IFORS NEWS

International Federation of Operational Research Societies

What's Inside

From the President

The Growth of Operational Research

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I started studying operational research almost forty years ago when I was an undergraduate student at the University of Waterloo in Canada. When I decided to continue in the field and applied for doctoral programs, I remember getting advice from my fellow students to find a faster-growing field. "There is no future to operations research", they said. "The future is in …" And they suggested a number of "hotter" fields.

Thirty-eight years later, the field of operations research shows no signs of stagnation. To the contrary, the field is as exciting as it ever has been. Some of this excitement is simply due to the relationship between OR and "analytics", today's current hot topic. But I think most of the excitement is due to the growth of OR in three different ways: growth of application, growth of scale, and growth of geography.

In terms of application, it seems that there is no area of endeavor that cannot be improved with OR. Whether it is sports, medicine, transportation, the arts, environmental planning, telecommunications, or practically any other field, there are now researchers and practitioners showing the value of OR in that field. I have worked for almost twenty years in the use of optimization in creating sports schedules. When I started, there were perhaps five people in the world who had looked at such problems: in 2017 alone, there were more than 50 papers published in the professional literature, many of which recounted the practical application of OR to real-world problems. This story can be repeated in hundreds of fields of application.

Much of this growth is due to the growth in scale of operations research. By this I mean that OR is not just used for big, multi-million dollar projects. With OR on every laptop computer due to both commercial and open-source software, OR can be used for everything from small one-shot decisions to huge, company-changing initiatives. When I started, OR meant big companies; now it means every company and organization. No decision is too big or too small for OR.

And that leads us to geographic growth. While OR is well established in the developed world, the developing world offers new applications and new opportunities for impact. When I was at the AFROS (African Federation of Operational Research Societies) conference this summer, I was struck by the variety of problems being faced in Africa and how OR was being used to address those problems. For a very small investment, companies and organizations throught the continent were being transformed by OR.

Thirty-eight years ago, my fellow students suggested a number of fields of study, many of which barely exist today: I am glad I stuck with operational research. 🌐

OR Everywhere!

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

The September issue of IFORS News presents articles showing the growth of OR with applications in a number of different areas, as mentioned by our President Michael Trick in his editorial.

In the OR Impact Section you can find the article "Assigning Inmates to Correctional Institutions and Programs in Pennsylvania", which summarizes the work that won the 2017 INFORMS Wagner Prize. Another important application of OR is described in the Tutorial Section with the article "Performance and Optimization of Network Evacuation Problems".

The OR for Development Section presents a startup project for refugees that makes intense use of OR analytics. Moreover, an article about self-directed learning and study groups is presented which describes a methodology that can be used in different contexts to develop OR skills. Artificial Inteligence is the subject of the Book Review Section with the book "Prediction Machines: The Simple Economics of Artificial Intelligence".

This issue of IFORS News also reports the celebration of 50 years of the Brazilian OR society (SOBRAPO), and, in November, 40 years of the Austrian Society of Operations Research (OEGOR). In a period of half a year, all of the IFORS Regionals and AFROS will have hosted their conferences! AFROS and EURO are already reported in this issue, and the articles give an idea of how extraordinary these events were. Moreover, many other international OR events are reported in the Conferences Section.

To conclude the issue, please read the inspiring article "The Must-Do list for association board meetings".

Finally, I would like to thank the IFORS News co-editor, James Bleach <managingeditor@ theobexproject.co.uk>, for his support in generating this issue. 🌍

OR Impact

Assigning Inmates to Correctional Institutions and Programs in Pennsylvania

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Introduction
According to the International Centre for Prison Studies, the United States (US) incarcerates 698 people for every 100,000 of its population. Although it has approximately 4.5% of the world's population, the US has 21.4% of the world's incarcerated population (1, 2). In 2015, the Pennsylvania Department of Corrections (PADoC) spent a staggering $2.15 billion to house 50,366 inmates (3) but the authorities believed there was much potential for increasing efficiency, security, and saving costs. Lehigh University was commissioned to explore ways of improving the assignment of inmates to correctional institutions while considering the scheduling of the correctional (rehabilitation) program at the time of the assignment and the outcome is described here.

