst. of Chartered Accountants); Prof. Dash, and Prof. M. Reddi (Acting Deputy Vice-Chancellor, UKZN).

state-level municipal bond database: "Supervised ML Mapping of Municipal Bond Returns between US SALT States and South Africa During the COVID-19 Regime". Encompassing over 100 million muni-bond trades, Dr. Kajiji covered methodology for managing, authenticating, and preparing a Big Data collection for nonlinear modeling using an enhanced radial basis function artificial neural network (i.e., K4-RBFN). As the title suggests, the focal point of the study was the spillover effects in the COVID-19 era that shaped municipal bond returns between the South African government bond market, and those U.S. states most impacted by the 2017 Trump Tax Act. Among several exciting findings, Dr. Kajiji could relate to how COVID-19 impacted precious metal trading between various states and South Africa. These findings helped to explain observed discontinuities in the returns of U.S. muni-bond trades.



▲ Prof. Kajiji delivering her presentation.

Dr. Kajiji's former Ph.D. mentee, Dr. Lousa Muparuri, also contributed research. Dr. Muparuri presented the manuscript "Mapping Corporate Vulnerability in Zimbabwe Using Trustworthy Machine Learning". >>

>> This research's novelty was an extension that converted the Altman Z-Score methodology to one that uses a K4-RBFN nonlinear regression-based estimation of financial distress probabilities. The results also incorporated an XAI analysis to identify the ranked importance of features that explain the likelihood of corporate distress in Zimbabwe-traded firms.



▲ Evelyn Zhou delivering her presentation.

Lastly, a senior-level undergraduate student mentee of Drs Dash and Kajiji also presented research findings. Evelyn Y. Zhou presented her findings in a talk titled "Advances in Machine Learning Methods to predict the performance of JSE listed mining entities in South Africa within the COVID-19 Era". The novelty of this study was tied to a comparative analysis of neural network estimation of market returns in the mining industry to estimates obtained by traditional econometric methods (i.e., OLS). Ms.

Zhou's study also introduced explainable artificial intelligence (XAI) as a plausible approach to interpreting machine learning model output. This study advanced her earlier research, which earned a first-place finish in a global competition sponsored by the [2022 COVID Information Commons Student Paper Challenge](#) (Columbia University, USA).

As a result of the collaborations, Drs Dash and Kajiji are now serving on the board of Exponento: A South African FinTech Company specializing in providing AI recommender advice to KZN registered SMMEs. The board of trustees met at the Durban Country Club to approve the firm's technology base and set working policies. 🌐



▲ Exponento Advisory Board members.

SWEDISH OPERATIONS RESEARCH ASSOCIATION'S CONFERENCE 2022 CELEBRATED IN STOCKHOLM

Jan Kronqvist <jankr@kth.se>

The *Swedish Operations Research Association SOAF* has been organizing a bi-annual conference that welcomes research covering all aspects of *Operational Research*. The conference serves as a meeting platform, bringing together researchers from both industry and academia with a common interest in OR and optimization. The conference was held on October 24-25, 2022, at *Scandic Hotel Järva Krog*, just a few minutes outside of the beautiful city of Stockholm. The conference is held every second year, varying between cities in Sweden. Typically, the conference is held in a city with an active OR and Optimization group. [Last time the conference](#) was held in Nyköping [and before that in Linköping](#).

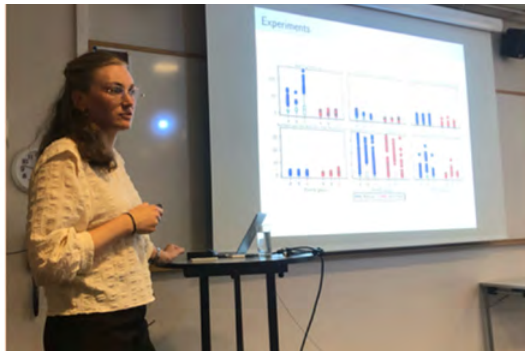
The conference was a two-day event, with all presentations in a single stream. There were 22 presentations covering a wide range of topics, ranging from scheduling radiation treatment patients and urban snow removal to selecting mixed-integer problem formulations using machine learning. There were two plenary presentations, one by [Ulf Brännlund](#) with the topic "Optimal power scheduling and some general reflections on using optimization models in practice", and one by [Rebecca Jörnsten](#) with the topic "On the regularization of neural networks: interpretation and a new approach". The conference had a nice mixture of talks covering topics in different industrial applications (e.g., scheduling in railway planning, planning in power systems, and crew teaming in airline optimization), fundamental research, and optimization solver software. The full program with abstracts can be found [here](#).



▲ Old Town and Södermalm in Stockholm.

The conference had a friendly atmosphere with many scientific discussions during the breaks and during the conference dinner, hopefully resulting in several new research collaborations.

The conference was organized by SOAF, specifically by Henrik Svärd (Marketing Committee member), Ida Källén (Organizing Committee member), Jonas Ekblom (OC member), Justin Pearson (Program Committee Chair), Mattias Grönkvist (Conference Chair), Nils-Hassan Quttineh (PC member), Per Enqvist (PC member), and Åsa Holm (OC member). The conference was sponsored by Boeing and Gurobi Optimization.



▲ Impressions from SOAK 2022 (L-R): Sara Frimodig (from KTH / RaySearch Laboratories) presenting her work on column generation for scheduling radiation treatment patients. To the right: Nils-Hassan Quttineh (from LiU) presenting his work on using optimization for planning a dinner safari.

The conference was a great success. Despite the tradition of arranging the conference every second year, SOAF is actually planning to hold the next conference already in the fall of 2023. Please check the [SOAF website](#) for news about the coming event. 🌐

ENJOYING OR AND STOCHASTIC MATHEMATICS, IN ATHENS - AND ONLINE: 19TH SUMMER SCHOOL IN RISK FINANCE AND STOCHASTICS

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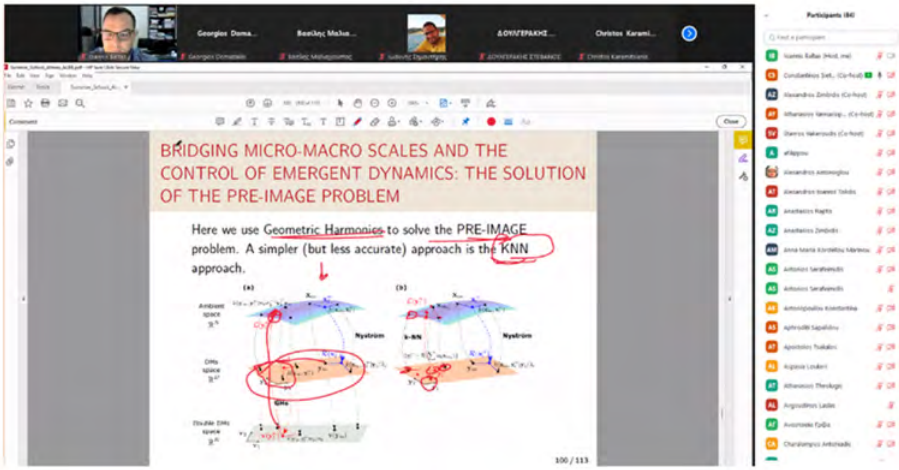
The 19th e-Summer School in Risk Finance and Stochastics, Athens, Greece, September 28 - 30, 2022, was organized by the Athens University of Economics and Business (AUEB), Departments of (a) Statistics, (b) Accounting & Finance, and (c) Business Administration, the Laboratory of Stochastic Modeling and Applications (Department of Statistics, AUEB) (cf. <https://aueb-analytics.wixsite.com/stochastics-lab?lang=en>), in collaboration with the University of the Aegean, Departments of (a) Financial & Management Engineering, and (b) Statistics & Actuarial-Financial Mathematics.

The Summer School on Risk Finance and Stochastics is an annual academic gathering that started in 2003 on Samos island, as an attempt to bring together students and academics both young and senior to present, reflect and discuss - in a relaxed environment - certain aspects of the fascinating field of Stochastic Mathematics and its close connection with Risk, Finance, Insurance, and - in general - *Operational Research*. Over the years the location of the school was moved to various places, depending on funding and circumstances, however, our rendezvous was always punctual and anticipated by all. For several years, the school was hosted on Samos Island, then on Chios Island, then Nafplio and Athens. Regardless of the location, we always had the honor of having with us world-class academics and experts who masterfully guided the participants through the elegant and important constructions of their current research and brilliant and eager to teach young researchers and students in the first steps of their career, the interplay among which always resulted in a creative and friendly atmosphere that we fondly remember.

Naturally, this would not be possible without the constant

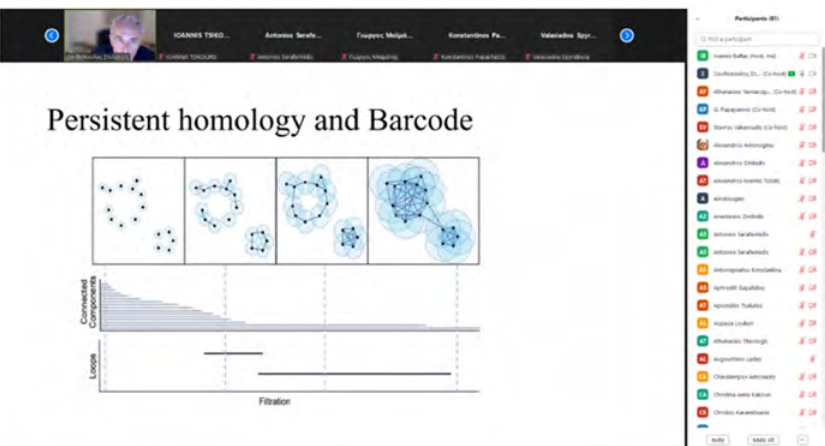
and generous funding and support of AUEB and the University of the Aegean. Even though the school is mainly addressed to postgraduate students, PhD students, postdocs, researchers, and practitioners, everyone who are interested to stay informed about the latest developments in the field of Stochastic Finance, are always more than welcome to participate. This year, as in the previous year, the school was fully held into e-mode (taking into account current restrictions of the COVID-19 pandemic) thus enabling distant participation. Even though the school is mainly addressed to postgraduate students, PhD students, postdocs, researchers, and practitioners, everyone who is interested to stay informed about the latest developments in the field of Stochastic Finance, are always more than welcome to participate.

In this issue, the central topic of the school was focused: (i) on option pricing in incomplete financial markets by Professor Agnes Sulem (INRIA & University of Luxemburg), (ii) on the numerical treatment of complex stochastic dynamical systems from a Machine Learning point of view by Professor Constantinos Siettos (Universita degli studi di Napoli), and (iii) on an application of stochastic differential games in bank assurance by Professor Gerhard-Wilhelm Weber (Faculty of Engineering Management, Poznan University of Technology, Poland, and IAM, METU, Ankara, Turkey). Further topics that were presented and discussed fall within the areas of *stochastic finance, portfolio theory, risk management & decision making, and machine learning* - always having in mind real-world applications and challenges. As always, we had the pleasure and honor of having with us distinguished academics and practitioners in the field, as well as new researchers and 3 PhD candidates.



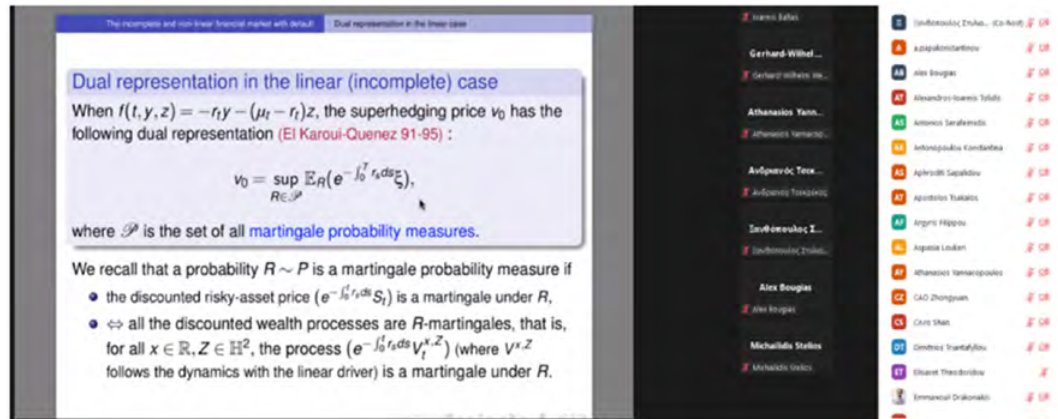
▲ A snapshot of the e-school (lecture by Prof. Constantinos Siettos).

