IFORS

NEWS

International Federation of Operational Research Societies

From the President

The IFORS Global Webinar Series

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This year is in many ways special, different from any other. On the personal side, we have been worried, about ourselves, our families, our friends. On the professional side, we have been working mostly from home. For some of us working from home has been easy, for some others it has been challenging because of poor connection or because of the need of taking care of children. We have been using the technology for synchronous or asynchronous lectures. We have had meetings with colleagues through one of the several platforms of which we have all become experts. Several webinars have been organized this year to somehow compensate the lack of conferences.

As many others, I have cancelled in the last months several flights. I attended no conference. Meeting colleagues, listening to the results of their research, exchanging ideas and experiences is one of the things I have been missing.

Sadly, we had to postpone to next year the IFORS triennial conference, scheduled for June this year, to which more than 2000 participants had already submitted an abstract. The question we asked ourselves became: what can we offer to the IFORS community this year? Karla Hoffman, responsible for conferences in the IFORS Administrative Committee, came up with the idea of organizing webinars, IFORS webinars. Great idea, Karla. Let us work on it. We developed the idea further and decided to create the IFORS Global Webinar Series, with the intention of connecting our community and getting to know each other better.

What makes the IFORS Global Webinar Series different from other webinars or series of webinars is that each webinar is organized by a regional grouping of operational research societies. In fact, IFORS has four regional groupings: ALIO (the group of societies in Latin America), APORS (the societies in the Asian-Pacific area), EURO (the societies in Europe and Africa), NORAM (the societies in North America). The Vice-President that represents a regional grouping in the IFORS Administrative Committee is in charge of organizing the webinar that will have the aim of presenting some of the best research carried out in the region. The first IFORS Global Webinar, dedicated to ALIO, took place at the end of July and was very well attended. A success, I dare to say. You will find in this newsletter a report by Rosiane de Freitas. The next will take place in September and the others will follow, one every two months. Keep an eye on the IFORS web site and do not miss this opportunity.

I look forward to seeing you at the IFORS Global Webinars! 🌍

What's Inside

Editorial

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Since the spread of COVID-19 the living style of human being has been changed a lot. The personal and family life has been shrinking to own home and the professional life has been roaming around the laptop where all the meetings and webinars take place. The education system has transformed to online education system and the digital technology has secured its future for the forthcoming generation.

The period of the year has some important news for all of us to share through the newsletter. The big news is the ranking of ITOR- the IFORS publication, and the IFORS Global Webinar which is being organized from July 2020. ALIO started the IFORS Global Webinar with three speakers. This issue includes the report of ALIO webinar. The next IFORS Global Webinar is going to be organized by APORS in September 30, 2020.

This issue includes all the permanent section like OR for development in which the inventory model is used to predict the optimum number of PPE in Brazil Hospital. The article in Tutorial section discusses on the constraint programming. The OR impact section presents the paper that has developed decision support tools for the safe sky over Spain that is called risk management in aviation safety, which has been successfully applied to support the Spanish State Safety Program. The report on conferences clearly reflects the virtual seminars taking places throughout the globe which is the need of today during the corona era.

Although the corona is vigorously growing, on the other hand there is a hope to get the vaccine against corona very soon. We all hope to overcome this situation and may people be leading their lives normal as earlier. Till then stay safe and let us interact through the IFORS Global Webinar series. 🌍

OR for Development Section Editor: **Rosiane Freitas**

Predictive Models for Inventory Management in Hospitals During the COVID-19 Pandemic in Brazil

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Many challenges have arisen from the COVID-19 pandemic, one of them being how hospitals deal with the consumption, purchases, and inventory management of personal protective equipment (PPE). The sudden increase in the rate in which PPEs were used has led some hospitals to stock them in excessive quantities, consequently causing their shortage in others. To find a balance between different hospitals, tools, and models used for healthcare management and demand forecast needed to be reworked.

The PPE availability is one of the main factors limiting the number of patients treated in a hospital and the number of available beds and staff (doctors, nurses, and physiotherapists). In this context, a team of researchers from the Center for Mathematical Sciences Applied to Industry (CeMEAI), a research center located at the Institute of Mathematical and Computer Sciences of the University of São Paulo (ICMC-USP), and professionals from Bionexo, a company specialized in solutions for healthcare management, worked together on a project focused on guaranteeing that hospitals did not lack the PPEs needed to treat the increased number of patients during the pandemic.
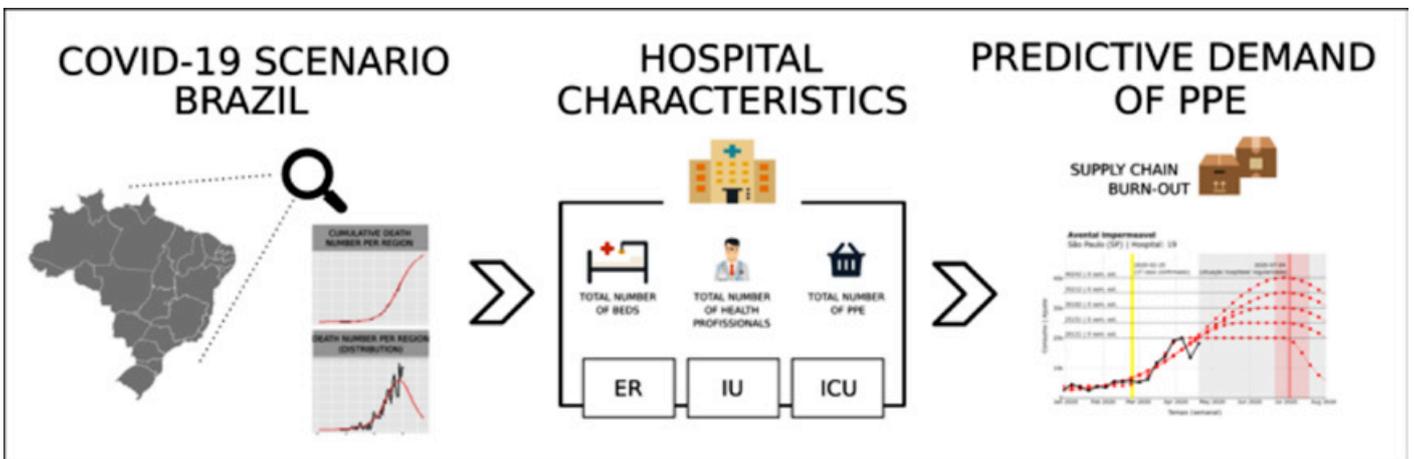
▲ Figure 1: The three main steps of the Safety-Stock system.

This project resulted in the development of the Safety-Stock, an user-friendly system that enables hospitals to predict their PPE consumption through the pandemic period in real-time, serving as support for short term decisions on material acquisition and inventory management. Joining both teams was a crucial step for the success of this project. The researches from CeMEAI provided expertise in several areas, developing predictive models to estimate the demand of each hospital based on the pandemic data form their location, creating formulations to calculate the amount of PPE consumed, processing a large amount of information involved, and embedding this system into an interface available for every hospital in the country. Meanwhile, Bionexo provided knowledge on healthcare management so the model could precisely represent real hospital scenarios, news from the frontline of the pandemic, and real-time data so the model could be fine-tuned for its implementation.
Solution Approach.

Safety-Stock consists of a naive statistical modeling based on growth curves such as logistic and Gompertz models, and it is capable of combining all the information needed for the forecast: historical data of PPE consumption from the hospital, the current protocols for this consumption (e.g., the number of units used per staff member per shift) and epidemiological data regarding COVID-19 from the region where the hospital is located. Figure 1 shows a framework of the Safety-Stock system, highlighting the three main steps of the application: gathering pandemic data from an open-source (https://brasil.io/covid19/), combining with hospital characteristics and using the modeling to predict the demand of each PPE.

As a result, the system provides a forecast of the demand and the consumption of PPE over time, and recommends the hospital the safety stock it should keep during the pandemic period. This forecast is illustrated in Figure 2, which shows the system's output for waterproof aprons in a hospital located in the city of São Paulo. The black line represents the historical consumption of this item, and the red lines are the estimates of consumption given different usage protocols and occupancy rates. Most importantly, the horizontal lines indicate the consumption plateau of PPEs, which are the periods when the hospital operates under its maximum capacity. Moreover, details on the predictive modeling are presented as an output of the tool. Figure 3 shows a forecast for the behavior of the disease in the following period in the city where the hospital is located.
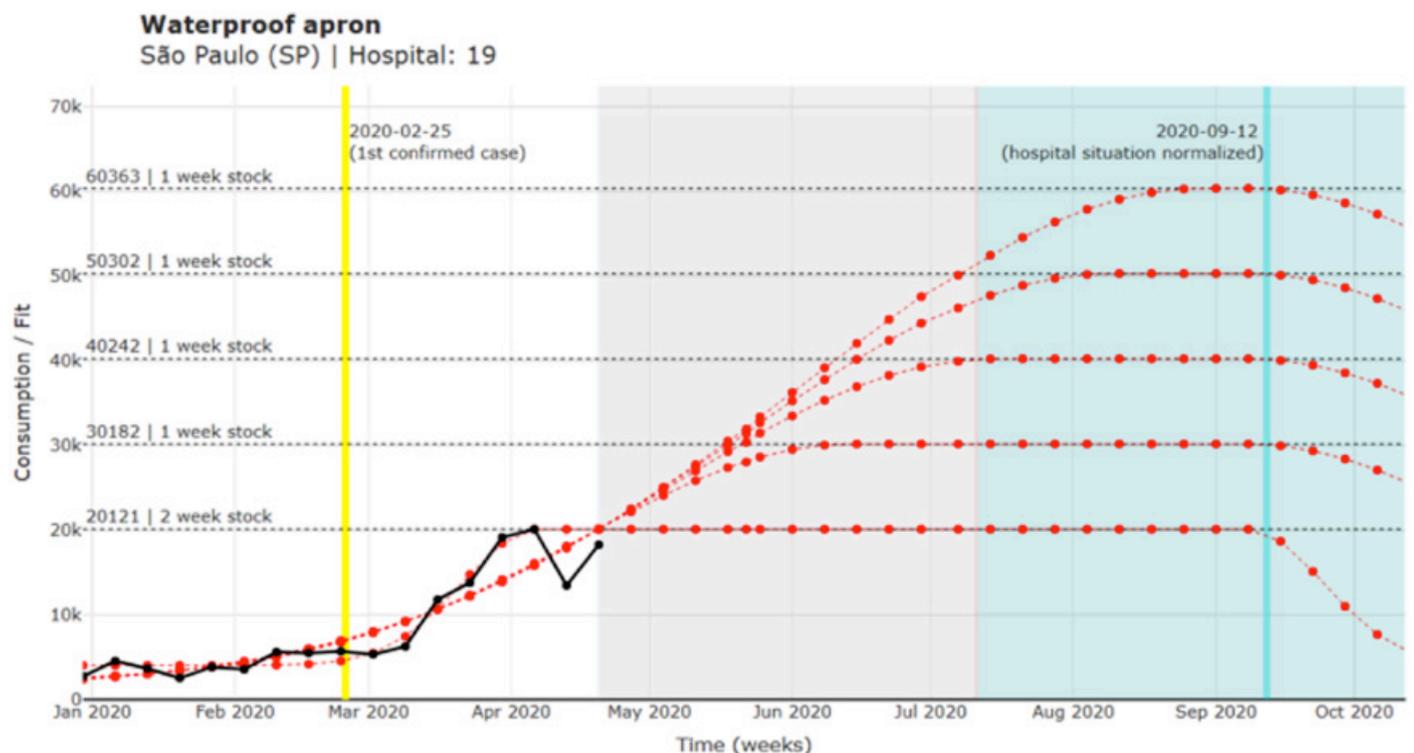
▲ Figure 2: Forecast of PPE consumption given by the Safety-Stock system.

Behavior of the disease with respect to the hospital
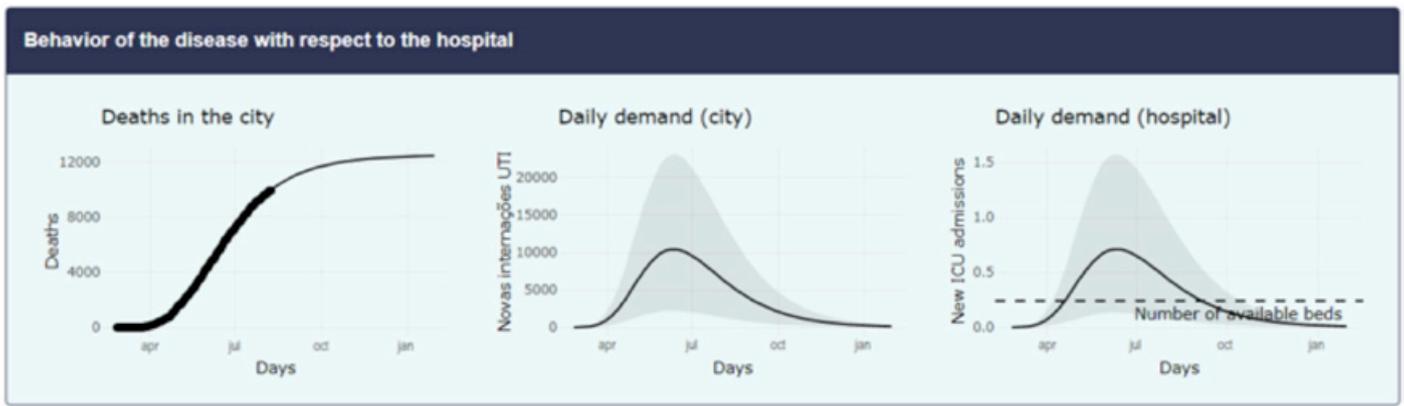
▲ Figure 3: Details on the predictive modelling and a disease behaviour forecast for the next period

This information provides the hospital an overview of their potential short- and medium-term necessities, all based on historical operational data and real-time information regarding the pandemic, allowing the adoption of management strategies focused on keeping the inventory at acceptable levels, mitigating shortage risks and avoiding overstocking.

Conclusions

The Safety-Stock system was launched as a free application aimed at providing information to any Brazilian hospital. The solution was implemented as a Shiny application and is available at https://cemeai.shinyapps.io/bionexo_covid19, with detailed instructions for its use.

This application is linked to Bionexo, and allows for partner hospitals to communicate with the company, informing their need for PPEs or the possibility of exchanging excessive inventory with other partner hospitals. Given this information, Bionexo is able to manage the relocation of PPEs, aiming at maximizing their availability at each and every hospital during the COVID-19 pandemic.

Lastly, this project was published in medRxiv under the name "Safety Stock: Predicting demand on the supply chain in Brazilian hospitals during the COVID-19 pandemic", and can be accessed through the following URL: https://www.medrxiv.org/content/10.1101/2020.05.27.20114330v6. A similar Safety Stock tool is currently being developed for Argentinian hospitals and will be available soon. 🌐

OR Impact

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Safer Skies Over Spain

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Overview Agencia Estatal de Seguridad Aerea (AESA), the Spanish Aviation Safety and Security Agency, applied an innovative risk-analysis methodology and decision support system, developed in partnership with the Spanish Royal Academy of Sciences (RAC), to improve Spain's national aviation safety. The agency used several OR and analytics methods to forecast the likelihood and impact of various types of safety occurrences, enabling management to focus attention and resources where they would be most effective. An example is the use of a nonlinear optimization model which allocates inspection resources. The overall result has been a major improvement in aviation safety and lower costs via reduced aircraft repairs, maintenance, delays, and expenses. The agency estimated annual savings to be about €800m in equivalent safety costs.)

Background The International Civil Aviation Organization (ICAO), an agency within the United Nations, aims to make aviation the safest transportation mode as this is a key factor in attaining sustainable growth of the industry and the global economy at large. However, recent increases in air traffic and increasing competition among airlines, have made maintaining and/or improving current excellent safety levels more complex and difficult. Whilst the coronavirus pandemic has significantly reduced the current level of air traffic, this is expected to grow again in the future.

Aviation worldwide operates at a high safety level; for example, in Europe, the average rate of fatal accidents was just 1.3 per 10 million flights of scheduled passenger and cargo operations over the most recent five years but agencies strive to reduce this rate. The civil aviation system in Spain entails more than 2.5 million aircraft movements (i.e., arrivals and departures) per year across 50 airports, 200 airfields, 44 airlines, 7,000 aircrafts, and more than 40,000 licensed personnel as well as aircraft design and production companies. Thus maintaining and improving safety is a very complex operation with multiple stakeholders.

All countries are required to develop a State Safety Plan (SSP) for civil aviation, which should include national safety objectives and identify all of the stakeholders involved (e.g., authorities, service providers, airports, airlines).

Supporting plans must identify major safety issues and assign a set of actions to mitigate and control the risks associated with them. In turn, each of the involved service providers (e.g., airlines, airports etc) must have a safety management system (SMS), which considers both the objectives and the safety issues identified in the SSPs, to align and contribute to the achievement of such objectives.

Methodology A full account of this pioneering work is given in Reference 1 and further technical details are contained in references 2 and 3.

Until recently, risk management in aviation safety has been based on the use of a risk matrix, which has several acknowledged pitfalls. (reference 4). To overcome these, AESA (the Spanish Aviation Safety and Security Agency) partnered with the Spanish Royal Academy of Sciences (RAC) to develop a more rigorous methodology which would facilitate optimal safety resource scheduling. In turn this would make safety-related occurrences less frequent and, should they occur, less harmful.
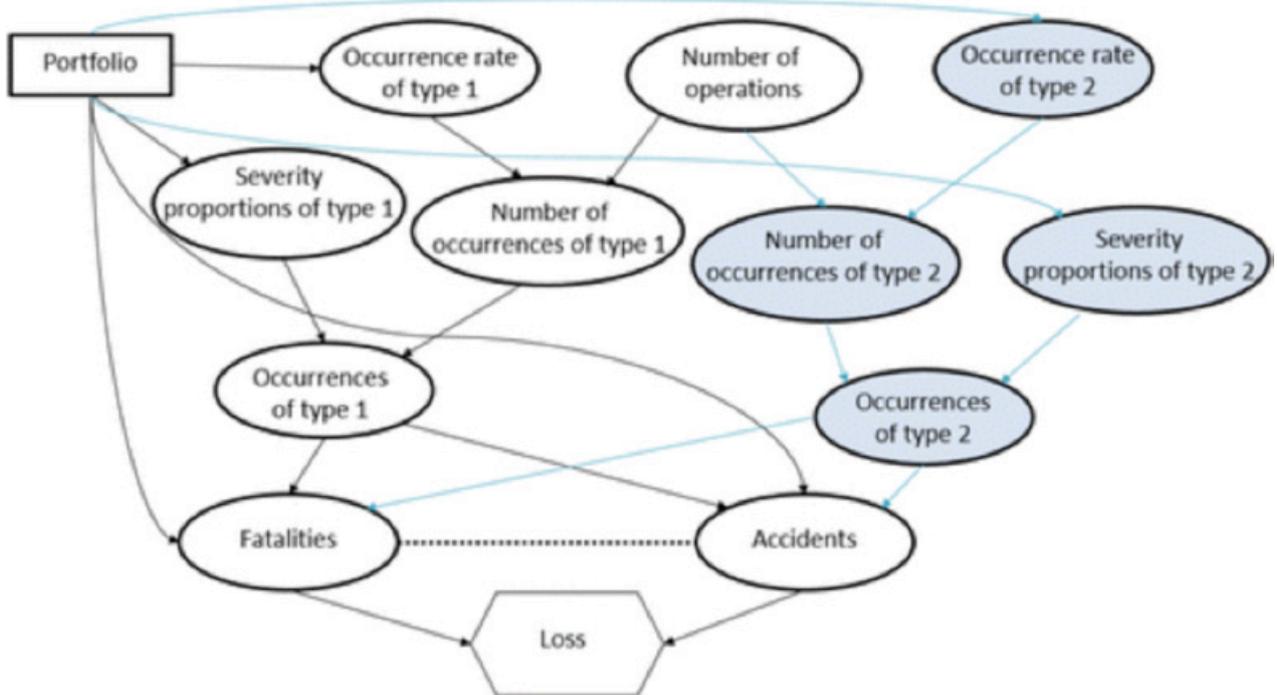
AESA handles **88 types of safety occurrences** (ranging from runway excursions to runway incursions as well as low-altitude operations or ground collisions) of **five levels** of (decreasing) **severity**: (1) accident entailing aircraft destruction or passenger/crew deaths, (2) serious incident, (3) major incident, (4) significant incident, and (5) occurrence without a safety impact. In addition, **four categories of**

▲ Figure 1 Four Examples of Aviation Safety Occurrences: Ground Collision with Vehicle, Evacuation Slide Deployment, Ground Collision with Moving Aircraft, and Bird Strike

aircraft have to be considered. For example, we may talk about a severity 3 engine failure with a category 3 aircraft. Annually, there are about 30,000 safety occurrences and approximately 40 of them are category 1. Some examples are shown in Fig. 1.