The main goal was to develop an inmate assignment decision support system (IADSS) which *simultaneously* assigns inmates to Correctional Institutions (CIs), schedules the treatment programs for these inmates, and considers all the relevant factors and criteria of each assignment.

Background
When a court delivers a sentence, the inmate often receives a list of treatment programs, all designed to reduce the likelihood of further criminal activity upon release. Inmates are usually given a sentence of minimum length in Pennsylvania (PA) and are eligible to be released conditionally (i.e., *paroled*) if they satisfy all the parole requirements, including completing all the required treatment programs. However, limited program resources at the Correction Institutes (CIs) causes inevitable delays in inmates taking up the programs, thus delaying their parole and contributing to overcrowding in prisons. For example, an inmate might receive a 12 month (minimum) to 24 month sentence for possession with intent to deliver drugs. The sentence includes the prescription of drug abuse and anger management programs, which have 4 and 6 months lengths, respectively. If perfect assignment is made, the inmate can start his/her programs within a month, complete both programs in 6 months from the program start dates and be ready for parole hearing at the minimum sentence time of 12 months. However, with a wait time of 5 months and if the inmate had to be transported to another CI for the second treatment program, the inmate would not be ready for the parole hearing until the 15th month and would be released at the earliest after 19 months.

2017 INFORMS Wagner prize team. Back row (left to right): Chaitanya Gudapathi, George Wilson, Kristofer Bucklen (Director at DoC PA), front row (left to right): Anshul Sharma, Mohammad Shahabsafa, Senator Lisa Boscola, Tamás Terlaky (project leader), Louis Plebani

Assignment Criteria
Previously each new inmate was manually assigned to a CI using a range of criteria such as security concerns, separation requirements, mental and medical conditions, capacities of the CIs (available beds), and home county of the inmates. This process was time-consuming, inefficient, prone to human error, and resulted in many violations of the criteria and capacity constraints.

Treatment Programs
Ideally, inmates should be assigned to a CI that can provide the required treatment programs and also all programs should be completed before the 4-month period prior to the end of their minimum sentence time. In practice, because of limited capacity at the CIs, waiting lists build up. Thus, an optimal assignment aims to *minimize both* the *total* and *maximum* waiting times.

Transfer Constraints
For a variety of reasons, an inmate may need to be reassigned after the initial assignment.

The Initial Approach
Previously the assignment was manual and subjective, with 7 staff members assigning inmates one at a time using information about the inmate and that of the available capacity of the CIs from an existing database. Scheduling of treatment programs was not considered at the time of the assignment. This was inefficient, unfair to inmates assigned later in the process and prone to manual error. Instead the project team proposed and developed a decision-tree based decision support system (DTDSS). This provided staff with a ranked order of possible CIs for a given inmate, removed much tedious work and enabled staff members to use their experience to choose from a smaller subset of the most suitable CIs. Further details of this approach are given at (5).

This approach was an improvement but not optimal as inmates were assigned one by one, as the system could not anticipate several assignments into the future, could not anticipate the bottlenecks at the CIs, nor the scheduling of the treatment programs. In other words, a batch or simultaneous assignment would give better results.

The Mixed Integer Linear Optimization (MILO) Approach
The aim was to assign inmates to the CIs and schedule their programs, using mathematical optimization. This involved mapping and formalizing all the inmate assignment processes, a challenging task. To address the need for simultaneous system-wide optimization of inmate assignments which incorporated all the conflicting factors, a hierarchically weighted multi-objective mixed-integer linear optimization (MILO) model was developed and fine-tuned (see 5 for the technical details).

The Inmate Assignment Decision Support System (IADSS)
The MILO model was incorporated into a web-based Inmate Assignment Decision Support System (IADSS), which enables a user to make optimal decisions for assignment and treatment program scheduling in a fraction of the time needed previously. In addition data collection and preparation procedures, which interface with the existing database systems, were developed.

The IADSS collects all the personal and sentence information needed for the assignment of an inmate and displays it in the web-based graphical user interface to facilitate the review of the system's assignment. It makes the simultaneous assignment of all the inmates that need assignment, while considering all the factors and criteria of the assignment.

As an additional output, the IADSS reports the program waiting lists to alert the user about current and future bottlenecks in program schedules and availability.


