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IFORS NEWS
International Federation of Operational Research Societies

From the President

Janny Leung < jannyleung@um.edu.mo>

As I write this, the azaleas outside my window are coming into bloom, signifying the spring season has arrived. Meanwhile, the first snow of the autumn has fallen in the Andes mountains just outside Santiago, where the next IFORS triennial conference will be held in 2023.

Spring and autumn are transitional seasons, bridging the periods of growth and consolidation in the annual cycle. As with the seasons, the IFORS Administrative Committee has transitioned from the 2019-2021 cohort to the current membership. Under the leadership of President Prof. Grazia Speranza, the previous Administrative Committee of 2019-2021 has done a lot to foster growth and development of Operational Research across the world. You can read about their achievements in their annual reports for 2021 in this newsletter issue. The current Administrative Committee will devote our efforts to build on the foundations they have established to continue to promote operational research worldwide.

One of the new "traditions" established two years ago is the IFORS global webinar, where we bring speakers and participants from all four regions of IFORS together for a focussed discussion (with an OR perspective) on current and relevant issues. The first Global Webinar of 2022, organised by Vice President Prof. Frits Spieksma on "OR and the Pandemic", was successfully held on 4th May, with over 70 particpants. You can read about this webinar also in this newsletter issue. Videos of this and all past webinars are available from the IFORS website.

This trasitional season also sees us emerging from the shadow of covid19, with in-person conferences being held again. Over the next months, there will be opportunities to see our colleagues face-to-face again at the CORS/Informs conference in Vancouver in June, the EURO conference in Espoo Finland in July, the APORS conference in Cebu Philippines in November and the CLAIO conference in Buenos Aires in December. I am sure those conferences will be buzzing with new ideas and stimulating interactions.

Until we meet again, I wish you a pleasant spring/autumn!

What's Inside

Editorial

Antonio Mauttone <mauttone@fing.edu.uy>

Welcome to the June issue of the IFORS Newsletter! The flow of activities within the global Operations Research (OR) community is really stimulating, and we hope this publication to be a sample of that. During my first months as Editor-in-Chief I have had the opportunity of interacting with many colleagues around the world, who enthusiastically have manifested interest in sharing their knowledge to the community through this publication. The world appears to start recovering from the COVID-19 crisis, where OR has contributed to many areas related to decision making. Nevertheless, big challenges remain to be addressed, and as OR professionals we hope to contribute with our methodologies and applications to the goal of having a better world.

This June issue is a particular one since it contains the *Annual Report* of IFORS, including notes from the President, the Treasurer and the Vice Presidents representing the regional groupings of Latin-Iberian America (ALIO), Asia (APORS), Europe (EURO) and North America (NORAM). Since this annual return corresponds to 2021, the reports come from officers of the previous term. We took this opportunity to acknowledge their work. Moreover, this issue contains a report on the new Executive Committee of the African Federation of Operations Research Societies (AFROS), not yet formalized as regional grouping within IFORS, but developing an intense activity including country members of the international federation.

Regular sections of the newsletter include on this issue an *OR and Development* article related to the use of Analytics to eradicate cervical cancer, a study developed by colleagues from Pontificia Universidad Javeriana, Colombia, and University of Southampton, United Kingdom. The *Tutorial* section presents a unified view on problems and benchmarks related to educational timetabling, provided by colleagues from the University of Udine, Italy. The *OR Impact* section reports on the joint work of colleagues from Massachusetts Institute of Technology, Northwestern University (USA), Indian School of Business (India) and the R4H non-governmental organization, aimed to develop a tool for optimising the transport of medical samples in Malawi, Africa. In the *Conferences* section we report activities carried out through 17 events across the world, including conferences, webinars, summer schools and more. The *Book Review* section covers the volume "Business Analytics - Descriptive, Predictive, Prescriptive".

Also, as additional sample of the intense activity of our community, in this issue of the newsletter we have a *Miscellaneous* section including the following content: (i) report on the webinar "OR and the pandemic" organized by IFORS, which took place on May 4 and included talks of representative work from each regional grouping showcasing applications of OR and related techniques to solve problems arisen from the COVID-19 pandemic, (ii) report on the elections of the new Executive Committee of AFROS for 2022, (iii) the call for submissions to the IFORS Prize in OR for Development 2023, (iv) announcement of the 13th Triennial International Conference of the Association of Asia Pacific Operational Research Societies (APORS), to be held at Philippines in November 2022, and (v) announcement of the 23rd Conference of the International Federation of Operational Research Societies, the flagship conference of IFORS, to be held at Santiago, Chile in July 2023.

We hope you enjoy the reading!

Annual Reports

Report of the Past President

Grazia Speranza <grazia.speranza@unibs.it>

In 2020 we have been hoping to live a more normal 2021 with respect to 2020, but unfortunately this has not been the case. The conferences postponed from 2020 to 2021 in the hope to held them online had to be postponed again to 2022 or to be held in virtual mode. However, thanks to the vaccines, we started the path towards some new kind of normality. The fear to get the COVID virus has not vanished and many restrict their mobility to reduce the risk. However, in most cases we are back to teaching in person and to attend conferences in person. Meeting colleagues and friends, having a chat in front of a cup of coffee is so much better – more pleasant and more productive – than having a chat on one of the many platforms that we got used to in the last couple of years.

The IFORS Administrative Committee (AC) has worked in 2021, as in 2020, through monthly virtual calls. Let me recall how the responsibilities are distributed within the AC: "David" Chang Won Lee - website; Richard Hartl - finances; Rosiane de Freitas - developing countries; Karla Hoffman - conferences; Stefan Nickel - publications; Sunity Shrestha Hada - newsletter. Mike Trick, the past president, has chaired the IFORS Fellows committee and worked on the registration process of IFORS. For this AC, 2021 has been the third and final year of work for IFORS. I am grateful for the opportunity I had to work with this fantastic group of colleagues. In support of the AC, Mary Magrogan and Christy Blevins have worked with enthusiasm and professionalism. It has been a pleasure to work with them.

I summarize here the activities we carried out in 2021. You will find more details in the reports of the other members of the AC.

Conferences. IFORS2020 was moved to 2021 and has become IFORS2021. It has been held as a virtual conference. Thanks to the Program Committee, co-chaired by Natashia Boland and Bernard Fortz, and the Organizing Committee, chaired by Suk-Gwon Chang, the conference was a success.

Global webinars. This series of webinars, that was started in June 2020 to compensate the lack of in-person events, continued with new bimonthly webinars. The recordings are available on the IFORS website.

Newsletter. The issues of the IFORS Newsletter have come out regularly. It is possible to subscribe to the Newsletter in the home page of the IFORS website to receive each new issue in the mailbox.

Publications. ITOR, the IFORS flagship journal, has confirmed its position as one of the top journals in our field, thanks to the commitment of its Editor-in-Chief, Celso Ribeiro, and his editorial board. The impact factor was 4.193 in 2020, increased by more than 40% with respect to 2019. In 2020 IFORS has announced a new journal, the Sustainability Analytics and Modeling journal (SAM), whose Editor-in-Chief is Elise Miller-Hooks. The journal has started receiving submissions in 2021 and the trend is towards more and more high-quality submissions.

Website. The IFORS website, after the redesign that was implemented in 2020, is regularly updated and improved.

Developing countries. The Developing Countries Committee has, as always, supported initiatives organized in developing countries aimed at strengthening the presence of operational research.

Finances. The finances of IFORS have improved. 2021 was a year of small expenses and good revenues thanks to IFORS2021 and to the generous role of the Korean Operations Research and Management Science Society (KORMS).

IFORS Fellows. The IFORS Fellows Award, established in 2020, serves to recognize a distinguished individual's contribution to international operational research and its communities. The Committee, composed by the three former IFORS Presidents, has selected in 2021 six new inductees. Their names can be found on the IFORS website. Congratulations!

Registration. 2021 has been a key year for IFORS as an organization. After a long and, to use an understatement, not always easy process, in 2021 IFORS has been registered in Switzerland as an official organization. This is the result of the joint effort of a number of people, but especially of Mike Trick and Marino Widmer, the EURO Treasurer.

Finally, I wish to acknowledge here the support of the several friends and colleagues who have worked with us at the IFORS activities in 2021. Thank you very much!

Report of the Vice President

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

As an IFORS AC member for the past 5 years, I have been very lucky and honored. Roles of IFORS VP Representing APORS for 2 years and IFORS VP for 3 years gave me a great opportunity to know how IFORS copes with and resolves urgent issues in the rapidly changing academic world and global situation. Such experiences will be very valuable to me in my future career development.

In the past three years, the vitalization of the homepage as an important communication tool among IFORS member countries has been emphasized. Improvement and redesign of the homepage was requested. Thus, especially in managing the website, we have tried to communicate with member countries to share the history, today and future of their activities. We also tried to highlight the reason for the existence of IFORS by clearly indicating the mission of IFORS and accurately expressing it in various booklets and virtual spaces.

One of the important values of IFORS has been global cooperation. As part of that, I held a joint academic conference in 2020 with the Korean Association of Business Education (KABE). IFORS President Professor Grazia delivered the congratulatory speech via online, which made the conference even more special. Also, in 2021, as the president of the Korean Association of Academic Business Administration, I co-hosted international academic conferences with IFORS, UNESCO and other important international societies. It was an opportunity to arouse more interest about IFORS to other management related scholars. The IFORS 2020 Seoul Meeting was postponed by one year due to the corona virus crisis and was held in 2021 at Hanyang University, where I belong. During my sabbatical in the US in 2014, I was corresponded several times with IFORS team to prepare, submit, and receive feedbacks on a proposal for hosting the IFORS 2020 Seoul Meeting. Eight years of that time has finally come to fruition. During the conference, I developed and chaired a special session of "IFORS history and beyond". Many living IFORS legendries were participated and shared their memories. The session went over 30 minutes more than expected. In the fall of 2021, I attended the INFORMS Annual Meeting and chaired the IFORS IDL session lectured by Professor Karen Aarda. Even in the COVID19 situation, many people attended offline. Of course, many participants also attended in the session via online, which became a heated session.

Report of the Treasurer

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

The 2021 budget (approved by the IFORS AC) projected an operating deficit of $ 51,700. In years with an IFORS triannual conference, we usually observe a certain surplus to compensate the deficit in the two years in between. However, a conservative forecast for 2021 (based on a scenario with low attendance at the Seoul conference that had been deferred from 2020 to 2021) showed a deficit. It turned out that the Covid-19 pandemic also changed the financial numbers of IFORS significantly. In fact, IFORS did financially much better than projected. In short, the reason is that the income of the triannual conference was even lower than projected, but also most expense items were reduced significantly. Before accruing (done by the auditor) the unaudited budget shows a surplus of $ 17,685.

What follows is a summary of the unaudited results for 2021 (all numbers in $US). The publication revenues of $ 63,819 from ITOR were above the budget of $ 55,000, and remain the main source of income for IFORS. Interest was positive but negligible, due to the globally low interest rates. The most dramatic change compared to the budget was the change of the Seoul conference to online, which is why the conference income for IFORS was only $ 42,106 (while $ 60,000 was projected). Nevertheless, IFORS is deeply grateful to the organizers of the Seoul conference for enabling a successful conference in spite of the difficult circumstances caused by the pandemic, thus creating a significant income for IFORS. The effect of these revenue movements was an income of $ 125,806, which was lower than the budget of $ 141,500.

On the other hand, 2021 spending at $ 108,122 was also significantly below budget ($ 193,200). Many items did not materialize at all or were way below budget, such as expenses related to the Seoul conference, the Developing Countries activities ($ 5,480), the summer/winter schools, the travel expenses of the AC, and the expensed for IDL/ITL. The main expense items that remained where related to the ITOR editorial team ($ 27,600), the IFORS website ($ 5,283), and the IFORS newsletter ($ 1,950). All of these were significantly below budget. The expenses for our office remained at $ 45,000, as projected. Bank charges and cost for auditing stayed roughly as projected. We also made some progress towards getting registered in Switzerland, which caused expenses of $ 12,471.

As mentioned, a deficit of $ 51,700 was budgeted, while in the end, the actual unaudited surplus for 2021 was $ 17,6845. While the Covid-19 epidemic negatively affected almost every aspect of our lives, it did not cause any damage to the financial situation of IFORS.

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 $1 445 648,61 by the end of 2021. Typically, the audited numbers will be slightly higher mainly because part of the ITOR profit share (for 2021) is paid in the year after (2022) while the auditor does some accruing and will add these to credits in 2021.

The original budget for 2022 shows a deficit of $ 94,350, which is somewhat typical for a year without a triannual conference. To date it is not clear how much deficit will materialize in the end. If history repeats itself, it will be significantly less than projected.

Summing up, 2021 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.

2021 IFORS Financials (in US Dollars)

		2021	
		Proposed Budget	**Unaudited Actual**
INCOME			
Member Society			
Dues		22 500	19 607
Royalties ITOR		55 000	63 819
Interest		4 000	275
Triennial Conferences: Seoul 20/21		60 000	42 106
TOTAL INCOME		***141 500***	***125 806***
EXPENSES			
Activities	Administrative Committee	18 000	
	Publications Committee		
	IAOR Editor/Website	1 200	1 096
	ITOR Editor	26 000	27 600
			1 250
	Scientific Activities & External Affairs		
	IDL, ITL, Fellowships, & Grants	9 000	4 000
	IFORS Website	7 000	5 283
	Summer/Winter Schools	5 000	
	Meetings Committee		
	Seoul 2020	25 000	
	President's Dinner	10 000	
	ITOR Subscriptions		
	IFORS Newsletter	11 000	1 950
	Developing Countries Committee	20 000	5 480
General Business Operations			
	Office & Secretary	45 000	45 000
	Auditor	2 000	1 816
	Bank Charges	1 500	2 176
	Contingency	2 500	
	Preparation new legal structure	10 000	12 471
TOTAL EXPENSES		193 200	108 122
OPERATING RESULT		***(51 700)***	***17 685***

Report of the Vice President representing ALIO

Rosiane de Freitas <rosiane@icomp.ufam.edu.br>

Face-to-face activities are being resumed all over the world, even though times of diverse threats to human civilization insist on persisting in a more direct way. Likewise, scientific activities and events in Operations Research (OR) in Latin America are taking place in person or in a hybrid virtual-presential way, with due care. Here a summary of the OR scenario in Latin America in the year of 2021 and the early of 2022, and what is already planned for 2022-2023, will be given.

ALIO - THE ASSOCIATION OF LATIN-IBEROAMERICAN OR SOCIETIES

The Association of Latin-Iberoamerican Operational Research Societies (ALIO) was created in Rio de Janeiro in November 1982, with the purpose to promote the exchange of experience and information among researchers, academics and professionals related to Operational Research in the region, as well as the circulation of techniques and methodologies related to these disciplines. ALIO is also the Latin American Regional Chapter of IFORS. National societies taking part in ALIO are those from Argentina, Brazil, Chile, Colombia, Cuba, Ecuador, México, Peru, Uruguay, an the Iberian region, with Spain and Portugal. These societies are also part of IFORS with the exceptions of Ecuador and Cuba.

For more information on other OR LATAM events, please visit ALIO´s website: http://www.alio-online.org/.

CLAIO - THE LATIN-IBERIANAMERICAN OR CONFERENCE

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

The main activity of ALIO is its biennial meeting the **Latin-IberianAmerican Conference on Operational Research - CLAIO**. CLAIO takes place biennially since 1982 in different Latin American cities and is sponsored by the Association of Latin-Iberoamerican Operational Research Societies (ALIO). 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.

The last CLAIO was held in Lima, Peru, in 2018, see http://www.sopios.org.pe/claio2018. Due to the COVID-19 pandemic, the 2020 edition of CLAIO has been canceled and the next edition will be held this year 2022 in Buenos Aires, on December 12-15. For more information about CLAIO 2022, please visit https://claio2022.dc.uba.ar/. We hope to see you in Buenos Aires, Argentina!

ELAVIO - The LATIN-IBERIANAMERICAN OR SCHOOL

24th Latin-IberianAmerican Operational Research school (ELAVIO June 13-16 2022, Monterrey, Mexico)

Another important activity of ALIO is the organization of an annual Latin-IberianAmerican OR school - ELAVIO ("Escuela Latinoamericana de Verano en Investigación Operativa"). The first ELAVIO was held in Chile in 1994. Since then, the School has run the event every summer to promote education in operational research among young researchers and graduate students (Ph.D. and Master's degree levels), mainly from Latin America. The purpose of ELAVIO is to stimulate new collaborations and encourage the involvement of young people in OR by bringing them up to date on research topics through short courses and plenary conferences. Participants also have the opportunity to present and discuss their works. At every School, a strong sense of camaraderie has been developed, solidifying contacts between the members of research groups from different countries.

The last edition, XXIII ELAVIO was held in Lleida, Spain, from July 1-5, 2019, as reported in September 2019 issue of IFORS News. See in http://www.elavio2019.udl.cat/. As ELAVIO is an event that was made to promote strong interaction between OR students from Latin America, so, during the COVID-19 pandemic it was not possible to hold the 2020 and 2021 editions. The next edition will be held this year 2022 in Monterrey, Mexico, on June 13-16. More information can be found at the ELAVIO 2022´s website: https://sites.google.com/view/elavio2022/home?authuser=0.

NATIONAL OR CONFERENCES OF LATIN AMERICAN COUNTRIES

Since 2020, most of the national OR events in Latin American countries have moved to virtual mode. An example is the OR Brazilian Symposium (SOBRAPO). On the other hand, now in 2022, most of the OR events promoted by the OR societies associated with ALIO are holding their main events in 100% face-to-face mode or in hybrid mode.

For more information on other OR LATAM events, please visit ALIO´s website: http://www.alio-online.org/.

OR CONFERENCES IN PARTNERSHIP WITH ALIO

ALIO promotes several events in partnership with other OR scientific societies from other regions, such as ALIO-EURO, ALIO-INFORMS and also some of the editions of the IFORS Global Webinar series, which appeared in 2020, at the height of these pandemic times, the first being jointly organized by IFORS-ALIO (O.R. in Latin America: From Theory to Practice - July 29,2020), as well as the sixth webinar, reported shortly thereafter. The recording of all the webinars is available in http://www.ifors.org/ifors-global-webinar-series/. Also, in this year of 2022, we organized the ALIO-EURO conference, as we reported in this section. Finally, the next IFORS tri-annual conference will be held together with ALIO, in Santiago-Chile, in 2023, as reported at the end of this section.

VI IFORS Global Webinar: Gender Diversity in the World: Initiatives and Issues in the O.R. Community - June 29, 2021

The sixth IFORS global webinar took place on June 29, 2021, one year after the first, and, instead of being focused on a community as all the previous webinars, was focused on a topic about gender&diversity and OR around the world, entitled "Gender Diversity in the World: Initiatives and Issues in the O.R. Community".

>> The topic of gender diversity has had in the last years a high priority in the agendas of national and international institutions worldwide. The global reach of IFORS and its community made it a natural candidate for an IFORS global webinar. The webinar had four speakers, one for each of the four regional groupings, each introduced by the IFORS Vice-President representing that region, so, in this way: (1 - ALIO) Luciana Salete Buriol, from the Federal University of Rio Grande do Sul (Brazil), was introduced by Rosiane de Freitas (ALIO Vice-President); (2 - APORS) Guiying Yan, from the Academy of Mathematics and Systems Science, Chinese Academy of Sciences (China), was introduced by Sunity Hada (APORS Vice-President); (3 - EURO) Paula Carroll, from the University College Dublin (Ireland), was introduced by Claudia Archetti, who replaced Stefan Nickel (EURO Vice-President); (4 - NORAM) Olga Perdikaki, from the University of South Carolina (USA), was introduced by Karla Hoffman (NORAM VicePresident). More information can be found at https://www.ifors.org/september-2021-issue/.

ALIO/EURO International Conferences
X ALIO/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. See the website https://www.alioeuro2021.cl.

The Joint ALIO/EURO International Conference on Applied Combinatorial Optimization is a triennial event jointly promoted by the Association of Latin-Iberoamerican Operational Research Societies (ALIO) and the Association of European Operational Research Societies (EURO), both of which are within the International Federation of Operational Research Societies (IFORS). The main purpose of the event is 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.

Previous editions of the Joint ALIO/EURO International Conference on Applied Combinatorial Optimization were held in Bologna, Italy (2018), Montevideo, Uruguay (2014), Porto, Portugal (2011), and Buenos Aires, Argentina (2008).

The 23rd IFORS Triennial Conference - Santiago, Chile, July 10-14, 2023
The 23rd Conference of the International Federation of Operational Research Societies, will be held at Santiago, Chile, from 10 to 14 July, 2023. The theme is "Advance Analytics for a Better World". The host organizations are: International Federation of Operational Research Societies (IFORS), Chilean Institute for Operations Research (ICHIO) and the Complex Engeneering Systems institute (ISCI). And the collaborating institutions are: Universidad de Chile, Pontificia Universidad Católica de Chile.

The International Federation of Operational Research Societies (IFORS) is a 60-year old organization which is currently composed of 50 national societies. Its beginnings date from 1955, when the vice-president of the Operations Research Society of America (ORSA) sent a proposal for an international conference to the secretary of the UK society, the Operational Research Society (ORS). The French Society, SOFRO, was added as a sponsoring society to what would be the first in a line of triennial conferences. This was the 1957 Oxford Conference, described by Maurice Kirby as the fifth of the seven defining moments in OR history (Cummins, 1998).

The organizers are working on putting together a very exiting conference, with a very strong scientific program and the possibility of visiting Chile, a very attractive country which has so many things to offer. Stay tuned for the news on the conference, which will be available in this website as well as through the announcements in scientific, professional and social networks. We look forward to seeing everyone in person in Santiago in 2023! For more information visit https://ifors2023.com/.

Report of the Vice President representing APORS

Sunity Shrestha Hada <sunity.shresthahada7@gmail.com>

There have been various activities in OR Societies of APORS member countries. The APORS triennial conference that was scheduled in June 2021 had to be postponed to November 2022 due to COVID-19. The activities of OR Societies within APORS are presented as below.

Operations Research Society of China, ORSC has carried out a variety of activities in academics, science popularization, women committee, international exchange, and member services. In October 2020, the ORSC held the 11th Member Representative Congress and the 15th Biennial National Academic Conference in China's central hub city of Hefei, and elected the 10th Council, with Prof. Yu-Hong Dai elected as the President. A record number of about 900 participants attended the conference. Eight OR researchers and three OR practice teams receive the ORSC 2020 Lifetime Achievement Award, the Research Award, the Young Scientist Award, and the Application Award, respectively.
Since April 30, 2020, the ORSC has organized OR Road-to-Future Forum online, which is a series of academic meetings focusing on mathematical programming, graph theory, computational mathematics, bioinformatics, machine learning, artificial intelligence, engineering problems, and their applications. The Forum provides the global research community with good opportunities to discuss recent research result outputs and develop new ideas and collaborations in a friendly and relaxed atmosphere. It has been held once a week in 2020 and every two weeks in 2021. By the end of 2021, 78 talks were held at the Forum. Over 100 internationally renowned experts, including IFORS President Professor Maria Grazia Speranza, were invited to share their insights on all aspects of OR.

ORSC launched a high-level Forum, called DOOR (Forum on Developments and Origins on Operations Research), encouraging young students to devote themselves to promising research towards the origins of OR.

The ORSC set up its Women Working Committee in October 2020, with Professor Guiying Yan as the first director. The committee, jointly with CSIAM, organized the First National Conference on Women's Applied Mathematics and Operations Research Management from July 9-11th, 2021, in Shandong, China. On June 29, 2021, Professor Yan gave a talk titled "Making Operations Research More Attractive to Women" in Gender Diversity in the Word: Initiatives and Issues in the O.R. Community.

ORSC has been proceeding with the popularization of OR during the last two years. Tens of talks about the International Day of Mathematics, golden ratio and problems arising from pandemic are given online or offline to public. Besides, short videos are put online for the popularization of science, including game theory, knapsack problem and, multi-objective optimization.

OR Society of India, ORSI organized an international conference on "Applications of Operational Research in Business and Industries (AORBI 2021)" on 17 - 19 December 2021 as 54th Annual Convention of Indore Chapter of ORSI. Keynote speakers include Grazia Speranza, the president of IFORS and Sunity Shrestha Hada, the VP to IFORS representing APORS. The event took place in hybrid mode, both online and offline.

Iranian Operations Research Society, IORS has been engaged to uphold quality and extend reliability of scientific activities relating Operations Research in Iran and beyond. The activities included research, education and administrative affairs concerned with Operations Research.

The 14th International Conference of Iranian Operations Research Society (ICORS) was held by Sadjad University of Mashhad on 19-21 October 2021 (website: http:// icors2021.sadjad.ac.ir/en/); due to Covid-19, the conference was held virtually. The conference received about 150 papers, of which 80 as oral presentations and 30 as posters were accepted. In the closing ceremonies, announcement was made for the next annual international conference of IORS to be held at Azarbaijan Shahid Madani University, during October 12-14, 2022. International participations are specially welcomed.