The aim of the methodology is to improve continuously safety over Spanish skies, including forecasting the number and severity of occurrences, forecasting their multiple consequences, assessing them, and optimally allocating safety resources for risk-management purposes. In addition, the models developed should be usable for safety monitoring and assessment, incident screening, reporting, and policy simulation. The use of advanced analytics and OR methods and tools underpin the approach.

▲ Figure 2 Influence Diagram for Aviation Safety Risk Management Portfolio (describes the set of actions implemented to improve the system (resource allocations, norms, etc.)
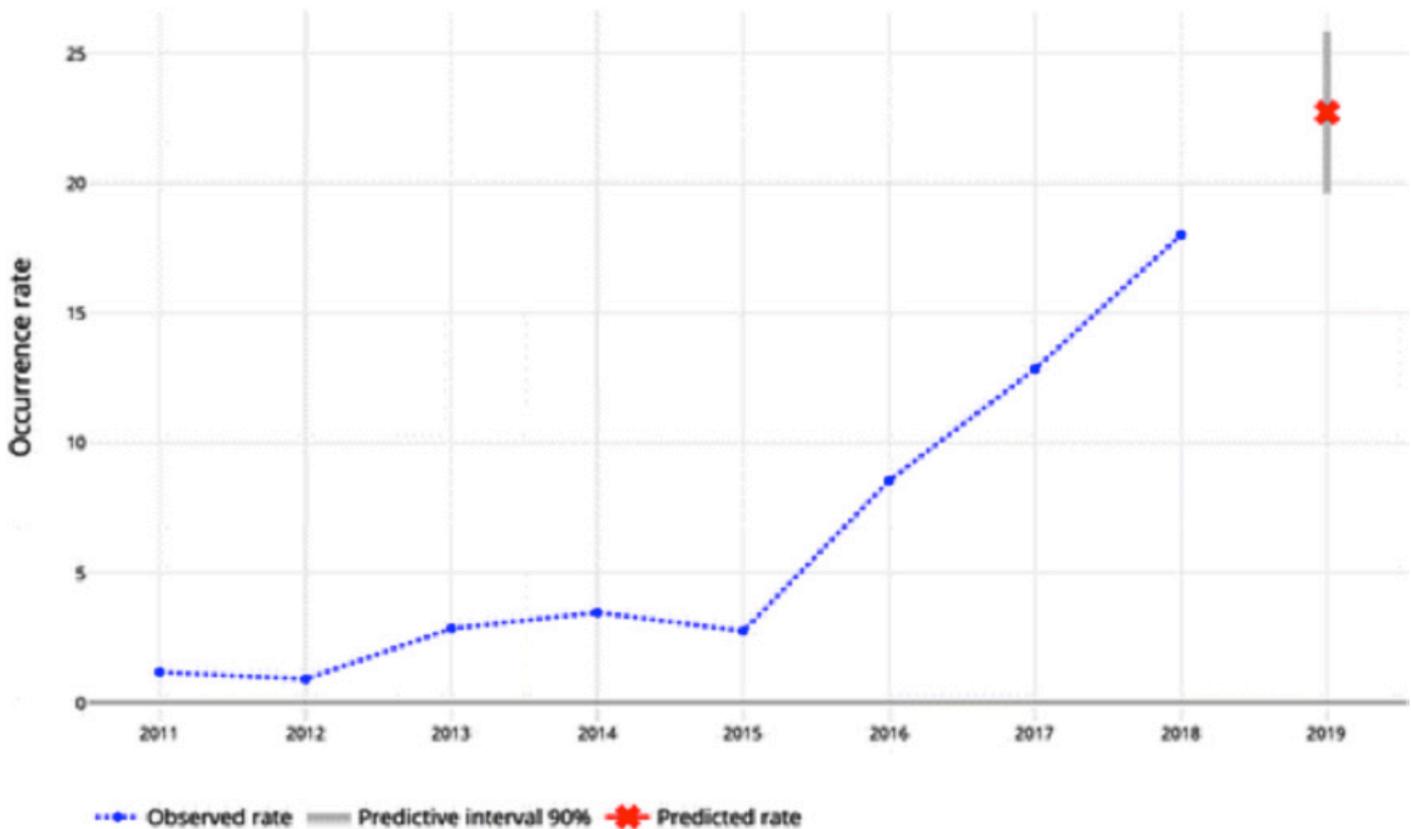
▲ Fig 3 Forecasting of the Annual Occurrence Rate for Occurrence 85

RIMAS: Advanced Analytics for Aviation Safety Risk Management

The methodology used constitutes a breakthrough in aviation safety risk management at the state level, by taking full advantage of the information available and deploying sophisticated analytical tools to develop a State Safety Programme (SSP). The outcome is a decision support tool that we call risk management in aviation safety (RIMAS), which has been successfully applied to support the Spanish SSP.

Prior analysis, including a literature review and brainstorming with senior executives of AESA led to the identification of 8 consequences of aviation safety occurrences:

health impacts (1) fatalities associated with the functioning of the aviation system, (2) minor injuries, and (3) severe injuries.

operational impacts, (4) delays and (5) cancellations.

aircraft impact, (6) maintenance and repair operations and (7) destroyed aircraft

country reputation, (8) loss of image (represented by occurrences of severity 1)

The aim of RIMAS is to find the resource allocation which optimizes national operational aviation safety, thus reducing, as much as possible, the occurrences of various safety types, their severities, and the resulting consequences. The problem is illustrated in Figure 2, which is a generic influence diagram, in which rectangular nodes represent decisions, the hexagonal node is a value node, and circle nodes represent uncertainties. The figure reflects only two of the 88 types of occurrences, labelled here as type 1 (unshaded) and type 2 (shaded).

In essence, this means forecasting the impact of the portfolio of resources deployed (e.g., the inspection plan introduced) over the occurrence rate and severity of the occurrences, as well as their impacts, attaching a loss value to such impacts and, consequently, finding the optimal portfolio. For example, more inspections should identify more potential faults and a safer outcome but the cost-effectiveness will vary between safety categories. Once an AESA inspection policy has been implemented and, given the number of operations (a key forecast), the specific occurrences will determine the corresponding fatalities, minor and severe injuries, resulting accumulated delays, flight cancellations, aircraft destructions, repairs and image loss. By aggregating over all the occurrences, the global impact of the policy can be calculated and evaluated through a loss function. By multiplying each loss by its probability, the expected overall loss value can be calculated. Consequently, the policy that generates minimum expected loss can be found.

The components of RIMAS support:

Forecasting the number of occurrences (eg Fig 3)

Forecasting Severity Types (in the 5 classes)

Forecasting Accident Consequences (using expert judgement)

Estimating the Impact of Resource Allocation (This is a major use of RIMAS and is based on non-linear optimisation. The recommended allocation of resources can then be simulated and compared to alternative allocations determined by current policies. For example, Figure 4 shows that the RIMAS recommended policy has a significantly better outcome compared to the current policy.
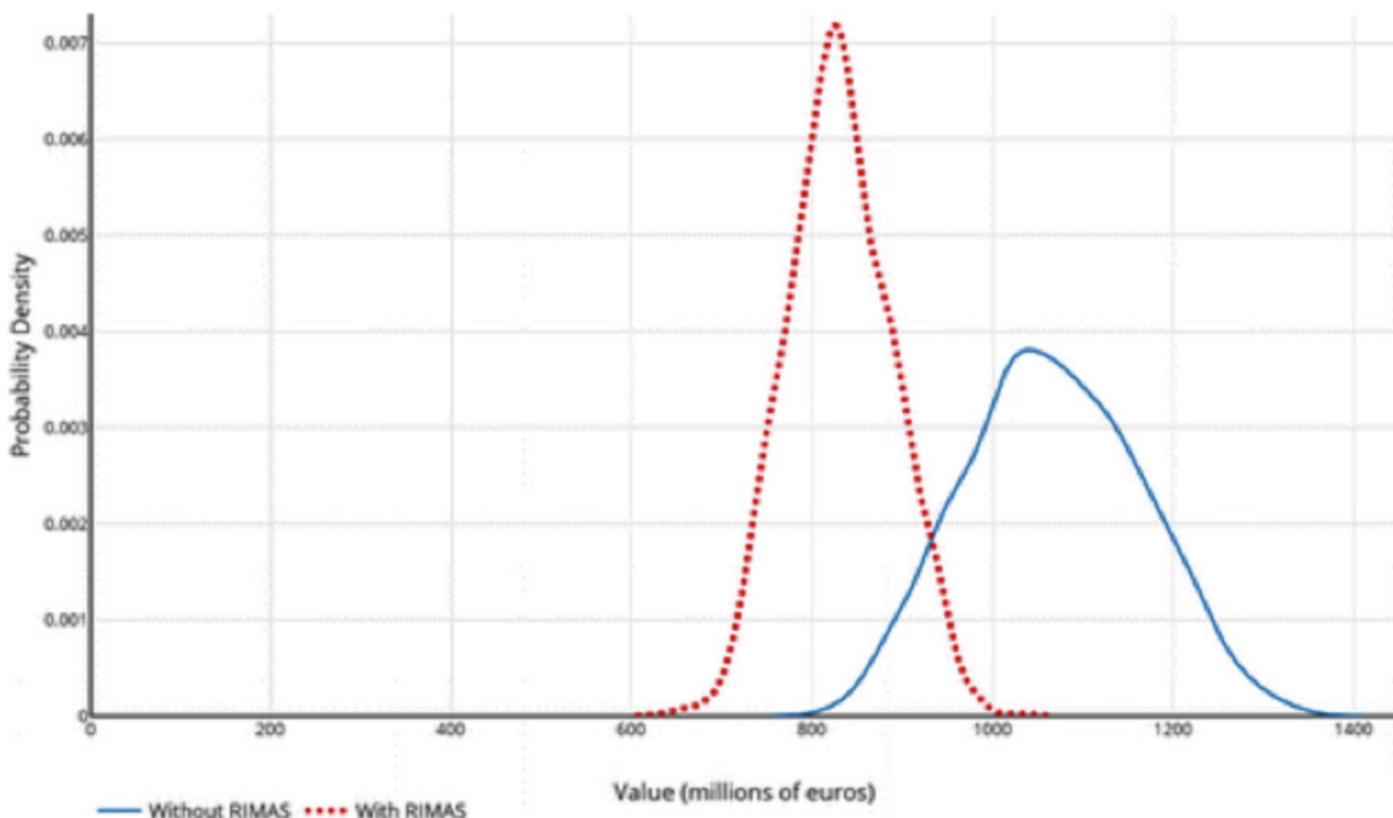
▲ Fig 4 Simulation of Total Loss (in Millions of Euros) with and without RIMAS

The main modules of the RIMAS system are shown in Fig 5 and a sample screenshot is shown in Fig 6.

Implementation of RIMAS

Two major challenges had to be addressed: first, enabling the output of RIMAS to be shared with international organisations: to address this a procedure was developed to transform RIMAS-favoured risk maps to risk matrices; and second, by training engineers, (initially ten) who would be using the system, in the concepts involved. This was achieved by delivering four one-week intensive courses on OR and advanced analytics so they could implement and use RIMAS with reduced external support. Subsequently these engineers have been able to propose and add further improvements to RIMAS and the operations of AESA.

Impact of RIMAS

The potential value from introducing RIMAS was validated by comparing the actual safety results for 2017 based on the recommendations from RIMAS with those that would have resulted by maintaining current policies. The results are given in Table 1, which shows the 95% predictive intervals for each aspect (in numbers of incidents) based on RIMAS and (by then) current policies and the actual outcome. Overall, the Table shows that the use of RIMAS provided significantly improved performance. For example, the actual number of fatalities, 17, was outside the prediction range had we not implemented RIMAS (39, 78) but was within the RIMAS-predicted range of (13, 61). Overall, the predicted ranges with RIMAS were better than

the previous method for all attributes except delays and repairs, which were not as good as RIMAS predicted, but better than with the (by then) policy.

RIMAS was formally introduced by AESA for 2017 and has led to major improvements in aviation safety and lower costs via reduced aircraft repairs, maintenance, delays, and expenses. The agency estimated annual savings to be about €800m in equivalent safety costs. From a more qualitative point of view, through the application of advanced OR and analytics, AESA is now capable of better supporting and documenting its decisions and discussing them more convincingly with the numerous stakeholders, particularly those who need to align their safety management systems with the SSP. This has led to changes in aviation procedures and practices. >>
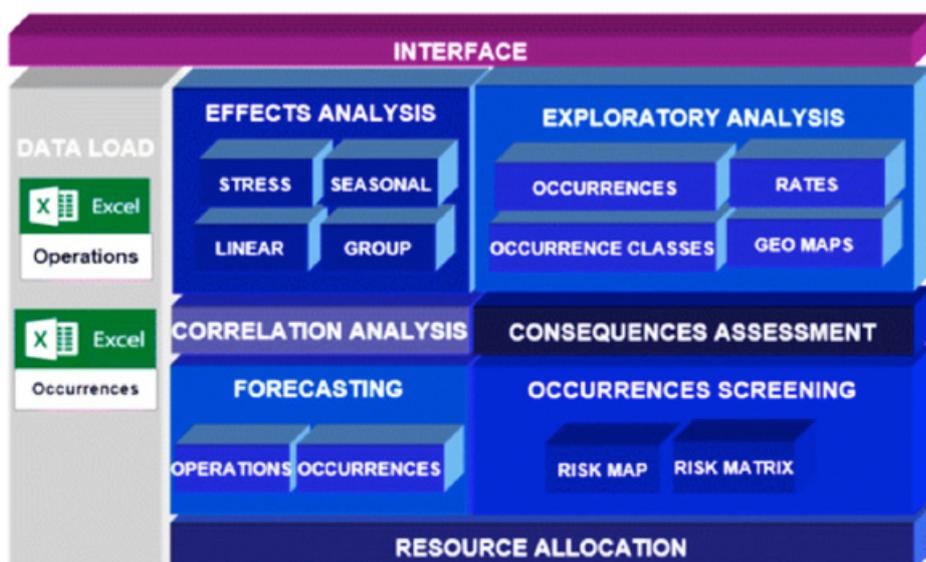
▲ Fig 5 Modules in the Integrated RIMAS Architecture for Risk Management in Aviation Safety

▲ Fig 6 A Sample Screenshot of RIMAS Showing the Monthly Evolution of Global Event Rates over Two Years

Table 1. Predictive Intervals with and Without RIMAS, Actual Observations, and an Assessment of the 2017 Results (Number of Incidents)

Attribute	Unit expected cost	Predictive interval without RIMAS	Probability smaller than observation without RIMAS	Actual	Predictive interval with RIMAS
Fatalities	1.69	[39, 78]	0	17 (6 commercial)	[13, 61]
Severe injuries	1.26	[1, 19]	0.776	9	[1, 14]
Minor injuries	0.43	[1, 24]	0.846	15	[0, 23]
Delays	0.00013	[322,000, 327,000]	0	316,000	[261,085, 272,229]
Cancellations	0.013	[143, 166]	0.363	159	[130, 160]
Repairs	0.012	[3,326, 3,334]	0	3,248	[2,073, 2,088]
Destroyed aircraft	54.18	[14, 21]	0	12	[9, 19]
Accident	0.69	[34, 59]	0.067	34 (16 commercial)	[21, 54]

>> The most important is that service providers, in the framework of their safety management systems, must monitor and put in place measures to control the high-priority risks identified by RIMAS and compiled in the Spanish SSP.

José Luis Lozano, Director of Safety Analysis and Quality Management at AESA commented "RIMAS is a major change in the way that we as State identify and prioritize our aviation safety issues. Our main factor is safety." (see reference 5)

Finally, as RIMAS is open-source it is available for use by other national aviation agencies, and the principles are relevant in other operational risk contexts, such as retail, banking, oil and gas.

This article is published with the kind permission of the editor of INFORMS' Journal on Applied Analytics where a fuller version can be found - see Reference 1. The project was a finalist in the INFORMS Edelman competition in 2019.

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JCR 29/7/20

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Constraint Programming: A Standard Tool for the Operational Researcher

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Abstract

Constraint programming (CP) is a paradigm for solving search problems that arose within the area of artificial intelligence. It has since matured into an independent field with an active research community and a track record of successful real-life applications. Modern solvers come equipped with full-fledged CP capabilities, while many conferences and scientific journals explicitly seek CP-related submissions. In this tutorial, I provide a brief introduction to constraint programming as a valuable resource for the operational research scholar or practitioner.

Constraint programming has attracted increased attention from the operational research (OR) community as a tool for modeling and solving combinatorial optimization problems. It has been used both as a standalone tool and in combination with traditional mathematical programming techniques [4].

Even though CP can handle problems with continuous search spaces, this tutorial will focus on *finite- domain* CP, the subset of CP that is responsible for its most significant and emblematic contributions to the OR community. The interested reader is referred to [2] and [6] for a more comprehensive overview.

A constraint programming problem is defined as a tuple $P = (X,D,C)$, with $X = (x_1,...,x_n)$ being a sequence of decision variables, $D = (D(x_1), . . . , D(x_n))$ encoding the corresponding finite domains of the variables, and C being a set of constraints that must be satisfied by any solution to P. Optimization problems can be expressed in this format via the encoding of an objective function as a special type of constraint. From this general point of view, the CP framework seems similar to that of mathematical programming. The most significant differences between the two approaches reside on the solution process and the type of constraints involved.

The fundamental CP solution strategy consists of an implicit enumeration, with some resemblance to the branch-and-bound (B&B) approach based on linear programming (LP). The process involves two main steps: partitioning the search space (branching) and tightening the problem's representation (constraint propagation).

Branching takes place by selecting a decision variable whose domain is not a singleton – i.e., a variable that is not yet fixed. The corresponding domain is partitioned, and two or more subproblems are created, each of which is processed recursively. Each subproblem is a simplified version of the starting problem, with a reduced search space. This naturally leads to a backtracking procedure that ensures a complete search of the solution space.