Figure 1: Inside a Typical Prison

Impact and Savings
The Office of Population Management (OPM) has used the IADDS to assign the inmates and schedule the programs for the daily assignment of inmates since September 2016. In January 2017, over 90% of the inmates (211 out of 234) were assigned to the facility suggested by the IADSS via simultaneous matching and a further 15 by individual matching.

The IADSS enables the PADoC to make high-quality, consistent assignments, while also increasing security and reducing violence. It has resulted in cost savings by reducing the inmate population and the number of transfers between the CIs. Additionally, it has enabled the PADoC to reduce the staff needed for making assignments and has resulted in a smaller number of assaults within the CIs. The PADoC saved $2.9 million in its first year using the IADSS and expects to reduce its costs by $19.8 million over the next five years.
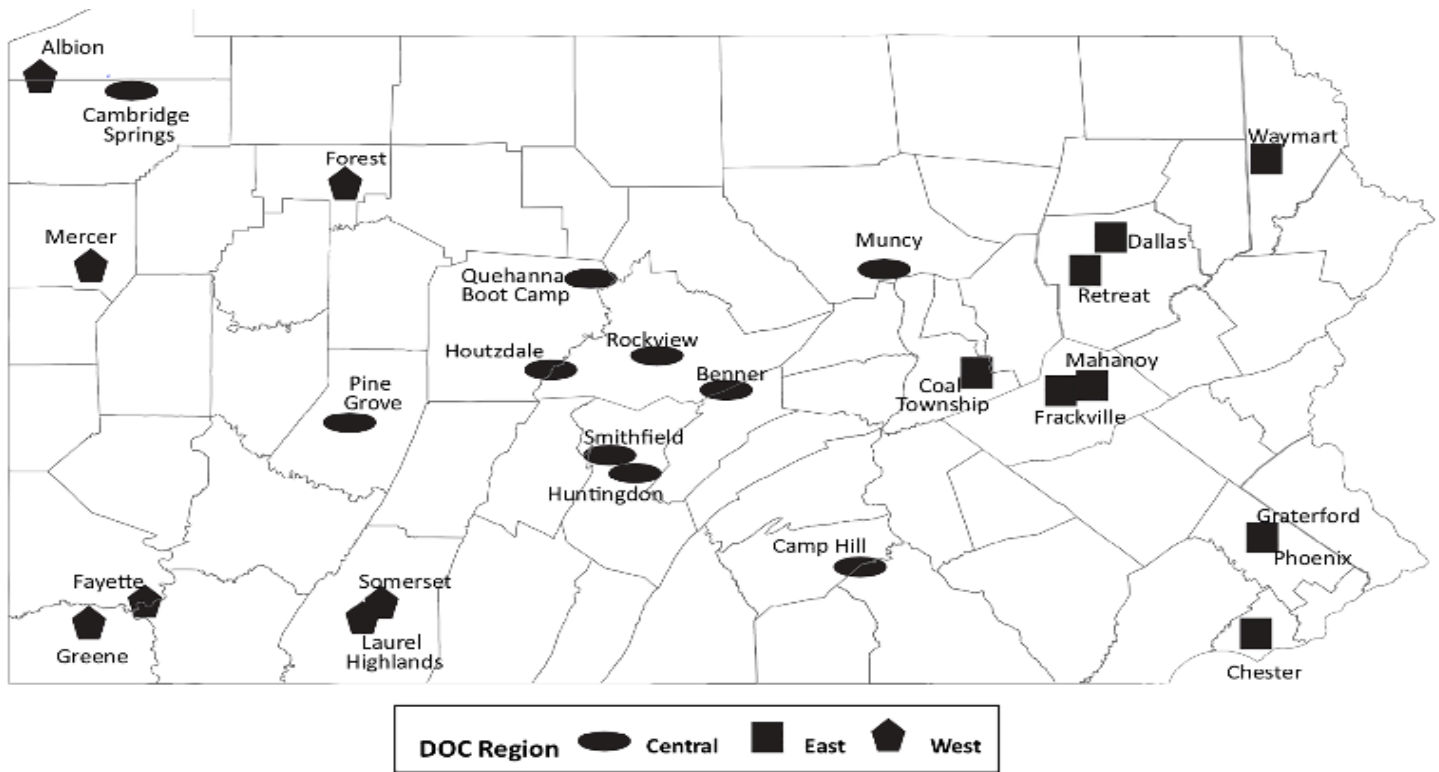
Figure 2: Location of Pennsylvania's 25 Correction Institutes (DOC Facilities)
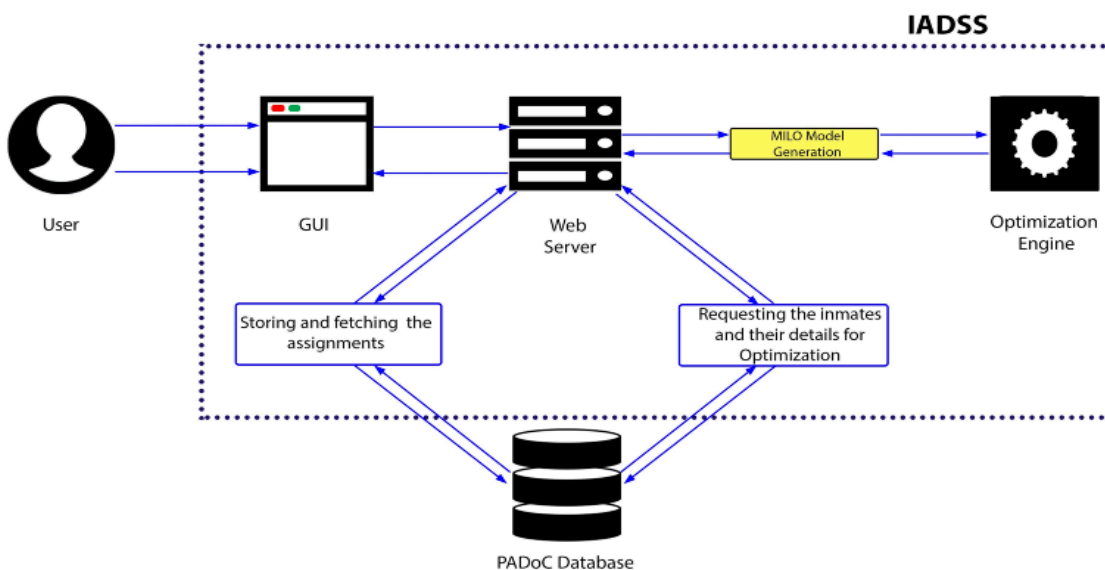
Endorsements