During 2020-2021, several issues of the Iranian Journal of Operations Research (IJOR) were published in English; see iors.ir/journal. IJOR sincerely welcomes international contributions.

OR Society of Nepal, ORSN organized the 12th international conference on February 1-2, 2021, with the theme of "Operations Research: Sustainable Development". ORSN also organized an International Conference on Sustainable Energy for Mitigation & Adaptation of Climate Change and Global Warming on May 28-31, 2021, at Kathmandu, Nepal, collaborating with Prince of Songkla University, Thailand.

OR Society of New Zealand, ORSNZ has many activities throughout the years. Some highlights are: International Workshop on Planning of Emergency Services OSHA ran the 6th International Workshop on Planning of Emergency Services, Feb 17-19, 2020 – highlights were visits from Prof. Shane Henderson (Cornell University) and Prof. Peter Taylor (University of Melbourne), as well as a visit to St John Ambulances HQ (thanks David Richards). Big thanks to Caroline Jagtenberg (SIG Leader of OSHA who has returned to the Netherlands). In February Prof Vicky Mabin was part of a team that won the Griffiths Medal from The Operational Research Society as well as (a big month for ORSNZ in 2020), we had talks on Women in Data Science from Prof Margot Gerritsen and Interpretable AI from Prof Dimitris Bertsimas.

ORSNZ talk at APORS Webinar, part of IFORS webinar series on 5th February 2021 where Michael O'Sullivan presented on Covid-19 spread modelling and its effect on the healthcare sector.

In Memoriam: "Peter Whittle, who died on 10 August 2021, at 94 years of age, will be remembered as a pioneer across the fields of probability, statistics and optimization."

OR Society of Philippines, ORSP is the host for 13th triennial APORS conference. Due to pandemic the scheduled conference on June 2021 could not be held, so, ORSP organized pre-APORS conference online/ vitual on theme "OR: Continuing Relevance in Challenging Times" during September 23-24,2020.

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 2021, despite the still ongoing exceptional situation caused by the COVID-19 pandemic. The main highlight was the 31st European Conference on Operational Research, EURO 2021, which took place at the University of West Attica in Athens, Greece, from the 11th until the 15th of July. The conference was offered in a hybrid format. Of the 1830 papers presented at the conference, 310 were presented on site, the rest online. Presenters and speakers communicated via ZOOM. Thus, the audience could watch both online and on-site sessions via livestream. Questions from the online audience could be asked via chat.

The main program of EURO 2021 covered a wide variety of current topics with numerous talks, presentations, and sessions, including three plenary and 12 keynote talks. The invited plenaries by Janny Leung on public transportation for Smart Cities and Coralia Cartis on optimization for data science can be named as examples here.

During the conference, the usual EURO awards were presented. Among the winners were Ulrike Leopold-Wildburger, receiving the 2021 EURO Distinguished Service Award (EDSA 2021). Prof. Ailsa Land was posthumously awarded the 2021 EURO Gold Medal (EGM 2021), the highest distinction within OR in Europe. As, sadly, she had passed away shortly before the conference, the customary presentation by the award winner about her work was substituted by several moving testimonials about her work and personality presented by her former students and collaborators.

Besides plenaries, keynotes, and regular streams, the program contained specific streams for EURO's forums. The WISDOM (Women in Society Doing OR and MS) forum organized a networking event and a stream highlighting the achievements of women in OR. The Practice of OR forum organized the MAI streams including researchers and practitioners.

The sponsors of EURO 2021 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 as they really did an excellent job of being flexible and professional under changeable and difficult conditions.

In 2021 the 33 working groups associated with EURO were actively promoting 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, e.g., in the form of EURO Mini Conferences. In 2021, Mini Conferences took place in a hybrid format as, e.g., the EURO-Hope mini-conference (webpage), or even entirely online as, e.g., the ISOLDE XV which was joined with the XXVI-th meeting of the EWGLA, the Euro Working Group of Locational Analysis (webpage). Furthermore, WISDOM organized a YoungWomen4OR Webinar via ZOOM on September 27th, 2021, during which three awardees delivered 10-minute research presentations on OR applications for healthcare and logistics.

The scientific results of the year 2021 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.

The EURO association continued supporting especially young researchers with various education and sponsoring programs in 2021. The EURO Ph.D. School, for example, is an initiative established for post-graduate education for Ph.D. students under a school format. The 2021 EURO Ph.D. school in Lisbon, Portugal, from the 18th until the 22nd of September, was dedicated to sustainable supply chains. EURO further supports Ph.D. students interested in participating in the National Taught Course Centre in Operational Research (NATCOR), which delivers taught courses in the UK.

The EURO Summer and Winter Institutes (ES/WI), another EURO education initiative, are meant to give early-stage researchers an opportunity for scientific exchange with other researchers of their field. For more information on ESWI and all previously mentioned EURO education initiatives, see the EURO webpage. The next ESI is planned for June 2022 and will cover topics in Location Science (webpage).

In conclusion, 2021 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 2022 and provide an outlook on activities planned for the rest of the year.

First, there are two changes to the Executive Committee of EURO compared to 2021: The new President Elect is now Prof. Anita Schöbel, who has replaced Immanuel Bomze, and the new Vice President (VP) 3 is Prof. Juan José Salazar González, who has replaced Prof. Claudia Archetti. Marc Sevaux continues to serve as President, just as VP 1 Joanna Jozefowska, VP 2 Prof. Julia Bennell, Secretary Prof. Jesper Larsen, Treasurer Prof. Marino Widmer, and IFORS Vice-President Prof. Stefan Nickel continue their service (for details see https://www.euro-online.org/web/pages/1456/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 (cf. https://www.euro-online.org/web/pages/1598/euro-officers). Second, there are a lot of events in 2022. For example, the ORPHES (webpage), the Winter School of OR in Public Health Emergencies, took place from January 10th until February 25th this year. In this novel format, 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.

We are looking forward to the EURO 2022, which will be placed at Espoo, Finland, from the 3rd until the 6th of July (EURO-2022), the ESI on Location Science, and 4 EURO Ph.D. schools(EURO PH.D Schools) all of whom have been deferred from 2020.

For more information, see the monthly (webpage) or the webpages of the events in question.

Report of the Vice President representing NORAM

Karla Hoffman <khoffman@gmu.edu>

The North American Research Societies (NORAM) is made up of two societies: The Canadian Operations Research Society (CORS) and the Institute for Operations Research and the Management Sciences (INFORMS). Activities of the two societies for 2021 as well as planned events for 2022 are reported below. Both societies have been extraordinarily active although many activities remained virtual and both societies worked to keep their membership informed during these difficult times.

CORS activities

The Canadian Operational Research Society (CORS), a.k.a. Sociéte Canadienne de Recherche Opérationnelle (SCRO) (www.cors.ca) is the leading Canadian professional society for operational researchers. Established in 1958, CORS brings together OR professionals with annual conferences held across Canada, special interest groups, traveling speakers' programs, and student support. CORS sponsors the INFOR journal and also publishes the Bulletin, a newsletter of the Society and related activities. It is administered by a Council of eleven members: President Jules Comeau (Université de Moncton), Vice President Peter VanBerkel (Dalhousie University) Secretary Marko Bijvank (University of Calgary) Treasurer Gregory Paradis (University of British Columbia) Immediate Past President Michael Pavlin (Wilfrid Laurier University) Councillors: Majid Taghavi (Saint Mary's University), Masoud Chitsaz (Kinaxis), Nadia Lahrichi (École Polytechnique de Montréal) and Samira Abbasgholizadeh (Mc Gill University).

Meetings

The COVID-19 pandemic has impacted all operations research societies and CORS is no exception. The CORS Conference for 2021 was held entirely virtually, June 7-10, 2021. The conference chairs were Fatma Gzara (University of Waterloo) and Timothy Chan (University of Toronto). The plenary speakers for the conference include: Susan Athey, Economics of Technology Professor at Stanford Graduate School of Business; Anna Nagurney, John F. Smith Memorial Professor in the Department of Operations and Information Management, Isenberg School of Management at the University of Massachusetts, Amherst who gave the Harold Lardner Memorial Lecture on "Novel Supply Chain Network Models Inspired by the COVID-19 Pandemic; and Georgia Perakis, William F. Pounds Professor of Management and Codirector of the Operations Research Center at the MIT Sloan School of Business. In 2022, CORS and INFORMS will hold a joint international conference in Vancouver, June 5-8, 2022. The Plenary speakers for this event include: Hau Lee, Stanford University, Elise Miller-Hooks, George Mason University, Renata Konrad, Worcester Polytechnic Institute, as well Ravi Ahuja (Optym) who will give the Harold Lardner Memorial.

Awards

The following awards were presented in 2021, since there was no conference in 2020:

• The 2020 **Harold Larnder Prize** was awarded to Anna Nagurney.

• The 2020 **Omond Solandt Award** recipient was Canadian Tire.

• The **Award of Merit** recipient was David Stanford.

• The **Eldon Gunn Service Award** was given to Mehmet Begen; Stanko Dimitrov, and Sonia Vanderby.

• The **Practice Prize** winners were Imadeddine Aziez, Jean-François Côté, and Leandro Callegari Coelho of Université Laval.

• The **CORS Student Paper Competition** winners were Nasrin Yousefi of the University of Toronto (Open Competition) and the Undergraduate Prize category winners were Theodore Morissette, Eric Entz, Andrew Veldhuis, and Razi Sayed of the University of Waterloo.

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

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. The Board of Governors for 2021 consisted of Steven Graves (President), Radhika Kulkarni (President-Elect), Mark Lewis (Secretary), David T. Hunt (Treasurer), Miguel Anjos (VP International Affairs), L. Beril Toktay (VP Marketing, Communication and Outreach), Pelin Pekrun (VP Membership and Professional Recognition), Robin Lugee (VP Practice), Kathryn Walter (VP Chapters and Fora), Melissa R. Bowers (VP Education), Rahgu Raghavan (VP Technology Strategy), Tamas Terlaky (VP Meetings), Cole Smith (VP Publications), and Maciek Nowak (VP Sections/Societies)

Meetings

As with most societies, the COVID-19 pandemic continued to impact INFORMS' conference activities in 2021. The 2021 Analytics Meeting was held April 12-14, 2021 virtually. Similarly, the INFORMS healthcare 2021 conference was held July 21-23, 2021 virtually. In the Fall, the INFORMS Annual Meeting was held in Anaheim CA, as a hybrid meeting. For 2022, all meetings are planned as in-person meetings. These include the Analytics meeting held in Houston TX April 3-5, 2022, the CORS/INFORMS meeting to be held in Vancouver from June 5-8, 2022, and the INFORMS Security conference August 29-30 in Arlington, Virginia. The INFORMS Annual meeting in Indianapolis Indiana is scheduled for October 16-19, 2022.

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. They are: *Decision Sciences, 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 and 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 newsletters (OR/MS Today, Analytics and a student newsletter). INFORMS also has a number of research series publications including, Editor's Cut, *TutORials in Operations Research*, *INFORMS Analytics Collection* and *Topics in Operations Research*.

Subdivisions

In addition, INFORMS has various subdivisions directed at members of the OR/MS community including 12 Societies, 23 Sections and 4 Fora. There are also 65 regional and student chapters.

Awards:

The following prize winners for 2021 include:

• **The Daniel H. Wagner Prize for Excellence in Operations Research Practice** was awarded to Hamsa Bastani, University of Pennsylvania, Kimon Drakopoulos, University of Southern California, and Vishal Gupta, Massachusetts Institute of Technology.

• **The Doing Good with Good OR - Student Paper Competition** was awarded to Lily Xu, Harvard University.

• **The Don P. Gaver Junior Early Career Award** was presented to Rahul Mazumder, Massachusetts Institute of Technology.

• **The Franz Edelman Winner for 2021 was The UN World Food Programme**

• **The Frederick W. Lanchester Prize** was awarded to Dimitris J. Bertsimas , Massachusetts Institute of Technology, Sloan School of Management and Operations Research Center and to Jack Dunn, Massachusetts Institute of Technology.

• **The George B. Dantzig Dissertation Prize** was given to Somya Singhvi, Massachusetts Institute of Technology.

• **The George E. Kimball Prize** was awarded to Cynthia Barnhart, Massachusetts Institute of Technology.

• **The George Nicholson Student Paper Prize** was awarded to Shi Dong, Stanford University.

• **The INFORMS Case Competition** was awarded to Georgina Hall, INSEAD, Piyush Gulati, INSEAD and Anton Ovchinnikov, Queen's University.

•**The INFORMS O.R. and Analytics Student Team Competition** was awarded to Hebrew University of Jerusalem.

• **The INFORMS President's Award** was given to Brenda Dietrich, Cornell University.

• **The INFORMS Prize** was awarded to Wayfair.

• **The John von Neumann Theory Prize** was awarded to Alexander Shapiro, Georgia Institute of Technology.

• **The Judith Liebman Prize** was awarded to Kayla Cummings, Massachusetts Institute of Technology, Maryam Daryalal, University of Toronto and Andrew ElHabr , Georgia Institute of Technology.

• **The Moving Spirit Award for Fora** was awarded to Vinod Cheriyan, Enova International.

• **The Phillip McCord Morse Lectureship Award** was presented to Alvin E. Roth, Stanford University.

• **The Prize for Teaching of the OR/MS Practice** was awarded to Jill Hardin Wilson, Northwestern University.

• **The Saul Gass Expository Writing Prize** was awarded to Michael Fu, University of Maryland.

• **The Volunteer Service Prize** was awarded to: Canan G. Corlu, Boston University, Kara M. Morgan, Ohio State University, Jorge Samayoa, Galileo University and Norm Reitter, CANA.

• **The Undergraduate Operations Research Prize** was awarded to Jisoon Lim, Georgia Institute of Technology.

• **The UPS George D. Smith Prize** was given to the Eindhoven University of Technology, Master of Industrial and Applied Mathematics.

In addition, the following people were inducted as **INFORMS Fellows in 2021**:

• Ritu Agarwal (University of Maryland)
• Russell Allgor (Amazon.com)
• Ronald G. Askin (Arizona State University).
• Stephen Chick (Healthcare Management Initiative at INSEAD)
• John Fowler (Arizona State University)
• David Gamarnik (MIT)
• Nicholas Hall (Ohio State University)
• Robert Leachman (University of California, Berkeley)
• Mark Lewis (Cornell University)
• Irv Lustig (Princeton Consultants)
• Alice Smith (Auburn University)
• Alexander Stolyar (University of Illinois, Urbana)

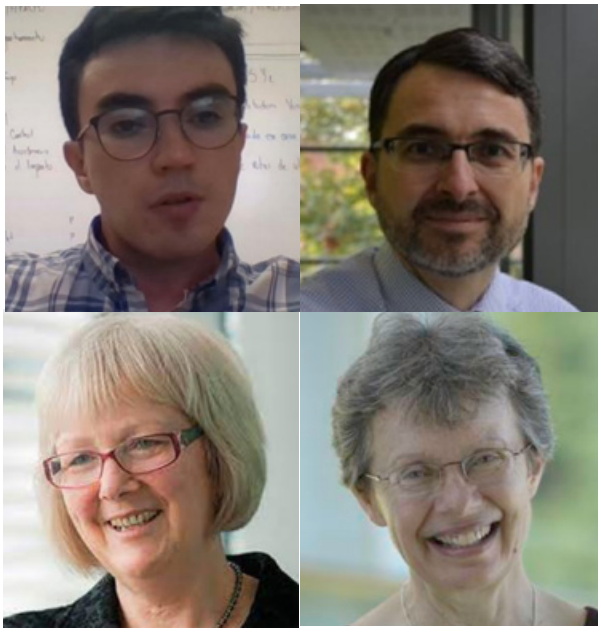
Can Analytics Help to Eradicate Cervical Cancer as a Public Health Problem? A Case Study from Bogotá, Colombia.

David Barrera <barrera-o@javeriana.edu.co>
Departamento de Ingenieria Industrial. Pontificia Universidad Javeriana
Southampton Business School. University of Southampton

Steffen Bayer <s.c.bayer@soton.ac.uk>
Southampton Business School. University of Southampton

Sally Brailsford <s.c.brailsford@soton.ac.uk>
Southampton Business School. University of Southampton

Honora Smith <honora.smith@soton.ac.uk>
Mathematical Sciences, University of Southampton



Despite being highly preventable, cervical cancer is the fourth leading cause of cancer death in women. In 2020, 341,831 women died worldwide of this disease [1]. To address this problem the World Health Organization (WHO) launched a global strategy to eradicate cervical cancer. The aim was to achieve an age standardised incidence rate (ASIR) lower than 4 per 100,000 women. The WHO strategy aims at increasing implementation of three proven interventions: human papillomavirus (HPV) vaccination, cervical cancer screening and timely treatment of precancerous lesions [2]. Nevertheless, while in high income countries the implementation of screening and vaccination programs has been successful, for many lower and middle-income countries it still represents a major challenge [3]. It has been found that this can be explained by the existence of cultural factors acting as deterrents for the adoption of preventive care behaviours, among others [4].

In Colombia, the ASIR is 14.9 per 100,000 women [5]. Additionally, available data indicate that urgent actions are required to achieve target goals for cervical cancer elimination. Consequently, the District Secretariat of Health of Bogotá (*Secretaría Distrital de Salud*, SDS) decided to implement two behavioural interventions to increase attendance for screening appointments among hard-to-reach women. While the first intervention is personalized and highly resource intensive, the second is a mass strategy aimed at improving coverage. In our research we present a data-based methodology to classify women into three groups: a group who would receive the personalized intervention (Group A), a group who would receive the mass intervention (Group B) and a group that would not receive any intervention at all (Group C). This classification can be made based on the predicted probability of screening attendance. By assigning those women with predicted probability of attendance less than some threshold value to group A, and those with predicted probability greater than some other threshold value to group C, it is possible to maximize the cost-effectiveness.

Understanding no-show behaviour[1] : We used a mixed methods approach to understand the reasons for no-show behaviour for cervical cancer screening appointments among low-income women. The objective of the quantitative phase was to predict individual attendance probabilities using routine health data. Two well-known machine learning models were implemented, Least Absolute Shrinkage and Selection Operator (LASSO) regression and Random Forests. On the other hand, the aim of the qualitative phase was to understand the patient experience and reasons for health-seeking behaviour. Data were collected through semi-structured interviews using purposive sampling, and analysed using the Framework method.

Assessing beliefs and improving accuracy of the no-show prediction[2] : The underlying theory of the widely-used Health Belief Model (HBM) from health psychology is that the adoption of a health behaviour can be explained by a patient's perceptions of their susceptibility to a specific illness, the threat this illness poses and the benefits and barriers of the protective behaviour [6]. We assessed the relationship between the constructs of the HBM and no-show behaviour. Before data collection started, training took place in eight workshops with 280 community workers (see Figure 1). The community workers collected data at the end of regular home visits. A sequential approach was used to improve the accuracy of the no-show prediction. First, we trained a model using information from Pap smear test appointments that were scheduled between 2017 and 2019. We used this model to predict the no-show probability for each patient in the survey data set. Then, a second model was fitted using the first model prediction and the 37 items in the survey.

Improving fairness[3] : One of the objectives in fair AI (artificial intelligence) is to avoid, as far as possible, discrimination against subsets of the population who belong to a group associated with a sensitive or 'protected' attribute such as socio-economic status, ethnicity or age [7]. >>

[1] This work is currently under review as: Barrera, D. Bayer, S. Bocanegra, L. Brailsford, S. Diaz, A. Gutiérrez, V. and Smith, H. *Understanding no-show behaviour for cervical cancer screening appointments among hard-to-reach women in Bogotá, Colombia: a mixed-methods approach.*

▲ Figure 1: Community workers training

>> The notion of group-level fairness refers to the distribution of the prediction errors among both the protected and unprotected classes [8]. Consequently, we developed an optimization post-processing approach to improve the fairness of the classification. Our results suggest that it is possible to improve the fairness of the solution without sacrificing accuracy. From the program management perspective, this means that it would be possible to offer the high-cost intervention to just 30% of the total population in our dataset, but still reach 73% of the predicted no-show patients with low levels of inequality.

The relevance of this result is twofold. First, behavioural interventions aimed at increasing cancer screening uptake are more effective when tailored to patients' beliefs. Therefore, the ability to accurately predict no-show probabilities can inform intervention design and increase impact. Second, health psychology constructs such as the perceived susceptibility or severity of cervical cancer (associated with the adoption of protective health behaviours) are likely to vary according to socio-economic status and the age of the patient, in addition to factors such as educational attainment identified in the health psychology literature but rarely captured in routine health data. By reducing inequality, we are ensuring that traditionally marginalized groups are proportionally represented in the intervention.

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[2] This work is accepted for publication at BMC Women's Health: Barrera, D. Bayer, S. Brailsford, S. and Smith, H. *Improving intervention design to promote cervical cancer screening among hard-to-reach women: assessing beliefs and predicting individual attendance probabilities in Bogotá, Colombia.*

[3] This work is currently under review submitted as: Barrera, D. Brailsford, S. and Chapman, A. *Improving fairness in machine learning-enabled affirmative actions: a case study in preventive healthcare.*

Educational Timetabling: Problems and Benchmarks

Sara Ceschia <sara.ceschia@uniud.it>, **Luca Di Gaspero** <luca.digaspero@uniud.it>, **Andrea Schaerf** <andrea.schaerf@uniud.it>



Introduction
Educational Timetabling, in essence, consists in assigning teacher/student meetings to days, timeslots, and classrooms. Despite this apparent simplicity, experience teaches us that every single institution has its own rules, conventions, and fixations, thus making each specific problem almost unique. As a consequence, uncountably many different problem formulations have been proposed in the literature on Educational Timetabling, depending on the type of institution (high-school, university, or other), the type of meetings (lectures, exams,...), and the different settings, constraints, and objectives.

Many papers in the literature tackle a specific problem using a selected search method. The authors normally claim the success of the application, though rarely dispelling the doubt over the readers that the method used was more the authors' "favorite" one rather than the most suitable for the problem under consideration.

This situation shows that, from the point of view of research, there is a clear need for a common ground for comparison of search methods. To this aim, we highlight here which datasets are available and have been considered most frequently in the literature, so that they have risen to the status of *benchmarks*, and the corresponding formulation to the status of a *de facto* standard. All these formulations are equipped with the necessary infrastructure to guarantee the verifiability of the results, such as precise file formats and software for solution checking.

We identified six standard formulations belonging the three main problems in Educational Timetabling [1]. Formulations are presented in chronological order, which incidentally corresponds also to the order of increasing complexity and adherence to the real- world situation. This fact shows that the research has moved continuously from very simplified prob- lems toward full-fledged ones.

Educational Timetabling Problems
Before listing the specific formulations, we need to introduce the general problems in the educational timetabling area, which are the following three:

High-School Timetabling (HTT) The weekly scheduling for all the classes of a high-school, avoiding teachers meeting two classes at the same time, and vice versa.

University Course Timetabling (CTT) The weekly scheduling for all the lectures of a set of university courses, minimizing the overlaps of lectures of courses having common students.

University Examination Timetabling (ETT) The scheduling for the exams of a set of university courses, avoiding overlap of exams of courses having common students, and spreading the exams for the students as much as possible.

Even though a clear cut between HTT, CTT, and ETT is not possible (e.g., some high-schools are organized in a university fashion), they normally differ from each other significantly, and most of the papers in the literature can be classified within on one of these three problems.

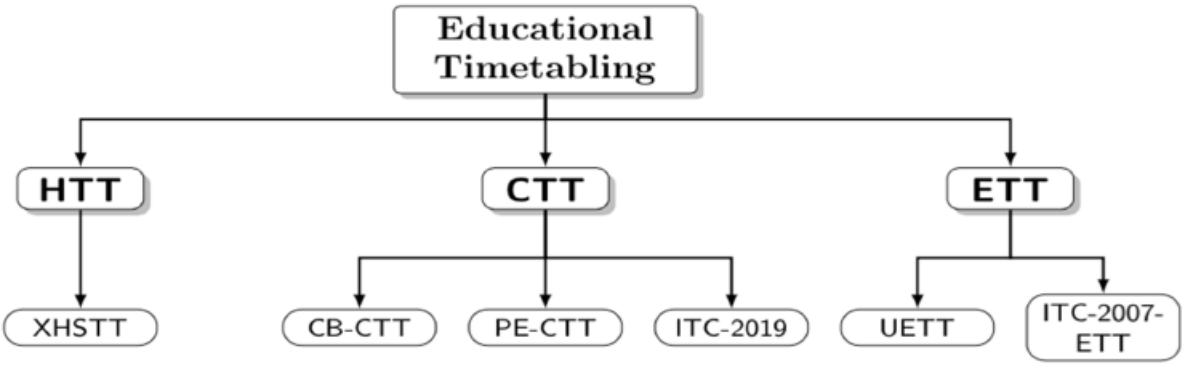
Formulations and Datasets
We introduce the specific formulations and the corresponding datasets. In the descriptions, we refer to the International Timetabling Competitions (ITCs) held in 2002, 2007, 2011, and 2019, respectively, which have brought these formulations to the attention of the community (see http://patatconference.org).