Unlike the LP-based B&B approach, the processing of a subproblem in CP does not entail solving a relaxed version of the subproblem. It consists in determining how the reduced domain of the branching variable impacts the domains of other variables. If a given variable x_k participates in a constraint along with the branching variable x_i, then the domain of x_k in a subproblem might be reduced. Indeed, let P' be one the subproblems resulting from the partition of $D(x_i)$ and suppose the original problem P admits a solution in which $x_k = v_k \in D(x_k)$. It is possible that P' admits no solution with $x_k = v_k$. Put differently, the branching might be such that the domain of x_i in P' does not contain any of the values that x_i assumed in those solutions in which $x_k = v_k$. This warrants the removal of v_k from $D(x_k)$ in P'

Example 1 *Consider a CP problem P on three decision variables, x_1, x_2, and x_3, with domains $D(x_1) = \{1, 2, 3\}$, $D(x_2) = \{1, 2\}$, $D(x_3) = \{1, 2, 3\}$, and constraints*

$$c_1 : x_1 - x_2 \geq 1$$
$$c_2 : x_1 + x_3 \leq 4$$

Assume that branching is performed on x_1, x_2, and x_3, in this order, restarting along the same order, if necessary. Figure 1 depicts a possible search for solutions to P. The first branching operation partitions $D(x_1)$ into $\{1\}$ (subproblem P^1 and $\{2, 3\}$ (subproblem P^2).

In subproblem P^1, none of the values in the domain of x_2 can satisfy c_1, because the value of x_1 is fixed to 1. Thus, all values in $D(x_2)$ are removed and subproblem P^1 is fathomed. In subproblem P^2, the absence of value 1 from the domain of x_1 causes $D(x_3)$ to be simplified to $\{1,2\}$: constraint c_2 cannot be satisfied with $x_3 = 3$, since $D(x_1)$ does not contain 1 in P^2. Subproblem P^2 is branched on x_2, whose domain is partitioned into $\{1\}$ (subproblem P^3) and $\{2\}$ (subproblem P^4). In subproblem P^4, the value 2 is removed from $D(x_1)$, because of constraint c_1 and the fixation $x_2 = 2$. Therefore, $x_1 = 3$.

Note that, as a result of this change to the domain of x_1 and the fact that x_3 participates in c_2 along with x_1, the domain of x_3 might be further restricted. In fact, the value 2 is no longer valid for x_3 because of c_2 and $x_1 = 3$. This results in a complete solution, ($x_1 = 3$, $x_2 = 2$, $x_3 = 1$). In subproblem P^3 $D(x_3)$ is partitioned into $\{1\}$ (subproblem P^5) and $\{2\}$ (subproblem P^6). The fixation $x_3 = 2$ in P^6 along with c_1, implies $x_1 = 2$, producing another solution: ($x_1 = 2$, $x_2 = 1$, $x_3 = 2$). Finally, subproblem P^5 is further branched, originating two additional solutions.
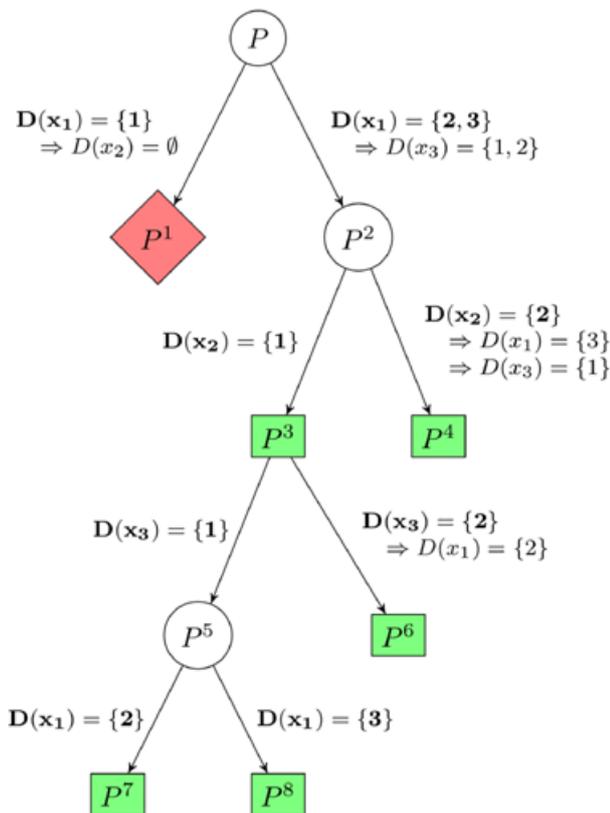
Figure 1: Example of the search process in CP. A green rectangle denotes a solution, while a red diamond shape denotes a fathomed subproblem. Bold-face labels correspond to branching choices, and labels in regular font are domain reductions ensued from branching.

As seen in the example above, domain reductions resulting from the branching can induce changes to the domains of further variables, possibly resulting in a cascading effect that can have a global impact on the subproblem. This process is known as *constraint propagation*, and the extent of this cascading effect is strongly dependent on the constraint set C.

In our example, all constraints involved exactly two variables, and constraint propagation required inspecting pairs of values from the two domains in order to detect values that could be removed. In general, constraint propagation is applied to constraints involving any number of variables and can detect values to be removed in more subtle ways, without resorting to such near-exhaustive inspection. Depending on the types of constraints present in the problem, different algorithms are employed in order to efficiently reason about the reduction of domains in a way that prevents loss of solutions. These are called *filtering algorithms* and often require calculating a maximal matching or solving a network flow problem in an appropriately defined graph (see, e.g., [6], chs. 3 and 6).

By reducing domains, constraint propagation effectively tightens the representation of each subproblem. Unlike LP-based branch-and-cut algorithms, however, the domain reduction caused by constraint propagation shrinks the size of the search space in the subproblem while introducing virtually no computational overhead. A general rule resulting from constraint propagation is: the

more constrained the CP problem, the fewer the branching operations required to solve it.

Constraints available in CP are diverse and can be highly nonlinear. Beyond linear (in)equalities, examples of constraints available in CP software include:

• **sort** $(x_{i1},...,x_{ik}, x_{j1},...,y_{jk})$: requires that the values of variables $x_{j1}, ..., x_{jk}$ are a permutation of the values of variables $x_{i1}, ..., x_{ik}$ and are in nondecreasing order;

• **regular** $(x_{i1}, ..., x_{ik}, E)$: requires that the sequence of values assumed by variables $x_{i1}, ..., x_{ik}$ matches the regular expression given by E;

• **gcc** $(Y, (a_1,...,a_k), (\ell_1,...,\ell_k), (u_1,...,u_k)$: requires that the number of times a variable in the variable-set Y assumes value aj is at least ℓj and at most uj, for $j = 1,...,k$. gcc stands for *global cardinality constraint*.

A CP constraint is often handled as a data structure that compactly represents the constraint's semantics, rather than as formulae that characterize allowed tuples. This permits the representation of virtually any type of constraint and is instrumental in the implementation of filtering algorithms that exploit the mathematical structure of each constraint. For in-depth information, the reader is referred to the Global Constraint Catalog [1], a dictionary on constraints that are found in the CP literature, including their typical usage, variants, filtering algorithms, and software availability.

The following example illustrates the use of gcc
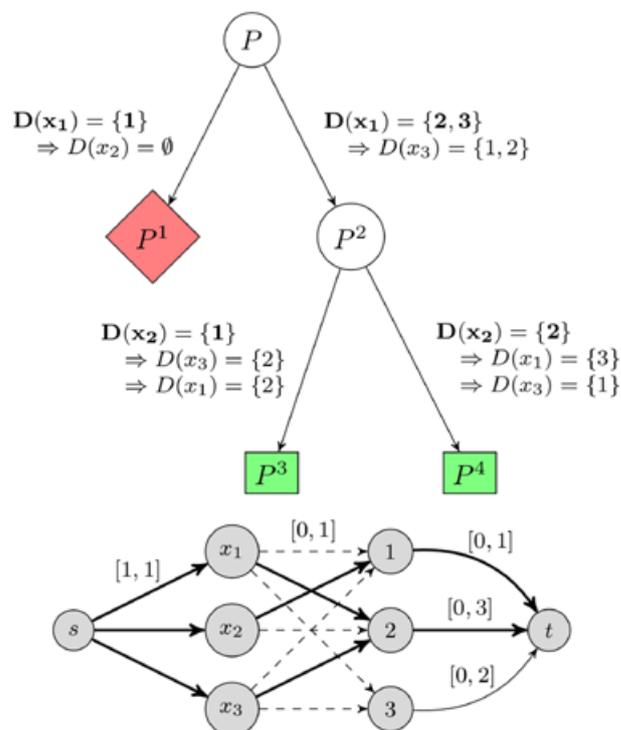
Figure 2: Effect of constraint propagation with additional gcc constraint. The graph at the bottom illustrates the underlying maximum flow problem used for filtering the gcc constraint (see [6]). Thick edges correspond to the solution at subproblem P^3, while dashed edges correspond to values that have been filtered out from the domains.

Example 2 *Consider the addition of the following constraint to our previous example:*

c_3 : gcc (x_1, x_2, x_3), $(1,2,3)$, $(0,0,0)$, $(1,3,2)$).

Constraint c_3 states that at most one of the variables can assume value 1 (other values are unrestricted by c_3). Figure 2 shows the effect of this new constraint on the search, as compared to the tree shown in Fig. 1. In subproblem P^3, the fixation $x_2 = 1$, along with constraint c_3, implies $x_3 = 2$. This, together with constraint c_2, results in $x_1 = 2$, completing the search with two solutions found.

Finally, it is fair to say that, in certain respects, constraint programming lacks the rich geometrical view of optimality and feasibility that plays a central role in mathematical programming. This is counter-balanced by exceptional modeling flexibility, a unified framework for solving a vast class of search and optimization problems, and a number of successful OR applications over the years (e.g., [3, 5]). Instead of a substitute for LP-based techniques – particularly when it comes to solving combinatorial optimization problems –, CP can be more appropriately seen as a time-tested, reliable tool, which has become ever more relevant to the OR community. And justifiably so.

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IFORS Award 2020 for OR in Development

Decision Support for Locating Optimal Tower Sites for Early-Warning Wildfire Detection Systems in South Africa

Andries Heyns, Warren du Plessis, Kevin M. Curtin, Michael Kosch and Gavin Hough

Early forest fire detection can effectively be achieved by systems of specialised tower-mounted cameras. With the aim of maximising system visibility of smoke above a prescribed region, the process of selecting multiple tower sites from a large number of potential site locations spread across vast expanses of terrain is a complex combinatorial optimisation problem. Historically, these systems have been planned by foresters and locals with intimate knowledge of the terrain rather than by computational optimisation tools. When venturing into vast and unfamiliar territories, however, such knowledge and expertise may not be available to system planners.

Since March 2017, a site-selection optimisation framework for tower-mounted camera-based wildfire detection systems (CWDSs) has been under development in collaboration with the South African ForestWatch system (created by EnviroVision Solutions based in Durban, South Africa) and is of special importance to the wildfire-prone South African environment. The optimisation of tower locations is required to maximise the camera-visibility cover achieved over valuable areas belonging to subscribed clients (typically from the forestry and timber sector). Additionally, reducing the number of towers required to achieve satisfactory cover is an added advantage which leads to significant potential cost savings and reduced future expenses for maintenance and upgrades.

The detection potential of a CWDS is evaluated according to the coverage it achieves with respect to *Cover Zones* (CZs) (Heyns and Van Vuuren, 2018; Heyns et al., 2019a). In the context of CWDSs, a CZ is the terrain surface that falls within the client and some buffer boundary (to detect threatening external fires), raised to a specified height above the ground (simulating a layer of smoke) so that the system's potential for detecting smoke at that height may be evaluated. This is a novel approach in surveillance and detection system applications, in which the standard approach is to evaluate visibility with respect to points on the terrain surface.

>> Lower smoke layers with smaller buffers serve the purpose of rapid and urgent detection, while higher smoke layers with larger buffers serve the purpose of detecting smoke which was not visible nearer to the terrain surface and which has risen to be (potentially) detectable.

Candidate layouts are evaluated with respect to the percentage of each CZ which is visible, *i.e.* the detection potential with respect to smoke at different heights above the terrain surface. All, or a subset, of the large number of feasible candidate layouts may be evaluated, from which a selection of superior solutions may be identified and presented to decision makers. More specifically, *non-dominated* solutions are sought, which form a *Pareto frontier* in objective function space and exhibit superior trade-off alternatives in objective function values when compared to the other solutions (Heyns et al., 2019a). The search for the *exact* Pareto front in these problems, however, involves a computational challenge that may become impractical to solve within realistic computation times. Thus, multi-objective metaheuristics are used to *approximate* the Pareto front in reasonable computation times.

Over a two-and-a-half-year period, this optimisation framework has been methodically tested, implemented, and refined in a number of practical site-selection problems. These problems have increased in complexity as the framework's various elements have been improved and refined and as user-confidence in the framework's capabilities has grown. The Geographical Information System (GIS) component of this framework has evolved gradually, first with implementation of basic placement criteria and spatial analyses to identify suitable placement sites, e.g. terrain degree of slope and distance from roads. Single-site selection problems in Mpumalanga Province provided the opportunity to further develop the GIS component to incorporate terrain landform classes to reduce the number of candidate sites – improving and streamlining the site-selection process's efficiency for real-word site-selection problems (Heyns et al., 2019b).

The framework has matured into a fully-functioning optimisation tool, culminating in its recent implementation in the selection of a four-camera CWDS in South Africa's Southern Cape. In this exercise, the optimisation-determined layouts drastically outperformed the coverage achieved by sites proposed by technical experts with years of experience in site selection. Furthermore, the numerous superior layouts were obtained by the framework within a number of days (including data collection, processing, optimisation and analysis) – drastically faster than the weeks of planning that were required by the experts to determine their site locations.

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Heyns, A.M., du Plessis, W., Kosch, M., Hough, G., 2019a. Optimisation of tower site locations for camera-based wildfire detection systems. International Journal of Wildland Fire 28, 651–665.
Heyns, A.M., du Plessis, W., Curtin, K.M., Kosch, M., Hough, G., 2019b. Analysis and exploitation of landforms for improved planning of camera-based wildfire detection systems. Submitted to Computers, Environment & Urban Systems. 🌍

Eco-Friendly Mobile Application for the Household Waste Collection and Transportation Problem: Case of the City of Sousse

Haifa Jammeli, Masri Hatem, Fouad Ben Abdelaziz and Mejdi Argoubi

The city of Sousse is in the Central East of Tunisia with an urban area of about 45 km2. The city economy is based on tourism and the population averages around 240,000 inhabitants but this number may double during the tourist season in the summer.

The municipalities are responsible for managing Household Waste (HW) on their territory. They determine the methods of collection including the types of bins to use, the frequency of collection, the methods of taxation and ancillary services, such as information and awareness. They carry out the collections either by their own means or by outsourcing to private companies. There are two types of waste collection modes: the first is door to door collection where the citizens usually dispose their waste in special bags or buckets in front of their house on the day of collection. Hence, collection is done along the streets by pick-up trucks or mini tractors of 3m3 capacity. The second is centralized collection, in which more valuable material such as glass, metal, plastics, or paper is brought to containers bins by the citizens. The HW is collected in plastic or metal waste bins. The collection is carried out by rear-end loaded compaction trucks of 16m3 capacity. The total annual amount of waste collected is 138,600 tonnes.

The city is facing a problem managing the Household Waste collection and transportation. The waste management collecting is done in an arbitrary manner. It is mainly determined based on the acquired experience of the managers and the judgment of the collecting drivers. The collecting process is usually determined based on simple practical rules rather than on scientific models. Several vehicles with a finite capacity are located at the depot. The vehicles must collect the waste accumulated in all bins. The waste is then delivered to a transfer center, before vehicles return to the depot.

We develop a model to determine the routes of the vehicles and the number of bins to be assigned to each potential location, while minimizing the collection costs and the environmental impact. The problem can be considered as a bi-objective optimization problem, as cost minimization will be ensured by the optimal assignment of the determined minimum number of bins. We also consider the stochastic aspect of population size, which is supposed to follow a normal distribution. Our model is then a stochastic bi-objective programming model. A solution is obtained with reasonable computational effort using a hierarchical approach consisting of two stages as "cluster-first route-second". In the first stage, a set of n locations of bins is assigned into k disjoint clusters using the k-means clustering algorithm. In the second stage, a certainty equivalent program to the bi-objective stochastic program is proposed, based on a chance-constrained, recourse and a goal programming approach. The model is tested and implemented using real data from the municipality of Sousse. The study shows that our model leads to lower environmental impact and an almost 38% reduction in the economic costs.

The optimal routing is illustrated in Figure 1.

We are the first to propose an optimization solution for this type of problem in Tunisia. The solution has been developed in collaboration with the municipality and the two private companies to which the waste collection service is outsourced. Our work is expected to help the municipality to decrease both the total numbers of bins and the total operational cost used for waste collection in the city of Sousse. 🌐

IFORS Flagship Journal ITOR performing better than ever

The new 2019 impact factor for International Transactions in Operations Research has been released and the journal now has an impressive IF of 2.987. ITOR is now ranked 23rd among 83 ORMS journals.

The development of ITOR over the last 5 years shows an extremely positive development (also compared to the average performance of all Operations Research & Management Science journals):

This success was only possible with the joint efforts of IFORS together with the editor-in-chief of ITOR – Celso Ribero – and the high commitment of our publishing partner Wiley.

Thanks go of course to all authors, reviewers and associate editors.

Please check https://onlinelibrary.wiley.com/journal/14753995 for the homepage of the journal and further information on the aims and scope.

IFORS encourages you to consider ITOR for your next top paper as an outlet. 🌐

On the 1st IFORS Global Webinar – ALIO Regional O.R. in Latin America: from Theory to Practice

Rosiane de Freitas (IFORS Vice President for ALIO, Brazil)

▲ Figure 1: The poster of 1st IFORS Global Webinar – ALIO (Latin America O.R. society).

The devastating impact on the world economy, international travel restrictions, and the fear still caused by the coronavirus pandemic due to the absence of vaccines and drugs of proven effectiveness created a climate of uncertainty that made it impossible to hold in loco scheduled international conferences. This is the case of the triennial IFORS 2020 conference, that was postponed to the middle of next year. With this scenario in mind that we had to rethink the way to provide a meeting of the international O.R. community, coming up the proposal for the **IFORS Global Webinar series**: with virtual meetings, in real-time (online), free of charge, with flexible formats and wide scope covering the multidisciplinary O.R field. The first cycle of webinars being held in partnership with the O.R. regional scientific societies.

The **1st IFORS Global Webinar** was organized by **ALIO (the group of O.R. societies in Latin America)** and took place on July 29th at 11:00 a.m. BRT (GMT -3), having as hosts **Grazia Speranza** (IFORS President, from UNIBS, Italy), **Guillermo Duran** (ALIO President, from UBA, Argentina), and **Rosiane de Freitas** (IFORS Vice-President representing ALIO, from UFAM, Brazil), who served as moderator (Figures 1-2).

The Webinar was held as a panel with 3 invited speakers from 3 countries - Brazil, Colombia, and Mexico, during one hour and a half, and presenting theoretical aspects and applications for improving the quality of life in Latin America.

There was great interest in the O.R. world community, with more than 250 interested people pre-registering via the IFORS website. Of these, a total of 149 participated effectively, from many countries around the world, covering all continents and the major O.R. scientific societies, as we can see in the World Map in Figure 3. About a third were women, it is important to register. After a brief introduction by the hosts, each panelist had 20 minutes of presentation. The final 30 minutes went to the Q&A section.