The highlights of the e-summer school included talks by Prof. Constantinos Siettos (Numerical Analysis, Departments of Mathematics and Applications, University of Naples, Italy): “Numerical analysis and modelling of complex dynamical systems with Machine Learning”, Prof. Agnes Sulem (INRIA, France & Department of Mathematics, University of Luxemburg): “Option pricing in a non-linear incomplete financial market model with default: the European and American cases”, Prof. Gerhard-Wilhelm Weber (Faculty of Engineering Management, Poznan University of Technology, Poland): “An application of stochastic differential games with Lagrange multipliers: Bank assurance”, Prof. Ronnie Loeffen (Department of Mathematics, University of Manchester, UK): “Optimal control of risk processes in insurance”, Dr. Lucia Russo (Italian National Research Council, Naples, Italy): “Frequency locking and routes to chaos: a tutorial”, Mr. Ronald Hersmis (Hersmis Consulting, the Netherlands): “Bridging the gap between Solvency II and IFRS17”, Dr. Maria Economou (Actuarial Association of Europe & Aon Hewitt, Greece): “From labour supply to labour productivity”, Prof. Stylianos Xanthopoulos (Department of Statistics & Actuarial-Financial Mathematics, University of the Aegean, Greece): “A first introduction to topological data



▲ A snapshot of the e-school (lecture by Prof. Stylianos Xanthopoulos).

analysis”, Dr. Panagiotis Papaioannou (Eurobank, Greece): “Manifold learning and applications in finance”, Dr. Konstantinos Kaloudis (Department of Statistics & Actuarial-Financial Mathematics, University of the Aegean, Greece): “On the approximation of basins of attraction using deep neural networks”, Prof. Theodoros Bratis (Department of Business Administration, AUEB, Greece): “Financial markets and associated risks under crises periods”, Mr. Alexandros Bougias (Athens University of Economics and Business & Stout, Greece): “The pricing of serial sovereign default risk: Theory and evidence from the equity and CDS markets”, Mr. Kyriakos Georgiou (PhD candidate, Department of Statistics, AUEB, Greece): “Modelling default probabilities in credit risk using PIDEs: Analysis and numerics”, Mr. Emmanouil Drakonakis (PhD candidate, Department of Economics, National and Kapodistrian University of Athens, Greece): “Stochastic exchange rate dynamics, intervention dynamics and the market efficiency hypothesis”, Mr. Emmanouil Louloudis (PhD candidate, Department of Statistics, AUEB, Greece): “Premium rating and capital requirements for seismic risk”.



▲ A snapshot of the e-school (lecture by Prof. Agnes Sulem).

The e-Summer School was very well attended with more than 80 participants who showed their interest and actively participated in a lively round-table discussion in the form of oral questions. During the breaks, new friendships were made, and research ideas were exchanged between the participants, who enjoyed the warm and welcoming atmosphere of the school and expressed their interest in continuing the discussion in our future events and endeavors. Finally, the school participants were informed by the organizing committee about upcoming interesting highlights in international and European OR calendar, namely, IFORS 2023 (<https://ifors2023.com/>) in Santiago, Chile, and EURO 2024 (<https://euro2024cph.dk/>) in Copenhagen, Denmark.

Further details on the e-summer school are available on the official school’s website: <http://www2.stat-athens.aueb.gr/~SummerSchool/index.html>.

12TH ICORES CONVENES IN HISTORIC LISBON: FOCUSING OPERATIONS RESEARCH METHODS AND APPLICATIONS ON ENTERPRISE SYSTEMS

Greg H. Parlier <gparlier@knology.net>

Following virtual conferences for the last two years, the annual *International Conference on Operations Research and Enterprise Systems (ICORES)* renewed our in-person format this past February 19-21, 2023 in Lisbon, Portugal.

This conference series is annually sponsored by the *Institute for Systems and Technologies of Information, Control and Communication (INSTICC)* and brings together researchers, engineers, graduate students, faculty, and practitioners interested in the methods and various applications of Operations Research. Although there are several conferences and symposia that orient on *Operations Research*, *ICORES* is unique in focusing *OR* methods and applications on large-scale, complex Enterprise Systems as our title suggests. Each conference is typically structured with two simultaneous tracks, one on mathematical methods and analytical techniques, and the second on practical work developed in specific application areas.

This year we initiated the conference with a plenary session observing the 85th anniversary of our unique, multi-disciplinary profession. This opening panel, consisting of our keynote lecturers and special session chair, offered insights and perspectives on *Operations Research* trends, challenges, and opportunities for academia, business, and government.

Our *keynote presentations* were delivered by three distinguished speakers:

- *Dr. Han Hoogeveen*, a leading researcher from the AI and Mobility Lab, Universiteit Utrecht in the Netherlands: *"The e-VSP Problem: Planning Electric Buses and Drivers"*,
- *Dr. Rainer Schlosser*, Data-Driven Decision Support research group leader at the Hasso Plattner Institute, University of Potsdam in Germany: *"Dynamic Pricing under Competition: Challenges and Opportunities"*,
- *Professor Joanna Józefowska* from the Institute of Computing Science, Poznan University of Technology in Poland, and currently Vice-President of *EURO* (see first photo): *"Two*



▲ Keynote Lecture *"Two Approaches to Just-in-Time Scheduling"*, presented by *Professor Joanna Józefowska* from Poznan University of Technology, Poland.

Approaches to Just-in-Time Scheduling".

We were also fortunate to have a special session devoted to *"Workforce Analytics-Practical Application and Theory"* chaired by *Dr. Jillian Anne Henderson* from the Canadian Defence Department's Centre for Operational Research and Analysis. *ICORES* Conference Chair *Dr. Greg Parlier* also continued his annual series of tutorials on developing, refining, and applying *Strategic Analytics* to enterprise challenges, this year focusing on national defense and international security applications.

Conference papers were submitted from 24 different countries, from which 22% were ultimately accepted as full papers. To evaluate each submission, double-blind reviews were initially performed by our Program Committee reviewers, whose members are highly qualified independent researchers across 36 different topic areas. Session chairs scored each presentation during the conference, and independent program chair assessments were also considered. This competitive selection process concluded with the announcement and formal presentation of awards which were presented in three categories at the conclusion of the conference: Best Poster; Best Student Paper; and Best Paper.



▲ Presentation of *Best Paper Award* (left to right): Program co-chair *Slawo Wesolkowski*; Keynote lecturers *Han Hoogeveen*, *Rainer Schlosser*, and *Joanna Józefowska*; Special session chair *Jillian Anne Henderson*; Best Paper co-author *Jean-Denis Caron* and presenting author *Robert Bryce*; Conference chair *Greg Parlier*.

In addition to the formal *ICORES Proceedings*, authors are provided the option each year following the conference to further refine, extend, and publish their work as book chapters in a dedicated Springer *"Communications in Computers and Information Systems"* (CCIS) annual text series, entitled *Operations Research and Enterprise Systems*. To date, the volumes have exceeded 25,000 chapter downloads.

Our social events have proven especially memorable in the past and this year was no exception. The evening began with an hour-long sightseeing tour to enjoy many of Lisbon's historic landmarks along the *Tagus River* followed by dinner at the *"Espaço Tejo"* Restaurant located in the Lisbon Congress Centre. Music accompanied by a traditional Portuguese folklore group culminated another unforgettable evening for all participants.

Conference goals for 13th ICORES next year include expanding our unique doctoral consortium for PhD students, adding papers and sessions focused on the integration of emerging technologies into operations, enterprise systems, and strategies, including artificial intelligence and machine learning, robotics and autonomous systems.

Please consider joining us and participating in future ICORES: 13th ICORES will be held in Rome, Italy, 24-26 February, 2024.

Our comprehensive website (<https://icores.scitevents.org/>) includes information on manuscript submissions, conference venue and joining instructions, various deadlines, and both keynote presentations and publications for our previous conferences. For further information or questions, please contact ICORES secretary *Marina Carvalho* (ICORES.Secretariat@insticc.org). We hope to see you in Rome next February! 🌐

SW23 - THE OR SOCIETY'S ANNUAL SIMULATION WORKSHOP SUCCESSFULLY HOSTED BY THE NATIONAL OCEANOGRAPHY CENTRE, SOUTHAMPTON, UK

Tasha Raymond <tasha.raymond@theorsociety.com>

In March 2023, *The OR Society* hosted its 11th *Simulation Workshop* at *The National Oceanography Centre*, in Southampton. *Operational researchers* from academia, consultancy and business joined together for three days of knowledge exchange and catching up with friends new and old.

The first *Simulation Workshop* to be run as a face-to-face event since the end of Covid-19 restrictions, the atmosphere felt both welcoming and energised, as colleagues greeted each other warmly, with some delegates meeting face-to-face for the first time despite having known each other and worked together for a few years, remotely.

Sponsored by *Simul8* and held in partnership with *INFORMS Simulation (CORMSIS)* and *The Society for Modelling and Simulation (SCS)*, this year's *Simulation Workshop* brought together a community of experts who work in the field of modelling and simulation, with a rich programme of keynote presentations, panel discussions, parallel streams, and tutorials. The event also included an exhibition area which featured poster displays and some of the latest developments in simulation software tools.



▲ The ORS welcomes delegates to their 11th *Simulation Workshop* at *The National Oceanography Centre*, Southampton.

Two Keynote speakers presented at the conference. One of the speakers was *Susan Howick*, Professor of Management Science and Vice-Dean (Academic), Strathclyde Business School. Delivering her talk titled "*Mixing methods: reflections for simulation*" - a key focus of *Susan's* research and work with industry has included using system dynamics, with much of her work exploring combining system dynamics with other methods, including other simulation methods.

We had a technical programme comprising a wide spectrum of simulation, modelling and analysis topics including Simulation standards, Design and analysis of simulation experiments, and Supply chain and transportation modelling.

The conference was a nice mix of work and play. The Gala dinner was hosted on the second night in the beautiful *Mezzanine Suite* of the *Leonardo Royal Southampton Grand Harbour Hotel*, which boasts a stunning glass atrium and is located exquisitely near the Southampton Waterfront. >>



▲ Delegates enjoyed networking and attending interesting poster presentations.



▲ The Gala Dinner was a huge success.

>> The evening kicked off with an arrival drink, followed by a three-course gala dinner meal with wine.

As I am sure many of you are aware, 2023 is a jubilee year for The OR Society, with its annual conference entering its 65th year! We are excited to announce that work is already underway to make this event an occasion to remember. Stay in touch with us via our website for news and updates and to book your early bird tickets, now! <https://www.theorsociety.com/events>.

Tasha Raymond is The OR Society's Marketing Manager. 🌐

NEW TRENDS OF OR & APPLICATIONS: SEMIT WORKSHOP IN ANKARA, ONLINE - "MACHINE LEARNING: SELECT AND IMPLEMENT"

Marwa Hasni <marwa.gharbi@enit.rnu.tn>, **Safa Bhar Layeb** <safa.layeb@enit.utm.tn>, **Leyla Chehrehgani** <chehrehgani@gmail.com>, **A. Mirzazadeh** <a.mirzazadeh@aut.ac.ir>, **Gerhard-Wilhelm Weber** <gerhard.weber@put.poznan.pl>

The *International Conference on Science, Engineering Management, and Information Technology (SEMIT)* organization, RefConf Institution (www.refconf.com) and Ankara Yildirim Beyazit University held a two-day workshop "Machine learning: Select and Implement" on March 13-14, 2023, online from Ankara, Turkey, via Zoom through Webinar. The workshop was animated by *Dr. Marwa Hasni* and *Prof. Safa Bhar Layeb* from the OASIS Lab at the National Engineering School of Tunis, Tunisia.

Dr. Marwa Hasni is an assistant professor in Industrial Engineering at ISSIG Gabes, University of Gabes, Tunisia. Her research focuses on the development and the analysis of forecasting techniques applied to production systems and to financial and banking systems. *Prof. Safa Bhar Layeb* is a professor of industrial engineering at the National Engineering School of Tunis, Tunisia. She is the founding chair of the *African Working Group in Health Systems*, affiliated with the *African Federation of Operational Research Societies (AFROS)*. She is particularly interested in data science and industrial engineering approaches and their applications in network design, logistics and healthcare. The workshop closed with a paper presentation session.

The *SEMIT workshop* targeted engineering students, PhD students, academic researchers, professionals and anyone interested in *Machine Learning (ML)* and *Data Science*. Indeed, *Machine Learning* is the science of programming machines to perform human tasks without being explicitly programmed, e.g., to e-mail spam recognition or spelling checkers, and platform



▲ Poster of SEMIT Workshop 2023.

video recommenders are commonly encountered *ML* applications that we are exploring in our everyday life. Obviously, there are several areas where *OR* and *ML* overlap. For example, both fields involve using data to make decisions. *OR* uses models and optimization techniques to find the best solution to a problem, while *ML* uses algorithms to learn from data and make predictions or decisions. In addition, *ML* techniques can be used to improve *OR* models. For example, *ML* can be used to optimize parameters in *OR* models, or to identify patterns and trends in data that can be used to improve *OR* models. Overall, *OR* and *ML* are complementary fields that can be used together to solve complex problems and make better decisions.