UETT (Uncapacitated Examination Timetabling): This is a very essential view of ETT problem, which extends just slightly the underlying graph coloring problem, with exams as nodes and periods as colors.

PE-CTT (Post-Enrolment Course Timetabling): This CTT formulation has been proposed within the Metaheuristics Network project (2000-04), then used as the subject of ITC-2002, and used again for ITC-2007 with a slightly more complex formulation.

CB-CTT (Curriculum-based Course Timetabling): This CTT formulation originates from University of Udine (IT), and subsequently adopted, in a slightly modified version, as the third track of ITC-2007. The main difference between PE-CTT and CB-CTT stems from the notion of course as a set of lectures that is absent in PE-CTT. Many constraints and objectives in CB-CTT are defined at the level of a course, whereas in PE-CTT constraints and objectives are always expressed at the level of the single event/lecture.

ITC-2007-ETT: This is the ETT formulation proposed for ITC-2007 (Track 1). ITC-2007-ETT is much more realistic than UETT. Indeed, it includes several novel features collected from the activity of a commercial software in use in many British universities.



▲ Figure 1: Educational timetabling problems and formulations.

Name	Formulation	#Inst	#Solved	LB	Format	Source	Link
Toronto	UETT	13	0	×	text	US/Canada	http://www.cs.nott.ac.uk/~pszrq/data.htm
ITC-2002	PE-CTT	20	7	×	text	artificial	OptHub
ITC-2007	PE-CTT	24	21	×	text	artificial	OptHub
ITC-2007	CB-CTT	21	17	√	text	Univ. of Udine (IT)	OptHub
ITC-2007	ITC-2007-ETT	12	0	×	text	United Kingdom	OptHub
XHSTT-2014	XHSTT	25	14	√	XML	many countries	https://www.utwente.nl/hstt/
ITC-2019	ITC-2019	30	5	√	XML	many countries	https://www.itc2019.org

▲ Table 1: Formulations and Benchmark. #Inst: number of instances, #Solved: number of instances solved to proven optimality, LB: tight lower bounds available (√ = Yes, × = No).

XHSTT: It was introduced as an attempt to create a unified formulation and data format for the HTT problem. The proposed formulation, called XHSTT, has also been used as the subject of ITC- 2011. XHSTT is extremely rich and the intent is to avoid, differently from the previous formulations, any concession to judicious simplifications.

ITC-2019: This is the formulation of the CTT problem proposed for the ITC-2019 competition. This formulation actually represents a combination of CTT with the student sectioning problem. It is indeed rather rich and structured, including courses with a complex structure of classes, and timetable varying from week to week.

The taxonomy of problems and formulations is shown in Figure 1. Table 1 reports the list of the selected formulations and corresponding benchmarks, along with the information about the datasets and the results. Detailed state-of-the-art results are discussed in [1].

Conclusions

The quest for formulations and benchmarks has brought out various aspects of the current practice in timetabling research:

• Most of the standard formulations arose from competitions, which have given the necessary initial boost in terms of infrastructure and promotion.
• Some benchmark instances are still very challenging after more than 20 years from their publication, whereas some others are not challenging anymore, as they are too easily solved to optimality by state-of-the-art techniques. There is a need for new benchmarks that could take over for the ones that turned out to be too easy.
• In order to avoid comparing apples and oranges, there is a need for the clear definition of the competition grounds, in terms of running time, statistical significance, PC architecture, usable technology, commercial licenses, and other issues. In the formulations coming form the competitions, the ground has been set by the official competition rules, which however might need to be refined and extended in order to do not harness future research.
• There is also need for more instances (possibly artificial ones) that could be used for the statistically-principled tuning of the solution methods, letting the benchmarks to be used only for the validation phase (avoiding overtuning).

All above points together highlight the need for the development of research infrastructures in terms of common formulations, robust file formats, long-term web repositories with instances and solutions, and solutions checkers. In our opinion, to this aim, the organization of future timetabling competitions could still be the right key to pursuit this task.

We are trying to give our contribution for solving these issues by the development of the web application OptHub (https://opthub.uniud.it), which is meant to provide a unified and up-to-date site for current contributions on Educational Timetabling, so as to facilitate and encourage further research and future comparisons. All data in OptHub, properly validated and timestamped, is available for download and inspection, along with scoreboards and statistics. OptHub, whose development is still ongoing, currently hosts four of the above formulations. The formulations hosted are the early ones that do not have a dedicated and updated online repository on their own.

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

Optimising the Transport of Medical Samples in Malawi

Emma Gibson, PhD Candidate, MIT Operations Research Center, <emgibson@mit.edu>
Jonas Jonasson, Assistant professor, MIT Sloan School of Management, <joj@mit.edu>
Sarang Deo, Associate Professor, Indian School of Business, <sarang_deo@isb.edu>
Kara Palamountain, Associate Professor, Kellogg School of Management, <k-palamountain@kellogg.northwestern.edu>
Mphatso Kachule, Country Director, R4H Malawi, <mkachule@ridersmw.org>

Introduction
Sample Transport (ST) networks move diagnostic samples (e.g., blood samples, nasal swabs, etc.) between healthcare facilities and medical laboratories in many healthcare systems. In sub-Saharan Africa, extensive ST networks have developed to facilitate regular Viral Load monitoring tests for people living with HIV. These networks provide access to essential diagnostic services at community health centres in low-resource settings and rural areas.

Malawi's national ST network is managed by Riders 4 Health, a non-profit organisation that employs 80 motorcycle couriers based at 27 district hubs across the country. R4H couriers visit a network of over 700 healthcare facilities to collect diagnostic samples, which are then consolidated at district hubs and forwarded to one of 10 molecular laboratories for analysis. The couriers also transport copies of test results back to facilities which lack the infrastructure to receive electronic results. Currently, the couriers drive around 1.5 million KM per year transporting 640,000 samples, 95% of which are dried blood spots for HIV viral load monitoring.

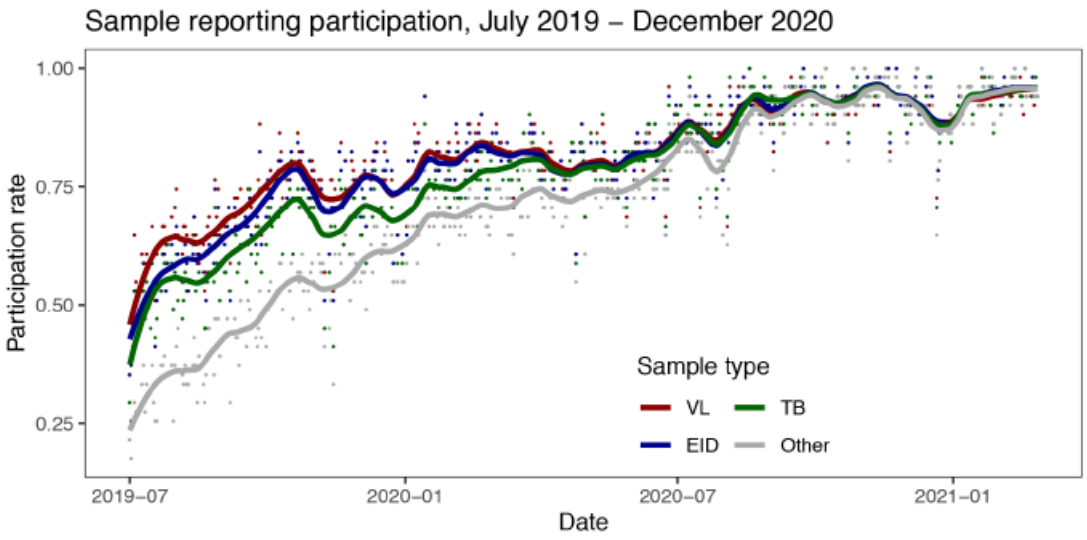
During a chance encounter in 2016, Mphatso Kachule, the country director for R4H Malawi, and Kara Palamountain, a professor from the Kellogg School of Management, discussed the logistical challenges in Malawi's national ST network and the possibility of using OR to design more efficient ST systems. Over the next two years, this idea grew into a research collaboration funded by a Grand Challenges Grant from the Bill & Melinda Gates Foundation. The research team included Sarang Deo, an associate professor at the Indian School of Business, Jónas Oddur Jónasson, an assistant professor at MIT Sloan; and Emma Gibson, a PhD Candidate at the MIT Operations Research Centre.

Objectives of study
The team worked closely with R4H over 5 years to identify inefficiencies in the ST system and develop operational interventions to improve ST services in Malawi. The team focussed on ways in which R4H could use their existing fleet and budget more effectively, such as reducing delays in the sample transportation process, thus ensuring that test results are delivered to health facilities as quickly as possible.

Initially, R4H couriers were operating on fixed weekly schedules that visited each facility and laboratory once or twice every week. The fixed courier routes provided regular and reliable transportation, but also resulted in a significant number of trips to facilities on days when there were no samples or results to be transported. In 2017, approximately 30% of the total trips to healthcare facilities were unnecessary. The aim of the ST optimisation project was to eliminate these unnecessary trips and utilise this capacity more effectively to reduce delays at other locations. Instead of visiting each location at the same time every week, courier routes would be optimised on a daily basis in response to the demand for transportation at each site.

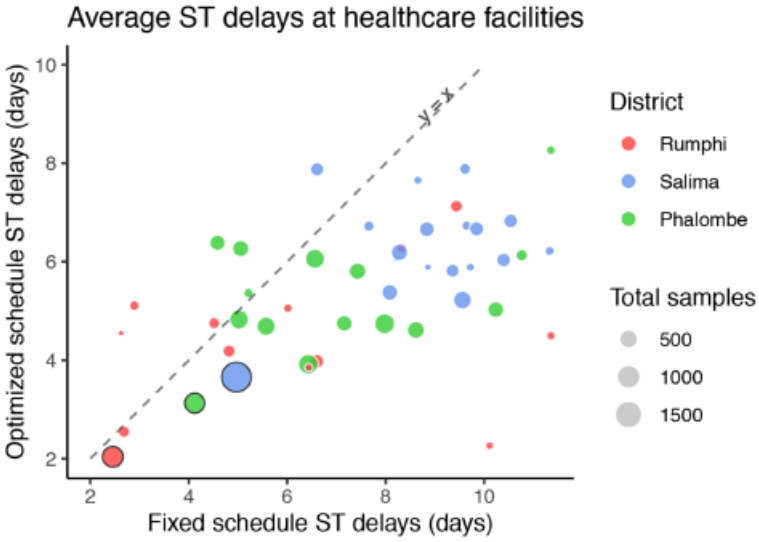
Methods used to optimise the courier routes and schedules
Deciding which health facilities should be visited by couriers each day is a complex tactical decision which is closely related to dynamic multi-period vehicle routing problems (DMVRPs). A key difficulty in these problems is the uncertainty about future demand - without knowing how many new samples will arrive at each site in subsequent days, it is difficult to anticipate how today's courier schedules will impact future decisions. The objective of the daily schedule decisions is to create an efficient flow of samples and results between facilities, district hubs, and laboratories, while also respecting practical constraints on costs and courier workloads, and allowing enough flexibility to accommodate ad hoc developments such as vehicle breakdowns.

To optimise these decisions, the research team developed a comprehensive network flow model that forecasts the movement of samples and results within the ST system over a finite planning horizon. Embedded within this framework is a scheduling model that determines which facilities should be visited each day, and a vehicle routing problem that calculates the most efficient routes to visit the scheduled sites. This mixed-integer model is solved on a daily basis to find routes that minimise the expected transportation delays over a rolling horizon of two weeks.



▲ USSD participation

The ST optimisation model requires a great deal of input data to estimate the current demand for transportation at each site in the ST network. Monitoring daily sample volumes at healthcare facilities is a significant practical challenge, as most sites have no formal communications infrastructure and rely on handwritten logbooks for data collection. To obtain access to this data in real time, the research team developed a low-cost mobile data platform that allows staff at healthcare facilities to report daily sample volumes from their personal mobile phones via USSD (Unstructured Supplementary Service Data) shortcodes, which are commonly used for mobile transactions in the region. The platform is accessible free of charge from any basic mobile phone and each report takes only a few seconds to submit.



▲ TAT facility

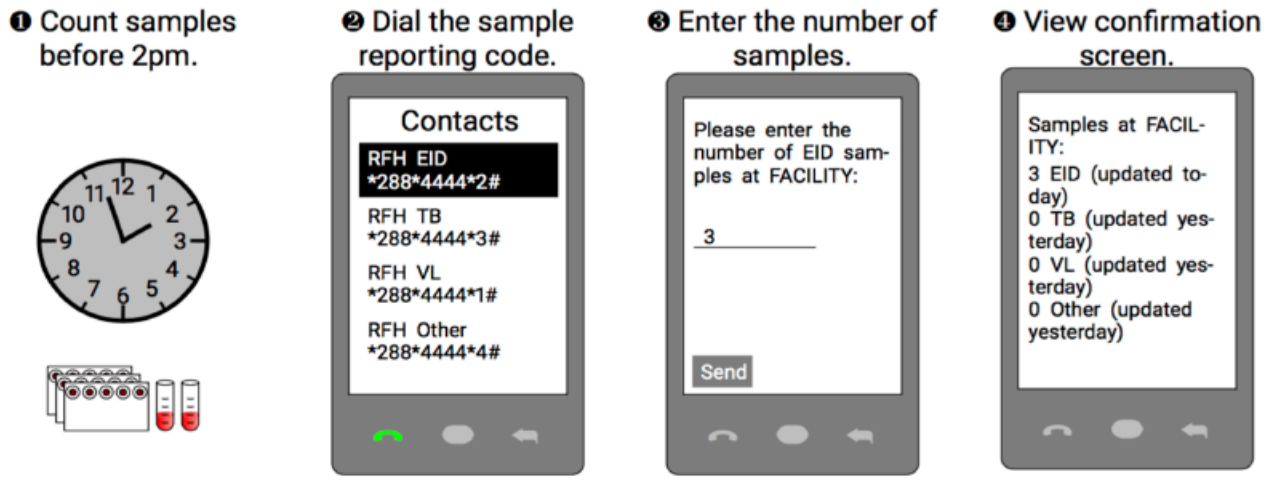
Trial implementation and results

After obtaining the necessary approvals from stakeholders in Malawi, a field trial was conducted to assess the feasibility and impact of the ST optimisation system. This practical implementation provided an opportunity to study the performance of the system in an unpredictable real-world setting, and to monitor the effect of changes to courier routes on other components of the diagnostic network. Testing was performed in three districts (Rumphi, Salima, and Phalombe) which were selected to represent the variations in population density and disease burden across different regions of Malawi.

In June 2019, the team began collecting daily sample volume reports from the 51 healthcare facilities in these districts. Over 150 healthcare staff were trained to use the USSD application, and local research assistants monitored incoming data and developed strategies to increase participation and accuracy. Thanks to the efforts of this team, daily participation rates increased steadily and reached the target level of 80% by the end of 2019.

In July 2019, the six couriers in these districts transitioned from fixed routes to optimised routes. The daily route optimisation was performed by the research team at MIT, with input and feedback from a local field manager, district coordinators, and couriers in Malawi. Over the following three months, the couriers transported over 12,000 samples and results on optimised routes and made approximately 1000 trips to healthcare facilities. The couriers used a mobile application to log every trip and each item transported, and this data was used to assess the performance of the new system.

▲ Trial map



Demonstration of value of the system

The results of the field trial were exceptionally positive: daily route optimisation reduced unnecessary trips by 50% and decreased the average transportation delays by around 25% relative to the previous fixed routes. The optimised routes also resulted in a fairer distribution of delays across facilities in these districts, with less variability in the average delays across different sites, both for collection of samples and the return of results.

Based on the success of the initial trial, R4H decided to continue using optimised routes in the trial districts while developing plans for expansion into other districts. This ongoing implementation provided valuable opportunities to improve the system in response to feedback from the field. For example, the research team incorporated increased flexibility in routes and schedules to allow couriers to make adjustments based on their knowledge of the conditions in each district.

Adapting to Covid-19

In 2020, the Covid-19 pandemic provided a unique opportunity to demonstrate the robustness and adaptability of the new system. Although there were significant disruptions to healthcare services in Malawi, participation in USSD reporting by health facility staff remained high. R4H used this data to adjust to the reduced demand for Viral Load testing by placing greater emphasis on avoiding unnecessary travel, and the proportion of unnecessary trips dropped to only 2% in mid-2020 (compared to 24% in mid-2019).

Future plans for wider implementation

R4H plans to expand the ST optimisation system into all 27 districts in Malawi and is currently testing a local version of the system that will be independently operated and maintained by R4H staff. Long-term sustainability has been a top priority throughout the project, and the research team placed heavy emphasis on developing practical solutions that could integrate smoothly into the existing operations of Malawi's diagnostic network.

Endorsement from Joseph Bitilinyu-Bangoh at Malawi Ministry of Health:

"We were impressed by the effort of the research team to involve local organizations in the preparation for the field implementation. We are encouraged by the reduction in unnecessary trips and support the use of the spare courier capacity generated to shorten turnaround times in the rest of the system. We hope to see a version of the system scaled-up beyond the implementation districts, as it has potential to improve ST operations nationwide."

TB Coordinator for Rumphi district Hospital:
"Unlike in the past where we had to wait for a particular day for facilities to be visited, the current [optimization] system is a great initiative as TB samples no longer have to wait for so long before they are picked [up]. Apart from ensuring that quality of TB samples is maintained, the system is also helping to improve the overall turnaround time of the samples."

This work has received international recognition for its impact on ST services in Malawi, including the "Doing Good with Good OR" award at the 2020 INFORMS Annual meeting, as well as the MSOM Practice-Based Research Award in 2021.

The success of this work has promising implications for ST systems in other countries in sub-Saharan Africa, which face similar challenges in delivering cost-effective access to diagnostic services. The tools and models developed for ST optimisation also have the potential for broader applications in the management of medical supply chains.

Acknowledgements:

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• An article about this research was published in ORMS Today in April 2022. The editor of ORMS Today has kindly agreed to the publication here of the version above.

A Young Perspective to OR: AIROYoung Workshop Back to Rome!

Tommaso Bosi <tommaso.bosi@uniroma3.it>; **Matteo Cosmi** <matteo.cosmi@uni.lu>
Bianca Pascariu <bianca.pascariu@uniroma3.it>; **Marcella Samà** <marcella.sama@uniroma3.it>
Marta Leonina Tessitore <marta.tessitore@uniroma3.it>

After the workshops coordinated by Roma "La Sapienza" (2017, 2019), University of Calabria (2018), Free University of Bozen (2020) and, due to the COVID-19 pandemic, the online version held by Federico II University of Naples (2021), the 6th edition of *AIROYoung Workshop* [1] has been organized at Roma Tre University, in a *hybrid* format during February 23-25, 2022, in Rome (Italy), by *Marcella Samà* (Chair; Roma Tre University), *Tommaso Bosi* (Roma Tre University), *Matteo Cosmi* (University of Luxemburg), *Bianca Pascariu* (Roma Tre University) and *Marta Leonina Tessitore* (Roma Tre University).

After a year of lockdown and limited travel, this 6th workshop has again provided an excellent opportunity for the *Young OR* community to meet again in person, in one of the most beautiful Italian cities. The *AYW* is a yearly tradition of *AIROYoung* [2], the youth chapter of *AIRO*, the Italian Operational Research Society [3].

The aim of these workshops is to provide a lively and energetic environment for people just starting their *OR* career, to promote the exchange of ideas and networking among peers, fostering collaborations between PhD students, young Researchers and Practitioners. After COVID-19, this was more important than ever so, this year workshop in *"Operation Research and Data Science in Public Services"* was held in hybrid form with 133 attendees from more than 20 countries evenly split between in-person and online attendance. Since students may have a limited funding ability, the event was free, with 13 participants provided also with accommodation thanks to sponsorships from *AIRO* and *OR*-interested companies.

To guide students, 2 plenary sessions were organized to provide motivation and perspective for what the future may reserve in their *OR*-driven path. *"Optimizing our life"*, by *Prof. Marco Pranzo* (University of Siena, Italy), was a motivational talk in which participants were invited to formulate their life as an optimization problem: what intuitions from *OR* world matches philosophical ideas on how to live a good life? When later asked, *Prof. Pranzo* commented: *"The AYW is a conference organized by young researchers and tailored to young researchers. I was positively impressed by the organization and the energy of all the participants. I am sure in the future they will all have fond memories of such a joyful experience. Highly recommended to all young researchers. Five stars. Thumbs-up!". "A glimpse on the mission of OR researchers in rail traffic management"* was instead given by *Prof. Paola Pellegrini* (Université Gustave Eiffel, France), to show the role of OR researchers in our applications' worlds, the developed solutions, and how industry and practice may or not be ready to their implementation, with a particular focus on railway. Afterwards, *Prof. Pellegrini* commented: *"I had the honor of being invited to give a plenary talk at the AIRO Young Conference organized by Roma Tre University. It was a great pleasure to speak in front of so many passionate OR researchers, the energy of a young public is definitely something that will stick to my memory. The atmosphere was great, thanks to a kind and efficient organizing committee and to all participants.*

▲ The *OC* of *AIROYoung 2022 Rome* (from left to right): *Tommaso Bosi, Marcella Samà, Matteo Cosmi, Bianca Pascariu, Marta Leonina Tessitore.*

I think the fact that this type of meetings are organized regularly is a major strength of the Italian OR community, and I hope many other countries will follow."

Additionally, *Dr. Selene Silvestri* (FICO) gave a tutorial on FICO Xpress Insight, the collaborative environment with interactive visualization of their optimization suite. She later stated: *"Being a Plenary Speaker at the AIROYoung Workshop has been a great honor for me. Not so long ago I was on the other side of the room, wondering where a career in OR would bring me. Therefore, being able to share my experience and talk about my work at FICO with all the young professionals that were attending the workshop was a real pleasure. It was also really nice to discuss afterwards with some attendees. The workshop was very well organized and the atmosphere was very pleasant, allowing everyone to enjoy each moment, from the technical discussions to the guided tour in Rome. Thanks for allowing me to be part of it!"*

Thanks to the attendees, 27 in-person presentations on *OR/MS* methodologies applied to, e.g., healthcare, public and freight transport and logistics, were given to sponsor new research and ask for early feedbacks. To include people affected by COVID traveling restrictions, online attendees showcased their research with 5 minutes pitch-talks.

Of course, together with the busy schedule of the daily works, a nice and relaxing social program was offered! According with the dynamic atmosphere, participants attended a guided tour of Rione Trastevere, one of the most vivacious and bohemian neighborhoods of Rome, with old-world cobbled lanes, ivy-clad facades and trendy vibes, followed by an informal dinner in a typical Roman restaurant. The day after, instead, the workshop social dinner was organized in a Tuscan Hosteria, nearby Fontana di Trevi, to link with the up-coming *ODS* conference, parent conference of the *AIROYoung Workshops*, which will be held in Florence.

▲ In-person and online participants to the *AIROYoung*.

To crown this fruitful meeting of young minds, proceedings will be published on *AIROSpringer Series*, where all participants are invited to submit their works. As a final novelty for more mature works, the *AIROYoung* board sponsors the "Optimization and Data Science in Sustainable Public Transport and Logistics" Special Issue on "Transportation Research Part E: Logistics and Transportation Review" [4].

References

[1] 6th AIRO Young Workshop https://ayw2022.uniroma3.it.
[2] AIROYoung Researchers Chapter (https://www.airoyoung.org/).
[3] Italian Operational Research Society (AIRO https://www.airo.org/).
[4] Special Issue TR part E: https://www.journals.elsevier.com/transportation-research-part-e-logistics-and-transportation-review/call-for-papers/call-for-paper-on-the-special-issue-optimization-and-data-science-in-sustainable-public-transport-and-logistics.