People from all continents participated. Most of them from Latin America, as expected (around 60 out of 149), but also many from Asia, Europe and North America, and some from Africa and Oceania, as we can see in the Table 1 below.

Table 1 - Number of participants by region of the world (continents).

CONTINENT	NUMBER OF PARTIPANTS
Africa	8
Asia	29 (2 Middle East)
Europe	36 - 6 Turkey (Europe/Asia)
Latin America	61 (+3 Ibero)
North America	13
Oceania	2
Total	149 Attendees

The first panel was given by **Marcia Fampa**, a Brazilian researcher from **UFRJ, Rio de Janeiro, Brazil**, involving Mixed Integer Nonlinear and Semidefinite Programming, and entitled "Parametric relaxation for the quadratic knapsack problem". The second panel was given by **Andrés Medaglia**, a Colombian researcher from **UNIANDES, Bogota, Colombia**, involving a case study in Urban Mobile applying Combinatorial Optimization techniques, entitled "Level of traffic stress in Bogotá: towards a friendlier city for cyclists". And, the third panel was given by **Roger Rios**, a Mexican researcher from **UANL, Monterrey, Mexico**, involving a case study in e-Healthy applying Combinatorial Optimization techniques, and entitled "A case study on the potential impact of a kidney exchange program in Mexico". See Figura 4. The abstracts of the panels are given below.

Panel 1: Parametric relaxation for the quadratic knapsack problem

Marcia Fampa - The Alberto Luiz Coimbra Institute for Graduate Studies and Research in Engineering **(COPPE)** - Universidade Federal do Rio de Janeiro – UFRJ, **Rio de Janeiro - BRAZIL.**

Abstract:
We consider a parametric convex quadratic programming relaxation for the quadratic knapsack problem (QKP), which maintains partial quadratic information from the original QKP by perturbing the objective function to obtain a concave quadratic term. The nonconcave part generated by the perturbation is then linearized by a standard approach that lifts the problem to matrix space.

We present a primal-dual interior point method to optimize the perturbation of the quadratic function, and propose valid inequalities on the lifted matrix variable, derived from cover inequalities for the QKP.

Our best bounds are obtained with an algorithmic approach that alternates between optimizing the parametric relaxation over the perturbation and applying cutting planes generated by the valid inequalities proposed.
(This is a joint work with Daniela Lubke, Fei Wang and Henry Wolkovicz.)

PANEL 2: Level of traffic stress in Bogotá: towards a friendlier city for cyclists

Andrés L. Medaglia - Centro para la Optimización y Probabilidad Aplicada (COPA), Departamento de Ingeniería Industrial, Universidad de los Andes - **UNIANDES, Bogotá - Colombia.**

Abstract:
The Level of Traffic Stress (LTS) is an indicator that quantifies the stress experienced by a cyclist on the segments of a road network. We propose an LTS-based classification with two components: a clustering component and an interpretative component. Our methodology is comprised of four steps: (i) compilation of a set of variables for road segments, (ii) generation of clusters of segments within a subset of the road network, (iii) classification of all segments of the road network into these clusters using a predictive model, and (iv) assignment of an LTS category to each cluster. At the core of the methodology, we couple a classifier (unsupervised clustering algorithm) with a predictive model (multinomial logistic regression) to make our approach scalable to massive data sets. Our methodology is a useful tool for policy-making, as it identifies suitable areas for interventions; and can estimate their impact on the LTS classification, according to probable changes to the input variables (e.g., traffic density). We applied our methodology on the road network of Bogotá, Colombia, a city with a history of implementing innovative policies to promote biking. To classify road segments, we combined government data with open-access repositories using geographic information systems (GIS). Comparing our LTS classification with city reports, we found that the number of bicyclists' fatal and non-fatal collisions per kilometer is positively correlated with higher LTS. >>
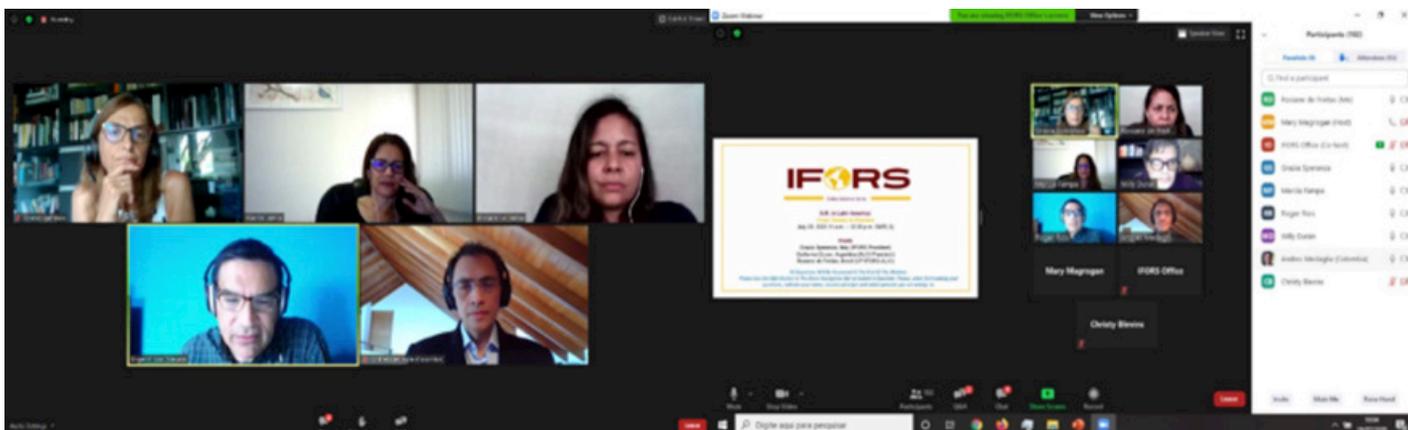
▲ Figure 2 – The Hosts of 1st IFORS Global Webinar: Grazia Speranza (IFORS President, ITALY), Guillermo Duran (ALIO President, ARGENTINA), and Rosiane de Freitas (IFORS Vice President representing ALIO, BRAZIL), the moderator.

▲ Figure 3 - World map of 1st IFORS Global Webinar (ALIO) participants, hosts and invited speakers.

▲ Figure 5 – Screens captured during the 1st IFORS Global Webinar – ALIO.

>> Finally, to support policy making, we developed a web-enabled dashboard to visualize and analyze the LTS classification and its underlying variables.
(This is a joint work with Jorge A. Huertas Alejandro Palacio, Marcelo Botero, Germán A. Carvajal, Thomas van Laake, Diana Higuera-Mendieta, Sergio A. Cabrales, Luis A. Guzman, Olga L. Sarmiento)

Panel 3: A case study on the potential impact of a kidney exchange program in Mexico
Roger Rios - Universidad Autonoma de Nuevo Leon – **UANL, Monterrey - Mexico**

Abstract:
The application of Operations Research in the medical field has been the key to save more lives in a variety of decision-making problems. With the aid of mathematical models and algorithms developed for specific problems, we can now develop plans and policies, and take decisions that can lead to optimal or near optimal solutions. This is the case of the Kidney Exchange Problem (KEP) addressed in this talk. The KEP is a combinatorial optimization problem arising in the context of transplant programs that allow exchange of kidneys between two or more incompatible patient-donor pairs. The KEP aims at maximizing the number of transplants in a given PDP compatibility graph. Finding cycles or paths in a graph of PDPs leads to finding feasible pairs that can benefit from kidney exchange between pairs.

The KEP has been studied from many angles for the past 15 years. Many studies have shown the tremendous impact and benefit of this type of programs in terms of dramatic reductions to organ waiting lists, and therefore saving the lives of many people. Nation-wide kidney exchange programs have been successfully developed in a few countries; however, in many developing countries, including Mexico, nation-wide programs do not exist. For instance, the kidney waiting list in Mexico is over 17,000 and growing at a very fast rate.

In this talk, we give a brief introduction to the KEP, its basic models and solution algorithms. In addition, a case study of optimal kidney transplant assignments in the state of Nuevo Leon, Mexico, is presented. The study, carried out by using data from Mexican population and hospitals, pretends to assess the potential impact of implementing a kidney exchange program in Mexico.

Concluding Remarks
In a general analysis, the free online virtual webinar provided comprehensive attendance of members of the O.R. community around the world, highlighting the fact that many participants had never attended the IFORS triennial on-site conference. The event went smoothly, with no problems in the Internet access of the organizers and panelists (having also observed stability in the attendees' access).

▲ Figure 4 – The Invited Speakers for this 1st IFORS Global Webinar: Marcia Fampa (UFRJ, BRAZIL), Andrés Medaglia (UNIANDES, COLOMBIA), Roger Rios (UANL, MEXICO), respectively.

As possible points for improvement, although we believe that the choice of 3 panelists from different countries was adequate in this first Webinar, as a way of ensuring greater coverage in Latin America, the 20 minutes for questions was relatively short for the demand. Also, we noticed that the average webinar attendance time was 51 minutes, which seems reasonable, but then either the webinar should be reduced to 1 hour (with just 1 speaker) or we should look for more interactive ways to ensure a large audience presence for (in-stream) webinars over 1 hour long. Thematic webinars (covering a specific topic) also seems to be a good alternative.

Anyway, the feedback received by the attendees and panelists was very positive, makes the event considered successful, and **a powerful and flexible way to bring IFORS closer to the global O.R. community**. Thus, **in these difficult times, it remains for us to reinvent ourselves and try to do what at first is very bad, all the difference.**

Long-life to the global, virtual, online, and for free, IFORS Global Webinars series! 🌍

IFORS

Global Webinar Series

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Recent Trends and Practices
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Hosts
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Francis Miranda, Philippines (APORS President)
Sunity Shrestha Hada, Nepal (VP IFORS-APORS)

Register for this free webinar on the IFORS website:
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Invited Speakers

Tanka Nath Dhamala
Tribhuvan University (TU), Nepal

Impact of Dynamic Network Reconfiguration on Optimal Evacuation Planning

Gokulanand Patel
Birla Institute of Management Technology (BIMTECH), Delhi, India

Application of DEA Tool in analyzing COVID-19

Dongdong Ge
Shanghai University of Finance and Economics, China

Supply Chain Network Management in Mitigation of Covid-19

Several times each year, IFORS will offer _free_ webinars on topics of key interest to those developing and applying Operational Research and Analytics methodologies and models.

Business and Entrepreneurship Development in a Globalized and Digitalized Era - Looking back at innovative, India

Sadia Samar Ali <ssaali@kau.edu.sa>
Rajbir Kaur <rajbir00@gmail.com>

Current managerial education requires scholars to stay relevant and keep pace with constantly evolving field of education. It is imperative that these candidates receive quality education exposure, and necessary scholarships and collaborations for continuation of their educational journey. This happens when they find suitable knowledge gaining and sharing platforms and enter the right network for strengthening their professional ties. Business and academic conferences, workshops and seminars have assumed importance as they provide unique learning opportunities, career building options and allow scholars to become research active and confident through exposure to the right audience. Academy for Global Business Advancement (AGBA) has been showing keen interest in these activities over past decades through collaborations with world-class business and educational organizations.

As a part of their annual practices of continuation of excellence in educational exposure, AGBA (http://www. agba.us) brought together entrepreneurs, government officials, business professionals, researchers, academic scholars, corporate delegates, Industry practitioners, consultants, and heads of major government-owned and private enterprises from across the world, for their 16th World Congress. The event was organized in the national capital of India, New Delhi, during July 1-3, 2019. It witnessed enormous national and global participation from well-established and reputed organizations in the field of power, hospitality, telecom, finance, education, and civil and corporate administration.

AGBA co-organized this conference with Indian Institute of Management Rohtak, State of Haryana, India (http://www. iimrohtak.ac.in/), and Millikin University, Decatur, Illinois, USA (http://millikin.edu/tabor), GIFT Society (India) (http://giftsociety. org/) and Indian Institute of Technology Delhi (https://home.iitd. ac.in/).

Special Issues of globally acclaimed journals like The Journal

▲ At 16th World Congress: an MBA scholar (Indonesia), Professor Ibu Sylvi (Indonesia), Nandita Raj (Jawaharlal Nehru University, India) and Sadia Samar Ali (from left to right).

of Business Research (Special Issue) (https://www.journals. elsevier.com/journal-of-business-research/call-for-papers/ thematic-literature-reviews-bibliographic-and-meta-analyses); European Journal of Business (Special Issue) (https://www. emeraldgrouppublishing.com/services/authors/calls-for-papers?id=8578); Service Industries Journal (Special Issue) (https://www.journals.elsevier.com/journal-of-business-research/call-for papers/thematic-literature-reviews-bibliographic-and-meta-analyses); Journal of Strategic Marketing (Special Issue) (https://www.tandfonline.com/doi/ full/10.1080/0965254X.2019.1572272) were main publishing supporters of the conference.

Three days events were organized at two different hosting venues: Indian Institute of Technology Delhi campus in Hauz Khas, and Jaypee Vasant Continental, a premium hotel in Delhi https://www.jaypeehotels.com/hotel/jaypee-vasant-continental-new-delhi.

▲ At 16th World Congress: Latha Karunakaran (India), Evaline Jerotich Bartoch (Kenya) and Sadia Samar Ali (Saudi Arabia and India) (from left to right).

The objectives of this interactive platform were to foster critical interactions on ever evolving and complicated business scenarios through presentations, research papers and business discussions. It also meant to strengthen connections between experts and doctoral students to broaden their research learning domain and offer them excellent professional networking platform. The conference intended to enrichen the faculty experience through one-to-one mentoring of selected doctoral students by globally renowned scholars and by offering them opportunities to publish in Scopus-indexed journals. Participants were encouraged to explore study abroad programs, joint degree programs with overseas universities and global internships, global fellowships such as US Fulbright Scholar Program and to explore opportunities to publish in a McGraw Hill sponsored "Monograph Book".

The theme of the conference was "Business and Entrepreneurship Development in a Globalized and Digitalized Era" and covered all major functional areas of Business Administration and modern OR, e.g., Accounting, Economics, Commerce, Operations, Finance, Information System, Management, Marketing, Entrepreneurship, International Business, Hospitality and Tourism Management, Business Law, Corporate Social Responsibility, Ethics, Agricultural Economics, Healthcare Management, and Recreation Resource Management.

The conference started on July 1, 2019, with its inauguration ceremony followed by welcome address by esteemed academic and corporate dignitaries. This was followed by 16 Faculty Development workshops in three modules throughout the day along with coffee/tea breaks and lunch. The events scheduled for first day were organized at IIT Delhi and covered workshops on themes of Development of American style doctoral program; design of "Executive Doctoral Program" for working professionals; Development of world-class research model; crafting a world-class manuscript for publication in .Scopus and Thomas Reuters ISI indexed journals; learning use of NEW statistical techniques in business research and to employ NEW pedagogical tools in teaching; Techniques of writing local cases and integrating cases in teaching; Techniques of earning AMBA, EQUIS, and AACSB accreditations. The first day events of conference were chaired by Don Capener, Sanjay Dhir, Dheeraj P. Sharma, Shivendra K. Pandey and Viput Ongskakul.

The second day witnessed paper presentations by almost 500 research scholars in 25 parallel sessions on broader themes of business management and educational research. The sessions chaired by Prof. Sadia Samar Ali had 28 scholars who presented their work on the themes of Entrepreneurship and Public Policy. More than 200 scientific papers were presented

▲ At 16th World Congress: Latha Karunakaran (India), Sadia Samar Ali and a student coordinator (IIT Delhi, India) (from left to right).

by authors from 20 different nationalities. The proceedings of the day culminated with Award Ceremony chaired by Dr. Christopher J. Marquette, Conference Director and Program Chair, Millikin University, USA. A tour of the beautiful national capital was organized in the evening to offer cultural and culinary delights to the participants.

On the third day of the conference, one-on-one mentoring was provided to the selected doctoral candidates by the patron of AGBA and other esteemed dignitaries. Awards were distributed in the categories of "Best Paper Award" in each category, "2019 AGBA Best Doctoral Dissertation Award", "2019 AGBA Distinguished Entrepreneur Award", "2019 AGBA Distinguished Dean Award", and "2019 AGBA Distinguished Corporate Leader Award". The conference concluded with a vote of thanks by Zafar U. Ahmed, AGBA's President and CEO, which was followed by a Gala Lunch for all the dignitaries and selected participants from USA, Europe, Middle East, and Central Asia. 🌍

Enjoying OR and Stochastic Mathematics in Athens - and Online: 17th Summer School in Risk Finance and Stochastic

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**Stelios Xanthopoulos** <xanthos@aegean.gr> and **Athanasios Yannacopoulos** <ayannaco@aueb.gr>

For the first time as an *e-Summer School*, the *17th e-Summer School in Risk Finance and Stochastics*, Athens, Greece, June 30 - July 3, 2020, was organized by the Athens University of Economics and Business (AUEB), Departments of (a) Statistics, (b) Accounting & Finance, and (c) Business Administration, the Laboratory of Stochastic Modeling and Applications (Department of Statistics, AUEB) (cf. https://www.dept.aueb.gr/en/stat/content/department-statistics), in collaboration with the University of the Aegean, Departments of Financial & Management Engineering, and Statistics & Actuarial-Financial Mathematics.

The *Summer School on Risk Finance and Stochastics* is an annual academic gathering that started in 2003 on Samos island, as an attempt to bring together students and academics both young and senior to present, reflect and discuss - in a relaxed environ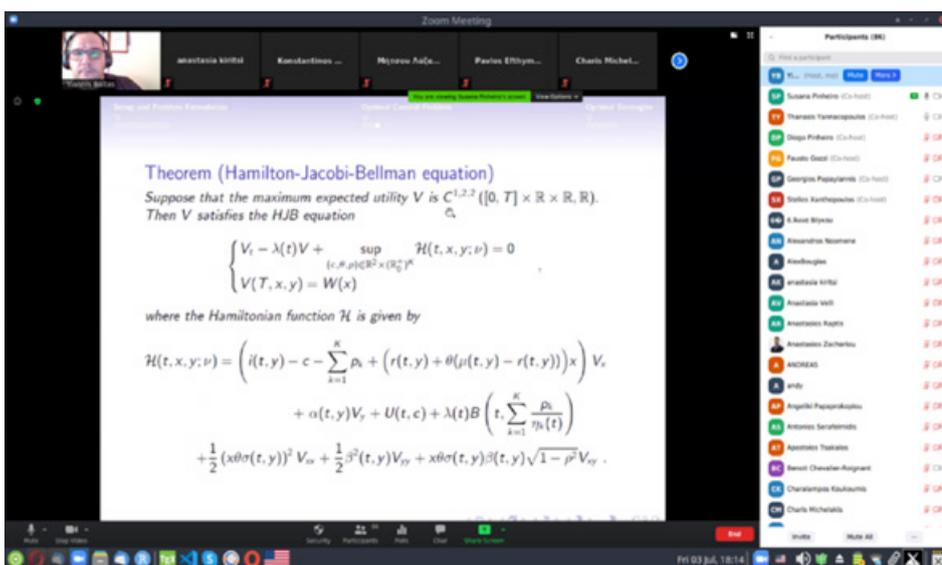ment - certain aspects of the fascinating field of Stochastic Mathematics and its close connection with Risk, Finance and Insurance. Over the years the location of the school was moved to various places, depending on funding and circumstances, however, our rendezvous was always punctual and anticipated by all. For several years, the school was hosted on Samos Island, then on Chios Island, then Naples and, of course, Athens. Regardless of the location, we always had the honor of having with us world-class academics and experts who masterfully guided the participants through the elegant and important constructions of their current research and brilliant and eager to teach young researchers and students in the first steps of their career, the interplay among which always resulted in a creative and friendly atmosphere that we fondly remember. Naturally, this would not be possible without the constant and generous funding of AUEB and the University of the Aegean.