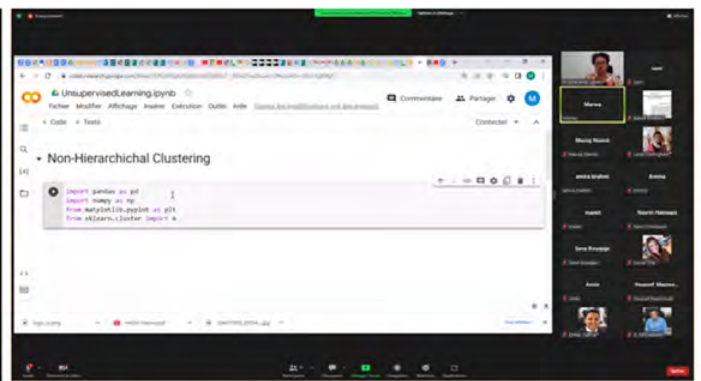
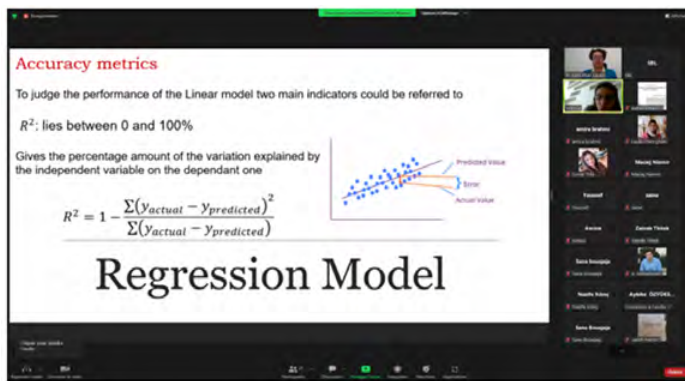
In this workshop, two learning objectives were targeted:

1. to acquire practice implementation of machine learning algorithms using Python,
2. to give key criteria to help to select adequate machine learning algorithm given a particular case study.



▲ Trainers of the SEMIT Workshop (from left to right): *Dr. Marwa Hasni* and *Prof. Safa Bhar Layeb*.

For the purpose of the first objective, a comprehensive review of algorithms covering major machine learning models were provided. More specifically, several Regression-based models, Decision Tree and Random Forest for classification models; and K-means, Nearest Neighbors and Support Vector Machine for the clustering ones. The Long Short Term Memory was presented as an example of deep-learning based approach.



▲ Snapshots from the *SEMIT Workshop*.

To accomplish the second objective, some popular use cases of *Machine Learning* were introduced and several *ML* interview questions were raised to assess practical market expectations. All along the workshop, specified labs were animated using Python and every part was ended with a validation Quiz. Special attention was given to highlighting the link between *OR* and *ML* by considering several concrete illustrations. For example, in supply chain management, *OR* techniques are used to optimize the distribution of goods across multiple locations and *ML* algorithms are used to analyze data about customer demand, inventory levels, and shipping times, and then provide recommendations on how to optimize the distribution of goods to minimize costs and maximize efficiency.

More information is available on the event webpage: https://semit.refconf.com/page_78.html. This was the first and seminal workshop of the *SEMIT* organization (which previously focused on the format of conferences) and so the total number of participants was around 30.

RefConf institution is honored to introduce the two upcoming events: 1.) the hybrid conference, *SEMIT 2023* (semit2023.refconf.com) to be held on September 14-15, 2023, in Ankara by Yildirim Beyazit University and RefConf, and 2.) the virtual conference, *ODSIE 2023* (odsie2023.refconf.com) to be held on November 2023 by Istanbul Istinye University and RefConf institution. Follow us on Refconf.com to see further events in 2023 and more. 🌐

MACHINE LEARNING NeEDS MATHEMATICAL OPTIMIZATION

NeEDS HAS NEWS FOR YOU FROM 2022 TO 2023

Emilio Carrizosa <ecarrizosa@us.es>, **Dolores Romero Morales** <drm.eco@cbs.dk>, **Thomas Halskov** <thha.fi@cbs.dk>, **Jasone Ramírez Ayerbe** <mrayerbe@us.es>

The [Online Seminar Series "Machine Learning NeEDS Mathematical Optimization"](#) is 100% virtual and takes place on Mondays. This has been running since January 2021 and we have just completed its fifth season. The presentations have covered important topics such as enhancing the explainability of black box machine learning models, incorporating fairness to reduce the risk of discrimination in algorithmic decision making, dealing with multiple objectives to build cost-sensitive machine learning models, the use of machine learning to enhance optimization algorithms, or fraud analytics. The program in 2022 and the first half of 2023 can be found below, and we are planning for more talks after the summer.

January 2021 - April 2023 KPIs of the "NeEDS" Online Seminar Series:

- o 88 speakers from 21 countries,
- o > 1500 people from > 85 countries subscribed to the [mailing list](#) to receive weekly updates,
- o > 19,500 views on [NeEDS YouTube Channel](#) and [IMUS YouTube Channel](#).

The Online Seminar Series has been widely advertised by [EURO](#), [ALIO](#), and [IFORS](#), and this support is highly appreciated by the **organizers**:



▲ Poster of the Online Seminar Series "Machine Learning NeEDS Mathematical Optimization"

[Prof. Emilio Carrizosa](#), [IMUS-Instituto de Matemáticas de la Universidad de Sevilla](#), [Prof. Dolores Romero Morales](#), [Department of Economics of Copenhagen Business School](#), [Thomas Halskov](#), MSc student at [Department of Economics of Copenhagen Business School](#), [Jasone Ramírez Ayerbe](#), PhD student at [IMUS-Instituto de Matemáticas de la Universidad de Sevilla](#).



▲ Countries of affiliation of colleagues registered to the mailing list.

Program of the Online Seminar Series “NeEDS Mathematical Optimization” (February 2022 - April 2023):

February 7, 2022: [Prof Peter Richtarik](#) (King Abdullah University of Science and Technology, Kingdom of Saudi Arabia) on [“Permutation compressors for provably faster distributed nonconvex optimization”](#);

February 14, 2022: [Prof Concha Bielza](#) (Technical University of Madrid, Spain) on [“Modeling multivariate time series with Bayesian networks”](#);

February 21, 2022: [YOUNG](#) with [Dr Sandra Benítez-Peña](#) (Universidad Carlos III de Madrid, Spain) on [“A clustered approach to Data Envelopment Analysis”](#), [Donato Maragno](#) (University of Amsterdam, The Netherlands) on [“Mixed-Integer Optimization with Constraint Learning”](#), and [Dr Yuri Malitsky](#) (Linköping University, Sweden) on [“Adaptive Gradient Descent without Descent”](#);

February 28, 2022: [Prof David Ríos](#) (ICMAT, Spain) on [“APS based optimization for adversarial machine learning”](#);

March 7, 2022: [Dr Pietro Belotti](#) (Politecnico di Milano, Italy) on [“Convex hulls of monomials in two-variable cones”](#);

March 14, 2022: [Prof Jean-Michel Loubes](#) (Université de Toulouse, France) on [“Fairness in Machine Learning: how to quantify the trade-off between accuracy and fairness with an application in structural econometry”](#);

March 21, 2022: [Dr Juan Pablo Vielma](#) (Google Research, USA) on [“Modeling and duality in domain specific languages for mathematical optimization”](#);

March 28, 2022: [Prof David Martens](#) (University of Antwerp, Belgium) on [“The Counterfactual Explanation”](#);

April 4, 2022: [Prof Veronica Piccialli](#) (Sapienza University of Rome, Italy)

on [“An exact algorithm for the semi-supervised minimum sum of squares clustering”](#);

April 25, 2022: [YOUNG](#) with [Dr Roi Naveiro](#) (ICMAT-CSIC, Spain) on [“Adversarial attacks against Bayesian forecasting dynamic models”](#), [Akhil Ahmed](#) (Imperial College, UK) on [“Learning Linear Representations of Nonlinear Dynamics Using Deep Learning”](#), and [Nidia Guadalupe López Flores](#) (Reykjavik University, Iceland) on [“Exploring study profiles of Computer Science students with Social Network Analysis”](#);

May 2, 2022: [Dr Radhika Kulkarni](#) (Vice President (Retired), Advanced Analytics R&D, SAS Institute Inc., 2022 President of INFORMS, USA) on [“Machine Learning, Artificial Intelligence and Optimization: Opportunities for Inter-Disciplinary Innovation”](#);

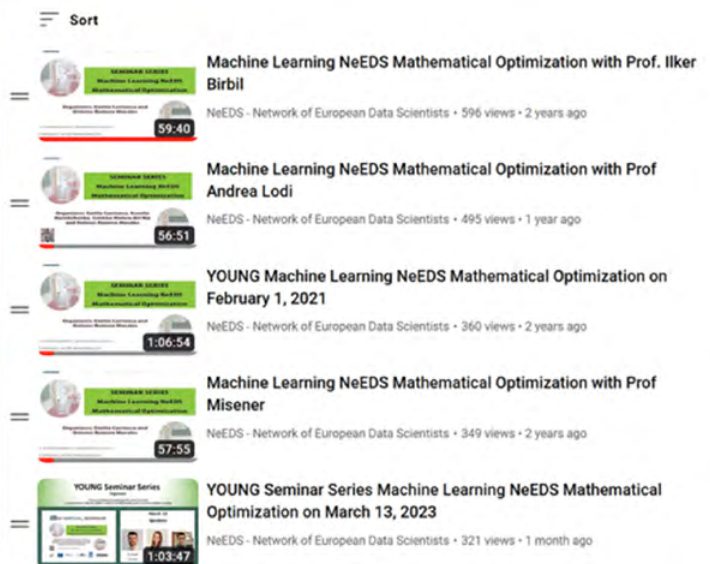
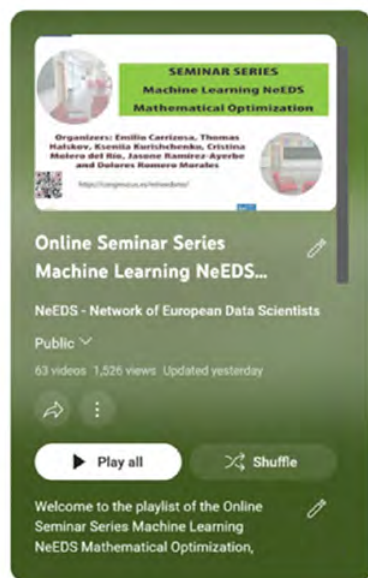
September 19, 2022: [Prof Michela Milano](#) (Università di Bologna, Italy) on [“Empirical model learning: machine learning meets optimization”](#);

September 26, 2022: [Prof José Antonio Lozano](#) (Basque Center for Applied Mathematics, Spain) on [“Beyond null hypothesis statistical testing: A Bayesian approach to analyze experimental ranking data”](#);

October 3, 2022: [YOUNG](#) with [Marta Monaci](#) (Sapienza University of Rome, Italy) on [“Maximum Margin Optimal Classification Trees”](#), [Bo Peng](#) (University of Vienna, Austria) on [“Conic formulation of QPCCs applied to truly sparse QPs”](#), and [Cecilia Salvatore](#) (University of Rome Tor Vergata, Italy) on [“Features Compression based on Counterfactual Explanations”](#);

October 10, 2022: [Prof Gabriel Peyré](#) (École Normale Supérieure, France) on [“Scaling Optimal Transport for High dimensional Learning”](#);

October 24, 2022: [Prof Fabio Schoen](#) (Università degli Studi di Firenze, Italy) on [“Clusters everywhere: Clustering methods for Global Optimization, Global Optimization for Clustering, with application to atomic Clusters”](#);



▲ YouTube Playlist of the Online Seminar Series “Machine Learning NeEDS Mathematical Optimization”.