▲ The *OC* (minus Tommaso Bosi) and *AIROYoung* Board (in front, from left to right): *M.L. Tessitore, V. Dal Sasso, M. Samà, L. Peirano, M. Cosmi, B. Pascariu, G. Macrina, S. Fugaro* (online, in the back, from left to right): *A. Raffaele and M. Barbato.*

Third Annual Smart Freight Symposium in Canada and Online

Elkafi Hassini <hassini@mcmaster.ca>; **Heider Al Mashalah** <almashah@mcmaster.ca>; **Shervaughn Bennett** <shbenne@mcmaster.ca>

The Smart Freight Centre (SFC), a centre of excellence for goods movement consisting of McMaster University's DeGroote School of Business, the University of Toronto Transportation Research Institute, the York University Lassonde School of Engineering, Ryerson University's Faculty of Engineering and Architectural Science, and the Region of Peel. The 3rd annual Smart Freight Symposium was hosted by the DeGroote School of Business at McMaster University on November 19 and 26, 2021. The symposium is an annual event to share findings from SFC research projects, hear freight industry latest trends, and discuss major current business and government policy challenges. Its audience includes academics, industry and government representatives

The Symposium was held remotely on ZOOM. It was attended by more than 150 guests from government, NGOs, universities, industry, and non-profits, and featured 38 speakers and moderators. 12 student speakers participated in the Symposium's first Student Presentation Competition, vying for the Best Student Presentation award and a cash prize of $1,000 made possible by the generous support of Kinaxis Canada.

Hosting institution McMaster University opened the Symposium with remarks from *Susan Tighe*, Provost and Vice-President Academic, and a welcome from *Khaled Hassanein*, Dean of the DeGroote School of Business. *Elkafi Hassini*, Professor at McMaster's DeGroote School of Business and Chair of the Smart Freight Centre, next provided an overview of the Smart Freight Centre, which was established in 2019.

The first session on November 19 discussed equity, diversity and inclusion (EDI) in the context of the transportation sector. Three industry leaders shared their own perspectives about EDI implementation. They highlighted the benefits of establishing EDI metrics and benchmarks in the workplace and the best ways to promote EDI within the recruiting process. *Dale Lynch*, Ontario Ministry of Transportation, moderated this session. *Alma Arzate*, Director of Global Supply Chain Logistics at Apotex, shared some of her personal EDI experience over the course of her career. *Angela Splinter*, CEO at Trucking HR, discussed diversity and inclusion in Canada's transportation and logistics industry. Anne Robinson, CSO at Kinaxis, spoke about the value of diversity and inclusion in the workplace.

The second session on November 19 featured the role of technology in freight transportation and the need to update the infrastructure to make use of the emerging innovations. Three industry leaders and a chair of local authority discussed the implementation of recent innovative technology and how that could generate more data that can be used to increase supply chain visibility. *Iain Tyrrell*, Transport Canada, moderated this session. *Nando Iannicca*, Chair at Region of Peel, gave a keynote address focusing on freight transportation updates in the Region of Peel. >>

>> *Shitiz Agarwal* and *Matthieu Bureau,* Vice Presidents at Schneider Electric Canada, shared the transformation plan to sustainable freight infrastructure to integrate electrical fleets. *Steve Bogie*, Vice President at Drone Delivery Canada, discussed the maturity of technology, regulations, and commercialization for operating drones' delivery in Canada.

The last session on November 19 outlined the initiatives taking place at the four Smart Freight Centre universities presented by the principal investigators from each university. *Nazzareno Capano* from the *City of Toronto* moderated this session. *Bilal Farooq* presented a research update from *Ryerson University*. *Elkafi Hassini* presented the McMaster University research update. *Peter Park* provided a research update from York University. *Matthew Roorda* shared the University of Toronto research update.

Closing the November 19 Symposium was *Lani Lindsay*, VP Replenishment and Supply Chain at Walmart Canada, who delivered the keynote address *"Global and local supply chain disruption"*, moderated by *Laura Cocuzzi*, Manager, Procurement Planning and Performance at Region of Peel.

Elkafi Hassini gave the closing remarks to end the first day of the symposium.

November 26 focused on recent research by graduate students and postdoctoral fellows of the Smart Freight Centre's partner universities. All 12 student presenters competed in the *Student Presentation Competition*.

▲ Elkafi Hassini, Chair, Smart Freight

The session opened with a welcome from *Polina Hristeva*, Director of Transport Canada.

The first session featured four speakers and was moderated by *Sabbir Saiyed* from the *Region of Peel*. They discussed Smart delivery logistics solutions including smart mobile lockers routing within city transit systems, two-to-one matching for sharing in dispatching systems, parking occupancy inference with LiDAR sensors, and community noise survey regarding off-peak deliveries. Those topics were presented by *Si Liu, Seyed Mehdi Meshkani, Elham Heydari-Gharaei,* and *Kianoush Mousavi,* respectively.

▲ Heider Al Mashalah, SFC Research

The second session on November 26 focused on data analytics for transportation and was moderated by *Lauren Crawford* from *York Region*. They presented about freight transportation data visualization, AI-based cyber-attacks on dispatching systems, progressive pricing of parking for demand segmentation, and assessment of commercial vehicle patterns during the COVID pandemic using Geotab data. The speakers in this session were *Yunfei Ma, Roderick Zhang, David Ornelas, Yaser Kouchakzadeh,* respectively.

The third session on November 26 outlined city logistics planning including presentations about rack repositioning and robot assignment in robotic mobile fulfillment systems, green logistics: vehicle routing problem, a swept path-based analysis of intersections for long combination vehicles (LCVs), and planning an inter-connected crowd logistics network in the GTHA. These presentations were delivered by *Yanling Zhuang, Saba Sabet, Ucchas Saha* and *Shang Zhang*, respectively.

Next, *Amir Khataie*, VP Logistics at Chit Chats, presented *"Ecommerce Reinvention". Traci McIntyre*, Academic Program Manager at Kinaxis, introduced the company's sponsorship of the *Student Presentation Competition*. This was followed by the award for Best Student Presentation to *Yanling Zhuang*, international visiting student at DeGroote School of Business, McMaster University. The competition was judged by a committee consisting of *Brian Belino* from Purolator International, *Matthew Judd* from Nestlé Canada, and *Sophia Sniegowski Begidzhanov* from Musket.

At the end of the symposium, closing remarks were provided by *Dhillon Gurpreet Singh Dhillon, Region of Peel Councillor*.

The Fourth Annual Smart Freight Symposium is scheduled for November 2022 and will be chaired by *Bial Farooq* from Ryerson University's Faculty of Engineering and Architectural Science. More information will be provided on the SFC website: www.smartfreightcentre.ca. For inquiries about SFC current research projects and membership please contact sfc@mcmaster.ca.

Copenhagen School of Stochastic Programming: 90 international PhD students in a week full of lectures and social activities

Giovanni Pantuso <gp@math.ku.dk>

The week from April 4th to April 8th 2022 has witnessed a deep dive into Stochastic Programming at the University of Copenhagen, Denmark. The *Copenhagen School of Stochastic Programming* was attended by 90 PhD students (mainly) and postdocs (a few) eager to learn about optimization under uncertainty. The school featured five days of lectures and exercises, provided by international lecturers, on some of the fundamental issues regarding stochastic programming.

Despite the challenges posed by COVID-19 and its variants during the winter 2021, the Copenhagen School of Stochastic Programming has been held physically. The week went smoothly and there has hardly been any serious impediment to a successful event, which also featured a rich social program. Perhaps, the only inconvenience was that not many students from outside Europe could participate as long-distance traveling is still somewhat complicated. Indeed, the registration list was much longer than the 90 who students eventually attended.

Stochastic Programming is the main research interest of the organizers, *Giovanni Pantuso* and *Trine Boomsma*, and their *OR* group. At the Department of Mathematical Sciences, University of Copenhagen, there is a Stochastic Programming course running every year for master's students in mathematical economics. This course is thought by *Giovanni Pantuso* and runs for 9 weeks in the spring and typically hosts a few PhD students from other Danish universities. The Copenhagen School of Stochastic Programming has been thought as a way of sharing this experience with a larger PhD audience.

▲ *Copenhagen School of Stochastic Programming* attended by 90 PhD students from several countries.

Over the five days of the course, April 4-8, the School offered an intense program consisting of lectures and exercises, provided by international experts on the different topics. The program was thought to provide the students both the theoretical framework and the hands-on experience that strengthens the understanding.

The *first day* began with *Trine Boomsma* giving an introductory lecture on Stochastic Programming. She touched upon some of the central modeling and solution concepts as well as ongoing challenges. In the afternoon, *Stein Wallace*, Professor at the Norwegian School of Economics, gave a lecture on *"Scenario Generation"*. He introduced the students to some of the available techniques to approximate continuous (possibly multidimensional) random variables (or discrete but with a large support) and commented on some of the current limits and challenges. Stein Wallace also led the *second day* of the School, offering the students practical examples of scenario generation end presenting challenging cases, that is where random variables are high dimensional or of mixed type (e.g., a mix of binary and continuous random variables).

The *third day* of the School focused on one of the most popular and widely used methods for two-stage Stochastic Programs, namely *"Benders decomposition"*. The topic was taught by *Mike Hewitt*, Professor at the Loyola University of Chicago. *Mike* began by illustrating the central theoretical concepts (e.g., decomposition, cuts, and convergence) and then went through the different techniques available to improve the original method. In the afternoon, *Mike* handed the students a problem to solve together with some Python code. The students were asked to implement a working Benders decomposition. The discussion that followed the exercise class illustrated that the exercise was successful in making the students experience some of the challenges that come with the method.

During the *fourth day* of the School the students learnt about an application of stochastic programming in the energy industry. The day was led by *Stein-Erik Fleten*, Professor at the Norwegian University of Science and Technology. *Stein-Erik* presented the problem of addressing *"Price Uncertainty in Energy Forward Contracts"*. During the morning lecture *Stein-Erik* went through the issues related to going into energy derivative contracts and the uncertainty therein. During the afternoon session, the students were handed a realistic case to address and asked to answer a number of questions.

The *fifth* and final day of the School focused on the solution of multi-stage stochastic programs. *David Wozabal*, Professor at the Technical University of Munich, presented the topics *"Approximate Dynamic Programming and Stochastic Dual Dynamic Programming"*. *David* started by presenting the challenges one faces when solving multi-stage stochastic programs and the different curses of dimensionality and introduced ADP as a framework to find good policies. Following, he introduced Stochastic Dual Dynamic Programming as a special case where the value function is polyhedral and the approximation converges to the true value function. During the exercise session, *David* provided the students an iPython notebook containing an implementation of SDDP for a hydropower scheduling problem. The students were required experiment with different algorithmic choices.

▲ *David Wozabal* and *Stein Wallace* teaching at the *Copenhagen School of Stochastic Programming.*

The School featured also a rich social program. Tuesday night was the Game Night. The students went to a local café that makes thousands of board games available to guests. On Thursday night dinner was served in the hall of the Department of Mathematical Sciences. Also in this case quizzes and games contributed to a charming night.

More information can be found at the Copenhagen School of Stochastic Programming's website https://www.math.ku.dk/english/calendar/events/cssp/ or by contacting the organizers.

Analytical Approach to Complexity in Nature, Medicine and Technology - Mathematics and OR at DSABNS 2022 in Beautiful Bilbao

Aytül Gökçe <aytulgokce@odu.edu.tr>**; Burcu Gürbüz** <burcu.gurbuz@uni–mainz.de>
Maíra Aguiar <maguiar@bcamath.org>**; Gerhard-Wilhelm Weber** <gerhard.weber@put.poznan.pl>

The *13th Conference on Dynamical Systems Applied to Biology and Natural Sciences*, was held online on 8-11 February, 2022 (*DSABNS 2022*). The conference was organised by the mathematical and Theoretical Biology Group (MTB) at the Basque Center for Applied Mathematics in Bilbao, Basque Country, Spain.

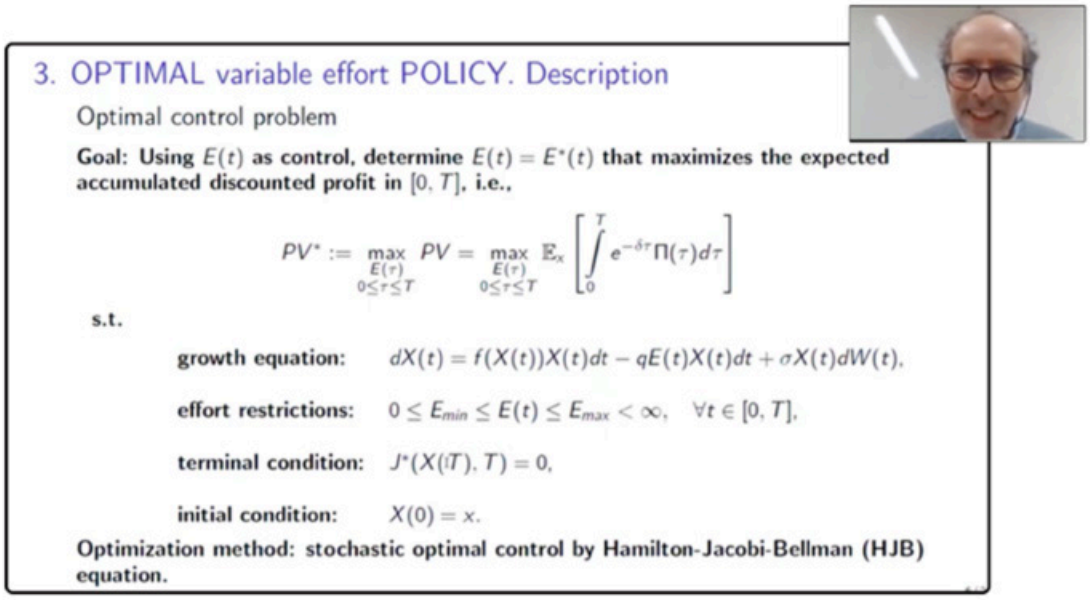
▲ Poster of Welcome (Bilbao, Spain)

DSABNS is a growing, well established scientific event that has been organized since 2010, every year during the month of February. Since it started, back in 2010, the *DSABNS* Conferences have never charged registration fee - an unique opportunity for many researchers to attend an international scientific event at lower costs. Due to the current pandemic, the last two *DSABNS* editions, the 12th and 13th, were organised virtually, with most of the contributions recorded and later available through the Conference Drive. With registrations from 60 different countries, more than 600 world-leading researchers on applied mathematics and natural sciences met at this fruitful conference, providing a strong motivation during the *COVID*-19 pandemic.

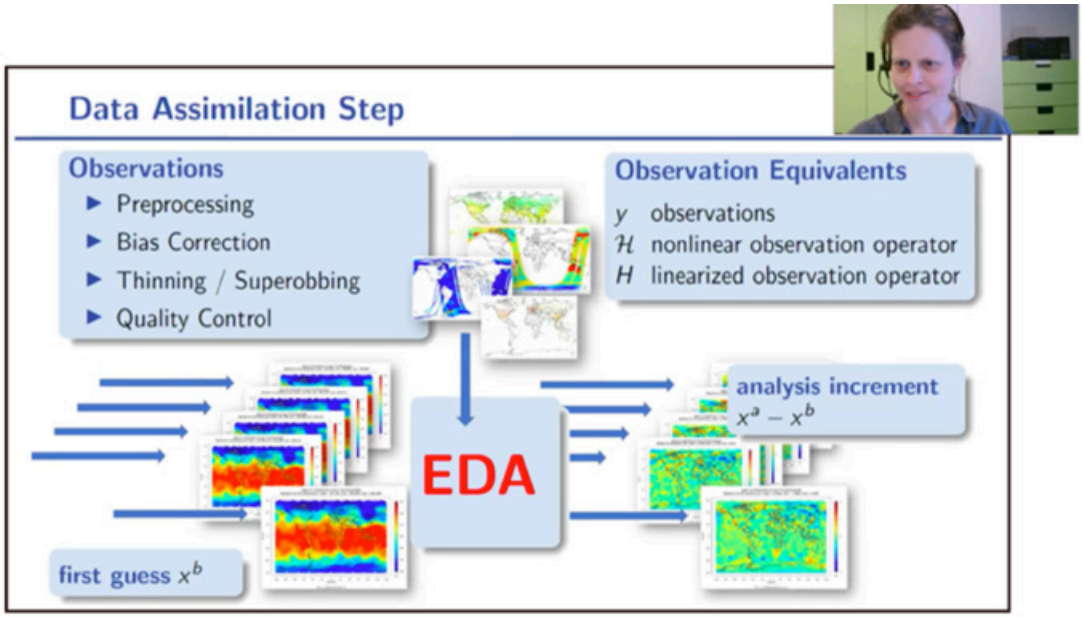
The conference programme covered a wide range of research topics in areas such as population dynamics, eco-epidemiology, epidemiology of infectious diseases, optimization and control theory in the natural sciences, molecular and antigenic evolution and methodological topics in the natural sciences and mathematics, including 2 Public Lectures, 14 Plenary Speakers and 20 Invited Talks. A record number of contributed talks (103) and Posters (42) were presented over these four days. Tremendous effort and care were spent by the Conference Chair *Maíra Aguiar* and her *MTB* team at Basque Center for Applied Mathematics (*BCAM*), together with international organisers: *Carlos Braumann*, *Bob Kooi*, *Paula Patrício*, *Andrea Pugliese*, *Lucia Russo*, *Costantinos Siettos*, and *Ezio Venturino*. The aim of the event was to provide an interdisciplinary environment that brings together theoretical biologists, natural science scientists and applied mathematicians to discuss mathematical concepts and techniques currently used to analyze real life problems in biology, epidemiology and medicine, e.g., linked to *Operational Research* (*OR*) topics.

Prestigious *Public Lecturers* gave their talks at *DSABNS* 2022: *Prof. Roberto Natalini* (Italian National Research Council) spoke about *"A mathematical path towards the understanding of cells' aggregations and morfogenesis"* and *Prof. Horacio Rotstein* (New Jersey Institute of Technology, USA) presented *"Resonance-based mechanisms of generation of oscillations in networks of non-oscillatory neurons"*.

The Plenary Speakers were: *Maíra Aguiar* (MTB, BCAM, Spain) with a talk *"The role of mild and asymptomatic infections on COVID-19 vaccines performance: a modeling study"*; *Malay Banerjee* (Indian Institute of Technology Kanpur, India) with the talk *"Effect of slow-fast time scale and nonlocal interaction on spatiotemporal pattern formation"*; *Nicola Bellomo* (University of Granada, Spain) with the talk *"Pandemic of mutating virus a multi-scale active particles systems approach"*; *Konstantin Blyuss* (University of Sussex, UK) with the talk *"Dynamics of a predator-prey model with ratio dependence and Holling type III functional response"*; *Carlos Braumann* (Universidade de Évora, Portugal) with the talk *"Harvesting profit optimization on random environments: the effects of alee effects"; Aaron King* (University of Michigan, USA) with the talk *"Markov genealogy processes for exact phylodynamic inference"*; *Yuliya Kyrychko* (University of Sussex, UK) with the talk *"Dynamics of coupled kuramoto oscillators with distributed delays"*; *Giovanni Marini* (Edmund Mach Foundation of San Michele all'Adige, Italy) with the talk *"Environmental drivers of West Nile virus in Europe: A modelling approach"*; *Carla Pinto* (Polytechnic Institute of Porto, Portugal) with the talk *"The epidemiology of T1D onset on HIV infected patients after immune reconstitution"*; *Ganna Rozhnova* (University Medical Center Utrecht, Netherlands) with the talk *"The dynamics of SARS-COV-2 during the vaccination rollout and in the post-pandemic period"*; *Lucia Russo* (CNR STEMS, Italy) with the talk *"Agent based models for urban mobility: emergent behaviour and bifurcation analysis"*; *Constantinos Siettos* (Universit degli Studi di Napoli Federico II, Italy) with the talk *"Numerical Solution of Partial Differential Equations and Stiff problems of ODEs with Physics Informed Random Projection Networks and Extreme Learning Machines"*; *Nico Stollenwerk* (MTB, BCAM, Spain) with the talk *"The Interplay between sub-critical fluctuations and import understanding COVID-19 dynamics and recent vaccination impact"*; *Ezio Venturino* (Universit degli studi di Torino, Italy) with the talk *"A model for the olive tree pest Prays oleae (Bernard)"*, respectively.



▲ *Carlos Braumann* (Évora, Portugal) talks on harvesting profit optimization in random environments and explains the optimal policy in terms of harvesting effort that maximizes the profit over some time period.



▲ *Stefanie Hollborn* (Offenbach, Germany) presents *"The EnVar plus LETKF data as- similation system at the German Meteorological Service (DWD)."*

During the closing ceremony, 5 *Contributed Talks* and 5 *Poster prices* were awarded. The prizes for the best Contributed Talks were granted to *M. Angeles Martínez Carballo* (Zaragoza, Spain), *Juan Calvo* (Granada, Spain), *Fernando Saldãna* (Bilbao, Spain), *Lea Sta* (Leeds, UK), and *Jason Whyte* (Melbourne, Australia). The prizes for the best Posters were given to *Kharmand Khdr Ahmad* (Erbil, Iraq), *Maria Eliza Antunes* (São Paulo, Brazil), *Silvia Garcia* (Bilbao, Spain), *Blai Vidiella Rocamora* (Barcelona, Spain), and *Ian Teixeira* (Lisbon, Portugal).

Furthermore, the conference was promoting new topics in mathematics and data science to improve the models for advanced predictions in nature. The conference has also included a Special Session with talks from the German Weather Service on *"New techniques on Dynamical Systems for weather prediction - Data Assimilation"*. During this session, different techniques to make observations for weather prediction using data assimilation were presented, for which the theory is combined in the form of numerical models with observations. In many areas of *OR*, the benefit of working on interdisciplinary subjects is significantly used and many researchers in this interactive environment have been supported.

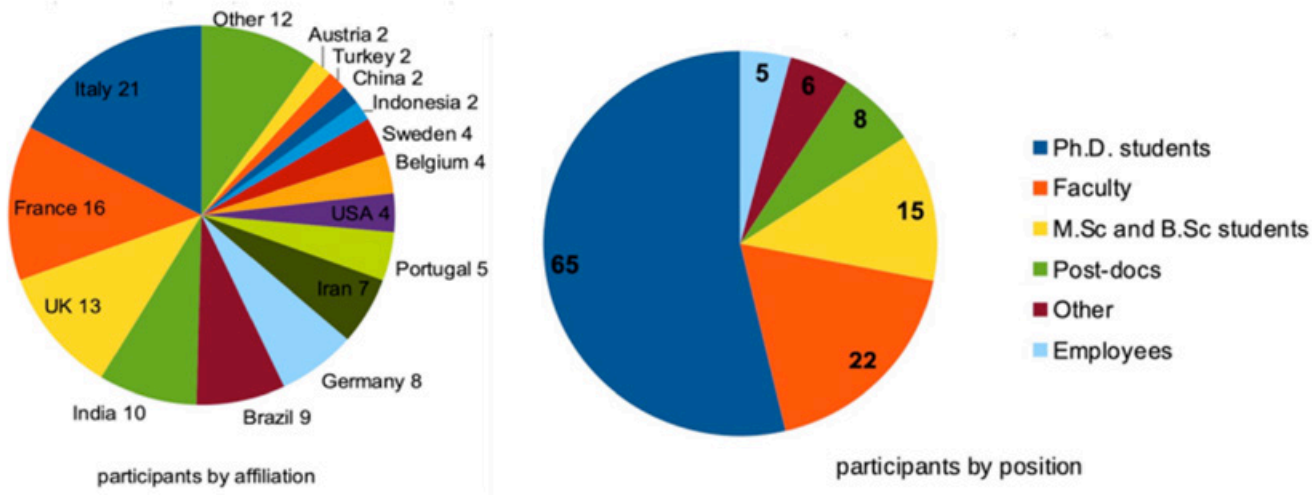
On the other hand, the conference provided a beneficial environment for a comprehensive understanding of emerging *OR* applications in healthcare, medicine, and environmental science. Study findings in these fields are crucially important for healthcare systems and our future due to the climate crisis and its results. They are also in the scopes of the *EURO* working groups on Health Services (*EWG ORAHS*), Combinatorial Optimization (*EWG ECCO*), Decision Support Systems (*EWG DSS*), Continuous Optimization (*EWG EUROPT*), Stochastic Modelling (*EWG STOCHMOD*), Computational Biology, Bioinformatics and Medicine (*EWG CBBM*), Data Science meets Optimization (*EWG DSO*), Stochastic Optimization, and additionally, the Societies of *INFORMS*: *Applied Probability, Computing, Data Mining, Health Applications, Information Systems, Optimization,* and *Simulation*. Outcomes of studies in these fields are going to be discussed in corresponding Areas and Streams at *EURO* 2022 in Espoo, Finland.

Need, Challenge and Success of an Online Summer School - EUROPT Summer School 2021

Giancarlo Bigi <giancarlo.bigi@unipi.it>

Schools provide students and young researchers a great opportunity to meet, get closer in touch while learning from distinguished scholars. Hence, the organisation of a summer school was a felt need and long term goal for *EUROPT*, the *EURO* Working Group on Continuous Optimization (https://www.euro-online.org/websites/continuous-optimization/).