Even though the school is mainly addressed to postgraduate students, PhD students, postdocs, researchers, and practitioners, everyone who are interested to stay informed about the latest developments in the field of Stochastic Finance, are always more than welcome to participate. This year, due to the current situation concerning the COVID-19 pandemic, the standard operation of the Summer School would have been difficult, if not impossible. However, trying to stay loyal to our usual annual meeting, we decided to transform the school into e-mode, thus enabling distant participation.
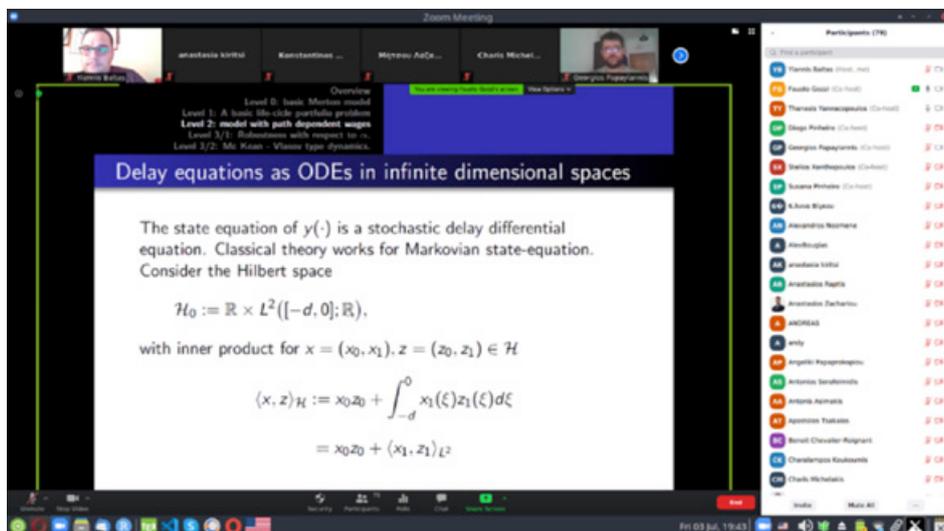
▲ A snapshot of the e-school (lecture by Prof. Fausto Gozzi).

As always, we had the pleasure and honor of having with us distinguished academics in the field. This year, the central topic of the school was about a *revision of the theory of arbitrage* by **Professor Ioannis Karatzas** (Columbia University, New York), one of the founding fathers of modern stochastic finance. Further topics that were presented and discussed include **stochastic finance, portfolio theory, risk management** and **decision making**, and **machine learning** – always having in mind real-world applications and challenges.

▲ A snapshot of the e-school (lecture by Dr. Susana Pinheiro).

- and an Application to Finance", *Prof. Dr. Catherine Kyrtsou* (Macro-Finance, Department of Economics, University of Macedonia, Greece, and Lyon, France): "Exploitation of financial information as trading characteristic: a causality-based analysis", *Athanasios Pantelous* (Department of Econometrics and Business Statistics, Monash University, and RiskLab, Australia): "Disappointment Aversion and Long-Term Dynamic Asset Allocation", *Prof. Dr. Diogo Pinheiro* (Department of Mathematics, Brooklyn College, The City University of New York. USA): "On a two player zero-sum stochastic differential game with a random planning horizon", *Dr. Susana Pinheiro* (Queensborough Community College, City University of New York, USA): "Life insurance purchase under a stochastic fluctuating economy", *Dr. Benoit Chevalier-Roignant* (Finance, Cranfield School of Management, UK): "Incumbent inertia: When and how to respond to an innovative startup", *Dr. Nuno Azevedo* (Research Department, Bank of Portugal, and Minho, Portugal): "Structural Systemic Risk: Evolution and Main Drivers", and *Dr. Pantelis Z. Lappas* (EXUS AI Labs, Research Fellow, Athens University of Economics and Business, Greece): "Evolutionary algorithms and machine learning in financial risk management".

The highlights of the e-summer school included talks by *Prof. Dr. Ioannis Karatzas* (Eugene Higgins Professor, Applied Probability, Departments of Statistics and Mathematics, Columbia University, USA): "Portfolio theory and arbitrage", *Prof. Dr. Fausto Gozzi* (Department of Economics and Finance, LUISS, Rome, Italy): "From simple stochastic control problems to more realistic ones: an example from lifecycle portfolio theory", *Prof. Dr. Filippo Santambrogio* (Applied Mathematics, Lyon, France, and Pisa, Italy): "An introduction to mean field games", *Prof. Dr. Gerhard-Wilhelm Weber* (Faculty of Engineering Management, Poznan University of Technology, Poland, and IAM, METU, Ankara, Turkey): "Maximum Principle for Stochastic Optimal Control of a Markov Regime-Switching Jump-Diffusion Model with Delay

The e-Summer School was very well attended with more than 120 participants who showed their interest and actively participated in a lively round-table discussion in the form of oral questions. During the breaks, new friendships were made, and research ideas were exchanged between the participants, who enjoyed the warm and welcoming atmosphere of the school and expressed their interest in continuing the discussion in our future events and endeavors.

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

Science Academy: Artificial Learning Summer School 2020 – Online, Hosted in Ankara, Turkey

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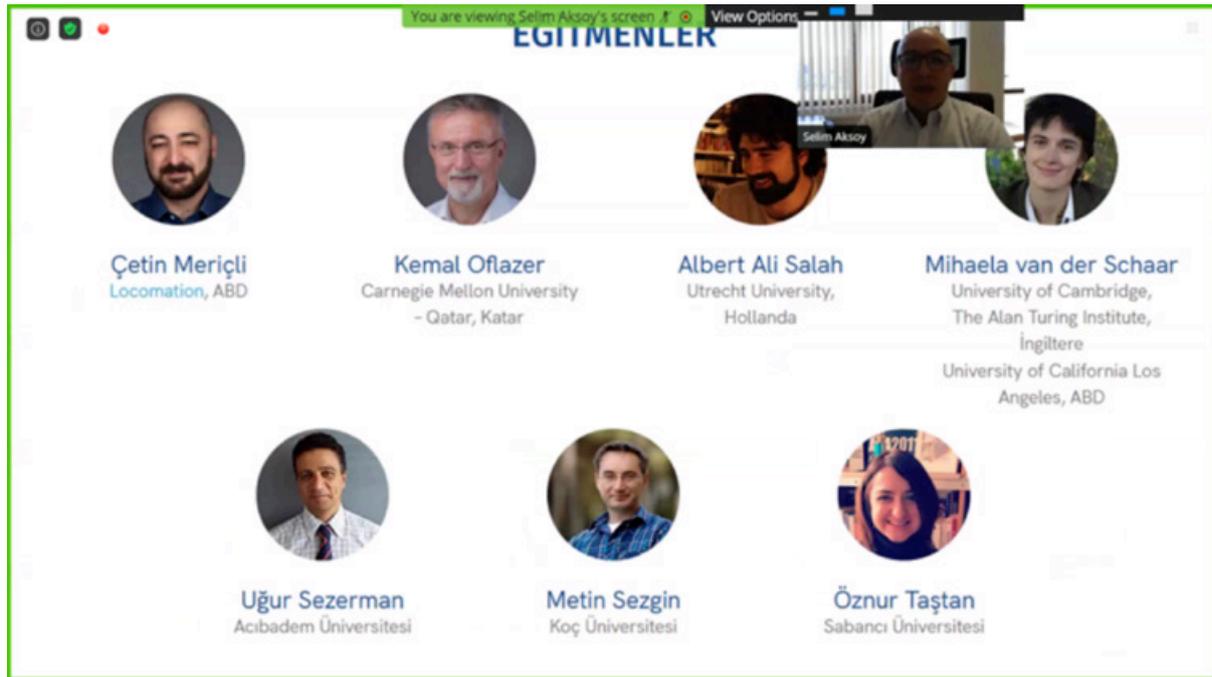
▲ Prof. Dr. Selim Aksoy introduces the 15 lecturers of the summer school.

The Bilim Akademisi - Bilkent University Artificial Learning Summer School 2020 (BYÖYO- 2020) has been held online during June 29 - July 2, 2020. The summer school has been organized under the leadership of Department of Computer Engineering, Bilkent University, Ankara, Turkey, with the academic members: *Prof. Dr. Selim Aksoy, Prof. Dr. A. Ercüment Çiçek, Prof. Dr. Hamdi Dibeklioğlu*, and also from the Department of Electrical and Electronics Engineering: *Prof. Dr. Tolga Çukur, Prof. Dr. Süleyman Serdar Kozat, Prof. Dr. Cem Tekin* by Bilim Akademisi and Bilkent University (https://yazokulu. bilimakademisi.org/yapayogrenme/2020/).

The opening speech was given by the chair of organization *Prof. Dr. Selim Aksoy* (Bilkent University) and the founder of the Science Academy (Bilim Akademisi) foundation which was a part of the organization of the summer school together with Bilkent University, *Prof. Dr. Mehmet Ali Alpar* (Sabancı University, Turkey). *Prof. Dr. Volkan Cevher* (École Polytechnique Fédérale de Lausanne, Switzerland) gave the first talk of the summer school. He explained his research with the related topics: Machine Learning (ML), Optimization, Signal Processing, Information Theory, and Statistics. The talk was mainly about the relations between ML with Artificial Intelligence (AI) including SWOT analysis. Besides, he introduced the participants his research team and laboratory (https://www.epfl.ch/labs/lions/). *Prof. Dr. Albert Ali Salah* (Utrecht University, The Netherlands) introduced his talk titled as "Human Behavior Modeling via Machine Learning" which was included three parts: Individual behavior, e.g., facial expression analysis, Dyadic behavior, e.g., social interactions, Aggregate behavior - computational social science, e.g., mobility modeling. Then *Prof. Dr. Metin Nafi Gürcan* (Wake Forest University, USA) gave his talk: "From Pixel to Diagnosis: Application of Artificial Intelligence to Medical Images". *K. Berker Loğoğlu* (KUARTIS, Turkey) introduced "Autonomous Driving in Tough Conditions". At the second

day of BYÖYO-2020, *Prof. Dr. Fatma Güney* (Koç University, Turkey) gave a talk titled "State-of-The-Art on Optical Flow". Then *Prof. Dr. Zeynep Akata* (University of Tubingen, Germany) introduced: "Representing and Explaining New Concepts with Minimal Control". Her speech was including the topics: "Generalized Low-Shot Learning with Side-Information" and "Generating Natural Language Explanations for Visual Decisions". *Prof. Dr. Gökberk* Cinbiş (Middle East Technical University, Turkey) introduced: "Unsupervised and Partially supervised Machine Learning". Then *Prof. Dr. Mihaela van der Schaar* (The Alan Turing Institute, University of Cambridge, UK & University of California Los Angeles) gave a different aspect with her talk on "Machine Learning: Changing the Future of Healthcare". The same day the medicine applications continued with the talks: *Deniz Katırcıoğlu Öztürk* (ICterra, Germany) "Health 4.0 and Artificial Intelligence Approaches" and *Fatih İrim* (DataBoss, Turkey), "Space-Time Prediction". At the third day of the event, *Dr. Ayşegül Dündar* (NVIDIA, USA) presented on "Image Synthesis with Deep Learning" and explained us new developments on image processing applications with regard to ML. Then *Prof. Dr. Metin Sezgin* (Koç University, Turkey) spoke about "Psychology-Driven Design of Intelligent Interfaces". The same day an important talk was given by *Prof. Dr. Kemal Oflazer* (Carnegie Mellon University, USA), "Classical Methods in Natural Language Processing". Research Director of Facebook AI, *Dr. Laurens van der Maaten* (Facebook AI, USA) then introduced "From Visual Recognition to Visual Understanding".

Furthermore, at the last day of the summer school the following lectures were given: *Prof. Dr. Uğur Sezerman* (Acıbadem University, Turkey), "AI applications for analysis of multi 'Omics' data for identification of personalized driver pathways and Cancer therapy candidates"; >>

▲ Prof. Dr. Volkan Cevher presents on robust Gaussian process optimization.

▲ Prof. Dr. Zeynep Akata on new concepts with minimal control, and their mathematical background.

>> *Prof. Dr. Öznur Taştan* (Sabancı University, Turkey), "Discovering Cancer Patient Subgroups with Functional Graph Kernels", *Prof. Dr. Taylan* Cemgil (Boğaziçi University, Turkey & DeepMind), "Robust Artificial Learning", *Dr. Çetin Meriçli* (CEO-Locomation, USA), "Autonomous Driving: From Past to Present", and *Ali Haznedaroğlu* (SESTEK, Turkey), "Voice and Text Processing with Artificial Learning".

Some statistical information about the event was given at the *Closing Ceremony* of the summer school BYÖYO-2020. With regard to this information, 1564 participants were accepted from 78 provinces of Turkey and from so many countries like USA, Germany, Austria, Czech Republic, Finland, France, the Netherlands, Iraq, UK, Italy, Canada, Cyprus, Hungary, Poland, and Kosovo. All the presentations were viewed alive are about 1403 people from 20 different countries including Turkey, USA, Germany, Albania, Austria, Ecuador, Finland, France, Holland, Iraq, Sweden, Switzerland, Italy, Canada, Qatar, Hungary, Poland, Romania, Singapore and Greece. A *YouTube* channel of the summer school BYÖYO-2020 has been provided at https://www.youtube.com/playlist?list=PLMGWwuh6-mEfmMAUoQZNfEA51RGh7bMyh. This link was viewed by 1,743 people (due 21/07/2020) and even this result gives us an idea about the impact of this event. 🌍

Operational Research for Value-based Health Care - Celebrating 40 Years of Portuguese National Health Service

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▲ Gathering of participants in sunny Lisbon

At a time in which the Portuguese National Health Service is celebrating 40 years, health stakeholders are discussing the need to devote more resources to health, to redistribute resources and to improve efficiency and access, with ongoing similar discussions existing in other countries. Although OR techniques and methods are known to improve decision-making in health and to help addressing those challenges, evidence points towards a limited use by health organizations, and one has been assisting to other health research communities (e.g., ISPOR) exploring the use of simulation, optimization and multicriteria decision analysis in combination with value in health concepts.

These issues inspired the organization of the EURO PhD Summer School "Operational Research for Value-based Health Care" to offer a scientific program designed to be a unique forum for PhD students and young researchers working in OR in health (http://orvalueinhealth.tecnico.ulisboa.pt/). Participants had the opportunity to get acquainted with multiple topics which are relevant to address health decision-makers needs and to generate sound operational research methods, knowledge and tools aligned with value-based health care. The PhD school took place at Instituto Superior Técnico (University of Lisbon, Portugal) during September 1-8, 2019. The school resulted from a partnership between the University of Lisbon (Portugal) and the Public University of Navarra (Spain). It benefited from the financial support of EURO, the Association of European Operational Research Societies, and received the academic support of

▲ Mónica Oliveira and Fermin Mallor, chairs of the summer school, firmed a partnership between Técnico (University of Lisbon) and the Public University of Navarra, and led a consortium of universities, OR societies, hospitals and pharmaceutical companies involved in the school.

ORAHS, the European Working Group on Operational Research Applied to Health Services, and from Portuguese and Spanish Operational Research societies (APDIO and SEIO). To answer to the challenge of bridging the gap between OR and value-based health care, the consortium also integrated health care providers and pharmaceutical companies: The North Lisbon Hospital Centre, Hospital Compound of Navarre, Janssen-Cilag and NOVARTIS assumed key roles; the pharmaceutical companies provided financial support and the four organizations provided real challenges for school participants working upon, as well as health professionals participating in discussions and working as advisors to students working on challenges.

The scientific program was set to have an intense program made up of a variety of learning activities, including theory and methods, case studies, software tutorials, experiments and games. Each day was devoted to a different topic with a prestigious internationally known expert. Participants learnt about the current health challenges and the different methodological approaches from Sally Brailsford (University of Southampton); about how to measure value in health and enable participation from Carlos Bana e Costa (University of Lisbon); about implementing simulation in a variety of settings from Erwin Hans (University of Twente); about mathematical programming and resource allocation modelling from Alec Morton (University of Strathclyde); and finally, Martin Utley (University College London) shared his experience in solving real cases by combining different methodologies.

Everyday there was time for the presentation and discussion of the ongoing research of several participants, who had the opportunity to receive feedback from OR experts and health professionals and enabled participants to get a good overview of what is being done in the interface between operational research and value-based health care.

▲ Professor Alec Morton performing lively experiments related with incentives and resource allocation in health.

their knowledge of OR, interact with world experts in the field, discuss openly several topics related to health care, and they created a research network of future scholars, planting the seeds from which ground-breaking scientific work may one day stem.

Finally, 27 out of the 32 school participants replied to an anonymous survey carried out

A distinctive learning activity of the school was making participants to work on two challenges to test and develop their capacities on team-work and real problems. Hospital Compound of Navarre challenged participants to address the problem of no shows in specialist consultations, while the pharmaceutical company Janssen-Cilag suggested taking on improving pathways of oncology patients. Participants worked hardly along the week and could work on data and on qualitative information, having the opportunity to consult health practitioners and academics in the development of their work.

Finally, the program also included social and cultural events that provided the participants ideal moments for networking and sharing experiences with other participants and mingle with lecturers and health professionals. Social events included quizzes with operational research and health topics, ethical challenges competitions, a "who is who" game, as well as a day spent at Ericeira beach, visiting the National Palace of Mafra, and tasting different cod fish traditional dishes.

The school attracted a broad attention from the community with 45 applications and 32 students accepted. This was a highly international and diverse group, composed of participants from 20 nationalities and located in universities from 14 countries. Participants had the chance of advancing

to collect feedback about the school. The following three key messages were obtained: 1. above 80% of participants strongly agreed or agreed that the content of the school met their expectations and enabled them acquiring new knowledge; 2. above 80% of participants felt more encouraged to consider other approaches to their own research, as well as more enthusiastic about bridging the gap between research and practice; 3. and almost all participants found the school useful for networking and stated to plan to keep in touch with other participants/lecturers. Regarding the challenges, participants highly recognized both the opportunity to work within a multidisciplinary team, and the contact with the different advisors to be important for their value-based health care learning process. However, participants also commented on the time pressure they were under to meet the challenge which is a learning to be considered in future events in order to find real challenges with adequate complexity, and feasible within the school time.

As organizers of the school, we believe that there is scope for the OR community to develop more events bridging the gap with practice by involving and collaborating with health stakeholders and experts, which will help shaping more impactful research. 🌍

IWOCA 2020 in Bordeaux (Oops! On-Line!)

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By mid-March it was becoming clear, as the global pandemic worsened, that plans could not reliably be made to hold *31st International Workshop on Combinatorial Algorithms, June 8–10, 2020, Université de Bordeaux, France, IWOCA 2020*, both in June and on site at l'Université de Bordeaux (see https://iwoca2020.labri.fr). The organizers (the first four authors of this report), in concert with the IWOCA Steering Committee (see https://nms.kcl.ac.uk/iwoca/steering.html), were faced with challenging options and little time to resolve the question *Postpone to later in the year? Cancel, and hope for better conditions in 2021? Plunge into terra incognita and go on-line?*

By May Day, the collective decision had been made: not only would *IWOCA 2020* be "virtual", but the original dates, June 8-10, would be retained. The quick mobilization of the local organizing committee enabled us to hold a successful meeting: we thus warmly thank all its members (see https://iwoca2020.labri.fr/committees). We also wish to thank the members of the program and steering committees, speakers, session chairs, participants and our generous sponsors. This article briefly describes our experience, which we hope may be of benefit to other on-line conference organizers in future, and also outlines the thematic scope of this meeting.