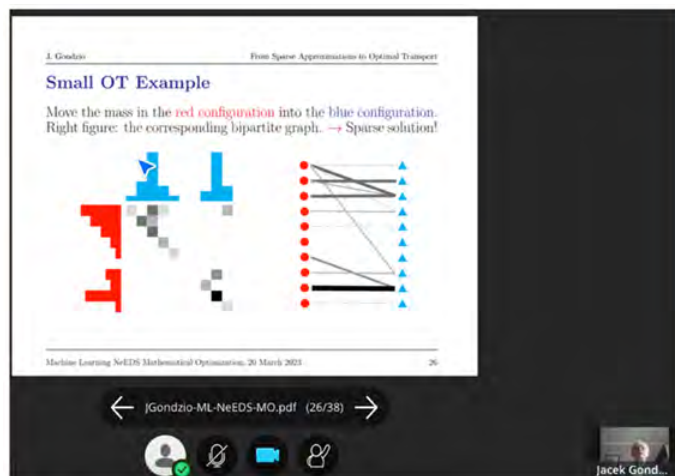
October 31, 2022: [Prof Theodoros Evgeniou](#) (INSEAD, France) on [“AI Explainability and Trust”](#);

November 7, 2022: [YOUNG](#) with [Buse Cisol Guldogus](#) (Bahcesehir University, Turkey) on [“Pruning in Deep Learning by Optimization”](#), [Sherly Paola Alfonso Sanchez](#) (Western University, Canada) on [“Credit Limit Adjustment using Reinforcement Learning”](#), and [Adrián Carrasco Revilla](#) (INETUM, Spain) on [“Building replicable models for energy grid management: A Graph Approach From RENergetic”](#);

November 14, 2022: [Prof Ce Zhang](#) (ETH Zürich, Switzerland) on [“Distributed Systems for Decentralized AI: Last Decade and Beyond”](#);

November 21, 2022: [Prof Adele Marshall](#) (Queen’s University Belfast, UK) on [“The Synergy of Data Analytics, Machine Learning and Statistics into Hybrid Models with Healthcare Applications”](#);

December 5, 2022: [Prof Botond Tibor Szabo](#) (Bocconi University, Italy) on [“Variational Bayes for high-dimensional linear and logistic regression”](#);



▲ [NeEDS 2023: Prof Jacek Gondzio](#) (The University of Edinburgh, UK) on [“Applications of Interior Point methods: from Sparse Approximations to Discrete Optimal Transport”](#);

December 12, 2022: [Prof Francisco Barahona](#) (IBM Research, USA) on [“Packing hypertrees and the k-cut problem in Hypergraphs”](#);

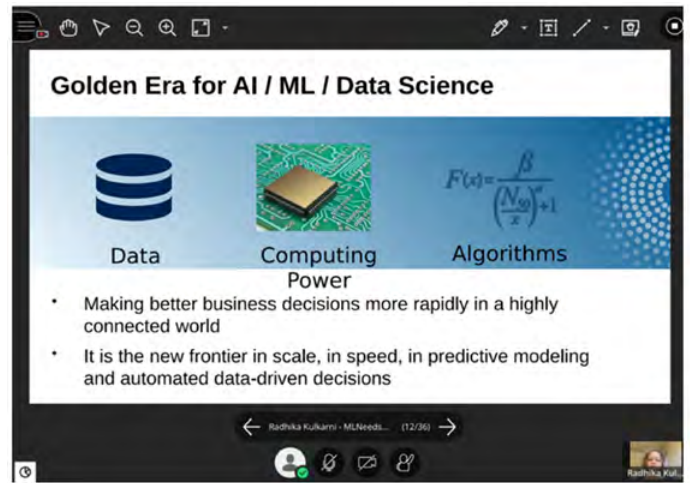
February 6, 2023: [Prof Simge Küçükyavuz](#) (Northwestern University, USA) on [“Consistent Second-Order Conic Integer Programming for Learning Bayesian Networks”](#);

February 13, 2023: [Prof Silvia Villa](#) (Università di Genova, Italy) on [“Implicit regularization and first order optimization methods”](#);

February 20, 2023: [Dr Francisco Jesús Rodríguez Ruiz](#) (Deepmind, UK) on [“AlphaTensor: Discovering faster matrix multiplication algorithms with reinforcement learning”](#);

February 27, 2023: [Prof Gah-Yi Ban](#) (London Business School, UK) on [“Selling personalized upgraded substitutes and co-purchases in online grocery retail”](#);

March 6, 2023: [Prof Ivana Ljubic](#) (ESSEC Business School of Paris, France) on [“Submodular maximization of concave utility functions composed with a set-union operator”](#);



▲ [NeEDS 2022: Dr Radhika Kulkarni](#) (Vice President (Retired), Advanced Analytics R&D, SAS Institute Inc., 2022 President of INFORMS, USA) on [“Machine Learning, Artificial Intelligence and Optimization: Opportunities for Inter-Disciplinary Innovation”](#);

March 13, 2023: [YOUNG](#) with [Dr Alexandre Forel](#) (Polytechnique Montréal, Canada) on [“Explainable Data-Driven Optimization: From Context to Decision and Back Again”](#), [Tabea Röber](#) (University of Amsterdam, The Netherlands) on [“Empowering the User: Finding Regions of Counterfactual Explanations via Robust Optimization”](#), and [Defeng Liu](#) (Polytechnique Montréal, Canada) on [“Revisiting local branching with a machine learning lens”](#);

March 20, 2023: [Prof Jacek Gondzio](#) (The University of Edinburgh, UK) on [“Applications of Interior Point methods: from Sparse Approximations to Discrete Optimal Transport”](#);

March 27, 2023: [YOUNG](#) with [Dr Farzaneh Pourahmadi](#) (Technical University of Denmark, Denmark) on [“Data-driven Warm-start for Accelerating Short-term Scheduling”](#), [Dr Brais González Rodríguez](#) (Ivey Business School, Canada) on [“Learning for Spatial Branching: An Algorithm Selection Approach”](#), and [Jiachang Liu](#) (Duke University, USA) on [“FasterRisk: Fast and Accurate Interpretable Risk Scores”](#);

April 17, 2023: [Prof Emma Frejinger](#) (Université de Montréal, Canada) on [“Tactical Planning under Imperfect Information: A Fast Matheuristic for Two-Stage Stochastic Programs Through Supervised Learning”](#);

April 24, 2023: [Prof José Ramón Zubizarreta](#) (Harvard University, USA) on [“Bridging Matching, Regression, and Weighting as Mathematical Programs for Causal Inference”](#). 🌐



▲ [YOUNG Online Seminar Series](#) with junior speakers from Austria, Canada, Denmark, Iceland, Italy, The Netherlands, Spain, Sweden, Turkey, UK, USA.

2ND WEBINAR OF THE AFRICAN WORKING GROUP "MULTICRITERIA DECISION AID"

- STUDYING EMERGING DOMAINS OF OPERATIONAL RESEARCH AND CELEBRATING FRIENDSHIP

Taicir Moalla Loukil <torsasso@gmail.com>, <loukilt@gmail.com>

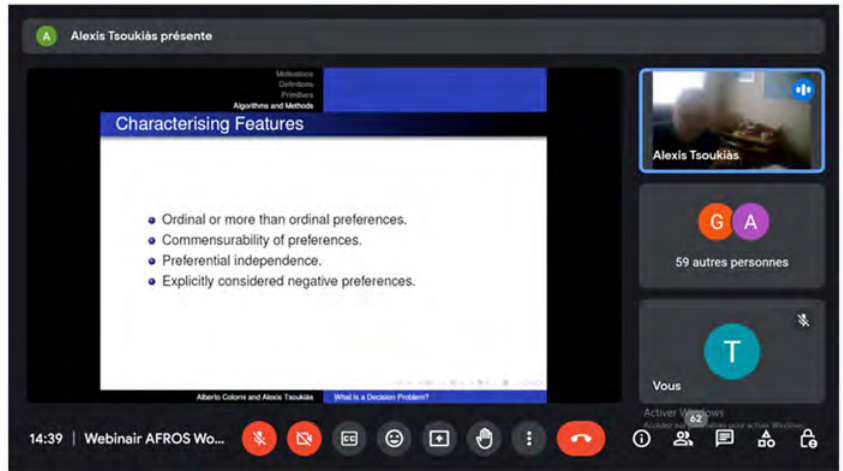
Multicriteria Decision Aid is an important branch of *Operational Research (OR)*. Beyond the exchange and meetings by means of international conferences and the publications in specialized scientific journals, the objectives of the *African Working Group "Multicriteria Decision Aid"* are the following:

- o To contribute to the development, at the African level, of an original way of thinking in the field of Multicriteria Decision Aiding,
- o To develop Multicriteria Aid for Decisions by facilitating contacts with everyone interested in the subject,
- o To keep the group alive and open by stimulating continuity and progress in exchange and work during periodic meetings,
- o To stimulate the emergence of new ideas.

The 2nd Webinar of The African Working Group "Multicriteria Decision Aid" was organized by Professor Taicir Loukil, the head of the group, online on March 15th, 2023, from 14h pm to 17h pm (GMT+1), via the link: meet.google.com/tro-qhhr-mhc.

The invited lectures were:

- "What is a decision problem?" by Professor Alexis Tsoukiàs (CNRS research director at LAMSADE, PSL University, Paris Dauphine; coordinator of the Peace Studies Master; former vice-president of ROADEF, former President of EURO);



▲ 2nd Webinar of the African WG "Multicriteria Decision Aid":
Invited Lecture by Professor Alexis Tsoukiàs.

by Professor Theodor Stewart (an Emeritus Professor of Statistical Sciences, University of Cape Town; Editor in Chief, Journal of Multi-Criteria Decision Analysis).

The webinar hosted 65 participants from Tunisia, France, Canada, Algeria, Poland and South Africa, which led to a smooth and enjoyable meeting.

The abstracts of the talks were:

What is a decision problem?

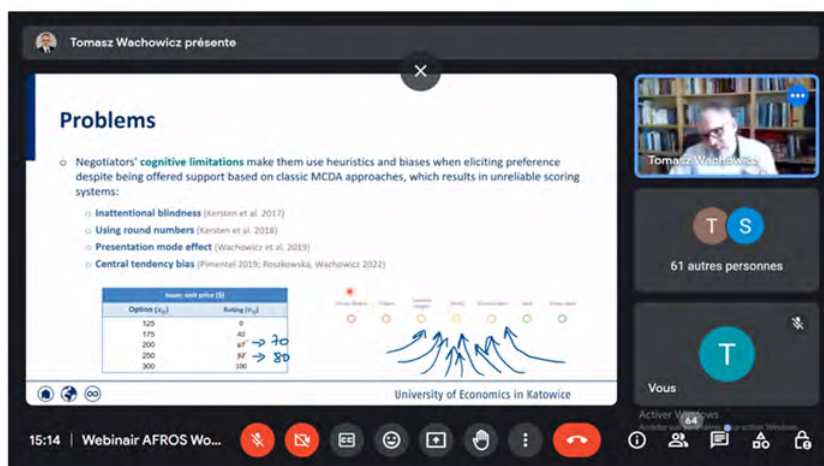
The talk presents a new general framework of what a decision problem is under a formal point of view (set partitioning).

The framework does not make any reference to existing decision support methods. We introduce a number of primitives (the strictly necessary information for defining a decision problem) and we show that the number of archetypes of decision problems is finite. We then show that real world decision aiding processes consist in handling sequences of formal decision problems.

Holistic MCDA methods for organizing the decision support in electronic negotiation systems

Electronic negotiation systems (eNS) have been designed for over two decades to support the parties in negotiating profitable and fair contracts via the web.

Since most negotiations are multi-issue, various multiple criteria decision-aiding (MCDA) methods can be used in designing decision-support units of eNS. The most popular negotiation supportive tools are based on the additive scoring model and use simple direct rating techniques to evaluate to negotiation template and build the scoring system, such as points allocation or SMARTS. >>



▲ 2nd Webinar of the African WG "Multicriteria Decision Aid":
Invited Lecture by Professor Tomasz Wachowicz.

- "Holistic MCDA methods for organizing the decision support in electronic negotiation systems" by Professor Tomasz Wachowicz (University of Economics in Katowice, Poland; Department of Operations Research, Head of GAIOR research group);
- "Multicriteria Decision Analysis as Focus for Strategic Planning",

>> However, many experimental studies show that using SMRAT-based approaches may cause problems with the quality of the resulting scoring systems. They raise the issues related to the misuse and misinterpretation of SMART-based scores by the negotiators. Some cognitive biases and heuristics may also affect the correct definition of the priorities using crisp scalar numbers. Therefore, other MCDA methods have been developed that avoid direct operations with numbers. Some of them utilize the ideas of preference disaggregation and assume the preferences for negotiation solutions may be declared holistically using the examples of some complete negotiation packages.

In this talk, we show how some notions derived from UTA and MARS MCDA methods can be combined to design a comprehensive prenegotiation protocol that allows negotiators to define their preferences cognitively easier and with better accuracy. Further, we show how such a protocol was implemented in our electronic negotiation system eNego. We also discuss the results of some electronic negotiation experiments conducted in eNego and compare the use and usefulness of the decision-aiding protocol to the one that uses the direct rating approach.

Multicriteria Decision Analysis as Focus for Strategic Planning
Many discussions of strategic planning are relatively



▲ 2nd Webinar of the African WG "Multicriteria Decision Aid":
Invited Lecture by Professor Theodor Stewart.

Analysis Analysis (MCDA) is restricted to the third (selection) phase, but this view is challenged. Analytic support to the first two phases might well be provided by "soft" OR, or Problem Structuring Methods (PSMs) preliminary to MCDA. We have however previously argued that MCDA itself can act as, and be utilized as, a PSM in the full sense of the expression, so that MCDA as a potentially integrating role throughout.