As the pandemic shocked the world and reshaped our habits, new challenges came up also for the way scientific meetings are carried on. Rather than deferring its goal to better times, *EUROPT* teamed with *ICMS* - the *International Centre for Mathematical Science in Edinburgh* (Scotland, UK) to set up and organise a 3-day summer school with a fully online format. Robust and nonsmooth optimization were chosen as topics and *Prof. Dr. Aharon Ben-Tal* (from Technion - Israel Institute of Technology) and *Prof. Dr. Manlio Gaudioso* (from Università della Calabria in Italy) agreed to deliver the lectures. The school was named *"The need, the challenge and the success of robust and nonsmooth optimization"*.



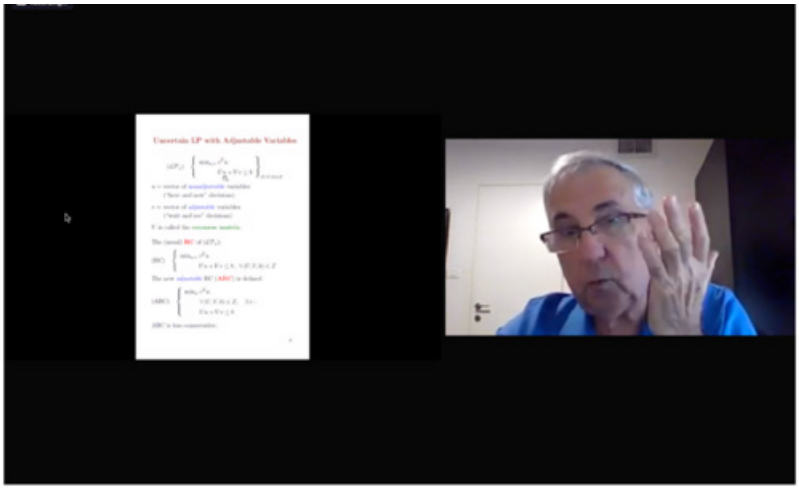
▲ *EUROPT Summer School 2021*: origin and structure of the participants. (Other affiliations include 1 from Bangladesh, Canada, Chile, Cyprus, Japan, Norway, Philippines, Russia, Slovenia, Spain, Tunisia, Vietnam.)

The call for participation was successful far beyond expectations and 242 people from all the 5 continents proved interested. The school took place during August 30 - September 1, 2021, with a 2 hour lecture per day for each topic. The lectures on robust optimization were delivered by *Professor Ben-Tal* in the mornings, on nonsmooth optimization by *Professor Gaudioso* in the afternoons. They were attended by 121 people from 27 countries, whose distribution by affiliation and position is reported in the tables. Though the lectures were conceived and designed mainly for Ph.D. students and young researchers, a meaningful number of faculty members and employees of research centres and companies attended as well.

Professor Ben-Tal explained the need of robustness to face uncertainty in optimization problems due to inaccuracy in measurements, lack of timely information on values of parameters and, last but not least, limitation on executing accurately a computed solution in applications. He addressed the basis of robust optimization as a methodology to address these difficulties successfully and showed some applications to inventory management and the recovery of signals from noisy output as well.

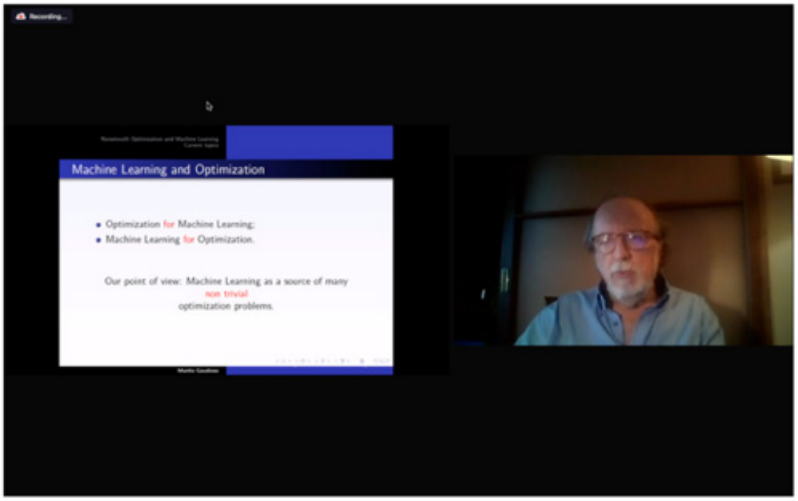
Professor Gaudioso discussed some sources of nonsmoothness in decision making problems so that standard algorithms for smooth optimization cannot be successfully exploited to tackle them. Hence, he addressed the basic mathematical tools that are used in numerical nonsmooth optimization together with the main algorithms. Finally, he showed applications to classification in machine learning and to integer programming via the Lagrangian relaxation approach.

Some complementary material and the videos of the lectures are available on the school webpage https://www.euro-online.org/websites/continuous-optimization/europtschool21/ (the videos can be streamed online thanks to the *Media Hopper Create* platform of the *University of Edinburgh* that hosts them).



▲ *EUROPT Summer School 2021: Prof. Aharon Ben-Tal* lecturing.

The school was made possible by the engagement of the *EUROPT* Managing Board to tackle this challenging goal, by the kindness of the two lecturers to devote some of their valuable time to share their expertise with us, last but not least by the technical support of *ICMS*, in particular the Centre manager *Jane Walker* and the staff members *Gillian Kerr* and *Liam Holligan*. My deepest thanks to all of them and to the participants as well.



▲ *EUROPT Summer School 2021: Prof. Manlio Gaudioso* lecturing.

Overall, the summer school was a successful experience: the online format brings in far more people than an in-presence school probably would and it cuts costs and organisational efforts down, fees may be very low or attendance may be even free of any charge, videos can be produced and stored easily for reaching further people later on. Nonetheless, an online format does not allow for meaningful interaction between participants beyond technical questions to the lecturers. On the contrary, live meetings help giving birth to and cementing long-time friendships and collaborations. Hence, the need of in-presence schools still stands. Maybe alternating between live and online formats could be a good choice in the long term. Indeed, *EUROPT* is already planning an in-presence school to be held after its 2022 workshop in Lisbon, as the next summer is predicted to be reasonably safe.

EURO PhD Summer School on Sustainable Supply Chains 2021 - 3rd Conference on Sustainable Supply Chains 2021: Celebrated Online

Ana Barbosa-Póvoa <apovoa@tecnico.ulisboa.pt>, **Karsten Kieckhäfer** <karsten.kieckhaefer@fernuni-hagen.de>
Renzo Akkerman <renzo.akkerman@wur.nl>

▲ *PhD School on Sustainable Supply Chains / SustChain 2021*: Online platform.

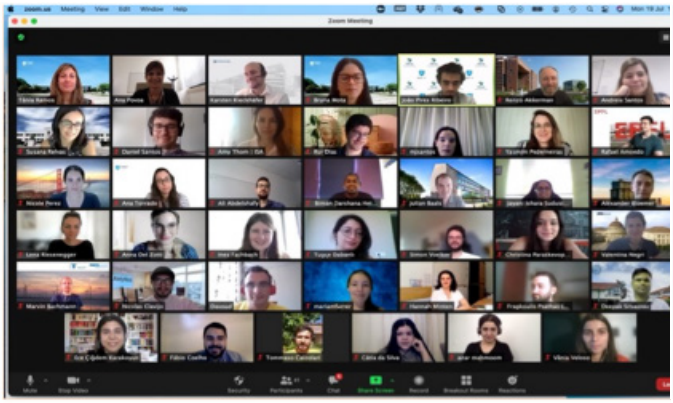
In 2021, the EURO Working Group on Sustainable Supply Chains (EWG-SSC) organised two main events: the *EURO PhD School on Sustainable Supply Chains 2021* and the *3rd Conference on Sustainable Supply Chains 2021* (*SustSC 2021*). These events were originally planned to be held in Lisbon, Portugal at Instituto Superior Técnico, University of Lisbon, but were run in a virtual form due to the COVID-19 pandemic.

The coordination of the *EWG-SSC* had the enthusiastic and professional help of the Operations, Logistics and Supply Chain Management group from the Centre of Management Studies of Instituto Superior Técnico, University of Lisbon, chaired by *Ana Barbosa-Póvoa*. Many of the group members contributed to the logistics and organisation of the two events, for which we sincerely thank them!

PhD School on Sustainable Supply Chains

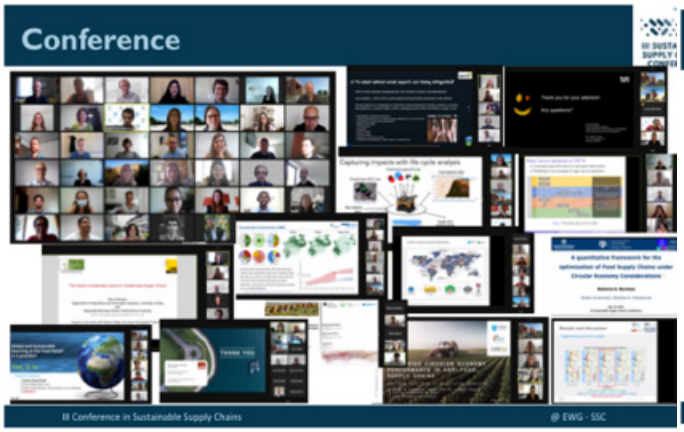
The school was an active forum for the PhD Students to learn on how *Operational Research* (*OR*) methods can support organizations in the design, planning, and operation of sustainable supply chains. It took place from July 19 to 21, 2021, and involved lectures, work in groups, and a round table with academics and practitioners on how *OR* can be used to meet challenges in sustainable supply chains. The students participated actively had the opportunity to get in touch with several colleagues working in the area.

Several messages were taken home by the students:



▲ *PhD School on Sustainable Supply Chains*: Welcome session

▲ *PhD School on Sustainable Supply Chains*: Home Main Messages.



▲ *SustChain 2021*: ZOOM sessions presentations.

▲ *SustChain 2021: Jacqueline Bloemhof PhD Thesis on Sustainable Supply Chains.*

3rd Conference on Sustainable Supply Chains

SustSC 2021 offered to the Sustainable Supply Chain community (researchers and practitioners) the opportunity to present developments and to discuss current research challenges in the area. The *EURO General Support Funding* covered the full participation of PhD students at *SustSC 2021*.

Overall, 56 participants from 14 countries joined the conference. The program involved 25 talks.

Two *plenaries* given by *Marc Reimann* from University of Graz, Austria, and *Duarte Rocha* from Sonae MC, Portugal, and a *round table* on the future challenges of sustainable supply chains with *Andreas Ciroth* from GreenDelta, *Miguel Silveira* from Altri Florestal S.A., and *Thomas Stefan Spengler* from Technische Universität Braunschweig were also part of the program.

The conference also involved a presentation by *Christian Thies* from Technische Universität Braunschweig, Germany, who received the 2021 *Jacqueline Bloemhof PhD Thesis Award*.

A Return to In-person Meetings:

65th EWG for Commodities and Financial Modelling in New York City

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

Spring 2022 signaled a long-awaited return to an in-person meeting with the *65th International Meeting of the EURO Working Group for Commodities and Financial Modelling* organized by the Center for International Financial Markets and Services at Hofstra University, held on April 28-30. The meeting featured an in-person attendance only at the Cornell Club in Manhattan, New York.

The conference was dedicated to *Dr. Jacob (Jaap) Spronk*, Emeritus Professor of Finance and Academic Dean at the Rotterdam School of Management. He founded the *EURO* Working Group on Financial Modelling in 1986 and served as its chair until 2009 when he appointed *Rita Laura D'Ecclesia* who is now the chair of the group. This conference had been planned with him in 2020 few days before the start of the COVID lockdown in various countries. Together with *Jaap, Anoop Rai* and I had agreed to hold the conference only in person so we kept on rescheduling it. Unfortunately he untimely left us on February 2021. For additional details in *Dr. Spronk*, see Tinyurl.com/jspronk.

Attendees discussed the latest research and discoveries on financial risk management and measurement, banking, corporate strategies, and portfolio management. *Operational research* (*OR*) and *analytics* are the essential tools to identify this field's optimal choices and strategy.

Scholars, practitioners and Ph.D. students who attended the meeting were able to listen to a large set of remarkable studies with three plenaries, 14 sessions, and networking events. Specially selected sessions highlighted the diversity of the meeting tracks. >>

>>Speakers brought their methodological expertise and innovations in banking, financial risk management, corporate strategies, optimization, probabilistic methods, and statistical learning. The entire meeting program is available at the following web page www.hofstra.edu/cifsm65.

The *plenary* and *keynote lectures* at the *Meeting* shed light on Banking, Financial Risk Management, and Monetary Policy. These talks both challenged and intrigued attendees and offered an exceptional opportunity to get insights into recent banking industry crisis, corporate strategies, and U.S. Treasury monetary policies. The latter lecture given by *Brian Ruane* was attended also by master's students of Hofstra University, reaching an audience of almost 100 people. The debate was quite stimulating and challenging for the audience.

▲ The *65th EWGCFM* was the first in-person meeting after two virtual meeting.

The keynote lectures.

Mark J. Flannery, Eminent Scholar in Finance at the University of Florida. He is a significant expert on mutual fund industry regulations, CDS trading standards, and various equity market and firm reporting requirements. MBA teaching award (Best core course professor in 2006, 2009, and 2014); "Most Significant Paper" in Journal of Financial Intermediation in 2013; Jensen Prize for Corporate Finance and Organizations at Journal of Financial Economics and "Best Paper in Financial Institutions" 1995 Financial Management Association Meeting. He gave a lecture on *Mergers & Acquisition Activity and the Capital Structure of Target Firms*.

▲ *Prof. Jacob Spronk*

Brian Ruane, Chief Executive Officer of BNY Mellon Government Securities Services Corp., Clearance & Collateral Management, Credit Services, Real Estate, and Leasing. Brian leads BNY Mellon's government securities clearance business and the firm's collateral management franchise. Critical voice on the Federal Reserve Bank of New York's Triparty Repo Infrastructure Reform Task Force. He also served on the Federal Reserve Bank of New York's Working Committee on The Future of the US Government Securities Markets. He gave insights on *The Evolution of the U.S. Treasury Market*.

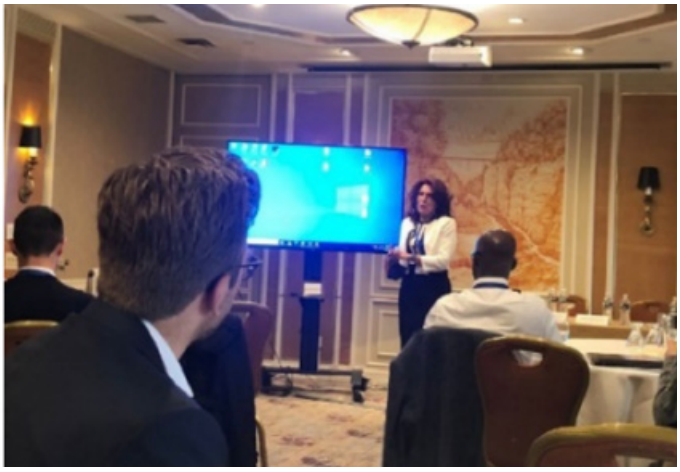
Gregory F. Udell. Bank One Chair of Banking and Finance at the Kelley School of Business, Indiana University. He is a member of Academic Advisory Board of the Turnaround Management Association, Board of the Directors of the Georgetown University Credit Research Center, and Board of Directors of the Financial Management Association. He has been a visiting economist and consultant to the Board of Governors of the Federal Reserve System. He is currently a consultant to the Federal Reserve Bank of Chicago and The World Bank. He has published extensively in top journals on topics in banking. He gave a lecture on *Banking Relationships during crises*.

▲ *Brian Ruane* during his keynote lecture.

▲ *Asset Pricing Session* on April 28 Fall Creek Room, Cornell Club.

Out of about 70 papers submitted for the meeting, the scientific committee accepted 45 articles distributed in 14 sessions, each featuring relevant topics and quality speakers carefully selected by the organizing committee. The various sessions dealt with Asset Pricing, Trading, Risk Management, Banking, Derivatives, Institutional Investors, Financial Markets, Portfolio Performance, and Corporate Finance. They called attention to essential innovations that included machine learning techniques in the banking industry and financial markets, the role of governance in the corporations, and the sustainability challenges.

The meeting hosted 60 participants, scholars, and industry experts from many countries. COVID-19 resulted in 2 consecutive *online Conferences*, which created barriers in staying connected with former colleagues and peers and made it challenging to meet and connect with new ones. >>



▲ *EWGCFM's Chair Prof. Rita Laura D'Ecclesia* giving Welcoming Remarks.

▲ *Presenter during Risk Management Session* in the Fall Creek Room.

>> The *65th EWGCFM meeting* provided ample opportunities for attendees to (safely) connect during receptions, meals, and the social dinner. This conference provided numerous additional opportunities, including:

• *Executive Forum*: An exclusive gathering for senior executives and managers to provide a unique opportunity to network with colleagues and discuss important issues in OR and finance.

• *Early Career Professionals' Network*: A group designed to help recent graduates, soon-to-be graduates, or anyone entering the field of risk measurement, corporate finance, and banking.

Exploring and Celebrating Analytics Excellence at the 2022 INFORMS Business Analytics Conference

This article contains content previously published in Analytics magazine. Coverage was provided by

Kara Tucker <ktucker@informs.org>, Editor, OR/MS Today
Ashley Smith <asmith@informs.org>, INFORMS Public Affairs Coordinator

The *2022 INFORMS Business Analytics Conference* in Houston, TX, April 3-5, marked a much-anticipated return to in-person Analytics Conferences at *INFORMS*, the first since 2019. More than 700 attendees from across the globe enjoyed more than 100 engaging talks, including keynotes by *Dr. Talithia Williams*, professor and television host, and *Russell Algor*, chief scientist at Amazon.

Kicking off the 2022 INFORMS Business Analytics Conference

The Monday morning keynote with *Dr. Talithia Williams*, professor of mathematics at Harvey Mudd College, host of NOVA Wonders on PBS and frequent TEDx Talks, can be simplified with four strategic keywords – innovate, aggregate, appreciate and illuminate – each vital to leading with data in organizations.

▲ *Talithia Williams* addresses attendees during her opening keynote address at the *2022 INFORMS Business Analytics Conference* in Houston, TX.

Innovate. *Williams* expressed the importance of taking a risk, failing and trying again, which can be seen in even the most high-profile companies. For example, Amazon, which was founded in a garage and started as a bookstore, now uses robots and AI and boasts some of the newest technology on the planet. They've mastered machine learning and data use, but not every endeavor has paid off. All told, even big companies fail, and not all risks pay off, but try again until you reach success.

Aggregate. Everyone is a data scientist, according to *Williams*. We've seen this throughout the COVID-19 pandemic with people all over the world posting photos of themselves getting their vaccines, which is an example of people unintentionally taking part in a data-driven initiative. Data is also changing how institutions make decisions. *Williams*, an academic herself, expressed that data-driven decision-making happens when data analytics are used to set goals and objectives, understand trends and inform actions.

Appreciate. *Williams* said you must mindfully collect, understand and evaluate data. Public mistrust of data has been around for decades. She talked about the Tuskegee Syphilis Experiment as an example of this mistrust. Another example was stop-and-frisk data from New York City, including how long police officers look at someone before they decide they are going to stop them – the data was startling. And what are the implications of that data?

Illuminate. According to *Williams*, it's key to lead with passion and purpose. An obvious passion of hers is to increase education opportunities in STEM. *Williams* and Harvey Mudd College offer a conference for young girls in southern California interested in STEM. This opportunity allows them to ask questions in a small setting and learn more about the field. A parent workshop is also offered to educate parents on STEM and provide ways for parents to talk to their child and encourage them to continue pursuing math.

An Inside Look at Amazon Optimization Techniques

Russell Allgor, chief scientist at Amazon, presented a keynote during the second day of the *2022 INFORMS Business Analytics Conference*, providing an inside look at the operations of the online company regarding package fulfillment optimization and associate scheduling.

His talk began with showing traffic to the Amazon website and how the focus has always been on the customer experience (CX). Then went on to discuss the impact of shipment seasonality on growth. Depending on certain times of the year, the company must expand fulfillment and the transportation network. The constant goal is getting packages to customers cheaper, faster and on time, so the order placement process is crucial to fulfilling this goal.

There are many decisions made throughout the process, and are also affected by different time horizons. It begins with looking at delivery depots, air gateways, etc. Next is planning, which is done on a monthly and weekly basis looking at connections between facilities, inventory management and resource planning, such as schedules for trucks and planes. Finally, the decision is executed in fulfilling orders and routing vehicles.

▲ The finalist team from Chile celebrates winning the *2022 Franz Edelman Award.*

Allgor then spoke about how his team plans labor across Amazon's fulfillment and logistics operations. This involves several key features across all facilities: associate attributes, hiring and staffing plan, facility and processes, and demand forecast. He delved into how Amazon handles associate scheduling with Shift Choice. The Amazon Shift Choice platform allows associates to request changes to their schedule in order to get the schedules that best fits their needs.

2022 Edelman Award Reprise: **Winning team from Chile relives inspirational project, emotional win**

▲ *Russell Allgor* walked attendees through optimization techniques at Amazon during his keynote session.

To finish out a fantastic return to in-person *INFORMS* conferences, the *2022 Edelman Award* winner Chile reprised their inspirational and well-deserved prize-winning presentation during the final day of the conference. The winner of the Edelman Award, along with several other prestigious *INFORMS* awards, was announced at the *2022 Edelman Gala*.

The project won for improving pandemic responses in Chile during the COVID-19 pandemic, which included guidance on contagion prevention, vaccination and central management of ICU beds.

Mobility. In 2020, COVID-19 cases were quickly growing in lower income areas and the lockdowns were too late to contain outbreaks. To understand the effectiveness of lockdowns, anticipate outbreaks and understand mobility during the pandemic, the team mapped movements to construct an origin matrix and implemented data aggregation to provide transparency to individuals on a publicly available platform. The platform also contributed to public policies developed in Chile during the pandemic.

ICU Allocation. During the COVID-19 pandemic, hospitals became one centralized system and a detailed forecast of beds needed in each region of the country was a necessity to for ICU capacity planning, which quickly became the first order of concern. The team assembled a compartment model and implemented a forecasting system that resulted in bed capacity in even the most congested regions of Chile. Forecasts were run every two days during entire duration of the hospital crisis resulting in approximately 850 fewer deaths attributed this work.

Testing. Analytics was used to increase testing capacity in Chile, in particular, group/pool testing. Group testing accounted for 20% of the total testing in Chile, 50% increase in testing capacity and $90 million in savings. The team began placing PCR testing stations in public spaces to study how disease moved in territories. This data was then integrated into the Ministry of Health platform as heatmaps, which helped pinpoint and prioritize areas in need of testing, identify case clusters and possible outbreaks, and project future cases.

Serology Surveillance. In all areas, the COVID-19 vaccine rollout was essential to contain the pandemic, but vaccine supply in Chile was uncertain. They did not have much access to mRNA vaccines and had to combine the use of vaccines with different technologies, which led to the Sinovac (CoronaVac) vaccine, used to inoculate 75% of the Chilean population. Because this vaccine was unique, testing stations were selected for monitoring using integer programming. The national strategy led to 29,000 fewer infections and 1,000 fewer deaths.

Partnership & Impact. The success of the project was mainly due to the interdisciplinary and institutional collaboration focusing on national needs that occurred in a timely and positive manner. The team created reliable systems in record time that can now be used for other diseases or future pandemics. All in all, the team, their project and its use of analytics, made a sizeable impact on many aspects, saving $207 million and 2,800 lives in Chile.

Experimental Science and Engineering and OR
8th ICCESEN Celebrated in Antalya and Online

Feride Kulalı Özdek <feride.kulaliozdek@uskudar.edu.tr>

▲ *Organizing Committee of ICCESEN* in Antalya (from left to right): *Dr. Hakan Akyıldırım, Dr. Zehra Nur Kuluöztürk, Dr. M. Fatih Kuluöztürk, Aycan Şengül, Dr. Ahmet Beycioğlu, Jale Yazgan, Dr. Iskender Akkurt, Dr. Feride Kulalı Özdek, Dr. Özge Kozguş Güldü, Dr. Melise Karatay.*

The *8th International Conference on Computational and Experimental Science and Engineering* (*ICCESEN 2021*) was successfully held from October 27-31, 2021 (http://2021.iccesen.org/). The conference, which is planned to take place in Antalya, one of the most beautiful cities in Turkey, has unfortunately been held online for the last two years due to the Coronavirus disease (COVID-19). The conference was organized by *Prof. Dr. Iskender Akkurt* (Süleyman Demirel University, Isparta, Turkey). Organizing committee members from various universities supported the chair.