The biggest surprise was that the registered participants in our virtual *IWOCA* surpassed 480 - at least six times the largest number ever recorded for any one of the 30 previous *IWOCA*s! The registration was free of charge, and we tried to distribute the call for participation as broadly as possible not only through classic distribution lists, but also through our personal contacts, which in several cases was very successful. The average attendance at the on-line talks was 75-80, ranging as high as 110, both figures again much higher than any recorded in the past. The participants in *IWOCA* 2020 hold appointments at institutions in at least 45 different countries on six continents (Africa, Asia, Europe, North America, Oceania, and South America). The represented countries were:

India (64), USA (45), Greece (44), Canada (40), France (37), UK (31), Japan (30), Germany (26), Iran (13), Italy (13), Israel (11), Austria (10), Brazil (10), Netherlands (6), Poland (6), Slovenia (6), South Korea (5), Russia (5), Spain (5), Sweden (5), Switzerland (5), Bangladesh (4), China (3), Serbia (3), Belgium (2), Chile (2), Hong-Kong (2), Indonesia (2), Mexico (2), Norway (2), Armenia (1), Argentina (1), Czech Republic (1), Denmark (1), Faeroe Islands (1), Hungary (1), Malaysia (1), Montenegro (1), New Zealand (1), Romania (1), Singapore (1), Taiwan (1), Tunisia (1), Turkey (1), United Arab Emirates (1). By continent, almost half (47%) came from Europe, with 30% from Asia, 22% from the Americas; there was one participant each from Africa and Oceania.

To accommodate as many time zones as possible, it was decided to have sessions from 9am to 6pm (Bordeaux time). The talks, including questions, were given live using the Zoom on-line conferencing system, and, with a little practice beforehand by speakers and session chairs, ran smoothly. The idea was to enable people to gather in real-time, which is why the talks were not pre-recorded.

Zoom was also made available for: informal chats in the *breakout rooms;* the Open Problems session, chaired by *Alessio Conte* (Università di Pisa) and *Gabriele Fici* (Università di Palermo); the Business Meeting, where presentations were made for *IWOCA 2021* (Lucia Moura, University of Ottawa) and *IWOCA 2022* (Henning Fernau, Universität Trier); Graphmasters, a satellite meeting held one day after *IWOCA 2020* (see https://iwoca2020.labri.fr/graphmasters).

In addition, impromptu meetings with the speakers or specific participants could be performed via a dedicated Discord server. The Discord server was also used during the small-group discussions of Graphmasters. In order to animate the breaks in between the talks, the moderators (organizers, session chairs) filled in the blanks by talking (e.g., with the next speaker), making announcements, etc. The idea was to make it a little bit like on a TV or radio live-show. The number

of questions asked after the talks were sometimes very low. It thus seems important to find a way to encourage questions and feedback, and perhaps the moderators should prepare more for this task. We also had two photo-sessions, where we asked voluntary participants to switch on their camera, and made some screenshots. This was well-received and helped to relax the atmosphere. In retrospect, perhaps this could have been done already at the opening of the conference, as it created a more personal experience. Indeed, the main challenge in a virtual conference is to emulate the social interactions that naturally occur in a physical conference.

Springer-Verlag this year made the Proceedings available on-line on the conference website, and in addition provided 50 hardcopies to those who requested them. Altogether the Proceedings (LNCS 12126), published in the ARCoSS subline of LNCS, include the 30 accepted papers (out of 62 submissions) and one of the three invited papers. Awards, sponsored by Springer, were made for the best paper by Peter Damaschke (*Two robots patrolling on a line: integer version and approximability*), and the best student papers, won jointly by Pratibha Choudhary (*Polynomial time algorithms for tracking path problems*) and Florent Foucaud, Benjamin Gras, Anthony Perez, Florian Sikora (*On the complexity of broadcast domination and multipacking in digraphs*).

The three invited talks were given by Dan Alistarh (*Optimization by population: large-scale distributed optimization via population protocols*), Sándor Fekete (*Swarms of objects at extreme dimensions*) and Tatiana Starikovskaya (*Algorithms for string processing in restricted-access models of computation*).

Graph algorithms dominated the contributed talks this year, but there were also several papers dealing with *Dynamic and online algorithms*, and *Parameterized algorithms,* reflecting the increased interest in these topics. Of the 30 accepted papers, 9 dealt with *Graph algorithms*, 5 with *Dynamic and online algorithms*, and 5 with *Parameterized algorithms*. The 11 remaining papers covered diverse topics from *Combinatorial algorithms, Graph theory, Graph matching, Matroids,* and *Distributed algorithms*.

As usual, authors of selected Proceedings papers were invited to submit significantly enhanced versions of their work to a special issue of an important journal - this year, *Algorithmica*.

IWOCA descends from the original *Australasian* Workshop on Combinatorial Algorithms, first held in 1989, and then renamed *International* in 2007 in response to consistent interest and support from researchers outside the Australasian region. The workshop's permanent website can be accessed at http://www.iwoca.org where links to all *IWOCA*s - past, present and future - can be found, as well as a list of Open Problems in the domain. 🌐

Intelligent Systems, Metaheuristics and Swarm Intelligence, Celebrated Online at India-Based Conference ISMSI20

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International Conference on Intelligent Systems, Metaheuristics and Swarm Intelligence (ISMSI) is one of the annual events of *India International Congress on Computational Intelligence (IICCI*; cf. http://iicci.in/).The aim of this conference was to provide the relevant researchers a platform to assemble every year to present their research findings before their peers as well as deliberate on the progress, challenges and innovative applications of intelligent systems with special emphasis on ever evolving and very focused fields of swarm intelligence and metaheuristics. *Professor Suash Deb* served as the *General Chair of ISMSI20.*

ISMSI commenced its journey in the year 2017 in Hong Kong. It was formally inaugurated on 25th March 2017 by *Prof. John MacIntyre*, the Honorable Pro Vice Chancellor, Sunderland University, UK, in the gracious presence of *Prof. Sam Kwong*, Head of Dept. of Computer Science, City University of Hong Kong, *Prof Thomas Hanne*, Head of Competence Center Systems Engineering, University of Applied Sciences and Arts, Northwestern Switzerland, and others. Subsequently, Phuket Island, Thailand, and Male, Maldives hosted the same conference in the year 2018 and 2019, respectively.

For 2020, Thimphu, capital of Kingdom of Bhutan, was chosen as the venue for ISMSI (March 21-22, 2020). This event was technically sponsored by *EU/ME*, the *EURO Working Group* on Metaheuristics. The preparation for the same was moving smoothly and nearly completed when we were caught off-guard due to Pandemic Covid-19 which threw a spanner on our effort on 6th March when Bhutan reported its 1st case of corona virus after one US tourist tested positive; the Government of Bhutan immediately sealed all its borders and banned the entry of foreign nationals of all origin for 2 weeks. Albeit disappointed, we hoped the situation would improve and accordingly decided to postpone the conference for one month. After taking among others, the Festival of Easter into account, the same was rescheduled to 18th and 19th April, 2020.

Unfortunately since then instead of subsiding, the pandemic had spread to almost all the major cities across the world, resulting in imposition of various travel restrictions and the cancellation of numerous international flights. With each passing day, the task of organizing *ISMSI20* was turning out to be more and more challenging. Ultimately, after taking stock of the prevailing situation, any plan for holding the *ISMSI* conference physically had to be formally abandoned for the year 2020 and we settled for an online virtual conference on the rescheduled date (April 18-19). Along with us, the same turned out to be colossal disappointment for the keynote speakers and all the registered delegates who rescheduled their air tickets as well as hotel reservations after booking both well in advance. Despite that, they extended incredible support and I owe all of them a deep debt of gratitude for displaying utmost patience as well as remarkable understanding throughout this tumultuous and chaotic period, when we were struggling to come up with cogent and rational answers to many of their legitimate queries regarding organizational aspects of I*SMSI20.*

For *ISMSI20*, 60 odd papers had been submitted all of which underwent double blind reviewing process led by the Program Co-chairs of the conference who ultimately shortlisted 28 papers, based mainly on the inputs provided by the IPC members coupled with their own discretion/wisdom, whenever needed. Ultimately 25 of those manuscripts were registered. The authors of all accepted and registered papers were provided with Zoom video conferencing system for presentation of their manuscripts. The proceedings of the conference published by ICPS, ACM and containing research efforts of peers from nations such as Czech Republic, South Africa, Brazil, Hungary, USA, Germany, Switzerland, China, India, Japan, Sweden, Slovenia, Thailand, etc., is available online and can be viewed by visiting https://dl.acm.org/doi/proceedings/10.1145/3396474.

In addition, the conference program consisted of very educative and stimulating Keynote Speeches from three distinguished scientists: *Professor Laszlo T. Koczy* (Hungary), *Professor Celso C. Ribeiro* (Brazil) and *Professor Andries P. Engelbrecht* (South Africa). All of them had shared a small subset of their vast knowledge and research experiences vide the same Zoom video presentation.

For the year 2021, ISMSI would be held in Victoria, capital of Republic of Seychelles, an archipelago in the Indian Ocean, during April 10-11. We do expect to receive quality papers from peers of many diverse nations! Those interested and/or wish to participate, should visit http://ismsi.org.

Annual MOTOR Conference in Russia Successfully Conducted "Online"

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The annual international conference *Mathematical Optimization Theory and Operations Research (MOTOR 2020)* (http://math.nsc.ru/conference/motor/2020/) was organized by International Mathematical Center in Akademgorodok, Novosibirsk, Russia in collaboration with Novosibirsk State University, Sobolev Institute of Mathematics, Krasovskii Institute of Mathematics and Mechanics, High School of Economics, and Melentiev Energy Systems Institute, during July 6-10. For decades, many conferences on mathematical programming, optimization methods, and operations research have been held annually in Russia. They took place in the Urals, Siberia, and the Far East: *Baikal International Triennial School Seminar on Methods of Optimization and Their Applications* (BITSS MOPT) established in 1969 by academician N.N. Moiseev, the 17th event in this series was held on 2017, at Lake Baikal in Buryatia; *All-Russian Conference on Mathematical Programming and Applications* (MPA) established in 1972 by academician I.I. Eremin, the 15th conference in this series was held in 2015, near Ekaterinburg; *International Conference on Discrete Optimization and Operations Research* (DOOR) was organized 9 times since 1996, the last event was held on 2016 on Russky Island in Vladivostok; *International Conference*

active researchers including students of the Novosibirsk State University. Sure, we understand that people wish to communicate in more active fashion. Thus, we create so-called round table sessions devoted to open optimization problems, solution approaches to problems with inexact and incomplete data, and industry applications. Such round tables attracted a wide interest of the participants. All the plenary lectures, tutorials, and industrial round table were recorded, the videos can be found at the site of the conference.

Following the well-established tradition, the main conference scope of *MOTOR 2020* included but not limited to novel theoretical and numerical results in the fields of mathematical programming, bi-level and global optimization, integer programming and combinatorial optimization, approximation algorithms with theoretical guarantees and approximation schemes, heuristics and meta-heuristics, game theory, optimization in machine learning and data analysis, and valuable practical applications in operations research and economics.

▲ Siberian pine forest on the Ob River bay – welcome to MOTOR 2020.

on Optimization Problems and their Applications (OPTA) was organized regularly in Omsk since 1997, the 7th event in this series was held on 2018. In 2018, the scientific community decided to joint these conferences under the auspices of the *Russian Operational Research Society* (RuORS) and hold the annual international conference Mathematical Optimization Theory and Operations Research (MOTOR). In 2019, the first joint conference was held in Ekaterinburg (http://motor2019.uran.ru). Academgorodok in Novosibirsk was chosen for the *MOTOR 2020.*

We planned this scientific event in a picturesque pine forest on the Ob River bay. Unfortunately, this year is difficult for the international conferences. Due to COVID-19, the most scientific meetings have been canceled or rescheduled for the future. We decided to save the timing for the *MOTOR 2020* and move it into the virtual space. All sessions, plenary talks, and tutorials were organized using the Zoom system. Almost all participants accepted this idea with enthusiasm. Moreover, it allows us to cancel the conference fee and open the door for all

In response to the call for papers, the *MOTOR 2020* received 175 submissions from the researchers around the world including Austria, Australia, Belorussia, China, Croatia, Germany, France, India, Italy, Kazakhstan, Mongolia, Netherlands, OAE, Portugal, Russia, Taiwan, UK, and USA. Out of 102 full papers considered for reviewing (73 abstracts and short communications were excluded because of formal reasons) only 31 papers were selected by Program Committee for publication in the main volume of the conference proceedings published by Springer in Lecture Notes in Computer Science, Vol. 12095 (https://link.springer.com/book/10.1007/978-3-030-49988-4). Each submission was reviewed by at least three PC members or invited reviewers, experts in their fields, in order to supply detailed and helpful comments. In addition, the Program Committee recommended including 33 papers in the supplementary volume after their presentation and discussion during the conference and subsequent revision with respect to the reviewers' comments, which will be published in Communications in Computer and Information Science soon.

▲ Participants of the MOTOR 2020 conference in Zoom sessions.

The conference featured nine invited lectures were given by outstanding scientists: *Prof. Aida Abiad* (Eindhoven University of Technology, The Netherlands, and Ghent University, Belgium) "Graph invariants and their application to the graph isomorphism problem"; *Prof. Evripidis Bampis* (Sorbonne Université, France) "Multistage Optimization Problems"; *Prof. Bo Chen* (University of Warwick, UK), "Capacity Auctions: VCG Mechanism vs. Submodularity"; *Prof. Sergei Chubanov* (Bosch Research, Germany), "Convex geometry in the context of artificial intelligence"; *Prof. Igor Konnov* (Kazan Federal University, Russia) "Equilibrium Formulations of Relative Optimization Problems"; *Prof. Alexander Kostochka* (University of Illinois at Chicago, USA), "Long cycles in graph and hypergraphs"; *Prof. Panos Pardalos* (University of Florida, USA), "Inverse Combinatorial Optimization Problems"; *Prof. Soumyendu Raha* (Indian Institute of Science, Bangalore, India) "Partitioning a Reaction-Diffusion Ecological Network for Dynamic Stability"; *Prof. Yakov Zinder* (University of

Technology Sydney, Australia), "Two-stage Scheduling Models with Limited Storage".

In addition, the following four tutorials were organized: "Evolution of sailor and surgical knots" by *Prof. Alexander Grigoriev* from Maastricht University, Netherlands; "Metrics of a fixed doubling dimension: an efficient approximation of combinatorial problems" by *Prof. Michael Khachay* from Krasovsky Institute of Mathematics and Mechanics, Russia; "Game Theory and Social Networks" by *Prof. Vladimir Mazalov* from the Institute of Applied Mathematical Research, Russia; "Practice of using the Gurobi optimizer" by *Dr. Andrey Melnikov* from Sobolev Institute of Mathematics, Russia

Technical program included 97 oral talks in the contributed sections. The next *MOTOR 2021* will be organized on July 2021 in Irkutsk, near the beautiful Lake Baikal. Welcome to the *MOTOR 2021!* 🌐

To fight the COVID-19 Pandemic: The e-ORAHS 2020 Conference in Vienna, Austria

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In 2020, the *EURO Working Group on Operational Research in Health Care (ORAHS*, http://orahs.di.unito.it/) organized this year's conference, which was supposed to take place at the University of Vienna, Austria (https://www.univie.ac.at/), as an e-conference (https://orahs2020.univie.ac.at/). The change to e-mode became necessary due to the coronavirus (COVID-19) pandemic. Despite the switch to e-mode, which had to be accomplished by the local organizing committee in a very short time, the conference was a complete success. With 102 accepted contributions, two outstanding keynotes, a round table on prevention and a COVID-19 Policy Modeling Session, the conference

program was extremely diverse. There were more than 150 participants.

The e-conference took place from Monday 27th until Friday 31st, July 2020. On the evening before the conference, one of the keynote speakers, *Professor Peter Zweifel*, emeritus professor at the Department of Economics of the University of Zurich, joined the local organizing committee on site. As part of a ring tour with a historic Viennese tram, the members of the local organizing committee and *Prof. Zweifel* had a wonderful tour around the city center. Following the city tour, everyone was able to fortify himself or herself for the upcoming conference in the Stiegl Bräu.

With his keynote talk entitled *"Preference Measurement in Health Using Experiments"*, *Prof. Zweifel* offered an excellent overview of the current state of research regarding preference measurement in healthcare, which has emerged in recent years as a very active research area in health economics due to the wide range of possible uses. After his lecture broadcasted live from the University of Vienna, the participants had the opportunity to discuss with *Prof. Zweifel* online about this topic.

Because of COVID-19, the second keynote speaker, *Professor Gregory Zaric*, Faculty Director of Management Science, Ivey Business School, Canada and Canada Research Chair in Health Care Management Science, attended the conference online. In his keynote entitled *"Incentives and Coordination in Healthcare"* on Tuesday, *Prof. Zaric* addressed problems that arise from the independent decisions of many different actors in the healthcare system, each with different goals and subject to different incentives. In his lecture, he gave an overview of three research projects into contracts that are concluded to coordinate the measures of independent actors in the healthcare sector.

In addition to the two keynotes, there was also a *"Round Table on Challenges in Health Care Prevention"* as a special event of the e-conference which was moderated by *Prof. Bernhard Schwarz*, the head of the Karl Landsteiner Society, Austria and affiliated with the Medical University of Vienna, Austria. With *Prof. Sally Brailsford* (University of Southampton, UK), Prof. Margaret L. Brandeau (Stanford University, USA), Prof. Alexandra Schosser (BBRZ Med GmbH, Austria) and *Prof. Bernhard Schwarz* (Medical University of Vienna, Austria), distinguished national and international researchers and policy makers took part in a lively discussion. First, the members of the round table gave an introductory statement. Afterwards all participants contributed to the open discussion, which, among others, also revolved around COVID-19.

To consider the current circumstances in healthcare prevention, a COVID-19 session entitled *"COVID-19 Policy Modeling"* was also set up and chaired by *Prof. Alexander*

▲ e-ORAHS 2020 Opening & Team.

Rutherford, Canada. In this session, research questions related to COVID-19, such as the optimization of patient admission to hospitals/ICUs (intensive care units), the optimization of the daily collection of swab tests to identify new cases of COVID-19 and the support of planning requirements for access to mechanical ventilators, were treated by international researchers. As expected, the interest in the contributions in this session was very high.

In addition to the opening and closing sessions, the keynote sessions, the Round Table and the COVID-19 sessions, there were additional 27 paper sessions and one additional poster session covering a wide range of research topics in healthcare. After each talk, there was a lively online exchange among presenters and audience. After the poster session, the students were also "live" around for discussion in eight poster rooms.

There were also two sessions of the Austrian Working Group *Operations Research in Health Care & Disaster Management,* one *ÖGOR healthcare management session* and one *ÖGOR disaster management session*. In these sessions, various topics were addressed, illustrating the extensive spectrum for OR methods in healthcare and disaster management.