"This application has transformed the way we assign inmates throughout our system," said Pennsylvania Secretary of Corrections John Wetzel. "Not only is it saving a significant amount of money, but we believe by better managing the population we can improve outcomes for inmates."

In a big prison system like ours, being able to optimize decision-making around where to place inmates brings incredible gains in efficiency," said *Bret Bucklen, director of the Bureau of Research and Planning* "Already this model has saved the Department of Corrections through lower staff costs, fewer inmate assaults, less transportation and streamlining of treatment waiting lists and prison releases."

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Figure 3: The Inmate Assignment DSS Workflow

Figure 4: The Web-based User Interface of the IADDS

Performance and Optimization of Network Evacuation Problems

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Evacuating a complex urban area or facility in case of an emergency is a complex, challenging problem. We survey this problem and point out the critical infrastructures and communication technologies, important planning issues, mathematical optimization formulations, properties and algorithms useful in approaching the problem.

Keywords: Performance Modelling, Optimization, Network, Evacuation

1. Introduction

What planning effort would be required to evacuate the cities of Paris, London, or Kathmandu in an emergency situation? How would one develop an evacuation plan for these cities? If one examines the street patterns, Figure 1, it is usually a mix of grid, curvilinear and other disjointed patterns. Couple this with the variety of transportation alternatives both above grade and subterranean (metro and the tube), the congestion within the network, and the problem of determining how the occupants would leave these areas becomes immensely difficult to design and control. Given the fragile nature of the security in the world today, such evacuation plans are becoming more critical, timely, and important.