In this presentation, we unpack the forms of MCDA techniques and approaches that can provide support for each of the three Mintzberg phases. These are represented in a diagram demonstrating the inherent feedback nature of the process and the interacting nature of the MCDA interventions. The process is illustrated by a simplified example drawn from a real world context in water resources.

During the Webinar, Prof. Dr. Gerhard Wilhelm Weber cordially invited the participants to 2 highlight events in our conference calendar: IFORS 2023, Santiago, Chile (<https://ifors2023.com>), and EURO 2024, Copenhagen, Denmark (<https://euro2024cph.dk>). 🌐

THE WORLD IS NOT LINEAR: THIRD MINLP WORKSHOP IN BEAUTIFUL SEVILLA

Federico Perea <perea@us.es>

We have organized the *Third Sevilla MINLP Workshop (3SMINLP)* in March 30-31, 2023, at the Institute of Mathematics of the University of Sevilla (Spain), which developed from two previous MINLP workshops with a broad international impact. Federico Perea chaired the organization of the workshop, and Laureano Escudero and Justo Puerto chaired the scientific committee. The conference had financial support from EURO (as a *EURO Mini Conference*, <https://www.euro-online.org/web/pages/313/euro-mini-conferences>), the University of Sevilla (<https://www.us.es/>), the *Institute of Mathematics of the University of Sevilla* (<https://www.imus.us.es/www/?lang=GB>), and the *Department of Applied Mathematics II* from the same university (<http://departamento.us.es/mateaplicada2/>).



▲ 3SMINLP: Group photo first day, at IMUS entrance.

The number of real-world applications that can be modelled and solved by means of *mixed-integer nonlinear programming (MINLP)* is growing, thanks to the advances in software and hardware. Therefore, the MINLP community is also growing, and demands events in which both academics and practitioners gather and discuss on the latest advances both in

methodology and applications of MINLP. Two such workshops were organized in Sevilla in 2010 (*The 2010 Exploratory Workshop on MINLP*, organized by Emilio Carrizosa, Laureano F. Escudero, Marco A. Lopez, and Justo Puerto, with around 40 attendants) and 2015 (*The Second Sevilla MINLP Workshop*, organized within a COST project by Emilio Carrizosa and Justo Puerto, with a similar number of attendants).

The 3SMINLP counted with the following two plenary talks:

- **Martin Schmidt**. Trier University (Germany) (Plenary talk) - *“Block Decomposition of Large-Scale MINLPs and (Penalty) Alternating Direction Methods: Some Theory, the Feasibility Pump, and Applications”*. Chair: Laureano Escudero;
- **Adrian S. Lewis**. Cornell University (USA) (Plenary talk) - *“How hard is nonconvex nonsmooth optimization?”*. Chair: Genaro López.

Besides, the following 12 invited talks were also given:

- **Adriana Nicolae**. Babeş-Bolyai University (Romania): *“Alternating projections in metric spaces with bounded curvature”*;
- **Leo Warnow**. Technische Universität Ilmenau (Germany): *“An image space method for multi-objective mixed-integer convex optimization”*;
- **Eligius M.T. Hendrix**. Universidad Málaga (Spain): *“Using the resource constraint formulation and decomposition to solve MINLP problems”*;
- **Florian Fontan**. Artelys France (France): *“Latest developments for mixed-integer nonlinear programming in Artelys Knitro”*;
- **Ignacio E. Grossmann**. Carnegie Mellon University (USA): *“Modeling hierarchical systems via nested generalized disjunctive programming”*;
- **Jan Kronqvist**. KTH Royal Institute of Technology (Sweden): *“SHOT - The Supporting Hyperplane Optimization Toolkit solver”*;
- **Antonio Rodríguez-Chía**. Universidad de Cádiz (Spain): *“A further study of single allocation hub location problem”*;
- **Jose Luis Sainz-Pardo Auñón**. Universidad Miguel Hernández (Spain): *“Decomposing Unrestricted Binary Quadratic*



▲ 3SMINLP: Group photo second day, at IMUS conference hall.

3SMINLP
Third Sevilla MINLP Workshop
 March 30 - 31, 2023

Institute of Mathematics of the University of Seville (IMUS)

PLENARY SPEAKERS

Adrian S. Lewis
 Cornell University, USA

Martin Schmidt
 Trier University, Germany

SCIENTIFIC COMMITTEE

Laureano Escudero Bueno
 Universidad Rey Juan Carlos, Spain

Justo Puerto Albandoz
 Universidad de Sevilla, Spain

ORGANIZING COMMITTEE

Federico Perea Rojas-Marcos
 Universidad de Sevilla, Spain

imus EURO / **THE ASSOCIATION OF EUROPEAN OPERATIONAL RESEARCH SOCIETIES**

▲ 3SMINLP in Sevilla: the poster.

- Programming problems”*;
- **Laureano F. Escudero**. Universidad Rey Juan Carlos (Spain): *“Strong formulations for mixed integer quadratic modeling MIQM”*;
- **Lavinia Amorosi**. La Sapienza (Italy): *“A Mathematical Programming Approach to Sparse Canonical Correlation Analysis”*;
- **Can Li**. Davidson School of Chemical Engineering, Purdue University (USA): *“Selecting convex relaxations in a branch-and-bound algorithm using machine learning”*;
- **Moritz Link**. Universität Konstanz (Germany): *“Computing enclosures for multiobjective mixed-integer nonconvex optimization problems with application to energy supply networks”*.

Full details about the workshop are available at the conference website: <https://www.imus.us.es/congresos/3sminlp/>.



▲ 3SMINLP: Visit to Sevilla Historical Centre, the Cathedral of Sevilla and the Giralda at the back.

There were 44 participants in total, coming from two continents and 13 different countries. All of them could enjoy coffee-breaks, where discussions continued after the sessions. Lunches were offered at a university restaurant barely 100 meters away from the venue. The conference dinner was on Thursday, March 30th, and also gave the participants an opportunity to gather in the casual atmosphere. Right before dinner, most of the participants joined us in a touristic walk around Sevilla historical center, led by a professional touristic guide.

IMUS continues promoting and organizing scientific activities like Odysseus 2024 (<https://gestioneventos.us.es/odysseus-2024/>). 🌐

EWG FOR COMMODITIES AND FINANCIAL MODELLING CELEBRATED ITS 67TH MEETING IN ROME

Rita Laura D'Ecclesia <rita.decclesia@uniroma1.it>

The 67th EWGCFM Meeting, organized in cooperation with the Interagency Law-Enforcement Academy of Advanced Studies, University of Roma Tre, and University Unitelma Sapienza, was held on May 4-6, 2023, in Rome, Italy, and hosted in the prestigious location offered by the Interagency Law-Enforcement Academy of Advanced Studies.

The meeting's theme was focused on "The role of fin-tech and artificial intelligence in risk management and measurement".

A special thanks go to the three well-known scholars who accepted to be keynote speakers:

- o Agostino Capponi from Columbia University, NY, illustrated the role of Decentralized Fintech platforms;
- o Nassim Nicholas Taleb, from the Tandon School at NYU, NY, presented the effect of fat tails on financial decisions;
- o Carol Alexander from University of Sussex, UK, gave a broad and very clear description of the Cryptocurrency markets and their regulation.

The meeting organized from Thursday to Saturday hosted 75



▲ Participants of the Round Table on "Fintech, AI and Cybersecurity: The new Holy Trinity" during the 67th EWGCFM Meeting on May 5th.

participants, 11 sessions, 3 plenary sessions, and a Round Table on the topic "Fintech, Artificial Intelligence and Cybersecurity: The New Holy Trinity?". Out of 67 papers submitted, 45 papers were accepted and organized in various sessions. Each presentation was commented on by a discussant. Each session featured relevant topics and quality speakers selected by the organizing committee. The various sessions dealt with Risk Management, Algotrading and DEFI, Decision Making, Sustainable Finance, New Challenges in Asset Pricing, Volatility Modelling, Financial Market Analysis, Insurance and Pension Funds, Deep Learning, Commodity Markets Modelling, and Portfolio strategies. They called attention to essential innovations that included machine learning techniques in risk management, the role of decentralized finance in financial markets, and the role of AI in cybersecurity and in the bank business.

The Round Table hosted three industry experts from major Italian Banks, Fabio Ugoste, SIO of Intesa San Paolo, Vittorio Calvanico, COO from Banco Monte dei Paschi di Siena, Edoardo Faletti, CRO of Banco BPM, a representative of the Monetary Authority, Bruna Szego, head of the Anti-Money Laundering at the Bank of Italy, and two scholars who are very active in the field, Pasquale Cirillo from Zhaw University, Switzerland, and Giuseppe Lusignani from University of Bologna. The Round Table event succeeded in creating a more active interaction between industry and academia. The round table participants provided important insights on the role of innovation in the financial world and highlighted the need for the academic community to provide tools to form new professional competences.

During the meeting the Francesco Paris Award was granted to Faycal Drissi, from University of Oxford. Faycal was one of the six young scholars who had applied for the award, the title of the paper is "Decentralised Finance and Automated Market Making: Predictable Loss and Optimal Liquidity Provision".

Papers presented at the Conference will be eligible to be published in the Special Issue of the journal [Decisions in Economics and Finance](#), Springer.

While ensuring the high quality of the papers to be published, the journal will follow an expedited review process. First-round referee reports are expected to be completed by March 2024 and the complete special issue should appear in 2024.



▲ Agostino Capponi during his talk on May 4th 2023.



▲ Nassim Taleb during his presentation.



▲ Carol Alexander during her presentation on May 6th 2023.



▲ Room Cenacolo, where parallel sessions of the 67th EWGCFM Meeting took place.



▲ Auditorium Mosca, where plenary sessions took place.



▲ Participants at the Dinner in Honour of *Jaap Spronk*, held at the Officers Club of the Army on May 4th 2023.



▲ Participants at the Dinner in Honour of *Jaap Spronk* on May 4th where a presentation of *Jaap's* legacy was shown.



▲ Participants at the Dinner in Honour of *Jaap Spronk* on May 4th where a presentation of *Jaap's* legacy was shown.



▲ Gala Dinner on May 5th 2023 at the OZIO Restaurant, part of the 70 participants who attended the dinner.



▲ *Stavros Zenios*, *Nassim Thaleb* and *Rita D'Ecclesia* at the Gala Dinner.

ICAISD 2023 IN JAKARTA, INDONESIA, ONLINE: INSPIRING ADVANCED NATURE ROBUST INFORMATION DISCOVERY

Taufik Baidawi <taufik.tfb@bsi.ac.id>, Dwi Puji Hastuti <dwi.dsu@bsi.ac.id>, Gerhard-Wilhelm Weber <gerhard-wilhem.weber@put.poznan.pl>

ICAISD 2023 was an International Conference for sharing knowledge and research in Computer and Information Science and providing a platform for researchers and practitioners from academia and industry to meet and share the cutting-edge development of Computer and Information Science research. In the ICAISD 2023, the topic chosen was "Inspiring Advanced Nature Robust Information Discovery".

The conference was held in Jakarta, Indonesia, by the Department of Research and Community Service (LPPM) of Universitas Bina Sarana Informatika. It was a collaboration between APTIKOM, APTIKOM DKI Jakarta, Universitas Sumatera Utara, Universitas Nusa Mandiri, Cyber University, AMIK-STIKOM Tunas Bangsa, Universitas Raharja, Institute of Computer Science, on March 9-10, 2023. The conference was mainly held online using Zoom. This event was the 3rd conference since 2020. Its topic, "Inspiring Advanced Nature Robust Information Discovery", is an essential worldwide issue in Physical Science, including Physics, Math, Engineering, Applied Science, and Artificial Intelligence, especially for an emerging nation, Indonesia. This conference invited scientists, engineers, researchers, practitioners, academicians, and representatives of civil society organizations in a scientific forum; to share and discuss theoretical, practical, and innovative Physical Science, including Physics, Mathematics, Engineering, Applied Science, and Artificial Intelligence. This conference was mainly used as a scientific forum for accommodating exchange between researchers who originated from Indonesia.

The conference was guided by the masters of the ceremonies Dr. Agus Priadi, M.Pd, and Rety Palupi, M.I.Kom. There were four keynote speakers at the meeting: Prof. Dr. Zainal Arifin Hasibuan, Indonesia: "Discovering Inherent Structure in Big Data for Multi-purpose Solutions"; Prof. Dr. Herman Mawengkang, Indonesia: "Geometric and Semi-Algebraic Regression Strategies for Uncertain Target-Environment Networks with Nonlinear Optimization"; Prof. Dr. Dorien DeTombe (MSc. Ph.D.), the Netherlands: "Compram Methodology Policy Making on Cybercrime"; and Prof. Dr. Habil. Gerhard Wilhelm Weber, Poland



▲ ICAISD 2023: Opening words by Rector: Dr. Ir. Mochamad Wahyudi, M.Kom., MM., M.Pd., IPU, Asean Eng.

and Türkiye: "Regime-Switching Models via Stochastic Optimal Control & Robust Control Theory, with applications in Finance and Insurance". There were also two invited speakers: Prof. Dr. Anton Abdulbasah Kamil, Ph.D., Türkiye: "Estimating Technical Efficiency of Crude Palm Oil in Malaysia"; and Dr. Burcu Gürbüz, Germany: "Solving A Class of Nonlinear Reaction-Diffusion Equation Through a Spectral Collocation Method".