ICCESEN 2021 was detailed in 10 different themes (http://2021.iccesen.org/page/topics): Physical Science and Technology, Mathematical-Modelling - Science and Applications, Energy and Applications, Earth Science and Applications, Engineering Science and Applications, Material Science and Applications, Biological, Medical and Health Science and Applications, Social and Education Sciences and Applications, Agricultural and Food Science and Technology, Forestry and Environmental Science and Engineering. Although the participation was lower than in previous years due to the pandemic, 40 speakers selected from over 100 applications attended the conference. The participants had the opportunity to listen to inspiring presentations from 6 invited speakers with the following topics:

Dr. Soumi Dutta, Institute of Engineering & Management (IEM), India: *"Challenges in Social Network Data Analytics"*,
Prof. Dr. Madjid Fathi, Dept. of EECS University of Siegen, Germany *"A beneficiary for advance in Knowledggraph for cyber technology"*,
Dr. Samira Fetni, University of Batna 2, Algeria, *"Genetic variants and mutations of SARS-CoV-2, vaccines and nonspecific immunity"*,
*Dr. Gökçe Şirvanal*i, Ufuk University, Turkey, *"Stress and Music from a Neuroscience Perspective: A Model of Wellbeing"*,
Prof. Dr. Gerhard-Wilhelm Weber, Poznan University of Technology, Poland: *"Sustainable Aggregate Production Planning with Overtime, Outsourcing and Human Factors under Uncertain Seasonal Demand"*, coauthors: *Selma Gütmen*, *Alireza Goli* and *Erfan Bababee Tirkolaee*,
Prof. Dr. Amir Hussain, Napier University, Edinburg, Scotland, UK: *"Big Data Application in Science"*.

The *first day* of the conference started with the opening session after a short welcome speech. The invited speaker session has begun with the presentation of *Dr. Soumi Dutta*. Her presentation focused on filtering and organizing of information obtained from social microblogging sites to extract meaningful information efficiently. The second plenary speaker *Prof. Dr. Madjid Fathi* connected from the border of Afghanistan. Under difficult conditions he gave the opportunity to listen to his excellent speech on knowledge management and integration.

The first talk of the second day was given by *Dr. Gökçe Şirvanli*, from the medical Ufuk University, Ankara, Turkey. Her interactive talk focused on effect of music on well-being. Expressing that music changes the neurological structure, she recommended listening to the compositions of artists such as Bach and Mozart for a mindful and fulfilling life.

▲ *ICCESEN 2021*: screenshot on community online.

▲ *ICCESEN 2021*: screenshots from invited speakers' presentations.

▲ *ICCESEN 2021*: plenaries by *Dr. Gökçe Şirvanlı* and *Prof. Dr. G.-W. Weber*.

▲ *ICCESEN 2021*: screenshots from the *farewel*l of the participants.

Prof. Dr. G.-W. Weber was one of the distinguished speakers. His presentation was followed with great interest. He focused on developing a mathematical model on sustainable aggregate production planning under uncertain seasonal demand with the aim of total cost minimization, total pollution minimization and reliability maximization. He also mentioned about ongoing and future international collaborations and invited the participants to *EURO 2022*, Espoo, Finland, July 3-6, 2022 (https://euro2022espoo.com). Besides he gave valuable advices to young researchers.

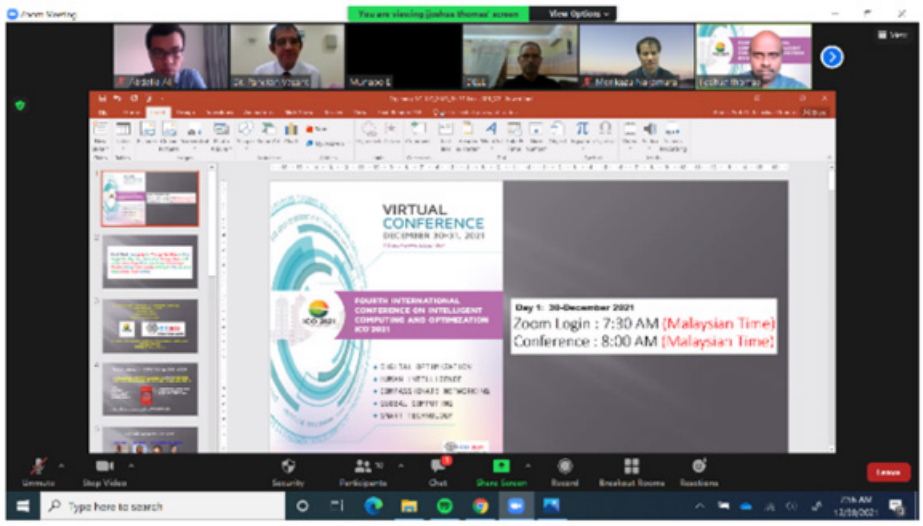
Following the invited speaker session on both days, other participants shared their presentations. *Dr. Zuhal Er*, Istanbul Technical University, added value to the conference with her questions and comments. The presentation *"First principles investigation of NV defect concentration in diamond during heat treatment"* delivered by *Mubashir Mansoor*, *Mehya Mansoor* and *Maryam Mansoor* from her team was quite interesting. Indeed, the talks spanned a wide variety of topics, from education to health applications. Radiation shielding, thin film and coating technologies, solar energy systems and radiotherapy were prominent topics as well. Many studies were promoted by *Operational Research* (*OR*) through Optimization, Network Data Analytics, Data Mining, Machine and Deep Learning and Artificial Intelligence. The conference provided a special medium and international platform to interconnect the attendees and share news on *OR* studies and *OR* meetings.

Although the conference was held online, there were many participants who knew each other from previous years, creating a sincere atmosphere. At the end of the conference, participants conveyed their best wishes to see each other face to face next year.

International Conference on Intelligent Computing and Optimization - 4th ICO Edition Celebrated in Malaysia and Online

Pandian Vasant <pvasant@gmail.com>**, Gerhard-Wilhelm Weber** <gerhard-wilhelm.weber@put.poznan.pl>
José Antonio Marmolejo <jmarmolejo@up.edu.mx>, **Elias Munapo** <elias.munapo@nwu.ac.za>

The fourth edition of the *International Conference on Intelligent Computing and Optimization* (*ICO'2021*; https://www.icico.info/) was held during December 30-31, 2021, via ZOOM. The objective of the international conference is to bring the global research scholars, experts and scientist in the research areas of Intelligent Computing and Optimization from all over the world to share their knowledge and experiences on the current research achievements. This conference provided an excellent opportunity for the research community to interact and share their novel research results, findings and innovative discoveries among their colleagues and friends.

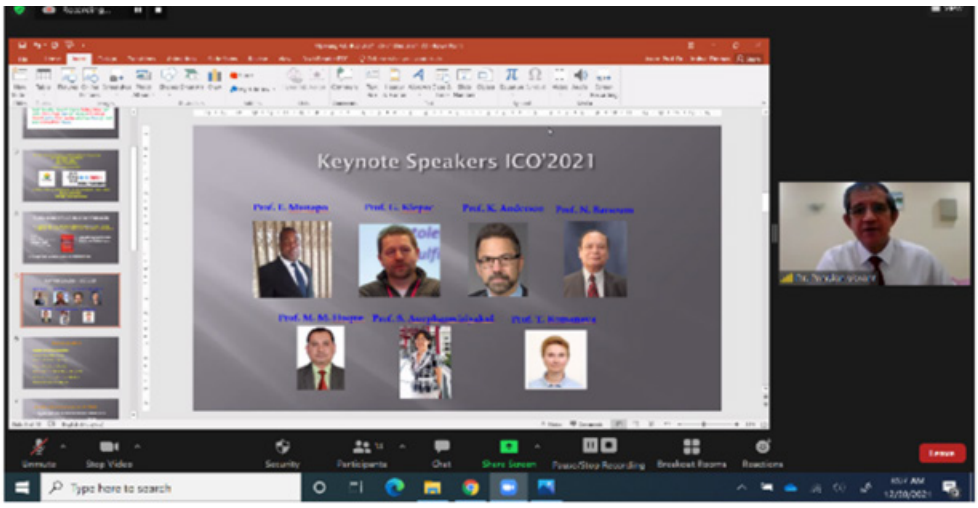


▲ *Welcome to ICO'2021.*

The *International Program Committee* received over 100 submissions from 50 countries and at least 3 expert reviewers reviewed each paper. The prominent technical committee has selected the best 70 papers for final presentation at the venue of Webinar form. The proceedings of *ICO'2021* are published by *Springer* (*Lecture Notes in Networks and Systems*) and indexed by Scopus and Web of Science. Best and high-quality papers will be selected and reviewed by the International *PC* in order to publish extended versions of the papers in international journals from Scopus and ISI Web of Science.

This conference could not have been organized without the strong help by AISC Springer Nature, Easy Chair, and the Committee of *ICO'2021*. We would like to sincerely thank *Professor José Antonio Marmolejo* (Universidad Panamericana, Mexico) and *Professor Elias Munapo* (North West University, South Africa) for their great support.

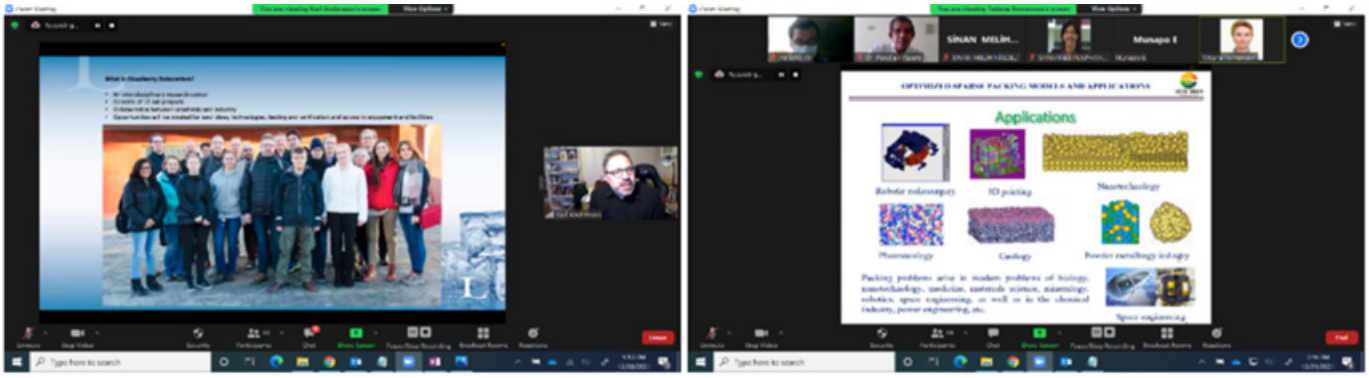
We also appreciate the fruitful guidance by *Dr. Leo Mrsic* (Algebra University College, Croatia), *Prof. Gerhard-Wilhelm Weber* (Poznan University of Technology, Poland), *Prof. Rustem Popa* (Dunarea de Jos University, Romania), *Dr. J. Joshua Thomas* (UOW Malaysia, KDU Penang University College, Malaysia), *Prof. Ivan Zelinka* (VSB-TU Ostrava, Czech Republic), *Prof. Roman Rodriguez-Aguiler* (University of Panamericana, Mexico), *Prof. Ugo Fiore* (Federico II University, Italy), *Prof. Mohammad Shamsul Arefin* (CUET, Bangladesh), *Prof. Mohammed Moshiul Hoque* (CUET, Bangladesh), *Mr. Anirban Banik* (National Institute of Technology Agartala, India), and *Mr. K.C. Choo* (CO2 Networks, Malaysia). *ICO'2021* Committee sincerely thanks all the authors, reviewers, keynote speakers, session chairs and participants for their contribution to humanity.



▲ *ICO'2021* Keynote Speakers (from left to right, and top-down): *Professor Elias Munapo* (North West University, South Africa); *Professor Goran Klepac* (Hrvatski Telekom, Croatia); *Professor Karl Andersson* (University of Technology, Sweden); *Professor Nader Barsoum* (Curtin University, Malaysia); *Professor Mohammed Moshiul Hoque* (Chittagong University of Engineering & Technology, Bangladesh); *Professor Sansanee Auephanwiriyakul* (Chiang Mai University, Thailand); *Professor Tatiana Romanova* (National Academy of Sciences of Ukraine). On the right side: Conference Chair *Prof. Dr. Pandian Vasant* (MERLIN Research Centre, Ton Duc Thang University, Vietnam).

We thank *Prof. Dr. Janusz Kacprzyk*, *Dr. Thomas Ditzinger*, *Dr. Holger Schaepe*, and *Mr. Nareshkumar Mani* of AISC Springer Nature for their great support and encouragement in making this event successful on a global scale.

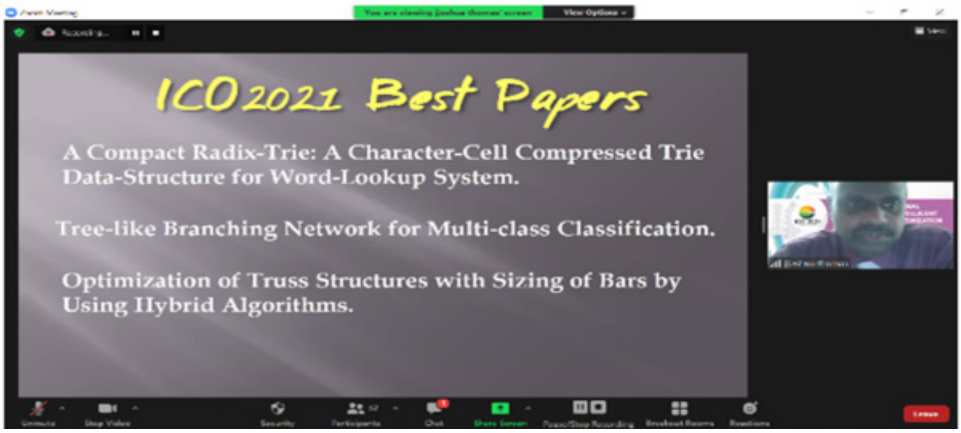
Finally, we cordially invite global research scholars to participate at the *5th International Conference on Intelligent Computing and Optimization* at G Hua Hin Resort and Mall in Hua Hin, Thailand, on October 27-28, 2022.



▲ *ICO'2021* Keynote Talks:

Professor Karl Andersson,
University of Technology, Sweden

Professor Tatiana Romanova,
National Academy of Sciences of Ukraine, Ukraine.



▲ *ICO'2021*: Best Paper Award Winners (e-Certificates): i. *Mengqi Xue, Jie Song, Li Sun* and *Mingli Song* (Zhejiang University, China): *"Tree-like Branching Network for Multi-class Classification"*; ii. *Rahat Yeasin Emon* and *Sharmistha Chanda Tista* (Chittagong University of Engineering and Technology, Bangladesh): *"A Compact Radix-Trie: A Character-Cell Compressed Trie Data-Structure for Word-Lookup System"*; iii. *Melda Yücel, Gebrail Bekdaş* and *Sinan Melih Nigdeli* (Istanbul University, Cerrahpasa, Turkey): *"Optimization of Truss Structures with Sizing of Bars by Using Hybrid Algorithms"*. On the right side: Conference Co-Organizer *Prof. Dr. Joshua Thomas* (Computer Science, UOW Malaysia KDU Penang University College, Malaysia).

▲ *ICO'2021*: Best Presenter Award Winners (e-Certificates): i. *Kohei Kaneshima* and *Morikazu Nakamura* (University of the Ryukyus, Japan): *"Using Model Formulation for Job-shop Scheduling Problems based on Colored Timed Petri Nets"*; ii. *Mieow Kee Chan, Chan Chin Wang, Hoe Chun Tee* and *Nurul Adela Bukhari* (SEGi University, Malaysia): "Optimis*ation and Prediction of Glucose Production from Oil Palm trunk via Simultaneous Enzymatic Hydrolysis"*; iii. *Kalyan Dummu, Azazkhan Ibrahimkhan Pathan, Prasit Agnihotri, Mohammad Yasin Azimi, Daryosh Frozan, Joseph Sebastian, Usman Mohseni, Dhruvesh Patel* and *Cristina Prieto* (Sardar Vallabhbhai National Institute of Technology, Surat, India): *"Effect of Climate Change on Sea Level Rise with Special Reference to Indian Coastline"*.

INFORMS Webinar Series for Students:
Transitioning from Student to Professional

Jill Capello <jcapello@informs.org>

INFORMS (www.informs.org) recently held its first in a four-part webinar series focused on students and those new to the *OR/MS* profession, entitled *Transitioning from Student to Professional*.

As part of the *INFORMS* goal of promoting the *OR/MS* field, the organization provides student members with the tools and guidance needed to help them navigate their future in the profession. The *2022 webinar series*, developed in conjunction with feedback from the *INFORMS* membership (including students, academics and practitioners), will cover a number of topics relevant to students beginning their *OR/MS* career.

The *Transitioning from Student to Professional* webinar, featured panelists *Banafsheh Behzad*, associate professor at California State University - Long Beach, and *Xiaonan* (*Shannon*) *Shang*, data analyst at the University of Tulsa. The panelists spoke to participants about deciding between the path towards academia or industry, the lifestyle changes that come with entering the professional world, and how to distinguish yourself in your career.

How do you make the decision between entering academia or industry? Look at your interests – do you enjoy research, coming up with problems and figuring out ways to solve them? Do you enjoy teaching and explaining things to others? Do you enjoy the scheduling flexibility that a career in academia provides? If job security is very important to you, academia might be the way to go – keeping in mind that it can be quite difficult to get tenure. *Behzad* shared, *"I personally love my job. I enjoy the fact that I can choose what to work on, what problems to work on and who to work with."*

If you've decided that a future in academia is for you, how do you begin your job search? Of utmost importance is starting early and committing to spending a lot of time on your application materials. Ask others for feedback on what you've prepared. Develop a job search spreadsheet so that you can keep everything organized. The *INFORMS* Career Center can be a huge help with this process. Send as many applications as you can so you don't limit yourself, and be sure to practice your interview – again and again!

Next comes the change in lifestyle – what can you expect as a junior faculty member? *Behzad* advises to continue with the same research you were working on as a Ph.D. student. You'll also want to find research collaborators, which is not easy. The key is to network, network, network – advice you'll hear many times! Conferences are a very important component of networking and expanding your circle. It's also important to give research talks. You'll need to initiate this by volunteering to give a talk at a specific school. Be patient with your students and remember to modify your expectations based on the level of your students. Read as much as you can, including research articles outside your area of expertise. Read the news as well; you never know where you'll find an idea for future research.

You'll also spend time applying for grants. They're hard to get, so prepare yourself for rejections. Use the feedback to improve your proposal for the next time. And keep in mind that, especially in the beginning of your academic career, you'll be spending a lot of time preparing for your classes, so you'll have less time for research. *Behzad* shared advice she received from one of her mentors to *"never leave your research without touching it for a while. Always try every day to do something with your research, even if it's just writing one sentence in your paper."* Research is the most important part of getting tenure, so don't neglect it.

Shang then spoke about her experience in industry. Although she started as an adjunct professor and lecturer at the University of Tulsa, she found that it didn't suit her. If you don't care for writing and prefer to have a more structured schedule, industry might be the best option for you. You'll also want to consider your salary concerns when you're deciding between academia and industry as you may have a better chance of a higher salary in industry, especially in the early part of your career, though that's not always the case.

▲ *INFORMS Webinar Series for Students: Banafsheh Behzad,* Associate Professor, California State University-Long Beach.

Careers in industry are considered very much skill-based. You need to be able to prove to recruiters that you are competent in a variety of software programs and languages. Exam-based certifications and projects you've completed using different tools are a good way to demonstrate your proficiency to potential employers. Earning certifications not only shows your experience with certain tools, it also shows your commitment to continued education.

When applying for jobs in industry, don't limit yourself by only looking at certain job titles. Different companies often have different job descriptions for the same job title. Spend time reading over job descriptions so that you can find openings that best fit your skill-set.

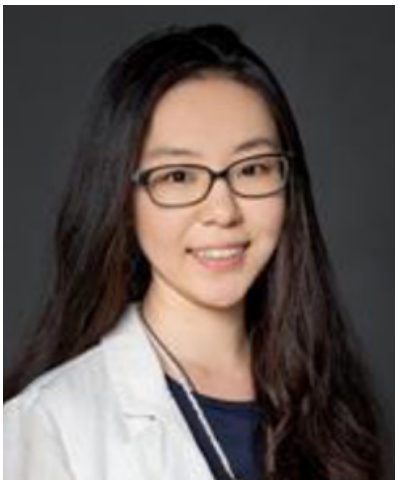
If you've decided on a career in industry, you also need to remember how important networking is, even within your company. *Shang* spoke about her former student who was not being recognized for his work even though he had an excellent skill set. She asked him to share his typical day. It turns out he was spending most of his time in front of his computer. He wasn't getting out and meeting people from other departments. By getting to know your colleagues, you'll begin to understand how your work can benefit the entire company, thus making the work more meaningful to you and making you more likely to earn recognition.

Another important point that *Shang* brought up is to speak to people outside of your department in "their language". Realize that people in sales or management may not be able to relate to the technical language that you use within your department. Remember that when preparing a presentation.

Saving Lives.
Saving Money.
Solving Problems.

Whichever path you choose, focus on learning the "soft skills" that can distinguish you from every other graduate in a technical field. For those in academia, sharpen your writing and presentation skills. *Behzad* shared a quote from a mentor, *"Clear writing means clear thinking."* Keep that in mind the next time you write a paper. Share your work with a colleague or mentor and listen to their feedback. Using ZOOM is a simple way to record your presentations so you're able to see which areas need improvement. For industry presentations, remember to speak the language of your audience, not the technical language. And for both academia and industry, networking is key. Continue to work on that throughout your career.

INFORMS was formed in 1994 as a result of the merger of *ORSA* (Operations Research Society of America) and *TIMS* (The Institute of Management Sciences). Headquarters are located in Catonsville, Maryland, USA. *INFORMS* is unified under a simple shared mission to advance and promote the science and technology of decision making to save lives, save money and solve problems.



▲ *INFORMS Webinar Series for Students: Xiaonan (Shannon) Shang,* Data Analyst, University of Tulsa.

The author, ***Jill Capello***, is Membership Associate at *INFORMS*. This report is based on the presentations of *Dr. Banafsheh Behzad* and *Xiaonan Shang*.

Emerging Domains of Production and Operations Management - 32nd Annual POMS Conference Celebrated Online

Funda Sahin <fsahin@bauer.uh.edu>

Production and Operations Management Society (*POMS*) is an international professional organization representing the interests of *POM* professionals from around the world.

The purposes of the society are:

• to extend and integrate knowledge that contributes to the improved understanding and practice of production and operations management (*POM*);
• to disseminate information on *POM* to managers, scientists, educators, students, public and private organizations, national and local governments, and the general public; and
• to promote the improvement of *POM* and its teaching in public and private manufacturing and service organizations throughout the world.

The *POMS 32nd Annual Conference* (https://pomsmeetings.org/conf-2022/index.html) was held online from April 21-25, 2022. The 32nd Annual Conference was initially scheduled as a face-to-face event in Orlando, Florida. Due to COVID-19-related concerns, the conference was held virtually.

The conference hosted 1520 participants from more than 50 countries. There were more than 550 sessions with 1420 presentations. The conference consisted of many special events and 33 tracks spanning a wide range of topical themes. It is the collective efforts of all presenters, track chairs, session chairs and technical managers for online support that executed a smooth and enjoyable conference. The following individuals served as the program chairs.

From the General Chair *Funda Sahin*'s Welcome Message in the *POMS 2022* Program Book (https://pomsmeetings.org/conf-2022/documents/POMS-2022-Program-Book-Version-1.1.pdf):

Funda Sahin, POMS 2022, General Chair, V.P. of POMS Membership

Bogdan Bichescu, POMS 2022, Program Co-Chair

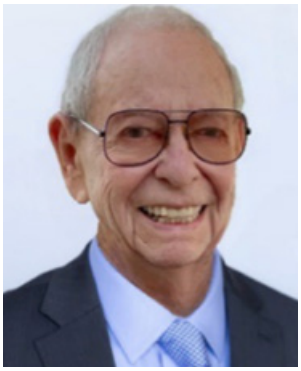
Rakesh Mallipeddi, POMS 2022, Program Co-Chair

Reza Zanjirani Farahanii, POMS 2022, Program Co-Chair

POMS 2022 Plenary Speakers

Anne Robinson

Ramanan Krishnamoorti



Martin Starr

"… events of this size cannot happen without a committed, hard-working program team. The organizing committee members- Bogdan Bichescu (Program Co-Chair), Rakesh Mallipeddi (Program Co-Chair, VP of Communications and AVP of Sponsorship), Reza Zanjirani Farahani (Program Co-Chair), Ken Klassen (AdvisorOperations), Anthony Ross (Doctoral Consortium Program Chair), Craig Forehle (Emerging Scholars Program Chair), Tej Dhakar (Proceedings Editor), Gerald Burke and Amy Pan (Vice President of Meetings), Nagesh Murthy (Associate Executive Director- Global Initiatives), Subodha Kumar (Virtual Meetings Expert), Xiuli He and Hossein Rikhtehgar Berenji (Vice President of Colleges and Scheduling Chair), Taylor Leh, Matt Miller, Keith Smith and John Cunningham (Website and IT), Seema Singhania (Program Coordinator), Ram Tewari (Coordinator of Conference Activities) - worked tirelessly to put together a successful conference. More than 100 volunteers provided technical support for the virtual conference. They all had conflicting demands on their times, but yet all made this conference a priority. A hearty thank you goes to all of them for everything they did for this year's conference. A very special thank you goes to Sushil Gupta (POMS Executive Director), and Hossein Rikhtehgar Berenji (Scheduling Chair). They are the real heroes of this event doing all the heavy lifting behind the scenes. We are truly inspired by the amazing job they do and consider them to be the invaluable players of this conference."