Figure 2 illustrates the complex relationship between the infrastructures involved in modelling the extreme event X(t) and its mitigation, the multi-objective nature of the problem, and the opti- mization problems and algorithms necessary to evacuate the occupants of the affected areas to safe refuge centers. The infrastructures are critical for the identification and mapping of the spread of the extreme event, communication notification, the potential mitigation of the event, and the emer- gency first responders assisting the occupants in the evacuation and the event's mitigation. The operations research models are crucial for planning the evacuation and identifying the shelters, their capacity assignments, the routing of the occupants and the resource allocation to deal with the extreme event. Finally, the overall problem is a complex multi-objective planning problem that needs to tradeoff the distance travelled, clearance time, congestion, and complexity of the evacuation process.

2. Issues Network

What are the key planning issues for an evacuation plan? When one begins to initiate this planning process, then there are certain factual, deontic, causal and instrumental planning issues one must raise and resolve. This is called an Issues Based Information System (IBIS).

Figure 1. City of Paris (top left), London (top right), Kathmandu (bottom) Evacuation Problems
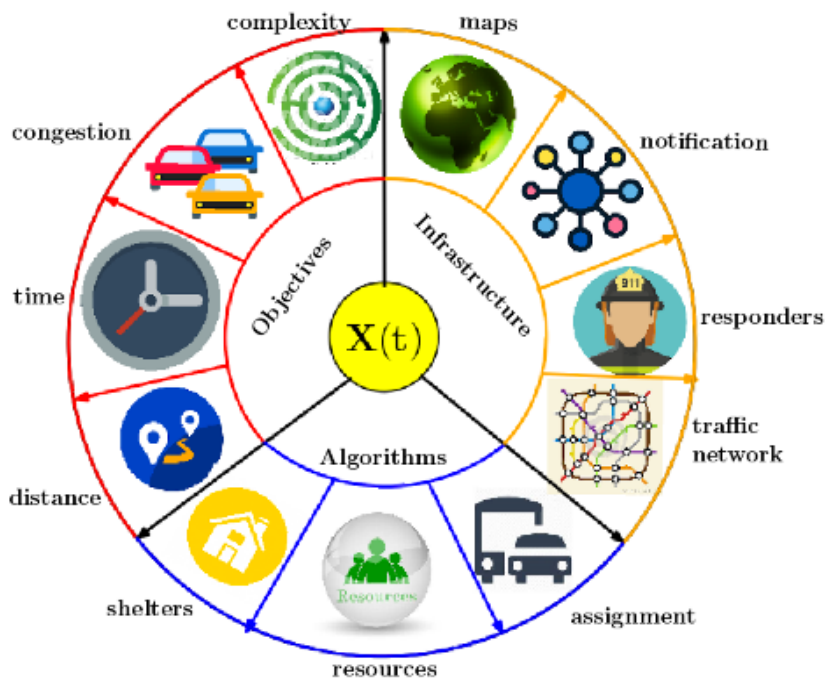
▲ Figure 2: Network Evacuation Problem Worldview

For example:

- How should one model the evolution of the extreme event and its eventual impact on the residential community [Stepanov and Smith, 2012]?
- How are all the emergency services, communications systems, information technology infrastructure, and transportation network coordinated and integrated in treating the evacuation problem?
- How does one best notify the occupants of the affected areas? Which technology is best?
- When do you notify the occupants? How long will they need to prepare to evacuate?
- Is it better to stay in place or evacuate?
- What will be the occupant arrival rates to the transport alternatives?
- Which transportation alternative should be utilized: pedestrians, vehicles, buses, trains, subways, boats, other?
- How do you route the occupants and to which evacuation

centers?

- How do you measure and mitigate congestion in the network evacuation process?
- How do you verify the evacuation and make sure that the occupants are safe?

We need to gather together these issues and create a IBIS logical framework to resolve them. It is argued that the pre-planning of the evacuation process is most critical.

One requires a systematic framework in order to navigate the complexity of this problem. It has essentially seven phases, see Figure 3.

3. Travel Time and Transport Alternatives

In terms of Operations Research (OR), a key performance measure is the travel time and clearance time of the occupants from the affected areas to the safe evacuation centers. The arrival process of the occupants to the transport alternatives and travel process and ensuing congestion is a transient stochastic process which can be modelled with queueing networks. How is one to model this queueing network and control its effects?