As an introduction, ICAISD 2023 proudly presents Website Open Conference System (OCS), developed by Universitas Bina Sarana Informatika. It has been used as a facilitator for submitting conference papers to the conference. ICAISD 2023 became a successful event, attracting researchers from many regions and providing an extraordinary academic experience for the participants; then attended by 300 participants through ZOOM, with more than 88 titles accepted to be presented at ICAISD 2023.

The committee also thanked all keynote speakers, invited speakers, reviewers, and editors for their commitment, effort, and dedication to the conference's success. ICAISD 2024 will start the agenda towards next year; we will introduce International Conference on Advanced Information Scientific Development (ICAISD) 2024 and invite your best paper submitted to ICAISD 2024.



Prof. Dr. Zainal Hasibuan



Prof. Dr. Herman Mawengkang

ICAISD 2023: Keynote Speakers (online):



ICAISD 2023: Keynote Speakers (online):

Prof. Dr. Dorien De Tombe



Prof. Dr. Gerhard Wilhelm Weber



ICAISD 2023: Keynote Speakers (online):
Prof. Dr. Anton Abdulbasah Kamil



Dr. Burcu Gürbüz

ICAISD 2023
International Conference on Advanced Information Scientific Development

ICAISD 2023
3rd International Conference on Advanced Information Scientific Development

CALL FOR PAPERS

TOPIC OF CONFERENCE
Inspiring Advanced Nature Robust Information Discovery

Prof. Tolib Aklin Hasbiwan
Chairman of the ICAISD 2023 Accreditation Council, INDONESIA

Prof. Gerhard-Wilhelm Weber
Fusion University of Technology, France, France

Prof. Dr. Herman Mawengkang
Sriwijaya University (SISU), Medan, Indonesia

Prof. Dr. Dorien DeTombe
Eindhoven University of Technology, Netherlands

Thursday - Friday, 9-10 March, 2023

Keynote Speaker

All accepted papers will be published in proceedings, Index by Scopus

Paper Acceptance
The Extended Final Paper Submission: February 15, 2023
Notification of Paper Acceptance: February 20, 2023
Camera Ready Due: February 25, 2023
Final Registration Due: February 28, 2023
Camera Ready Due: February 13, 2023

The topic of this conference, namely :
1. Computer Science 3. Software Engineering 5. Information Technology, Information Systems and Information Management
2. Computer Engineering and Computer Systems 4. Mobile Multimedia

Scopus AIP Publishing Who's Who in Informatics 2023

Contact Us: Taufik Baldawi : +62 877 8667 9136, Agus Junaidi : +62 813 1834 0588, Sopyan Dali : +62 813 8085 2848, Haryani : +62 813 1100 7854, Dwi Pul Hastuti : +62 877 7838-7444

▲ ICAISD 2023: Call for Papers.



▲ ICAISD 2023: Keynote and Invited Speakers, framed by the Masters of Ceremonies: Dr. Agus Priadi, M.Pd (left) and Rety Palupi (right).

During and at the end the conference, *Willi* warmly welcomed the participants of ICAISD 2023 to 2 highlights of our OR calendar: IFORS 2023 in Santiago, Chile (<https://ifors2023.com>), and EURO 2024 in Copenhagen, Denmark (<https://euro2024cph.dk>). 🌐

"HUMAN AGRO-ENERGY OPTIMIZATION FOR BUSINESS AND INDUSTRY"

by Pandian Vasant, Roman Rodríguez-Aguilar, Igor Litvinchev,
and Jose Antonio Marmolejo-Saucedo

IGI Global

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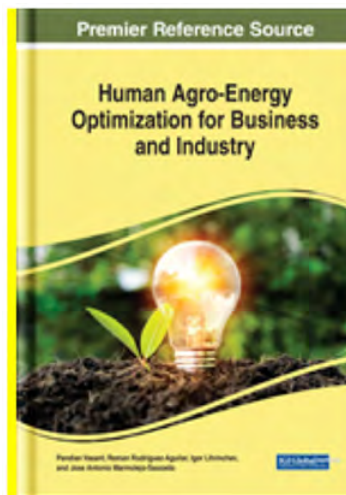
OR-MODELLING - A HUMAN AGRO-ENERGY OPTIMIZATION PERSPECTIVE

Jinal Parikh <jinal.parikh@ahduni.edu.in>,
Gerhard-Wilhelm Weber <gerhard-wilhelm.weber@put.poznan.pl>

This compendium is an arduous attempt by its authors to put together original, innovative, creative, scientific, practical and contemporary applications of smart optimization, classical and novel computing, artificial intelligence and operational research to the all-important fields of agriculture, renewable energy and sustainability; economics, finance and business; city and rural planning; meta-heuristics and big-data analytics; biology, life quality and healthcare; modern industries and emerging technologies. It acutely explores and continues to promote the latest developments of mathematical ideas and techniques in modelling and simulation, related to (i) Modelling Agro-Energy and its links with business and industry, including their foundations in physics, mathematics, statistics, and related elements of optimization, optimal control and game theory, (ii) Simulation of the models from agenda step (i), including simulation foundations in probability theory and stochastics, stochastic calculus and stochastic dynamics, numerical, computational and discrete mathematics and algorithms, graph and network theory, and (iii) Optimization of the models and simulation results received in the agenda steps (i) and (ii).

The superseding theme of this book is to present research on humanized optimization approaches for smart energy and the agro-business industry. This novel compendium depicts vivid applications of creative techniques in *Operations Research* and artificial intelligence, including fields of Data Science and deep learning, inverse problems and machine learning, neuroscience, and statistical learning, in addition to explaining how to intelligently condense, arrange and reduce the dimensions both of input variables and of datasets. Through this original compendium, the authors adeptly attempt to compile scholarly contributions of various expert researchers and academicians working in these areas.¹ They demonstrate synergies derived from deep model-based methods of mathematics, model-based (i.e., analytic, combinatorial or structured algorithms and codes) in consonance with their model-free (i.e., heuristics based) handy, practical counterparts in engineering, computer science and informatics along with their applicability to real-life problems in the distributed energy and hybrid renewable energy systems.

This handbook discreetly discusses codes of modelling and simulation, intelligent optimization and optimal control which could be applied in numerous branches of energy engineering



▲ *OR-Modelling - A Human Agro-Energy Optimization Perspective.*

whenever uncertainty and stochasticity is a major concern. From an energy perspective, special attention is paid to the role of agriculture, farming and corresponding modern fields of landscape architecture and design as well as rural and city planning. Specifically, the topics covered in this book include but are not limited to: *aeroponics, aquaponics, biomass characterization, energy efficiency, floating solar power plant, hydroponics, IoT-based smart farming, renewable energy systems, sustainable development, weather characterization, etc.*

Nevertheless, the contents of this book also underline the application of *Operational Research* to one of its most important domains, i.e., "*OR for Development and Developing countries*". For example, *Chapter 7* which highlights the importance of energy

efficiency in the Indian context by suggesting solar energy to be a more sustainable and energy efficient alternative vis-à-vis the conventional sources of energy given that India's "*major energy worries remain due to fast rising energy costs, resource depletion, and environmental consequences. These concerns call for a nationwide energy conservation movement*", as quoted by the author. Similarly, *Chapter 1* demonstrates the design and analysis of a typical floating solar power plant on the water surface of the Goreagab dam located in Namibia given that "*Sub-Saharan countries are facing shortages of energy and food*", as quoted by its authors.

A brief overview of the highlights of the thirteen chapters in this book follows:

Chapter 1: "Design and Simulation of a Floating Solar Power Plant for Goreagab Dam, Namibia" presents a design and analysis of a typical floating solar power plant on the water surface of the Goreagab dam in Namibia through three different case scenarios.

Chapter 2: "Experimental study on reliable smart hydroponics system" portrays the development an IOT-network enabled, sensor-based hydroponic setup which is not dependent on the outside environment and consumes less water and fertilizers as compared to a soil-based system.

Chapter 3: "A study on conversion of ligninolytic biomass to biofuels" discusses thermophilic ligninolytic bacterial enzymes in biomass-to-biofuel conversion. Utilization of agro-waste in ethanal and biofuel production are exemplified.

Chapter 4: “Sustainable developments of modern soil-less Agro-cultivation system” explains various terminologies and classifications of soilless agro-cultivation systems; and illustrates various fabrication elements of soil-less aquaponic systems with bio-fish and plant waste components.

Chapter 5: “IOT Based Smart Farming” demonstrates how IOT based smart and innovative farming techniques can enable the farmers to predict climate changes more accurately and take better decisions in real time to save losses and optimize yield.

Chapter 6: “Sustainable development in Modern Aquaponics cultivation system using IoT Technologies” showcases the development of a workable commercial aquaponics system using IoT and smart systems through sensors and digital twin framework system.

Chapter 7: “Energy Efficiency in Indian Scenario” shows that solar energy will play a vital role in helping to fulfil India’s expanding demand for energy.

Chapter 8: “Sustainable Developments of Hybrid Floating Solar Power Plants” discusses various sustainable development activities of hybrid floating solar photovoltaic technology with various emerging technologies.

Chapter 9: “Comprehensive Characterisation of Biomass and Weather for Deployment of the Renewable Energy Systems” demonstrates the use of renewable energy resources to overcome the challenges posed by traditional biomass energy sources and scarce electricity in least developed countries.


Chapter 10: “Artificial intelligent techniques in water purification and utilization” explains that use of AI, Machine Learning, and cutting-edge technologies such as data analytics, regression models and algorithms can facilitate better water management and prediction in agriculture.

Chapter 11: “New Strategies in Treatment and Enzymatic Processes” demonstrates that ethanol can be made from lignocellulosic biomass, a promising replacement for fossil fuels and that conventional and well-established corn-to-ethanol technology can be cost competitive with the cellulosic ethanol process.

Chapter 12: “Bioethanol Production from Biomass Extracted from Sunn Hemp Seed” explains the application of optimization methods to procedures for biomass and bio-ethanol manufacturing processes.

Chapter 13: “A Glance at Trends Manufacturing Systems Modelling and Optimization” analyses main optimization methods as well as presents results obtained from relevant scholarly documents used in flexible manufacturing systems.

While this book astutely covers *OR Modelling from the perspective of Human-Agro Business Industry perspective* many further scientific, practical, and real-world applications may be further explored.

¹Though we acknowledge the remarkable contributions of all authors, we regret our inability to add the names of all the contributors of this book owing to limitations of space. The following link gives a brief description of the book and all its authors - <https://www.igi-global.com/book/human-agro-energy-optimization-business/287870>. 

"QUADRATIC UNCONSTRAINED BINARY OPTIMIZATION PROBLEM - THEORY, ALGORITHMS AND APPLICATIONS"

by **Abraham P. Punnen**

Springer Nature Switzerland AG 2022
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OR-ANALYTICS - A BINARY OPTIMIZATION PERSPECTIVE

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Gerhard-Wilhelm Weber <gerhard-wilhelm.weber@put.poznan.pl>

In today’s unpredictable and turbulent times, when both classical and traditional optimization approaches are struggling to obtain holistic solutions to real-time complex optimization problems, *Quadratic Unconstrained Binary Optimization (QUBO)* provides a set of generic, flexible, robust, and versatile framework for solving them. Though studies on *QUBO* including its theory, algorithms, and applications can be dated back to the late 1950s and early 1960s, it has caught renewed attention of researchers and academicians of late due to the recent developments in the fields of quantum and quantum-inspired computers. This book prepared by *Abraham P. Punnen* on *QUBO* problems is a dedicated effort to compile the recent developments of the theory, algorithms, and applications of *QUBO* in a consolidated form which is otherwise scattered across many disciplines¹.

Given its rich content and manifold scholarly citations to significant contributions in the field of *QUBO*, this compendium can be a state-of-the-art authoritative reference volume to a wide range of audience comprising researchers, students, and practitioners in various fields, including operational research, computer science, mathematics, and industrial engineering, etc.

There are 11 chapters in this book, each of which vividly describes a specific aspect of the problem. A brief overview of the highlights of the chapters in this book follows:

Chapter 1 “Introduction to QUBO” introduces *QUBO* by providing some historical notes, sample applications, and general representations of the problem. >>

>> It also discusses some of the basic mathematical programming formulations of *QUBO* along with some additional interesting and motivating examples like person detection and tracking in a crowded environment, module flipping in circuit layout design, side-chain positioning in protein design, machine scheduling, etc.