▲ Keynote of Professor Peter Zweifel from University of Zurich, Switzerland, and Keynote of Professor Gregory Zaric from Ivey Business School, Canada (from left to right).
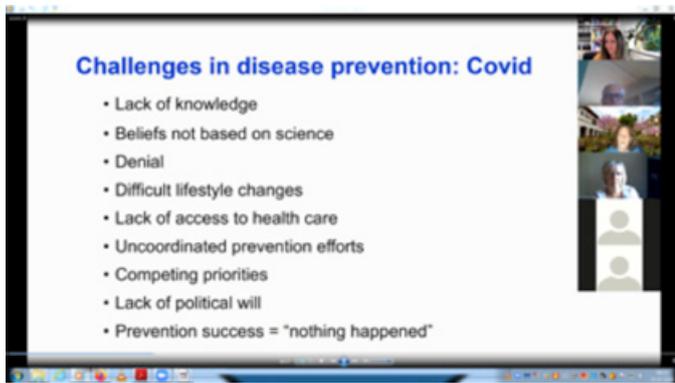
▲ Introductory statements by Prof. Margaret Brandeau and Prof. Alexandra Schosser.

The social program was also an important part of the e-conference in which *Nurcan Cakan* played a key role taping all the sights and traditions in Vienna. From Monday to Wednesday, the participants were able to marvel at Schönbrunn, including the garden and the zoo, get to know historic Vienna by e-walk, and take part in an e-boat cruise on the Danube.

During the e-social program, hidden tips for a *"Mozartkugel"* competition were provided, which were solved as part of the e-banquet on Thursday. During the e-banquet, ORAHS co-chair *Prof. Roberto Aringhieri* also announced this year's laureate for the *Steven Gallivan Prize* for the best poster, including the best setup for the zoom room. *Erin Roman* from Belgium received the Steven Gallivan Prize for her poster entitled *"Variability in hospital treatment costs: A time-driven activity-based costing approach for early stage invasive breast cancer patients".*

Overall, the e-conference went smoothly, not least due to the tireless efforts of the many people who supported the local scientific committee around *Marion Rauner* (University of Vienna), *Patrick Hirsch* (Vienna University of Natural Resources and Life Sciences) and *Margit Sommersguter-Reichmann* (University of Graz). Further essential team members included *Sabine Grahsner* (University of Vienna; secretary), *Alexandra Wassipaul* (University of Vienna; registration), *Lorena Reyes-Rubiano* (Vienna University of Natural Resources and Life Sciences; EURO-Tool, Web), *Nurcan Cakan* (University of Vienna; e-social program), *Matthias Leon Eller* (University of Vienna; e-technician zoom & u-cloud), the president of ÖGOR *(Raimund Kovacevic)* and the heads of the ÖGOR Working Groups, the coordinators of the ORAHS working group *(Ines Marques and Roberto Aringhieri)*, and the members of the international scientific committee of ORAHS.
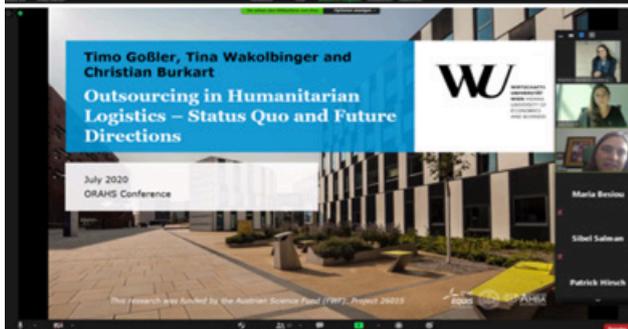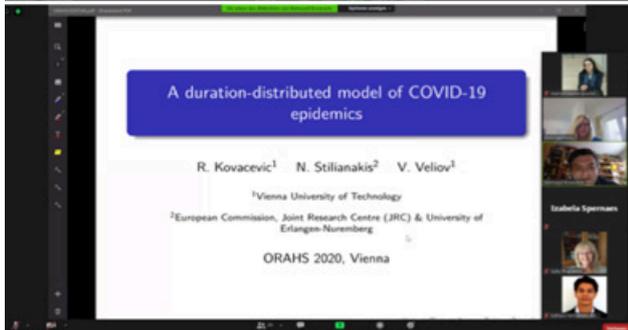
▲ Illustration of the extensive areas of application in health and disaster management for OR methods. 🌐

OR Goes into Space - OSE Workshop successfully held in Slovenia

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▲ Keynote talks by Cèlia Yábar Vallès and Edmondo Minisci

The *5th workshop on Optimization in Space Engineering (OSE)* was organised on November 21-22, 2019, by the European Space Agency, the University of Strathclyde, the Jožef Stefan Institute of Ljubljana and ESTECO S.p.A. This edition of the workshop was held in conjunction with the second Global Virtual Workshop (GVWII) of UTOPIAE, a European research and training network looking at cutting edge methods bridging optimisation and uncertainty quantification applied to aerospace systems (http://utopiae.eu/).

Optimal control of spacecraft and rovers; Planning and scheduling for autonomous systems in space; Multiobjective optimization for space applications; Resource allocation and programmatics; Evolutionary computation for design and control; Distributed global optimization; Mission planning and control; Robust mission design under uncertainties; Uncertainty treatment in optimization; Intelligent search and optimization methods in aerospace applications.

The *OSE5* Workshop was attended by 40 participants

▲ Panel discussion on Optimization Methods (on the left photo, from the left: Annalisa Riccardi, Matthias Knauer, Mariapia Marchi, Cèlia Yábar Vallès, and Gregor Papa) and Interactive Panel discussion on the Future of Optimization (on the right photo, Edmondo Minisci).

The goal of the OSE initiative is to provide a forum for space companies, universities, research institutes and organisations to discuss recent advances in space technology and further research in the area of optimization in space engineering. Participants were invited to share their latest engineering problems and proposed solutions so as to promote the creation and exchange of ideas and the identification of new trends and required developments. In addition to the latest theoretical advances in the field of optimisation for space engineering, OSE is also devoted to the promotion of optimisation tools and techniques.

Discussion topics included (but were not limited to): Global trajectory optimization; Multidisciplinary design for space missions; Formation and constellation design and control;

at the location. As the workshop was livestreamed, the attendance of remote attendees during the two days was around 15 people. In total the workshop was attended by 55 participants (including more than 20 post graduate students) with the following geographical distribution of on-site attendants: Slovenia, 11; United Kingdom, 9; Germany, 6; Italy, 5; Belgium, 3; France, 2; The Netherlands, 2; Japan, 1; Portugal, 1.

The OSE5 program included **Two keynote talks:** *Cèlia Yábar Vallès*, European Space Agency, talking about "Real-time optimization guidance in space applications" (http://cs.ijs.si/project/utopiae/gvw-ii/files/K1.pdf); and *Edmondo Minisci*, University of Strathclyde, presenting the *"UTOPIAE project"* (http://cs.ijs.si/project/utopiae/gvw-ii/files/K2.pdf).

Eight regular sessions took place on: Distributed optimisation tools; Space exploration and decision making; Optimisation techniques under uncertainty; Optimal control (six sessions); Optimisation of Space System; and Optimisation for Aerospace Systems and Manufacturing.

Two discussions sessions were on: a panel session on *"Optimization methods",* and an Interactive discussion on *"Future directions of optimization"*. The interactive discussion was run via Sli.do and, among the many outcomes it pointed at machine learning as the next disruptive technology for both optimization (followed by quantum

▲ OSE5 Gala dinner at the Ljubljana Castle.

computing) and space engineering (followed by digital twins).

The *OSE 2019* Workshop incorporated also a series of social events, including lunches in the foyer area, and the *Conference Gala Dinner* at the Ljubljana Castle.

The scientific and social programmes of the *OSE 2019* Workshop would not have been possible without the support of the UTOPIAE project, the European Space Agency, the Jožef Stefan Institute of Ljubljana, ESTECO S.p.A, and the Intelligent Computational Engineering Laboratory (ICELab). 🌐

▲ OSE5 Gala dinner at the Ljubljana Castle.

Decision Support System Technologies – ICDSST 2020 online: a Success Story Evaluated in France

Pascale Zaraté < pascale.zarate@ut-capitole.fr >

The *EURO Working Group on Decision Support Systems* (https://ewgdss.wordpress.com/) annually organizes the *International Conference on Decision Support System Technologies*. Prof. Dr. *Pascale Zaraté* (University Toulouse 1 Capitole-IRIT, Toulouse, France) is one of the coordinators of the EURO working group. For 2020 the *ICDSST* was hosted by the University of Zaragoza, Spain, May 27-29, 2020 (https://icdsst2020.wordpress.com/). Due to the pandemic situation because of the Corona virus, the executive board of the EWG-DSS and the organization committee of the *ICDSST 2020* decided to organize the conference on-line using the Zoom system. The *ICDSST* series generally presents long papers, published in proceedings at Lectures Notes in Business Processing, Springer; short papers and posters are published in a local proceeding. For 2020, 13 long papers, 22 short papers and 8 posters were presented during the meeting.

The conference was organized in 6 sessions on three days,

plus an opening and a closing session. In order to allow all participants from all over the world to participate, one special session for geographically more Western countries was scheduled at the end of the day in Spain and another one at the beginning of the day in Spain for more Eastern countries. In each session, 7 contributions were given.

▲ ICDSST 2020: Here we are!

Before the conference, the participants were asked to create a 10 minutes video of their presentation. In order to allow, the participants to see the videos, all videos were storage on the Cloud accessible to all registered participants before the conference. For each session, one moderator was assigned. The moderator briefly introduced the session, requested to the technical support to broadcast the video, and at the end enabled sound and video of speaker and asked him questions received by chat. He also asked to the audience if any more comments or questions are still open putting the image of the speaker. At the conclusion of questions, he then went to the next speaker repeating the same sequence.

At the end of the conference, an **On-line Survey**, including 11 questions, was sent to all the participants. We received 45 answers on the 60 registered persons. The following feedback was found:

o 69% think that the conference is prestigious or very prestigious.
o 79% are satisfied or very satisfied with the online organization.
o 79% are satisfied or very satisfied with the overall organization.

Comments:
+ Amazing / Excellent coordination and organization / A success / Great alternative / Thank you
- Miss the networking
- Satisfied or very satisfied with sessions
o Starting time: 71%,
o Duration: 69%,
o Content: 71%.
Comments:
+ Perfect timing / Different time zones well managed
- Short break / Long Sessions
- 73% are satisfied or very satisfied with the videos.

Comments:
+ Well-prepared / excellent technical support / Congratulations
- 73% are satisfied or very satisfied with the moderation.

Comments:
+ Well-trained / Impressive punctuality

- 69% are satisfied or very satisfied with the communication system (Zoom).

Comments:
+ Very good
- Improve the questions system asking to prepare them in advance
- 62% would participate in the future in online conference.

Comments:
+ Poster session very promising to be re-organized in this way (5-10 minutes presentations by video)
- Prefer face-to-face meeting / Social component absent
- 49% would like to introduce online session in future ICDSST meetings.

What was the worst in the conference?
Social network / Not being able to hug friends / Not having personal contacts / Lunch time too short

What was the best in the conference?
Perfect organization / Excellent community spirit / Exciting presentations / Closing session / Keynote presentations / Everything / Prepared videos / Good interaction / Quality of papers / Followed Schedule

General comments: Thank you / Positive experience / Great team

As a conclusion of this survey, even if the participants appreciated the conference for its organization, videos, sessions, schedule on time, content, we can assume that they missed their colleagues and friends. As a perspective, we can think to organize posters session including a video of 5-10 minutes based on the *ICDSST 2020* format.

Finally, I would like to thank GDMZ, the University of Zaragoza and its Faculty of Economics and Business, *Prof. Dr. José Maria Moreno, Prof. Dr. Alberto Turon, Prof. Dr. Maite Escobar* and *Prof. Dr. Isabelle Linden* from University of Namur, Belgium, for this perfect organization. 🌍

Thousands attend INFORMS Virtual Analytics Conference

Kara Tucker < kara.tucker@informs.org >

The 2020 I*NFORMS Conference on Business Analytics*, originally set for April 26-28 in Denver, was canceled due to the coronavirus crisis, but the show went on a few weeks later rebranded as the first-ever INFORMS *Virtual* Business Analytics Conference. Despite the obvious obstacles, including the radical change in format and limited advance notice, thousands of individuals registered for the online event held May 18-22, 2020.

The conference committee and *INFORMS* staff members went to great lengths to make the virtual conference resemble the real thing by including live Q&A opportunities after each session, along with virtual award presentations and a virtual networking session. The only thing missing was a virtual goody bag. Conference chairperson *Scott Nestler* noted in his welcoming remarks that it was going to be a *"one-of-a-kind analytics experience"* – and it certainly was.

The virtual conference had more than 5,200 registrants, and the highest attended presentation saw 1,100 attendees from around the world – about the same number of total attendees during last year's in-person event in Austin, Texas. The virtual conference featured 13 sessions artfully moderated by INFORMS Creative Director *Mary Leszczynski*, with help from *Ashley Kilgore*, INFORMS communications manager, and INFORMS Meetings Department staff to keep each Q&A session on track and running smoothly. Any questions that were not addressed during the live Q&A session were answered by presenters later and are included in the full presentation slides on *INFORMS Connect* (cf. link at https://pubsonline.informs.org/do/10.1287/orms.2020.03.18/full/).
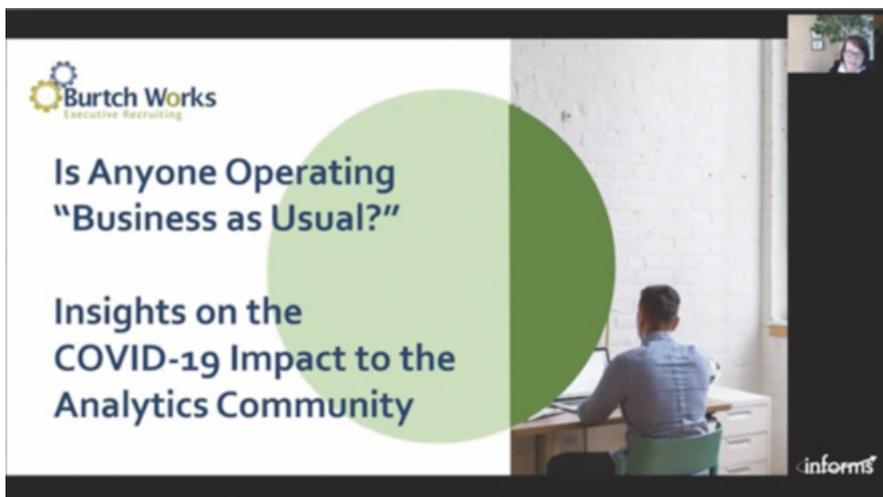
for Analytics, discussed the many ethical, privacy and legal issues to consider because, in the absence of clear standards, organizations and individuals must lean on their own principles to guide them.

The rest of the sessions, delivered by a select cast of thought

▲ Screenshot of Bill Franks' presentation.

leaders and subject matter experts, covered a range of themes and timely topics. Not surprising, the coronavirus crisis and related COVID-19 disease – the topic on everyone's minds, especially analytics professionals – drew plenty of attention. "Is anyone operating 'business as usual?' Insights on the COVID-19 impact to the analytics community" was the title of the presentation by *Linda Burtch*, founder of Burtch Works. *Robin Dillon-Merrill*, a professor at Georgetown University's McDonough School of Business, followed with her session titled, "Prevent disasters: How to identify and manage risks by learning from near-miss events." *Genetha Gray* of Salesforce discussed "Using analytics to address the impacts of COVID-19 on the workplace" and *Zahir Balaporia*, CAP, of FICO gave perhaps the timeliest presentation: "Analytics leadership during a crisis."

Other presentations included: "Pricing a Subscription Service to Maximize Customer Lifetime Value" by *Anand Srinivasan*, chief data scientist, Kaizen Analytix, "Transitioning to the Digital Factory at Lockheed Martin Aeronautics" by *Bryan Massie*, data engineer/architect and technical fellow, and *Tony DeMarco*, principal data scientist, Lockheed Martin, "Why AI/Data Science Projects Fail – How to Avoid Project Pitfalls" by *Joyce Weiner*, data scientist, Intel Corporation, "Executive Perception of Machine Learning for Marketing Decisions" by *Beverly Wright*, CAP,

▲ Screenshot of Linda Burtch's presentation.

As usual, this year's Analytics Conference began with a plenary session. In his talk, "The Ethics of Analytics," *Bill Franks*, chief analytics officer for the International Institute

partner – data science, RelationalAI, "Minimizing Risks through Data-Driven Decisions" by R*ony Chatterjee*, technical advisor to the corporate vice president, Microsoft Azure Data,
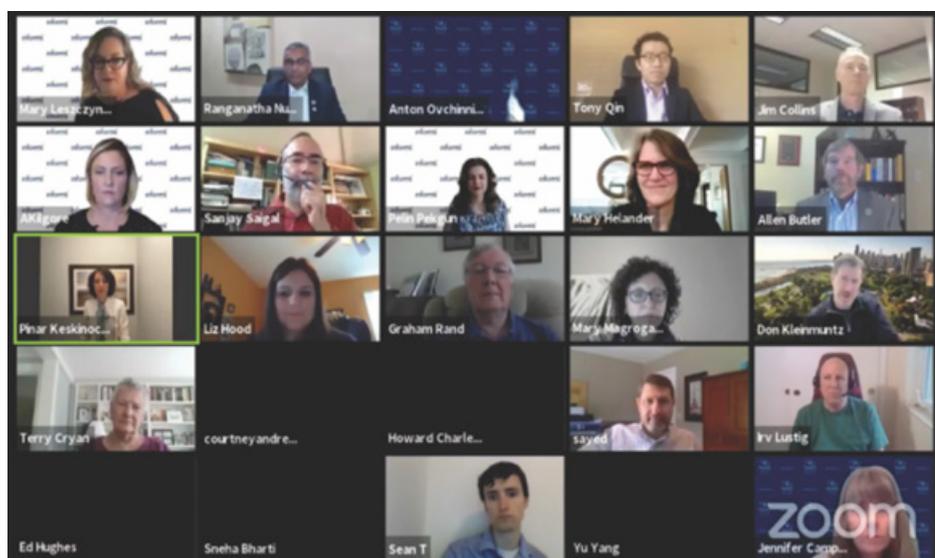
>> "10 Things You Need for AI-Enabled Knowledge Discovery" by *Swami Chandrasekaran*, managing director & head of solution architecture, digital solutions, KPMG, "Supply Chain Optimization Now and in the Future: How Will Advances in Analytics and AI Influence Decision Making?" by *John Poppelaars*, co-founder and director, LITIC by, "Removing Technical and Cultural Barriers Standing in the Way of Operationalizing Predictive and Prescriptive Models" by *Libin Varghese*, solutions consultant, FICO. All presentation videos are available on the *INFORMS Virtual Business Analytics Conference* website (http://meetings2.informs.org/wordpress/analytics2020) and full presentation slides can be found on INFORMS Connect (https://tinyurl.com/y8e4dkjz).

▲ Screenshot of John Poppelaars' presentation.

▲ Attendees of the virtual awards ceremony.

The final portion of the *2020 INFORMS Virtual Business Analytics Conference* was an awards ceremony followed by a networking session. The following **INFORMS award winners** were recognized: *2019 Daniel H. Wagner Prize*: DiDi Research America and Didi Chuxing Technology Co., *2020 INFORMS Prize*: UPS, *2020 UPS George D. Smith Prize*: Smith School of Business at Queen's University in Kingston, Ontario, Canada, *2020 O.R. & Analytics Student Team Competition*: Hebrew University of Jerusalem, Israel. In addition, an Analytics Society of INFORMS Award was presented: The *2020 Innovative Applications in Analytics Award (IAAA)* was presented to an international team composed of researchers from Mexico and Colombia for their winning application "*Integrated Analytics for Sustainable Agriculture in Latin America*".