One suggested model to accommodate the travel time and congestion is to use $M/G/c/c$ state depen- dent queueing models which have been shown to accurately capture the dynamics of the pedestrian and vehicular travel time process [Smith and Cruz, 2014].
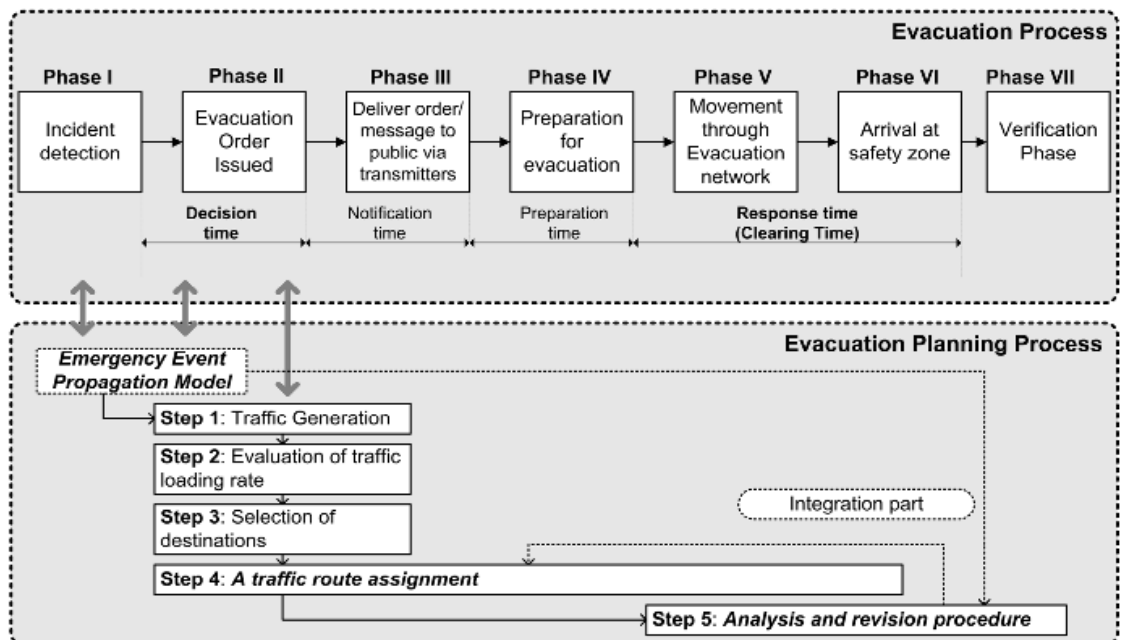
▲ Figure 3. Systematic Decision Framework

Variables	Description
$\alpha_{\ell ijk}$	routing probabiilty
C_j	Shelters
d_{ijk}	distance involved in route
D_t^{min}	total distance travelled
i	index for populations
j	index for destinations
k	k-shortest paths
λ_ℓ^L	arrival rates to a road link
λ_ℓ^{Lmax}	maximum arrival rate along a road link
P_i	population from source i
t_ℓ	travel time along route link ℓ
T_C^{min}	best clearance time
V_1	Free-flow speed along $M/G/c/c$ link
W	weight of importance between time and distance measures
x_{ijk}	(0,1) decision variable of where to route population i to destination j along path k

The problem formulation trades off the time and distance to route the occupants along road links and ensures that the populations are all evacuated to safe shelters. The detailed model and its exposition are contained in [Stepanov and Smith, 2009].

$$\min_{\mathbf{x}} = W\frac{1}{D_t^{min}}\sum_i P_i \sum_j \sum_k x_{ijk}d_{ijk}+(1-W)\frac{1}{T_C^{min}}\sum_\ell t_\ell(\lambda_\ell^L)\times\sum_i P_i \sum_j \sum_k x_{ijk}\alpha_{\ell ijk} \quad (1)$$

$$\text{s.t.} \sum_j \sum_k x_{ijk}=1 \text{ for all } i \text{ (Sources)} \quad (2)$$

$$\sum_i \sum_k P_i x_{ijk} \leq C_j \text{ for all } j \text{ (Shelters)} \quad (3)$$

$$\sum_i \lambda_i \sum_j \sum_k \alpha_{\ell ijk} x_{ijk} \leq \lambda_\ell^{Lmax} \text{ for all } \ell \text{ (Roadlinks)} \quad (4)$$

$$x_{ijk}=0 \text{ or } 1 \text{ for all } i,j,k \text{ (Routes)} \quad (5)$$

4. Integer Programming Optimization Models

We need to optimize the travel time and evacuation routing process in order to minimize the travel time and mitigate the congestion processes. This is a multi-objective programming problem. There can be dynamic flow algorithms as well as stochastic flow algorithms. The former, however, do not treat congestion which can be come a major issue. The topology of the evacuation network is also an important entity as it is essentially a rooted spanning arborescence.