Chapter 2 "Applications and Computational Advances for Solving the QUBO Model" presents a thorough summary of various application areas, with a detailed reference list. The various application areas covered include classical combinatorial optimization, financial services, transportation, manufacturing, pharmaceuticals and related, network and energy, machine learning, etc. It also covers some model formulation techniques and sample experimental results.

The authors also emphasize the importance of the *QUBO* model as an underpinning of the quantum computing area in this chapter.

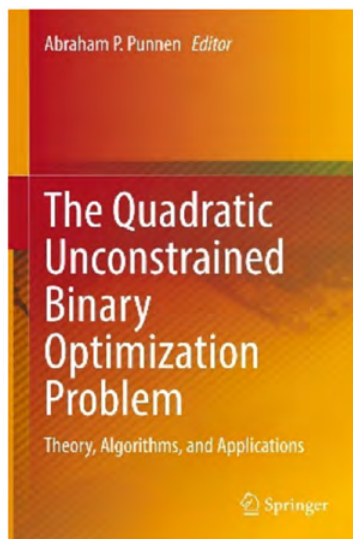
Chapter 3 "Complexity and Polynomially Solvable Special Cases of QUBO" highlights the computational complexity of the problem and contains a detailed discussion of polynomially solvable special cases that can be solved in polynomial time, in pseudopolynomial time or in subexponential time. While it provides detailed proofs for some special cases, it gives appropriate references along with partial results for others. The algorithms for the tractable special cases discussed in this chapter exploit properties of the associated support graphs or properties of the involved cost matrices or both.

Chapter 4 "The Boolean Quadric Polytope" deals with the Boolean quadric polytope and its applications in developing branch-and-cut algorithms for the problem. Specifically, it gives a brief introduction to polyhedral theory, reviews the literature on the Boolean quadric polytope and related polyhedra, and explains the algorithmic implications.

Chapter 5 "Autarkies and Persistencies for QUBO" deals with so-called autarkies and persistencies for *QUBO*. This chapter examines these and some related notions from the literature and recalls algorithms for their recognition. It establishes that while these techniques provide efficient pre-processing for *QUBO* problems, in some applications these also result in substantial reduction in problem sizes. It exhibits how autarkies and persistencies can be used to fix variables a priori and to enhance exact and heuristic algorithms.

Chapter 6 "Mathematical Programming Models and Exact Algorithms" is focused on exact algorithms. Various mixed-integer linear programming and semidefinite programming formulations of *QUBO* are discussed, and there is an overview of specially designed exact algorithms.

Chapter 7 "The Random QUBO" discusses the analysis of random *QUBO* instance which are often analyzed within the topic of "probabilistic combinatorial optimization". While the introduction of randomness makes the problem more challenging from a computational perspective, the goal of these problems is to study the behavior of the distribution of



▲ OR-Analytics – A Binary Optimization Perspective.

the optimal value and the distribution of the optimal solution.


Chapter 8 "Fast Heuristics and Approximation Algorithms" talks about approximation algorithms for *QUBO*, analyzed from a theoretical point of view. It elaborates the theoretical analysis of approximation algorithms for *QUBO* and the *Ising QUBO*. While the authors underline that the standard performance measure of relative performance ratio is not suitable for analysing the quality of approximation algorithms for the general versions of *QUBO* and the *Ising QUBO*, they state that the polynomial time approximation algorithms can be considered and analyzed for the general problems using normalized relative error and domination analysis.

Chapter 9 "Metaheuristic Algorithms" provides a state-of-the-art account on metaheuristics for *QUBO* which are used to produce approximate solutions to large *QUBO* instances that cannot be solved exactly due to the high computational complexity. This chapter provides a detailed review on the general metaheuristic approach for solving the *QUBO*.

Chapter 10 "The Bipartite QUBO" discusses the *Bipartite QUBO* by extending those results which can be applied to *QUBO* to *BQUBO*. This chapter primarily focuses on the results that exploit the special structure of *BQUBO*. In particular, the concepts of computational complexity, polynomially solvable special cases, approximation algorithms, MILP formulations, and exact and heuristic algorithms are considered.

Chapter 11 "QUBO Software" provides a summary of the currently available *QUBO* software, with details of how to access this software. The chapter compiles information regarding various *QUBO* available solvers including general purpose MILP solvers, SDP solvers, codes for heuristics, exact algorithms, and test instances. The chapter also provides information on solvers and test instances for problems that are equivalent to *QUBO* and the equivalent formulation can be obtained directly without significant effort. This includes the maximum cut problem, the maximum weight stable set problem, the maximum clique problem, and bilinear programs.

While this book provides an authentic access to the most contemporary, extant, exemplary, and scholarly literature for its readers for solving *QUBO* problems, many further scientific, practical, and real-world areas and their applications like Logistics and Production, Medicine and Neuroscience, Network Theory and Neural Networks, Pension Fund Systems and Portfolio Management, Stochastic Games and Optimal Control, Regime Switching and Jump Processes as well as Inverse problems (notably Discrete Tomography) remain yet to be explored by means of the methods and results of this book.

¹ We gratefully acknowledge the remarkable contributions of all contributors. However, we regret our inability to add the names of all the contributors of this book owing to limitations of space. The following link gives a brief description of the book and all its authors: <https://link.springer.com/book/10.1007/978-3-031-04520-2>. 

OBITUARY FOR PROFESSOR EMERITUS JAKOB KRARUP

Anita Schöbel <anita.schoebel@itwm.fraunhofer.de>, David Pisinger <dapi@dtu.dk>, Dorit Hochbaum <hochbaum@ieor.berkeley.edu>, Cathal MacSwiney Brughha <cathal.brughha@ucd.ie>

Jakob Krarup, former professor at the Department of Computer Science, University of Copenhagen (DIKU), passed away on February 25th, 2023. He will be remembered as one of the founders of *operations analysis* (OR) in Denmark, and for his active work within the *European Association of Operational Research Societies* (EURO).

Jakob was one of the pioneers in computer science in Denmark. He started in 1958 with a student job on Denmark's first electronic computer (DASK) at the then Regnecentralen. This was followed by a few years at the Institute for Mathematical Statistics and Operations Analysis (IMSOR) at the Polytechnic Institute (today DTU), where he worked closely with *Peter Pruzan* within the new research area "operational analysis" which had been founded shortly after the Second World War. Over 25 years, *Jakob* and *Peter* published close to 40 publications in the areas of location problems, quadratic optimization and routing. *Jakob* was a central figure in the facility location research community, and many of his papers and associated datasets are still being cited.

When the Department of Computer Science at the University of Copenhagen (DIKU) was founded in 1970, *Jakob* was employed as an associate professor, and later as a professor. Here he helped shape computer science and inspire future generations.

In addition to his academic work, *Jakob* will be especially remembered for his involvement in *EURO* where he was one of the pioneers, and which was part of his life for almost 50 years. *Jakob* was President of *EURO* in 1989-1990, and he is the only person who has been Chairman of the Programme Committee at two *EURO* conferences. In 2009, *Jakob* received the *EURO* Distinguished Service Medal for his enormous work within *EURO*. In fact, the award was invented because of him. *EURO* member societies wished to express their appreciation for his work in building our community.

Jakob Krarup liked to challenge the established society. When he wrote his doctoral thesis with *Peter Pruzan*, the rules required each person to write their



▲ The young *Jakob*, with *EURO* tie.

own thesis. Therefore, *Jakob* and *Peter* had the doctoral thesis printed so that *Jakob Krarup* was written on the front and *Peter Pruzan* was on the back. Depending on which side was facing up, you could then have different authors. It caused quite a debate in the Danish media about whether this was allowed, and it is one of multiple examples of *Jakob's* irreverence towards bureaucratic rules.

Jakob loved to teach, and was a great inspiration to many of us within operational analysis. His slides were always decorated with little stickmen, and he supplemented the dry fabric with pictures from "The Great Bastian". As he said: Lectures must be entertaining so that they inspire people to read more about the material. You don't want people to fall asleep over boring math.

Many of his former students later became professors at universities in Denmark (*Jens Clausen*, *Jørgen Tind*, *Pawel Winter*, *Stefan Røpke*, *Jesper Larsen*, *David Pisinger*) and helped carry on his tradition. *Jakob* was also very supportive and encouraging of young scholars, such as *Gerhard Wilhelm Weber*.

As the son of an organist, *Jakob* was always interested in music, and he was gifted with absolute hearing. At festive events, he could take some empty wine bottles, fill them with water until they had the right natural frequency, and then play a piece of music on the bottles. *Jakob* loved listening to classical music and had a huge collection of rare recordings. But we will also remember him for being able to lift a glass of red wine to his ear to hear if it was a good vintage.



▲ *Jakob*, Knight of the Order of Dannebrog, awarded by H.M. Queen Margaret II (1999).

Jakob was active until the very end. As recently as this autumn, he wrote a column in *Politiken* about digitization in Denmark, and he was looking forward to the *EURO* conference finally coming to Copenhagen in 2024. He was also in the process of gathering material for *EURO's* 50th anniversary. As if he had had a premonition, in December he sent more than 18 files with his memories about *EURO*, including anecdotes, the birth of *EURO*, memories about conferences, information on the working groups, but he also wrote obituaries for four *EURO* presidents who passed away. >>

>> It is a strange feeling that we now write about him. Thanks to his fantastic memory and his enormous image archive, he helped to remember and shape *EURO's* history and identity. As *Jakob* always said: “without the people and stories that shaped the field, there would just be some empty formulas”. When *Jakob Krarup* was knighted in 2001, he was asked to write his life story. When he was in audience with *Queen Margarethe II*, she thought it was a life-affirming and entertaining story. The life story can be found at the web page of the *Danish OR Society*, for those who would like to know more about *Jakob*.

We will miss *Jakob* for his always entertaining speeches, and for having gathered the people behind the *OR* profession for 50 years.

In Denmark, the prime minister makes a proclamation upon the death of a monarch: *Kongen leve, kongen er død*, which translates as: “Hail the King, the King is dead”, from the balcony of Christiansborg Palace, the Danish Parliament building.

The original phrase was: *Le roi est mort, vive le roi!*: “The King is dead. Long live the king” which was first declared by the new King of France, *Charles VII*, after the death of his father in 1422. For many of who had the wonderful experience of his humour,

friendship, warmth and enthusiasm *Jakob* was the King of our *OR* community. For years we had looked forward to coming to his home of Denmark in the *EURO* conference in 2024, and to celebrate him as our popular king.

Sadly he has died. So now we can only say: “The King is dead. Long live the memory of *Jakob Krarup*”.

With his memories among us, *Jakob* will never be forgotten. Thank you, *Jakob*, for your great engagement for *Operational Research*, for *EURO*, and for being such a wonderful happiness-spreading person.

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The Editor-in-Chief of the *IFORS* Newsletter would like to thank Prof. Roman Slowinski, Editor-in-Chief of the *European Journal of Operational Research*, for coordinating the permission to reproduce part of the content of the original article, and Prof. G.-W. Weber for coordinating the editing of this article. 🌐

IFORS GLOBAL WEBINAR SERIES

Frits Spieksma <f.c.r.spieksma@tue.nl>

Sustainability is a key word in our times. It has become a cliché to state that using our global resources in a responsible, i.e., sustainable way is an enormous challenge. Dealing with vested interests, with rapid innovations, with rising standards of living leads to multi-faceted questions. Our field is well-placed to contribute to answer these questions. All this sets the stage for our global webinar “OR and Sustainability” which featured four presentations on very different topics, that however, all fit very well in the webinar’s theme.. More precisely, on April 27, 2023 *IFORS* organized a Global Webinar on this topic. Elise Miller-Hooks, editor-in-chief of the *IFORS* journal, Sustainability Analytics and Modelling, gave a short presentation about the subject areas of the journal. Further, there were four presentations of invited operations researchers from the four different regions, who are deeply involved in questions arising from sustainability. The webinar, hosted by *IFORS* President Janny Leung and moderated by Frits Spieksma (Vice-President of *IFORS*) and Elise Miller-Hooks (Editor in Chief of Sustainability Analytics and Modelling), had as presenters and panelists:

(i) Adrián Ramírez Nafarrate from Tecnológico de Monterrey (Mexico). Adrián presented work on the adoption of electric vehicles (EVs) in Mexico. Due to the mindset of customers, the adoption of EVs in Mexico has been increasing significantly. However, there are still many barriers that discourage the adoption of EVs. As a consequence, the proportion of market share of EVs is still very low compared with traditional vehicles. Adrián discussed the barriers for adopting EVs in Mexico and the opportunities to study this problem from an *OR* perspective.