The conference started on Thursday, April 21, 2022, with special events including two *mini-conferences* of *POMS Colleges* which represent *special interest groups* within *POMS*: *Humanitarian Operations and Crisis Management* and *Operational Excellence*. *College of Healthcare* held its mini-conference earlier than the conference start date, on April 15. Several *POMS colleges* sponsored best paper competitions presented throughout the sessions of the main conference. *Doctoral Consortium* was held on April 22 along with many other sessions. *Emerging Scholars Program* for junior faculty was scheduled for April 25, 2022. Additionally, there were dedicated events to engage attendees such as sessions to meet *POM* journal editors, workshops, tutorials and panels.

Other special events included the *Applied Research Challenge* organized by *Chris Tang* and *Felipe Caro*. *George Shanthikumar* provided several *POMS tutorial sessions*.

Plenaries by *Anne Robinson* (Chief Strategy Officer, Kinaxis) on *"Inspiration, Credibility and Trust - The Key Tenets for a Strong POM Ecosystem"*; *Ramanan Krishnamoorti* (Chief Energy Officer, University of Houston) on *"Energy Transition: The Opportunities and the Challenges"*; *Martin K. Starr* (Director of Strategic Planning, POMS) on *"POM's Mastery of Emerging Domains"* were very well-received.

Many thought-provoking sessions that provided new insights and possible ideas for research and teaching were also part of the online experience of *POMS 2022* Conference. Organizers of international meetings had a special session where they provided their observations and experiences from their events. Award winners, *POMS 2022* Program Committee members and all volunteers were recognized during the Awards Ceremony.

The online conference platform was developed and supported by Tenex Software Solutions, Tampa, Florida, U.S.A.

For more information about the *Production and Operations Management Society*, please visit https://www.poms.org/.

Academia-industry Collaboration on Latest Advances in Research,Practice and Development of OR: SEMIT2022 Ankara, Online

Eloísa Macedo <macedo@ua.pt>**, Gerhard-Wilhelm Weber** <gerhard.weber@ put.poznan.pl>
A. Mirzazadeh <a.mirzazadeh@aut.ac.ir>

The *International Conference on Science, Engineering Management and Information Technology 2022* (*SEMIT2022*; cf. https://semit2022.refconf.com/) was held online from the 2nd-3rd of February 2022. *SEMIT2022* was an opportunity to share experience, scientific and research findings of the recent theoretical and practical achievements of *Operational Research* (*OR*), especially concerning engineering management and IT in both research and industry.

The *Chairs of the Conference* were *Prof. A. Mirzazadeh* from Kharazmi University, Tehran, Iran (https://eng.khu.ac.ir/cv/326/english), and *Prof. Babek Erdebili* from Ankara Yildirim Beyazit University, Turkey, and the *Conference Coordinator* was *Leyla Chehrghani* from Kharazmi University, Tehran, Iran (https://khu.ac.ir/en). *SEMIT2022* was supported by the Ankara Yildirim Beyazit University (https://aybu.edu.tr/aybu/en), *Prof. İbrahim Aydinli*, Rector, *Prof. Hasan Okuyucu*, Dean of Faculty of Engineering and Natural Sciences, and *Prof. Mete Gundogan*, Head of IE Department. *SEMIT2022* accounted for special scientific sponsors including universities from Czech Republic, France, India, Brazil, Morocco, UK and Turkey.

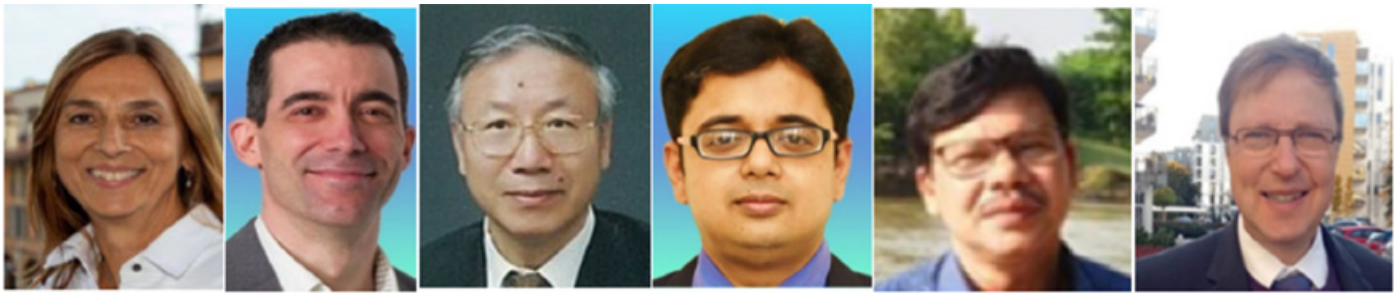
The *SEMIT2022* online meeting had keynote lectures, workshops, and panel sessions covering several topics within the *OR* field, from big data, decision making and support systems, risk management, supply chain management, applied soft computing in engineering management, to applications on E-government, E-commerce, and E-marketing.

▲ *SEMIT2022: Prof. A. Mirzazadeh*, *Prof. B.D. Erdebilli*, and *L. Chehrghani* (from left to right).

The Opening Ceremony had welcome words from *Prof. Hasan Okuyucu*. The *SEMIT2022* Scientific Report (https://semit2022.refconf.com/page_53.html) was presented by *Prof. A. Mirzazadeh*. Then, a video of all the contributing countries was shared with participants. *Prof. Maria Grazia Speranza*, previous *IFORS* President, also devoted some words to the participants, referring to the importance *OR* community has in gathering solutions for improving our daily life.

The scientific program included six *Invited Talks*: *"Contributions from operations research to sustainable mobility"*, by *Prof. Maria Grazia Speranza*, University of Brescia, Italy; *"How to publish good scientific papers: editorial secrets"* by *Prof. Ruben Ruiz*, Polytechnic University of Valencia, Spain; *"How to Expand Hybrid Metaheuristics for Flexible Jobshop Scheduling Problems with Applications"* by *Prof. Mitsuo Gen*, Tokyo University of Science, Japan; *"Theory building with big data-driven research"* by *Dr. Arpan Kar*, Indian Institute of Technology, Delhi; *"Developing research articles for top journal publications"* by *Dr. Arpan Kar*, Indian Institute of Technology Delhi; *"Supply Chain Sustainability: A New Era of Logistic Management"* by *Prof. Sankar Kumar Roy*, Vidyasagar University, India; *"Robust Stochastic Optimal Control for Defined Contribution Pension Funds"* by *Prof. Gerhard-Wilhelm Weber*, Poznan University of Technology, Poland, and Workshops: *"A Hybrid Evaluation Approach for Social Sustainability Performance Measures in Warehousing Hub"* by *Prof. Sadia Samar Ali*, King Abdul-Aziz University, Saudi Arabia; *"Importance of Circular Economy for Sustainable Development"* by *Dr. Abdullah Yildizbasi*, Ankara Yıldırım Beyazıt University, Turkey; *"Evaluating the environmental efficiency of OECD countries with DEA in the context of the circular economy"* by *Dr. Reza Kiani Mavi*, Edith Cowan University, Australia; *"Collaborative Logistics with Combinatorial Auctions"* by *Dr. Chefi Triki*, University of Kent, UK.

SEMIT2022 gathered 240 participants from 42 countries, with 140 paper submissions, from which 93 were selected for presentation and incorporated into 15 panel sessions: *"Supply chain management"* by *Prof. Josef Jablonsky*, University of Economics and Business, Prague, Czech Republic; *"Internet data and MIS for Risk Management Strategy in the Concept of Sustainability in industry 4.0"* with 2 parts by *Dr. Dinh Tran Ngoc Huy*, International University of Japan, *Dr. Esra Sipahi Dongul*, Aksaray University, Turkey, and *Dr. Sylwia Gwoździewicz*, Jacob Paradise University, Poland; *"Optimization algorithms for data science, decision making and transportation"* by *Prof. Tatiana Tchemisova* and *Dr. Eloísa Macedo*, University of Aveiro, Portugal; *"Decision Making & Support Systems in an uncertain environment and risk management"*, by *Dr. Roya Soltani*, Khatam University, Tehran, Iran; *"Competing in the era of globalization based on Industrial Engineering and Management techniques"* by *Dr. AllaEldin Hassan Kassam*, University of Technology, Baghdad, Iraq; *"Recent developments in Decision Making Situations and their potential on Cooperative Games, Operations Research and Disaster Management"* by *Prof. S. Zeynep Alparslan*, Suleyman Demirel University, Turkey; "*Case studies of manufacturing/service industries"* by *Dr. Fayçal Belkaid*, Abou Bekr Belkaid University of Tlemcen, Algeria; *"Artificial intelligence and expert systems"* by *Dr. Erfan Babaee Tirkolaee*, Istinye University, Turkey; *"Human Factors Engineering in Contemporary Research"* by *Dr. L.P. Singh*, NIT Jalandhar, India; *"Towards smart systems based blockchain technologies for enhancing cybersecurity and building resilience"* by *Dr. Karim Zkik*, School of Engineers, France; *"Inventory control, production planning and scheduling+Optimization and Decision Making: methods and algorithms"* by *Dr. Chefi Triki*, Business School at University of Kent, UK; *"Engineering Optimization and Artificial Intelligence"* by *Dr. Aybike Özyüksel Çiftçioğlu*, Manisa Celal Bayar University, Turkey; *"Industry 4.0 and Information Systems: Innovations, Optimization and Decision Support Systems"* by *Dr. Vijay Kumar Gahlawat* and *Dr. Rahul S. Mor* from NIFTEM Kundli, India, and *Prof. Rakesh Kumar Sharma*, NUST, Windhoek, Namibia; and *"Models and Computational intelligence approaches for transportation, logistics and manufacturing systems"* by *Dr. Mustapha Oudani*, International University of Rabat, Morocco. Selected papers will be published in Springer's CCIS book series and will be indexed in Scopus, SCImago, EI-Compendex, etc., and will be considered for possible publication in peer-reviewed Journals, e.g., the EJIE (European Journal of Industrial Engineering), IJSOM (International Journal of Supply and Operations Management), and JTOM (Journal of Turkish Operations Management).



▲ *SEMIT2022*: Snapshot of the conference keynote speakers (from left to right): *Prof. Maria Grazia Speranza*, *Prof. Ruben Ruiz*, *Prof. Mitsuo Gen*, *Dr. Arpan Kar*, *Prof. Sankar Kumar Roy* and *Prof. Gerhard-Wilhelm Weber*.

▲ *SEMIT2022*: Snapshot from the *Closing Ceremony.*

The *OC* prepared a video on the *SEMIT2022* highlights and shared it with participants during the *Closing Ceremony*. Closing remarks were given by *Prof. Mete Gundogan* and *Prof. Babek Erdebilli*.

The *OC* of *SEMIT2022* is grateful to all participants and interesting discussions that deepened the relevance of all the studies presented, as well as inspired new solutions and partnerships for overcoming emerging challenges.

A Varied Style Approach for the Events Industry - by The OR Society of the UK

Caitlin Griffin <Caitlin.griffin@theorsociety.com>
Keri Porter-Keily <Keri.Porter-Kiely@theorsociety.com>

The start of 2022 has signalled a start to a variety of approaches within the events industry to fit attendees and a new era for the events industry where attending face to face is no longer always the preferred option. We have implemented a variety of approaches within the *ORS* Society Events Calendar, Hybrid, Virtual and the -highly anticipated- face to face events return too.

We would like to highlight our three different approaches across our events which are all being presented in their unique forms depending on their target audience and overall needs.

Webinar Wednesday - *Virtual Event*
Our hugely popular *Webinar Wednesday* series is now continuing as virtual. Each month features a different topic within the field of operational research. Our audience are a mixture of academics, and public sector and private sector practitioners, providing the chance to engage with a wide range of *Operational Research* professionals. Attendees range from companies such as Sellafield Ltd, British Airways, Atkins, ONS and numerous government departments and universities.

The theme across *ORS* webinars is *"Use of OR in the real world"* and explores *OR* areas of interest and methodologies. A few of the topics showcased are:

o *Combinatorial optimisation,*
o *AI and machine learning*,
o *Analytics,*
o *Soft OR and problem structuring methods,*
o *Sustainable development goals,*
o *Systems thinking,*
o *Healthcare,*
o *OR Research,*
o *Simulation*,
o Many more topics!

Our *Webinar Wednesday* on March 30, 2022, was by *Ian Seath* who is an independent consultant and Director of Improvement Skills Consulting Ltd. He works with clients in the private, public, and voluntary sectors and specialises in process improvement, project management and performance management. You can join upcoming Webinar Wednesdays here.

▲ *Photograph from Analytics Summit 2019.*

Analytics Summit 2022 - *Hybrid Event*
The Annual *Analytics Summit* on Tuesday 5th July 2022 brings together over 300 analysts and data scientists from across the academic, public, and private sector for insight, discussions, and networking. This event provides the skills and tools to drive unique business results with your data, as well as to provide you with the latest developments affecting *analytics*, *OR* and *AI*.

Additionally, to a range of talks from speakers throughout the day, there are several practical workshops which delegates can engage and network in with their peers, senior managers, and consultants.

The speakers will include but not be limited to, *Alex Mahon*, Head of Analytics at UK Power Network, *Dr Harvey Lewis*, Associate Partner and Chief Data Scientist at Ernst & Young LLP, and *David Foster*, Co-founder Data Applied Science.

You can sign up to the event now or apply to be an Exhibitor or Sponsor at the event by clicking here.

OR64 Annual Conference - *Face to face event*

Our *annual conference* will be taking place between Tuesday 13th - Thursday 15th September at University of Warwick, after two successful years hosting the conference within online platforms, the conference will be returning to a full face to face format with an on-demand option following the conference too.

The annual conference brings together delegates both across the world and from different areas of *OR*. The theme for this year's annual conference is *"OR for a better world together"* which will be introduced through all the plenary speaker sessions. The following plenary speakers will be in attendance during the conference:

- *Professor Dick Den Hertog*, the Science-to-Impact Director of the Analytics for a Better World Institute,
- *Dame Julia Moore*, the former Chief Executive of University Hospitals Birmingham NHS Foundation Trust,
- *Dr Dan McGonigle*, Head of Systems, Innovation and Futures in the Department for Environment, Food and Rural Affairs (DEFRA),
- *Dr Betty Schirrmeister*, Head of Data Science at Royal Mail.

There are a range of different delegate packages available, and we are also welcoming potential sponsors and exhibitors who would like to extend their profile within the *Operational Research* sector. You can find out further information to register for the conference or view sponsorship and exhibitor packages here.

▲ *Photograph from OR61 Annual Conference, 2019.*

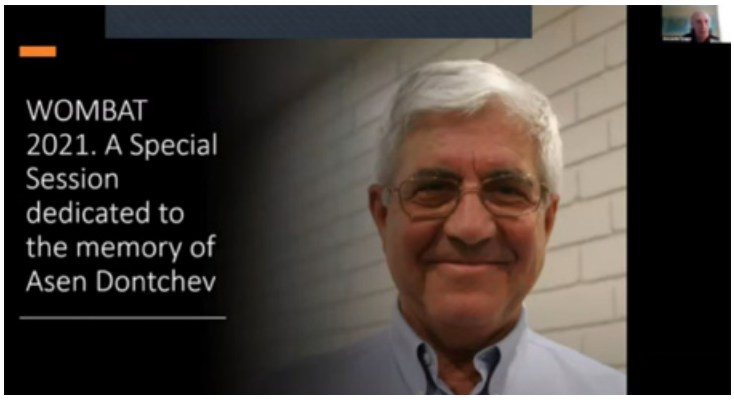
You can get in touch with the *ORS* team today to find out further details about our events, membership, training, or partnership opportunities by emailing event.enquiry@theorsociety.com.

WOMBAT 2021: Celebrating Optimization and OR in Australia and Worldwide

Alexander Kruger <akrugeremail@gmail.com>

Since 2016, *Mathematics of Computation and Optimisation* (*MoCaO*) group of the *Australian Mathematical Society* has been running a series of annual *Workshops on Optimization, Metric Bounds and Transversality* (*WOMBAT*). For those not familiar with Australian fauna, wombat is a cute Australian animal. Although we had originally hoped to get together face-to-face, ongoing travel restrictions meant that for the second year in a row, the workshop was conducted in the fully online mode.

The 6th instalment of the workshop took place December 13-16, 2021. It mostly focused on discussions around several *optimization* and *OR* topics of general interest, led by recognized experts in the field:



▲ *WOMBAT 2021: Memorial session* dedicated to *Prof. Asen Dontchev*.

o *Prof. Javier Peña* (Carnegie Mellon University, USA): Keynote talk *"Perturbed Fenchel duality and first-order methods"*,
o *Prof. Regina Burachik* (University of South Australia): Keynote talk "Generalized Bregman distances" followed by tutorial *"Survey on enlargements: properties, applications and examples"*,
o *Prof. Russell Luke* (University of Göttingen, Germany): Keynote talk *"Structured nonconvex optimization: local and global analysis"* followed by tutorial *"Is my algorithm an almost α-firmly nonexpansive fixed point iteration?"*,
o *Prof. Stephen Wright* (University of Wisconsin, USA): Keynote talk *"Optimization in data science"*,
o *Prof. Joydeep Dutta* (Indian Institute of Technology Kanpur, India): Keynote talk *"Bilevel programming: A personal journey"* followed by tutorial *"Simple bilevel programming and extensions"*.

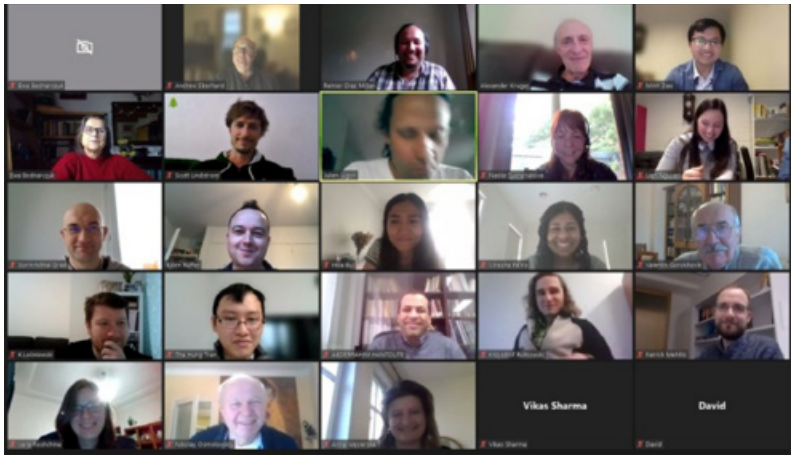
The workshop included a memorial session dedicated to *Prof. Asen Dontchev* who passed away in September 2021. *Asen Dontchev* had been one of the leaders in optimization, variational analysis, and operations research internationally. He had been strongly connected with Australian researchers including some of the organizers of *WOMBAT*. He had participated in the last three *WOMBAT*s, and had been a keynote speaker in 2020 when he had shared with the participants his views on teaching variational analysis at universities, which later formed the foundation of his new book which is going to appear soon in Springer.

Asen's colleagues *Andrew Eberhard* (RMIT University, Australia), *Terry Rockafellar* (University of Washington and University of Florida, USA), *Vladimir Veliov* (Vienna University of Technology, Austria), *Michel Thera* and *Samir Adly* (University of Limoges, France), *Marco Lopez* (University of Alicante, Spain), and *Alexander Kruger* (Federation University Australia) spoke about his contributions to the field and shared their memories of him as a person. >>

>> The participants of the workshop were pleased to have *Asen*'s daughter *Mira* and son *Kiko* as guests at the memorial session and listen to their personal memories.

Altogether, there were 32 keynote and contributed talks presented by researchers from Australia, Europe, Asia and America. The program of the workshop and recordings of all presentations can be accessed at https://wombat.mocao.org/.

The online mode of the workshop was reflected also in a new way of taking conference photos. It was impossible to gather all the participants in a single photo. The next one presents a portion of the participants in one of the sessions.



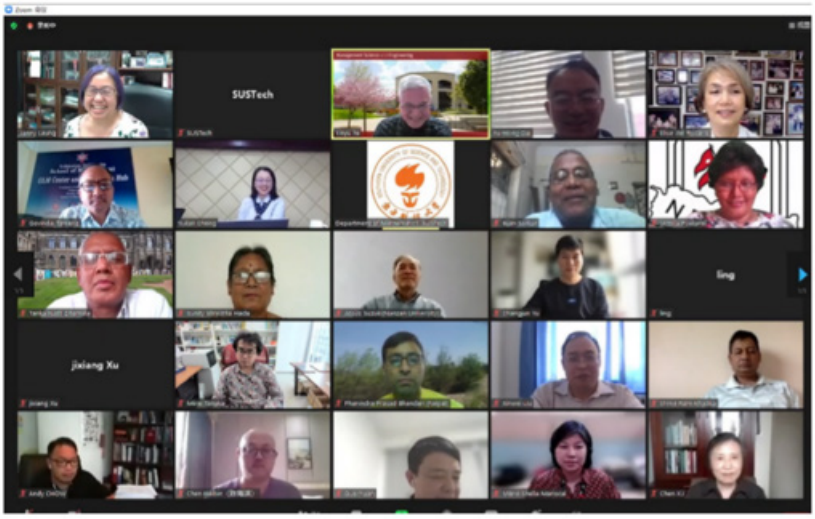
▲ *WOMBAT 2021:* a conference photo.

Workshop organizers were *Nadia Sukhorukova* (Swinburne University of Technology), *Minh Dao* and *Alexander Kruger* (Federation University Australia), *Reinier Díaz Millán* and *Julien Ugon* (Deakin University), *Andrew Eberhard* (RMIT University), *Nam Ho-Nguyen* (The University of Sydney), *Vera Roshchina* (UNSW Sydney), and *Björn Rüffer* (The University of Newcastle).

The First APORS Youth Forum (virtual) held successfully

Yukun Cheng <ykcheng@amss.ac.cn>, **Jin Zhang** <zhangj9@sustech.edu.cn>**, Changjun Yu** <yuchangjun@126.com>

To strengthen communications among the 12 member societies of *APORS* (Australia, China, Hong Kong, India, Iran, Japan, Korea, Malaysia, Nepal, New Zealand, Philippines, and Singapore), especially under the shadows of COVID-19, an all-*APORS* virtual conference, called the *First APORS Youth Forum*, in which all 12 member societies of *APORS* participated, was proposed by *Prof. Yu-Hong Dai*, from the Chinese Academy of Sciences, soon after he took his position as the *APORS* president (2022-2024). The proposal was immediately welcomed and responded by all the *APORS* members and an academic committee was formed with presidents of the 12 societies. An organizing committee was established, with *Prof. Govinda Tamang* as a chair, who serves as the general secretary of *APORS* and the president of *OR Society of Nepal*. The two-day virtual conference of the *First APORS Youth Forum* was held on April 26 and 27, 2022. *Janny Leung* and *Elise del Rosario*, the current president and ex-president of *IFORS*, were also deeply involved in this conference.



▲ Welcome to the *First APORS Youth Forum*!

The event provided an opportunity for young *OR* researchers invited by each member societies to showcase their academic achievements and frontier progress. Meanwhile, 4 prominent professors as *keynote speakers* were also invited. They are: P*rof. Yinyu Ye*, Stanford University, USA, giving a lecture on *online linear programming - applications and extensions*; *Prof. Atsuo Suzuki*, Nanzan University, Japan, presenting scheduling program in healthcare; *Prof. Chung Piaw Teo*, National University of Singapore, Singapore, giving a presentation on *science of prescriptive analytics – integrating model with data for better decisions*; and *Prof. Tamás Terlaky*, Lehigh University, USA, *presenting quantum computing and optimization - opportunities, challenges, and perspectives*. The invited young speakers from 12 *APORS* member societies presented their work in 4 sessions with topics on continuous and discrete optimization, along with applications using operational research methods to solve practical problems, especially in modeling strategies for logistics, healthcare, and COVID-19 pandemic.