After the virtual awards

were "handed out," the presenters, award winners and attendees were encouraged to stay logged in for some virtual networking. Using Zoom's breakout room feature, the attendees were divided into small groups to discuss analytics-related questions such as: *"What does the 'analytics world' look like for you today? How has it changed in the past few months?"* and *"Given the accomplishments witnessed today and the current environment, what do you predict to be the next major contribution to or use of analytics?"*

We hope all attendees enjoyed the first-ever virtual Business Analytics Conference – from presentations to thoughtful Q&As to meeting a new colleague or two – and we look forward to the next conference! Virtual or otherwise.

In addition to INFORMS and especially to the author, dear *Kara Tucker* who is assistant editor of OR/MS Today and Analytics magazine, we cordially thank dear *Ashley Kilgore*, for communication and help to make this reprint possible.

- Gerhard-Wilhelm Weber 🌍
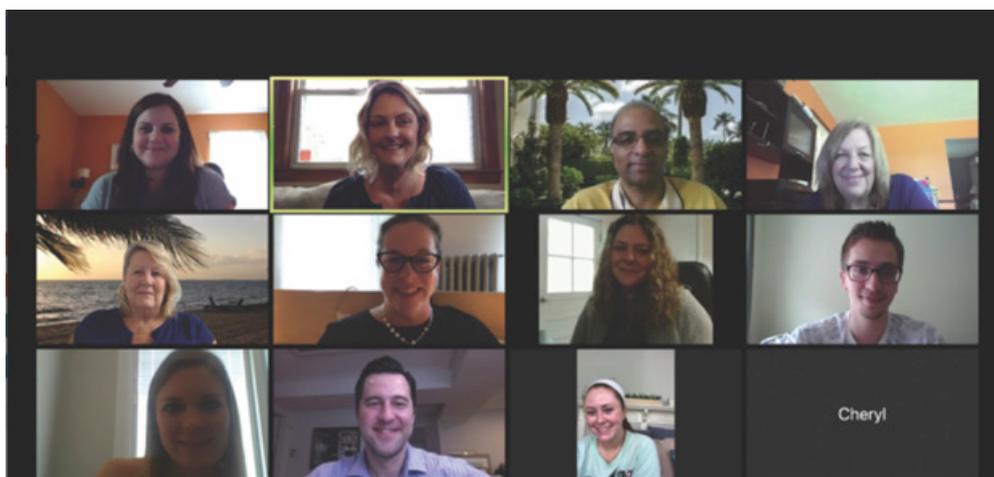
▲ Members of the INFORMS staff welcome conference attendees.

EURO WISDOM Webinar "OR/MS for Healthcare and Gender" and WISDOM Forum Summer News

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Tatiana Tchemisova <tatiana@ua.pt>, and **Ozgen Karaer** <okaraer@metu.edu.tr>

*WISDOM (**W**omen **I**n **S**ociety: **D**oing **O**perational Research and **M**anagement Science)* is a forum launched at the beginning of 2020 by EURO, the *Association of European Operational Research Societies* (https://www.euro-online.org/) within *IFORS* (https://www.ifors.org/). WISDOM is designed as a forum to support, empower, and encourage the participation of all genders in Operational Research and Management Science within *EURO*. The WISDOM initiative restates the need for gender main-streaming and affirms that OR/MS can offer exciting opportunities for all genders if they have equal access to resources and adequate training. Gender main-streaming aims to integrate a gender dimension into existing institutions and practices in order to achieve meaningful gender equality. We now share the most recent WISDOM updates. Further details on the *EURO WISDOM* Forum planned research and events are available at euro-online.org/web/pages/1654/wisdom. The *EURO WISDOM* Forum can be contacted by emailing wisdom@euro-online.org. WISDOM invites all interested also to join the forum on *LinkedIn*.

1. WISDOM webinar "OR/MS for Healthcare and Gender"

On July 20, 2020, WISDOM held its second event, a webinar titled "OR/MS for Healthcare and Gender". The panelists of the webinar were two well-known OR scholars: *Prof. Dr. Christine Currie*, Director of the Centre for Operational Research, Management Sciences and Information Systems (CORMSIS) at the University of Southampton, UK, and *Prof. Dr. Roberto Aringhieri,* Computer Science Department of the University of Torino, Italy, and a Co-coordinator of the European Working group on Operational Research Applied to Health Services (ORAHS).
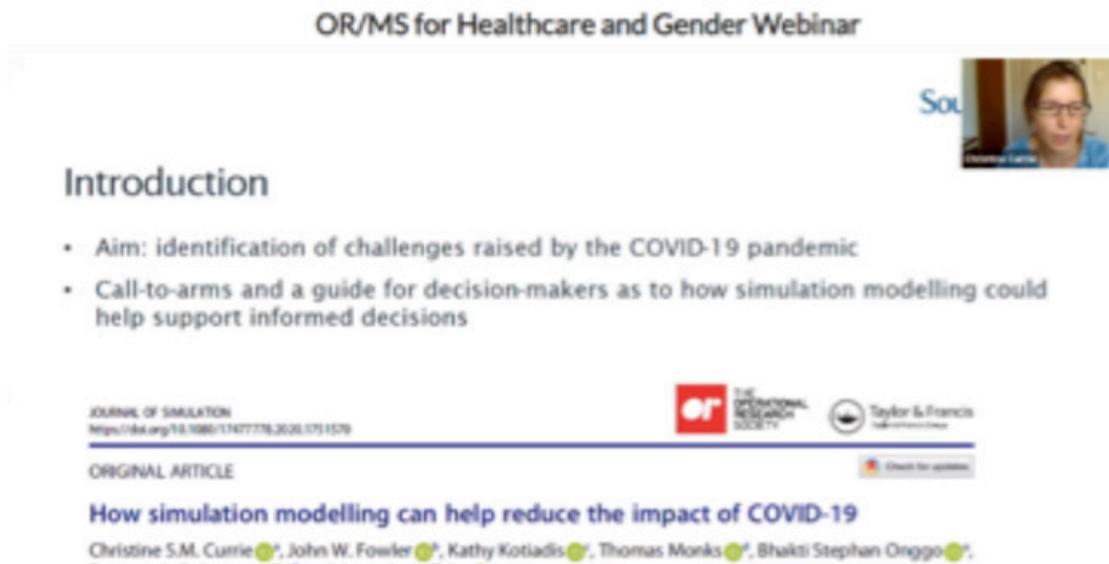
Christine Currie presented her recent paper *"How simulation modelling can help reduce the impact of COVID-19"* while *Roberto Aringhieri* talked about online optimization in healthcare applied to the radiotherapy patient scheduling problems as well as prediction and real-time allocation of emergency department services. Hence, both speakers dealt with very timely topics as exacerbated by the COVID-19 pandemic.

The webinar attendees had an opportunity to present their questions in written form or during the Roundtable discussion that was moderated by the facilitator *Dr. Paula Carroll*, Chair of *EURO WISDOM* Forum.

2. WISDOM White Paper promoting EDI (Equality, Diversity, and Inclusivity)

WISDOM has published its first research work in June, a white paper titled *"Promoting Gender Equality and Inclusivity in EURO Activities"*. This is the joint work of a group of authors, members of the WISDOM research subcommittee, and aims to identify the problems and challenges met by the *OR/MS* community which are connected with Equality, Diversity, and Inclusivity (EDI). These authors are *Paula Carroll, Annunziata Esposito Amideo, Andreina Francisco Rodriguez, Renata Mansini, Nicola Morrill, Frances O'Brien*, and *Tatiana Tchemisova*. The white paper starts with a systematic literature review to gain a broad array of disciplinary perspectives on the context of EDI problems so as to identify which initiatives could be useful for the *OR/MS* community in general, and by *EURO*, in particular. The authors considered for their analyses 37 papers from peer-reviewed international journals such as *Journal of Management, Equality, Diversity and Inclusion, Journal of Business Ethics*, and several reports and expert groups reviews, including the U.N. report *"Tackling Social Norms:* A game changer for gender inequalities". Fifteen of these articles were selected for more detailed analysis so as to identify how each paper: (1) contributed to EDI practices, (2) highlighted pros and cons in the current EDI framework and, eventually (3) proposed practice(s) that could eventually be adapted as a recommendation within the WISDOM remit.

▲ Snapshot of the Webinar: presentation by Prof. Dr. Christine Currie.

OR/MS for Healthcare and Gender Webinar

Our solution is based on an **ad-hoc process mining model** [18] to **predict** the use of the resources starting from the information available at the triage.

The **first step** is to generate **clusters** of similar patients to reduce tree

▲ Snapshot of the Webinar: presentation by Prof. Dr. Roberto Aringhieri.

The authors of the white paper believe that the adoption of their best practice recommendations in *EURO*'s instruments, by its national societies, working groups, at *OR* conferences, and in *OR* publications can serve to raise the visibility of the contribution of women in *OR/MS*, and make it an attractive career option for women. Examples of recommendations/ actions are the identification of the current diversity management and promotion policies, the design of metrics that could track the progress of women (and men) in academia and practice within *OR* and, the organization of *OR*-specific career planning, and others. It is important to stress that the objective in answering research questions in the paper was not to contribute to the theory of EDI, but to learn which practices may be useful for adoption by the *OR* community. Encouraging diverse perspectives will benefit the *OR* discipline in its entirety, not just its female actors. The white paper recommendations for actions to support, empower and encourage the participation of all genders in *OR* will be considered by *EURO*. The white paper containing the full list of recommendations is available at https://www.researchgate.net/publication/342639072_ Promoting_Gender_Equality_and_Inclusivity_in_EURO_ Activities_WISDOM_Forum_White_Paper. 🌎

The World Speech Day Morocco-2020: An OR Guidance for Post Covid-19 Period - Inspiring Women's Perspectives

Burcu Gürbüz <burcugrbz@gmail.com>

The *World Speech Day Morocco-2020 (WSD Morocco-2020)* has chosen to combine voices and perceptions and invite women from all over the world to imagine together the world of tomorrow. The resilient society we hope for after Covid-19. The *WSD Morocco-2020* has been hosted in University of Mohammed Premier Oujda, in Morocco under the leadership of *Prof. Dr. Saida Belouali* (University of Mohammed Premier Oujda) with the theme *"Women's perspectives on world post Covid-19"* on June 17, 2020 at 15.00 (GMT + 01: 00). Due to the globally difficult times, the event has been organized online (https://meet.google.com/gny-tjrp-kbt). The official languages of the *WSD Morocco-2020* have been in English, French and Arabic and, preferably, with English subtitles during the sessions.

The opening speech was given by the Rector of University of Mohammed Premier Oujda, *Prof. Dr. Yassine Zarhloule*. Besides, the chairman and the founder of the *World Speech Day* platform, *Simon Gibson*, said that this event, which was attended by experts from different countries of the world, with different perspectives, will help everyone in the period after Covid-19.

WSD Morocco-2020 was mainly about understanding our "new normal" life styles, and the inspiring invited speakers from Morocco, Tunisia, France, Egypt, Norway, Haiti, Saudi Arabia, USA, Germany and South Africa who work in different fields of science and OR, introduced their experiences and studies during Covid-19 times to support people through guidance (https://www.facebook.com/World-speech-day-of-Morocco-2020-102451098057544/).

While *Prof. Belouali* and *Vino Pillay* (National Ambassador WSD South Africa) talked about the importance of communication and understanding of us, *Kaylee Steck*, who is officer and responsible for exchange programs at AMIDEAST, mentioned the current meaning of communication and change.

Screenshot of John Poppelaars' presentation.

▲ The official poster of WSD Morocco-2020 including the participants.

Assist. Prof. Dr. Maha Gmira (School of Digital Engineering and Artificial Intelligence (EIDIA), Euro-Mediterranean University of Fes, Morocco) made a very successful presentation on digital transformation and Artificial Intelligence applications after Covid-19. *Vicky Bristow* (PhD Candidate, MED School, University of East Anglia, UK) emphasized the importance of unity and solidarity while addressing the "psychology" of Covid-19. *Prof. Dr. Amal El Fallah Seghrouchni* (Laboratoire d'informatique de Paris 6 (LIP6), Sorbonne University, France) provided information on ethical and "artificial Intelligence" practices.

At the event, *Burcu Gürbüz* (Post-doctoral Research Associate Johannes Gutenberg-University of Mainz, Germany, and Assist. Prof. at Üsküdar University, Istanbul, Turkey) gave a talk titled *"A Mathematical Approach to Covid-19"*. She explained how Operational Research studies and mathematical applications in *biology* have played an important role in medicine, healthcare and biology during the Covid-19 period.

She also elaborated how OR techniques are useful and very important for making convenient decisions and strategical planning. Besides, some studies show that *OR*-based ideas play a crucial role to support academics, practitioners and policy makers with man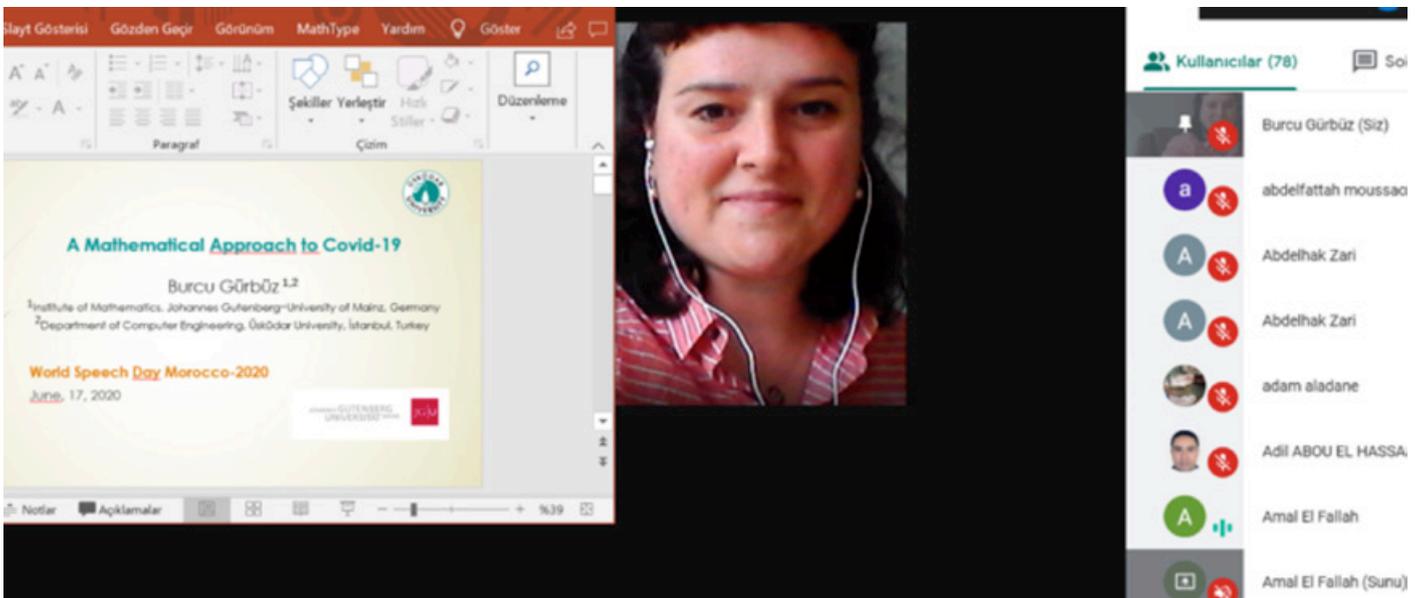y topics in sectors such as supply chains, epidemiology, healthcare, social science, economy, logistics, resource allocation, agriculture, retail, energy, medicine and technology. In addition, she shared her personal experiences in academic life during the Covid-19 period, in particular at digital platforms and as a female academician. She gave messages regarding her "positive thinking" style and about holding on to her work which could play an important role in overcoming this period. Finally, her speech gained a lot of attention and she answered questions of listeners interested.

The *"World Speech Day"* (www.worldspeechday.com/) is a platform that encourages people to talk and share their ideas by organizing open events in more than 100 countries. The platform, which provides people with an environment which shows that they can build bridges with "world citizenship", also carries out joint studies with the British Council.

World Speech Day of Morocco-2020
Women's perspectives on the world post Covid-19
Le monde après la Covid-19, regards au féminin
Date: Wednesday, June 17, 2020 at 3:00 p.m. (Casablanca time-GMT +01:00)
Language: Arabic, English, French.
Platform: Google Meet
https://meet.google.com/gny-tjrp-kbt
https://www.facebook.com/World-speech-day-of-Morocco-2020-102451098057544
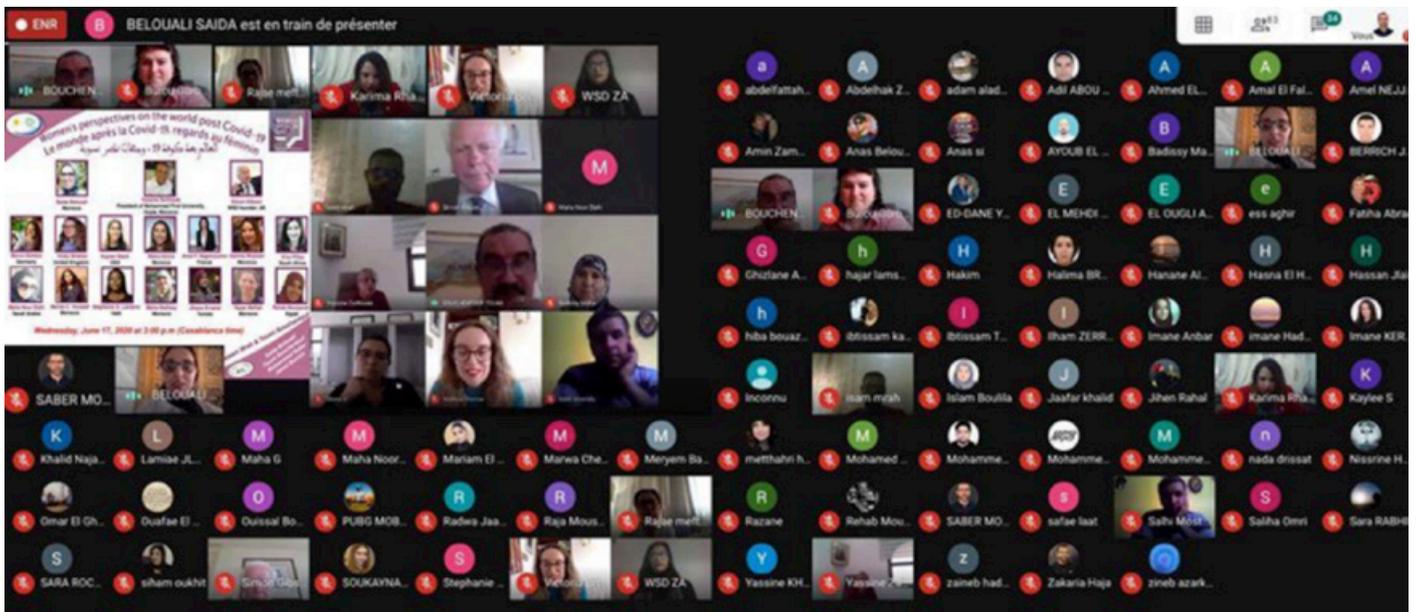
▲ Participants of WSD Morocco-2020, photo taken by Prof. Saida Belouali.

▲ Dr. Burcu Gürbüz and the list of the participants of WSD Morocco-2020. 🌐

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