(ii) Michael Craig from the University of Michigan (USA). His presentation focused on Small nuclear Modular Reactors (SMRs), and their potential for replacing more traditional energy sources. Using case studies from various states in the

USA, a model was set up that predicted at what price of regular energy sources, SMRs would become a competitive alternative. The impact of various assumptions of the model was discussed as well.

(iii) Kristen Schell from Carleton University (USA). She sketched how, for a small community, particular choices of infrastructure (wrt sewer system, or powerlines, or water network) behave after a rare event (such as a natural disaster). Using a multi-objective linear integer program that incorporated various facets of this problem, the impact of various choices was discussed.

(iv) Marc Reimann (University of Graz). In his talk, Marc gave an overview of public repair initiatives in Austria, in particular in the city of Graz. Working together with local government, a consortium of small repair firms on all kinds of durable consumer goods contributed to the circular economy. While successful as an initiative, there is quite some potential to grow in relevance as well. Finally, Marc briefly explained two current projects dealing with different approaches and addressing different repair stakeholders.

Around 140 participants registered for the Webinar, and posed questions that further clarified the contributions of the speakers. The webinar, like all *IFORS* Global Webinars, is available free of charge at <https://www.ifors.org/ifors-global-webinar-series/> 🌐

The poster features the IFORS logo at the top, with a globe icon. Below it, the text reads "Global Webinar Series" and "OR and Sustainability". The date and time are listed as "April 27, 2023, 9:00 am Washington DC / 3:00 pm Rome / 9:00 pm China". The hosts are Janny Leung (IFORS President), Frits Spieksma (IFORS Vice President), and Elise Miller-Hooks (IFORS SAM Journal Editor in Chief). A registration link is provided: <https://www.ifors.org/ifors-global-webinar-series/>. The invited speakers are: Adrián Ramírez Nafarrate (Tecnológico de Monterrey), Michael Craig (University of Michigan), Kristen R. Schell (Carleton University), and Marc Reimann (University of Graz). Each speaker has a small portrait photo. At the bottom, it states: "Several times each year, IFORS will offer free webinars on topics of key interest to those developing and applying operational research and analytics methodologies and models."

FINALISTS OF THE IFORS PRIZE FOR OR IN DEVELOPMENT TO PRESENT IN CHILE

Mario Guajardo <mario.guajardo@nhh.no>



In the past issue of the newsletter we announced the titles and authors of the six works selected as finalists of the IFORS Prize for OR in Development 2023. In this issue, we are extending the announcement with additional information about the finalist works. Note the authors will deliver their final presentations during the IFORS Triennial conference in Chile, in July 10-14, 2023. Two sessions are being planned for that, under a thematic cluster called *IFORS Prize for OR in Development Finalist Presentations*. The winner and runner-up will be announced during the conference dinner.

You will soon be able to find these presentations in the conference schedule, once the scientific programme is announced. At the moment, we are delighted to treat you with a short abstract of each work and the photos of the authors of the finalist teams.

Improving Health Outcomes with Less Cost? Provision of Mobile Clinic in Developing Economies

F. Liu, P. Guo, Y. Wang, Y. Xi.



Consider a public healthcare system consisting of a hospital, a mobile clinic (MC), and a population of potential patients. The government needs to decide whether and how to provide the MC service to maximize the social welfare that consists of two terms: the system's long-run average healthcare cost and the population's average quality-adjusted life year (QALY). We model the population's natural disease progression and derive both the average healthcare cost and the average QALY for a given MC delivery cycle. We then characterize the optimal MC delivery policy for both fast- and slow-progressive diseases. We show that the MC service is provided only when the setup cost is below a certain threshold under both disease types. Once the MC service is provided, we show that if the disease is fast-progressive, the MC service is provided either every or every other period. In contrast, when the disease is slow-progressive, we find that a larger MC capacity leads to a weakly less frequent provision of the MC service. The provision of the MC service always results in a longer average QALY compared to that without the MC service. It can also reduce the average healthcare cost when the setup cost is sufficiently low and the relative treatment cost-saving per person with the provision of the MC service is positive. Our case study reveals that when the ICER is negative, on average, the provision of the MC service leads to a 141% improvement in average QALY and a 13.1% reduction in average healthcare cost compared to those with no MC service; when the ICER is positive, on average, the average QALY can be increased significantly by 266.4% at the cost of increasing the average healthcare cost by 5.8% with the provision of the MC service.

Cooperative Traffic Light Signal Control: Optimization Models and Algorithms

X. Yang, C. Wu, C. Gu, J. Pi, W. Liu, S. Xu, W. Liu, Z. Huang.



Traffic signal control and optimization is one of the most important research topics in the field of operations research. Traditionally, methods for traffic signal control and optimization are typically model based without considering the interactions between traffic and the environment. With the emergence of big data, incorporating data into transportation systems provides opportunities to improve the performance of traffic signal control. We propose a data- and model-based dual-driven unified framework for intelligent traffic signal control. To enable real-world implementation, we have been actively collaborating with traffic equipment suppliers to embed our proposed algorithm into actual signal control systems. To verify and evaluate the effectiveness of our approach, we are working with functional government departments to collect real data from controlled traffic intersections as well as feedback from road users. Theoretically, our approach bridges the gap between model-based and data-driven approaches by introducing a data-driven traffic modeling approach and model predictive control (MPC) to generate traffic control strategies. Practically, our approach can improve traffic flow efficiency by at least 20% on average during peak hours in simulation environments. During the test-bed implementation, we observed a corresponding improvement of about 15%. According to data from the Ministry of Transport of China, the economic loss caused by traffic congestion accounts for 20% of the disposable income of urban residents. Clearly, widespread implementation of our approach could bring significant economic benefits and facilitate the development of operations research as a practical problem-solving tool.

OCP optimizes its supply chain for Africa

E.M. Er Raqabi, I. Himmich, A. Beljadid, M.A. Bennouna, R. Bennouna, S-E. Boumahdi, L. Boussaadi, N. El Hachemi, I. El Hallaoui, M. Fender, H. Guellaf, A. Jamali, E.M. Mahboubi, A. Metrane, I. Rakhis, N. Si Hammou, F. Soumis.

Morocco holds 70% of the world's phosphate rock reserves, a crucial element for fertilizers' production, giving it a leading role in satisfying our planet's needs for food. Aware of its duty, the Moroccan government has been leveraging its expertise in agriculture and fertilizers production by establishing the largest agriculture hub in Africa. This hub is led by the OCP Group, a Moroccan state-owned phosphate rock miner, phosphoric acid manufacturer, and fertilizer producer. Operations research specialists at the OCP Group, the Mohammed VI Polytechnic University, and the Polytechnique Montreal operationalized a system optimizing OCP's supply chain downstream activities. The system simultaneously schedules production, inventory, and vessels while ensuring the highest demand fulfillment. Therefore, it has become central to the planning process, fundamentally transforming the supply chain and operations management at the OCP Group. Planners now use the optimizer's solutions and insights to improve plans. The optimizer was initially a bottleneck curbing the usage of other supply chain management tools. However, after operationalizing it, OCP management credits the system with providing operational benefits, contributing to over a \$240 million increase in annual turnover.



Data Science and Simulation Tools Developed at Public Universities for Supporting Argentina's COVID-19 Response Decision-Making

R. Castro, R. Grimson, D. Feierstein, E. Kofman, E. Pecker-Marcosig, G. Durán, A. Farall, J. García, D. Parada, N. Kreplak, S. Gonzalez.

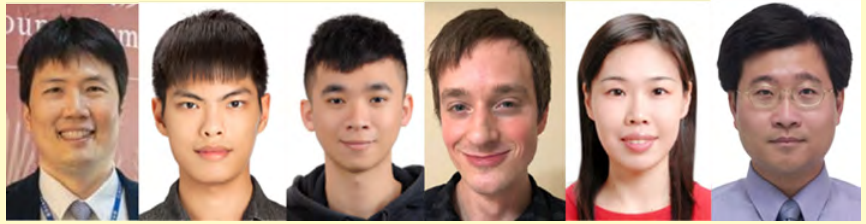
This work summarizes the efforts and innovations of a group of computer scientists, engineers and mathematicians working together with social scientists and biologists in a project initiated shortly after the arrival of the COVID-19 pandemic in Argentina. Their work resulted in a series of contributions relating to the management of the health emergency, including data processing and analyses, simulations of future scenarios, evaluation of policy impacts, alternative lockdown schemes and monitoring the evolution of key pandemic indicators. These tools were designed to function in real time in a context of great uncertainty, responding to frequently changing demands and situations and shaped by a close collaboration with public officials in a developing country whose society and institutions are organized very differently from those of the developed world. All of these factors together required that local aspects of social relations and their regional variations be considered in the task of adapting existing strategies and imagining new ones in support of evidence-based pandemic policy planning through the analysis of data and the projection of future scenarios.



Safer Homeland: Developing Evacuation Simulation and Humanitarian Relief Logistics Models for Effective Disaster Preparation and Response in Taiwan

K-H. Chang, T-Y. Hsiung, Y-Z. Wu, R. Cuckler, T-Y. Chang, S-S. Ke.

We developed two data-driven, practice-based streams of interrelated post-earthquake disaster operations research, one pertaining to pedestrian evacuation and the other to humanitarian relief logistics. The two studies were carried out in collaboration with the National



Science and Technology Center for Disaster Reduction (NCDR) in Taiwan, a think-tank established to strengthen disaster management and risk reduction for the government. Developing these simulation-based disaster operations frameworks was challenging because the post-earthquake environment is highly complex and stochastic and the evacuation and relief goods distribution processes themselves are also characterized as dynamic and uncertain. In particular, the evacuation simulation model was built as an agent-based model in which pedestrian agents decide their walking paths and destination relief centers based on dynamically-changing congestion levels at each cell in a cellular-based road network. Meanwhile, the humanitarian relief logistics models optimize the routing of vehicles and relief goods in order to meet demand at relief centers in minimal time. Extensive numerical experiments were carried out to explore important issues related to both evacuation and humanitarian logistics. Key insights have led to disaster management officials amending evacuation and humanitarian logistics policies which may result in a decrease in human suffering and lives lost. Moreover, these two lines of research have been integrated into a decision support tool called the Comprehensive Disaster Decision Support System, a key component of the all-hazard management approach which is currently being developed by the NCDR and other government entities in Taiwan.

A model for land rent analysis and implementation of the national rural domain for the optimal management of agricultural land in West Africa

E.A. Raimi, A. Alinsato, L.M. Hounsa.

In Africa, the nature of the relationship between agricultural public investment and agricultural value added reflects areas of inefficiency in which public agricultural investment does not always make it possible to make the best combinations of factors of production or generates waste of resources. Public agricultural investment can paradoxically result in a diversion of agricultural activity towards other activities with immediate or rapid returns. To mitigate this effect, particular attention must be paid to the implementation of public agricultural investment. Thus, in the context of the promotion of development projects, the availability of land, particularly rural land, has proved to be a real challenge for countries in West Africa. In order to mitigate the difficulties of land mobilization and make it available at low transaction costs, a model has been developed for the establishment of national economies for ECOWAS countries. The analysis model used is inspired by the Ricardian approach to land rent. This project is part of the perspective of informing the decision through thematic reflections related to land reform in West Africa. The study aims to indicate the economic implications or gains associated with the implementation of the National Rural Domain. The approach is illustrated in a data case from the Republic of Benin. The main results indicate that net land income is a non-linear function of public investment, whereas it is an increasing function of private agricultural investment.




14th Triennial Conference of the Association of Asia-Pacific Operational Research Societies

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IFORS 2023 CONFERENCE

We are getting ready for a great IFORS 2023 conference!

The Program and Organizing Committee are working hard in preparation of the 23rd Conference of the International Federation of Operational Research Societies (IFORS 2023), which will take place in Santiago, Chile, in July. The conference is locally organized by ICHIO, the Chilean Institute for Operations Research, together with ISCI, the Institute of Engineering Complex Systems, and with the support of the University of Chile and the Pontifical Catholic University of Chile.

We have received more than 850 abstracts in many different topics, showing the enormous reach that our discipline can have. In addition to the regular scientific sessions, the conference will feature exiting plenaries and several invited keynote talks covering a wide range of Operational Research and Analytics subjects, also some tutorials on current topics will be offered.

Wednesday will be the opportunity to tour around Santiago and we will have a wide variety of options, including tours to the vineyards near Santiago and the famous port city of Valparaiso. Options will also be available to visit the ski centers near Santiago and other places. Information is available in the conference webpage.

For all of you attending IFORS 2023, stay alert to the information we will send with more details, including arrival in Santiago, how to move around, tips on the city, etc. Do not forget to make your hotel reservations. The conference webpage has information on hotels that are offering special rates to attendees. Check www.ifors2023.com.

We look forward to seeing all of you in person in Santiago in July 2023!

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