The two-day forum opened with the welcome speeches by *Janny Leung* and *Elise del Rosario*, the current president and ex-president of *IFORS*. They first congratulated a successful opening of the virtual conference that brought together all the *APORS* members, and then delivered heartful greetings to all the invited speakers and audiences. *Elise*, as the past president of *Operations Research Society of the Philippines*, also shared her experiences in organizing the young scholar forum event during the *APORS 2006* Conference. She hoped this forum to be a continuous program to help more young scholars get involved in the activities of *OR* communities worldwide. In the opening ceremony, the APORS president *Yu-Hong Dai* also thanked all the member societies for their support and involvement. As one of the *APORS* leaders, he hoped for more frequent and high-standard exchange events during his term.

In the closing ceremony, *Francis Miranda* (*IFORS* vice president for *APORS*), *Nezam Mahdavi-Amiri* (vice president of *APORS*), *Govinda Tamang* (general secretary of *APORS*), and *Guochuan Zhang* (organizing committee co-chair from *ORSC*) summarized the *First APORS Youth Forum* as a successful one thanks to the strong support from member societies of *APORS*. The upcoming *APORS* triennial conference in November 2022 in Cebu Philippines and December 2024 in China will warmly welcome all *OR* researchers from both academia and industry.

The virtual conference was scheduled carefully by considering speakers' time zones. A technical supporting team from the *Operations Research Society of China*, led by *Prof. Yukun Cheng* from Suzhou University of Science and Technology, who was also an invited young speaker, *Prof. Jin Zhang* from Southern University of Science and Technology, and *Changjun Yu* from Shanghai University, helped to invite speakers, schedule the conference, arrange for ZOOM and live broadcast services, and ensure the smooth running of the sessions.

About 1300 people attended the forum through ZOOM meeting or watched the live streams on *koushare.com* and *youtube.com*. The 12 member societies would like to give many thanks to the above keynote speakers and the following invited young speakers, who and whose talks are listed below:

o *Mirai Tanaka*, the Institute of Statistical Mathematics, Japan: *"A gradient method for multilevel optimization"*,
o *Yukun Cheng*, Suzhou University of Science and Technology, China: *"Incentive study on strategic behaviors in resource sharing on P2P networks"*,
o *Andy Chow*, City University of Hong Kong, HK China: *"Dynamic transport system operations with reinforcement learning"*,
o *Zati Aqmar Zaharudin*, Universiti Teknologi MARA, Malaysia: *"A reverse logistics of sustainable household solid waste management-an overview, challenges, and current works"*,
o *Phanindra Prasad Bhandari*, Khwopa Engineering College, Nepal: *"Network contraflow problem with intermediate storage capability - evacuation planning perspective"*,
o *Sandeep R. B.*, IIT Dharwad, India: *"Subgraph Complementation of graphs"*,
o *Mazyar Zarepour*, University of Auckland, New Zealand: *"Districting decisions in (home) health care strategic planning"*,
o *Drew Mitchell*, Monash University, Australia: *"Generation, storage and transmission expansion planning using benders decomposition"*,
o *Jaeyeon Jang*, Catholic University of Korea, Korea: *"A deep multitask learning model for detecting unknown patterns of wafer bin maps"*,
o *Erfan Babaee Tirkolaee*, Istinye University, Turkey: *"Sustainable fuzzy multi-trip location-routing problem for medical waste management during the COVID-19 outbreak"*,
o *Destiny S. Lutero*, University of the Philippines Los Banos, Philippines: *"Mathematical modeling studies of COVID-19 in the Philippines"*,
o *Aldy Gunawan*, Singapore Management University, Singapore: "*Orienteering problem - a survey of recent variants, solution approaches and applications"*.

ALIO/EURO Jointly Celebrate Applied Combinatorial Optimization in Viña del Mar, Chile

Eduardo Moreno <eduardo.moreno@uai.cl>

▲ Group photo from wonderful days of *X^th ALIO/EURO* in Viña del Mar.

The *Joint ALIO/EURO International Conference on Applied Combinatorial Optimization* series is a triennial event jointly promoted by the *Association of Latin-Iberoamerican Operational Research Societies* (*ALIO*) and the *Association of European Operational Research Societies* (*EURO*). The main purpose of the event is to bring together Latin American and European researchers (together with researchers from other parts of the world) and to stimulate activities and developments in the field of applied combinatorial optimization.

Following the tradition, the locations of this conference alternate between Latin America and Europe. The *X^th ALIO/EURO* was held in Viña del Mar, Chile, from April 11 to April 13, 2022. The conference was originally scheduled for 2021, but was postponed to 2022 due to the COVID pandemic. The conference took place in a hybrid format, with both in-person and virtual attendees, thus allowing for a safe environment in which all interested researchers and students could participate. A total of 25 people coming from 11 countries attended the conference in person, whereas 80 people from 17 countries attended virtually.

The conference accepted both short papers and extended abstracts. A total of 60 works were accepted by a program committee consisting of 46 researchers from 13 countries. The conference also featured three invited speakers: *Dr Javiera Barrera* (Universidad Adolfo Ibáñez, Chile), *Dr Markus Leitner* (School of Business and Economics, VU Amsterdam), and *Dr Nicolás Stier Moses* (Facebook Core Data Science). Short papers have been published in OpenProceedings.org (an open access publication). For more information about the conference, please visit https://alioeuro2021.cl.

There will be a Feature Cluster at the European Journal of Operational Research dedicated to the conference topics. We invite every participant to submit a full paper corresponding to his/her presentation. Other submissions in topics related to the conference are also welcome. Submissions will be open until August 5, 2022.

Book Review

"Business Analytics -Descriptive, Predictive, Prescriptive"

by Jeffrey D. Camm, James J. Cochran, Michael J. Fry, Jeffrey W. Ohlmann,

Cengage Learning, Boston, MA 02210, USA,
ISBN-978-0-357-13178-7, ISBN 10: 0357131797 / ISBN 13: 9780357131794

OR-Analytics for Businesses of Tomorrow

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

Given the current dynamic yet paradoxically uncertain business environments, business decision making poses quite a challenge. The COVID19 outbreak is a case-in-point. Availability of massive data accompanied with fast-paced technological advances, an upsurge of improvements in analytic methodologies, significant rise in the computational power and improved storage capability of systems have simplified business decision making on one side but have increased its complexity on the other. Thus, *analytics* has emerged as a powerful tool for business decision makers. This work comes at just the right time and is very topical, it is very valuable, beautiful and forward-looking.

Business analytics is the scientific process of transforming data into insight for making better decisions[1]. Spanning across all functional areas of businesses - Operations, Supply chain, Marketing, Finance, HR, etc., business analytics is concerned with data-driven approaches and applications to every field of business decision making. This book provides a sound understanding of the role that business analytics plays in the decision-making process by vividly describing the business analytic concepts through a variety of applications. Each chapter (except Chapter 1) has been entwined with *"Analytics in Action"* vignettes that demonstrate solution of real-world problems faced by real organizations.

The book comprises of three broad categories of business analytic techniques viz. - descriptive, predictive, and prescriptive as shown in the following table adopted from the book.

Chapters 1 and 10 cover introduction and application of all the three categories respectively. Chapters 2 through 6 cover descriptive, 7 through 9 and 11 predictive; and 11 through 15 cover prescriptive analytics respectively.

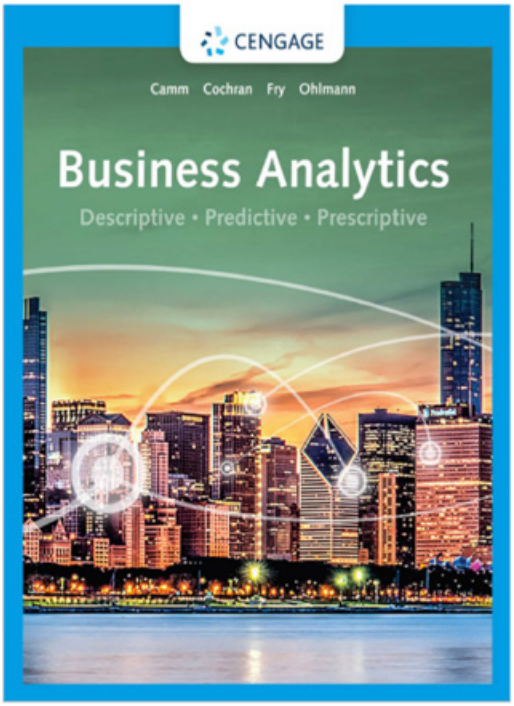
Chapter 1 presents an overview of business analytics and the authors' approach to the material covered in the textbook. It starts with a discussion on the complexity of business decision making to defining business analytics to categorization of analytical methods and models followed by a discussion on *big data* to deliberating on various application areas of business analytics, viz Finance, Human resource, Marketing, Health care, Supply chains, Government and Non-profit organizations, Sports and Web analytics. It concludes with a discussion on various legal and ethical issues regarding data usage, sharing and privacy. *Chapters 2-6* lucidly cover the concepts of *descriptive analytics* by discussing models used for summarizing, visualizing and understanding historical data. >>

TABLE 1.1 Coverage of Business Analytics Topics in This Text

Chapter	Title	Descriptive	Predictive	Prescriptive
1	Introduction	●	●	●
2	Descriptive Statistics	●		
3	Data Visualization	●		
4	Probability: An Introduction to Modeling Uncertainty	●		
5	Descriptive Data Mining	●		
6	Statistical Inference	●		
7	Linear Regression		●	
8	Time Series and Forecasting		●	
9	Predictive Data Mining		●	
10	Spreadsheet Models	●	●	●
11	Monte Carlo Simulation		●	●
12	Linear Optimization Models			●
13	Integer Linear Optimization Models			●
14	Nonlinear Optimization Models			●
15	Decision Analysis			●

▲ *Applied OR-Analytics* for businesses of tomorrow
(Source: Business Analytics, 4E, *Camm*, *Cochran*, *Fry*, *Ohlmann*, Cengage Learning).

>> *Chapters 7-9* expose the readers to concepts and applications of *predictive analytics* through methods that can be used for gaining insights from historical data and their usage for predicting possible future outcomes. While *Chapters 11-15* exhibit applications of *prescriptive analytics* that pertaining to diverse decision-making situations, *Chapter 11* adroitly discusses the concept of uncertainty through Monte Carlo simulation and its analyses through spreadsheet models. *Chapters 12-14* discuss *optimization models* which play a pivotal role in selection of the best decision alternative/s based on the available data. *Chapter 15* provides an overview of various *decision analysis* approaches in situations involving uncertainty and risk. *Chapter 10* deftly encompasses the use of spreadsheets for examining data and building decision models for all the three categories of analytic techniques.



The authors of the book have skilfully illustrated the application of appropriate business analytic tools like Microsoft Excel, Microsoft Access, R (an exceptionally popular open-source software), Rattle (a library package providing a graphical user interface for R), JMP Pro and Tableau. Whereas *Chapters 1-9* introduce the use of *RStudio*, *JMP Pro* and *Rattle for data mining*, *Chapters 2-3* demonstrate the use of *Tableau* as a powerful data *visualization* software. While *spreadsheet modelling* through *Microsoft Excel* has been meticulously integrated throughout the textbook, *Chapters 10-15* focus on applications of spreadsheets to analytics for improved decision making in particular. All the chapters that require the use of software have been supported by *DATAfiles* and *MODELfiles* to develop a better understanding of the importance and application of these tools to complex business decision-making situations.

Each chapter familiarizes the readers with the difficulty level, varied nature and versatility of the problems faced in business decision making by appended cases and problems.

Due care has been taken by the authors to ensure that the book proves to be an enriching resource for the readers who have or have not had a prior exposure to statistical methods.

This book is very well suited for everyone who either wants to learn or has a keen interest in applied business analytics, as for practitioners and researchers interested in its *OR*- and optimization-based approaches. This can also be a hands-on reference book for experts of *business analytics*.

This book justifies the role that *OR* has been playing, i.e. - being an interface between academia and practice to what *OR* practitioners actually do - apply analytics[2] . The book also aptly describes the future role of *OR* in terms of *a. amalgamation of OR and analytics*, and *b. its importance as a critical tool for business decision making as we advance into an era of exponential availability of data*.

▲ *Coauthors on clustering-analytics* (from left to right): *Jeffrey D. Camm, James J. Cochran, Michael J. Fry, Jeffrey W. Ohlmann.*

As *OR* continues its service to industrial, environmental, life and space-sciences, developmental and societal applications and humanity, further research extensions and advancements in theory, methods and applications could be provided by the authors and the academic and practical communities of *OR-analytics* in these and other novel and emerging *OR* areas like neuroscience, computational biology, bioinformatics and medicine, healthcare, *OR* for development and developing countries, *OR* ethics and societal complexity, etc., for the advancement of humanity.

Report on the IFORS Webinar "OR and the Pandemic"

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

Until 3 years ago, the word "pandemic" only stirred images of the past, like the Spanish flu of 1918-1920, or the medieval plagues from faraway times. Now, all over the world, we have experienced what it means to live during a pandemic. By developing vaccines, science has saved us from the most severe consequences, nonetheless, the impact of COVID19 has been huge, and will remain so in the coming years. While OR is not a medical profession, we do deal with scarce resources, and decision making under uncertainty. Policy makers have been forced to make far-reaching decisions, and in our community, all over the globe, many many colleagues have been applying our tools to covid19-caused situations in order to assist making these decisions. On May 4, 2022 IFORS organized a Global Webinar on this topic, and invited four operations researchers who are deeply involved in with this increased use of analytics. The webinar, hosted by IFORS President Janny Leung and moderated by Vice President Frits Spieksma, had as presenters and panelists:

(i) **Sheldon Jacobson from the University of Illinois (Urbana-Champaign, USA)**. Sheldon presented work on the number of excess deaths in the USA over the period that the pandemic unfolded. A detailed study of these statistics provides revealing information on a number of issues, and allows to debunk particular myths. The impact of different measures also shows up in excess deaths, allowing one to study the impact and the effectiveness of these measures.

(ii) **Ger Koole from the Free University of Amsterdam (the Netherlands)**. His presentation targeted the situation in the Netherlands, and described how occupancy rates can be predicted by carefully analyzing arrival rates (based on historical data) and residence times. These predictions were then used to allocate patients in order to balance the load over hospitals. Their work continues to be used by the government.

(iii) **Denis Sauré from the University of Chile (Santiago, Chile)**. He presented work that was awarded the Franz Edelman award, a collective effort of many institutions and people in Chile to combat COVID 19. Many detailed and interesting facts came out such as the ability to abide by protocols depends on income, and the high booster percentage in Chile as a result of the government's efforts.

(iv) **Adibah Shuib from the Technical University of Malaysia (Malayasia)**. She presented a model whose goal is to determine the location of ambulance stations, and the number of ambulances at each station in order to maximize coverage. For various scenarios, it is shown that there is an increased accessibility.

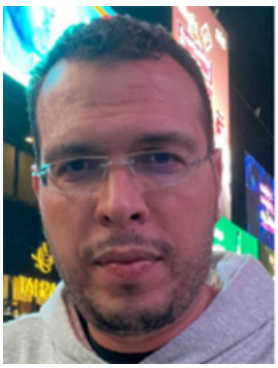
The seventy participants in the Webinar then posed questions and made observations that gave rise to engaging discussions on all various aspects of the pandemic, and to what extent societies are prepared for upcoming unforeseen events. The webinar, like all IFORS Global Webinars, is available free of charge at https://www.ifors.org/ifors-global-webinar-series/

AFROS new Executive Committee

Dave Evans (President of AFROS) <davevans@gmail.com>
Sue Merchant (AFROS' Action Manager) <suemerchant@hotmail.com>

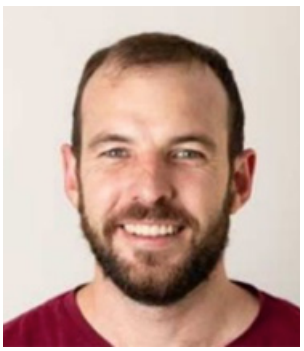

Dave Evans


Hatem Masri


Youssef Masmoudi


Serigne Gueye


Phillips Obasahon


Bernie Lindner


Taicir Loukil


Fouad Abdelaziz


Jules Degila


Rose Karimi


Gituro Wainana

At AFROS' AGM at the end of November 2021 elections were held for the positions listed below. The outgoing President, Professor Hatem Masri thanked all the outgoing members for their hard work, particularly Bernie Lindner (the Secretary) and those who had put themselves forward for election. He congratulated the successful candidates for their determination to help take AFROS further towards its vision of 'being recognized as the main contributor in Africa for promoting OR for the benefit of African Countries'. (*See www.afrosocieties.org for further info.*)

Hatem was thanked for his inspirational leadership over the last few years, which had resulted in the setting up of many vibrant chapters and working groups across the continent, and Dave Evans from South Africa was congratulated on becoming AFROS' 3rd President from January 2022.

President ORSSA: **Dave Evans** (South Africa)
Past President: **Hatem Masri** (Tunisia)
Secretary and Treasurer: **Youssef Masmoudi** (Tunisia)
Database Manager, Webmaster and Public Relations Manager: **Serigne Gueye** (Senegal)
Representative of each full member society: (**Phillips Obasahon** (INFORN, Nigeria); **Bernie Lindner** (ORSSA, South Africa); **Taicir Louikil** (TORS, Tunisia)
Representative from associate members: (**Fouad Abdelaziz**, TDAS).
Representative from chapters: **Jules Degila** (Benin)
Representative from working groups: **Rose Karimi** (Kenya)
Representative from regional alliances: **Gituro Wainana** (ORSEA)

Dave Evans said that he was delighted to be chosen to take AFROS further towards its goal and to be working with such an enthusiastic group of OR people, though Hatem would be a hard act to follow.

He hopes to be able to expand the Federation's Societies' and Chapters' membership. Committee members wished him every success in his role.

IFORS Prize for OR in Development 2023

Mario Guajardo <Mario.Guajardo@nhh.no>, **Francis Miranda** <franzmiranda@yahoo.com>

IFORS is pleased to announce that the long-standing IFORS Prize in OR for Development will be awarded again during its 23rd triennial conference to be held in Santiago, Chile, on 10-14 July 2023. The competition aims at promoting the practice of OR for development in developing economy countries and economies in transitions. Past winners and finalists include works that have improved health, wellness, education, public investments and other issues in Africa, Asia and Latin America. The submission process will consist of two stages, where the first requires a short summary. For the selected entries after the first stage, the second stage requires an extended paper. More details given below.

• **First stage.** Entries should be submitted by email to the Chair of Judges by **24th October 2022**. Each entry should comprise a maximum 5 page summary of the work specifying title, authors and affiliations, and including the following sections: (i) *Context/Problem description*; (ii) *Methodology/ Solution approach*; (iii) *Results/Impact*; (iv) *Timeline* (when the project started, when the solution was implemented, how long it has been used, eventual future plans); (v) *Involvement of local researchers* (specifying the geographical region of the application if it has not been specified in previous sections); (vi) *Others*, if the authors would like to highlight something else, and a list of *References* if citations have been used through the text.

A verification/support letter from the client (i.e. the organization(s) benefitting from the work) is strongly appreciated and may be required, as well as other means of verification, during the evaluation process if not included in the submission.

It is expected that, to a large extent, the work must have been conducted after 1st October 2019 (deadline of the previous competition).

Submission format: pdf file, 11-point font text, A4 paper size, standard margins. Title, authors and affiliations can be specified in a cover page, so the 5 page limit applies only to the content of the following sections. 9-point font can be used for references and captions.

• **Initial Evaluation.** The evaluation of the entries will be carried out by an international panel of jury members, and entrants are expected to be notified of the outcome by middle/late November 2022. The evaluation will be based on the following criteria: problem definition, creativity and appropriateness of approach, MS/OR/Analytics content, stress on developmental issues, extent of involvement of local researchers, and impact.

• **Second stage.** Entrants selected by the jury in the *Initial evaluation* will be invited to submit, by **19th December 2022**, a full-length manuscript of up to 25 pages describing their work in more detail. This may be based upon other reports or articles previously submitted or published but must include, at least, content about topics (i)-(vi) specified in the summary submitted for the first stage. Where appropriate, the relevance of the country's state of development to the study should be addressed. Manuscripts will be evaluated based on the criteria used in the *Initial evaluation*, as well as the manuscript organization and structure and quality of writing. A stress on developmental issues will be an important factor in the judging. Manuscripts of a purely technical nature, or those which have no relevance in the developmental context, will not be of interest.

Submission format: pdf file, 11-point font text, A4 paper size, standard margins. 9-point font can be used for references and captions.

• **Selection of finalists.** The panel is expected to complete the evaluation of manuscripts and select the finalists by late January 2023.

• **Final stage.** Finalists will present their work in a special session of the competition at the next IFORS Triennial conference (Santiago, Chile, July 10-14, 2023). The winner and runner-up will be selected based on the previous stages and their oral presentation. At least one author of each finalist team is expected to attend the IFORS conference banquet to receive their prizes.

• **Dissemination.** Abstracts of all finalist works, and a note about the winning work, will be published in the IFORS Newsletter. Material about the finalist works might also be uploaded to the IFORS' website. The presentations at the IFORS Triennial conference might be recorded and promoted in the IFORS website or other dissemination channels. At any point of the competition, entries describing novel contributions will be encouraged to submit a full-length manuscript to the IFORS' journals *International Transactions in Operational Research* (ITOR) or *Sustainability Analytics and Modeling*, although this will not be a requirement to participate in the competition.

Inquiries and submissions should be sent by email to the Prize Chair:

Mario Guajardo
Professor at the Department of Business and Management Science,
NHH Norwegian School of Economics, Bergen, Norway.
E-mail: **mario.guajardo@nhh.no**

In your email submission please add in Cc' the email address of the Chair of the IFORS' OR for Development committee, Francis Miranda: **franzmiranda@yahoo.com**

Important Dates

Submission deadline summary (first stage): October 24, 2022
Submission deadline full paper (second stage): December 19, 2022
Finalists will be notified by: January 31, 2023
Date of oral presentation: July 10-14, 2023

Webpage: https://ifors2023.com/prizes

IFORS 2023 Conference

Rafael Epstein <repstein@dii.uchile.cl> **Jorge Vera** <jvera@ing.puc.cl>

IFORS 2023 Organizing Committee Chairs

After more than two long years in which all of us have been affected by the COVID-19 pandemic, with most conferences, as well as other activities, happening online, we are happy to announce that IFORS 2023 will be held in Santiago Chile, from July 10th to July 14th as a fully in-person meeting. The conference will cover the broad spectrum of Operations Research and show the impact of our discipline in many areas, including some connected to the recent pandemic, as well as state of the art methodological developments.

IFORS 2023 will be hosted by the Chilean Institute of Operations Research, together with the Institute of Complex Engineering Systems, with the collaboration of the University of Chile and the Pontifical Catholic University of Chile. The organizing Committee, chaired by Rafael Epstein and Jorge Vera, working closely together with the Program Committee, chaired by Alice Smith, are working hard to organize a very exciting conference, with a strong scientific program as well as taking advantages of all the opportunities that Chile, and its capital, Santiago, has to offer to all attendants.

The meeting will be held in facilities belonging to both universities, with everything within walking distance, in downtown Santiago, with conference rooms of various sizes and all the support that speakers and attendants might need.

Santiago can offer many exciting panoramas to the visitor. A new, state of the art, international terminal was inaugurated early this year at Santiago's airport, making arrival to the city an easy task. Hotel offer in Santiago is vast and many good hotels are in nearby neighborhoods as well as in the Providencia and Las Condes areas of Santiago, which are a short trip away, in subway, from the conference site. Those areas are, also, packed with a diverse restaurant offer for any taste, ranging from traditional Chilean to vegan options.

There is a large cultural offer in Santiago. Significant places in the city are the La Moneda Cultural Center and the Gabriela Mistral Center, across the street from the conference site, both with important rotating exhibits. Attendants will be also able to visit important museums in Santiago like the Pre-Columbian Art Museum, the Museum of Memory and Human Rights, the Fine Arts Museum, as well as "La Chascona", one of the houses of renowned Chilean poet Pablo Neruda.

Although July is winter in Chile, the central region of the country has mild winters, and the conference will organize several tourism opportunities for the "tourist day". Vineyards, the ski centers in the Andes mountains, are within a couple of hours from Santiago. Valparaiso, the port city which is a UNESCO heritage site is also within a couple of hours.

We are assembling a very exciting conference and we expect to see many friends again in person in Santiago, after these long pandemic years. Further information will be available through the conference webpage, ifors2023.com , and mailing lists and social networks.

See you all in Santiago in 2023!

IFORS NEWS Editor in Chief: Antonio Mauttone