We will examine a mathematical optimization model for constructing the evacuation routes where the M/G/c/c network is used to estimate the timing and congestion performance measures of the highway network.

The notation underlying the optimization model is described below.

5. Algorithm

Whether it be a large regional evacuation problem as in Figure 4 or a building evacuation problem, one needs an algorithm to implement the EEP formulation. The algorithm we have employed in the past relies on the previous concepts discussed along with the k-shortest path algorithm to lexicographically order the evacuation routes.

Step 1.0: *Representation* Configure the network G_T (N,A)as a rooted spanning arborescence. Utilize the *k*th shortest path algorithm to determine the 1st, 2nd, 3rd, . . . , kth shortest egress routes. Using the kth shortest routes, define subsets of road links which comprise the evacuation network G_e(N, A).

Step 2.0: *Analysis*

Step 2.1: Compute upper bounds on the arrival rates for each road link λ^{Lmax} to minimize the possibility of blocking on the traffic link.

Step 2.2: Compute maximum travel times on each link $t^{(C)}$ which correspond to when a link is fully utilized.

Step 3.0: Synthesis

Step 3.1: Formulate and solve the EEP IP model. The solution to the EEP model will generate the route assignments vector x.

Step 3.2: Evaluate the route assignment network G_e(N,A) the state dependent *M/G/c/c* simulation program to obtain total clearance time T_{min}, total distance travelled D_T, and performance C measures for the road links.
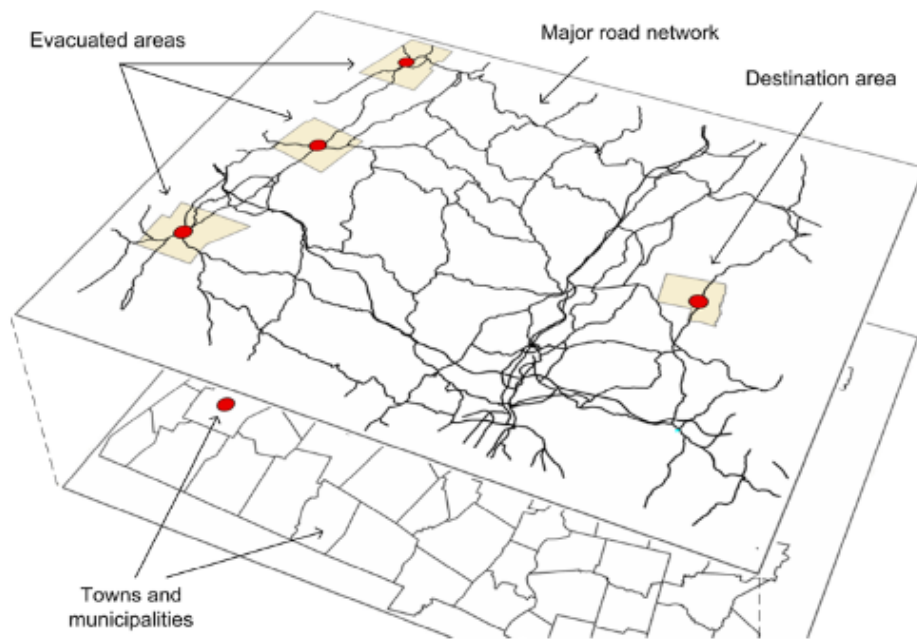
▲ Figure 4. Regional Evacuation Process Network

6. Summary and Conclusions

We have provided a brief overview of the issues, mathematical formulations, and algorithmic principles for dealing with the performance modeling and optimization of the evacuation network problem.

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OR for *Development Section*

OR-Analytics in a Start-Up Project for Refugees

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The joint presentation entitled *"Liberated social entrepreneur using business metrics: QZenobia refugee/migrant big data analytics startup"* took place in the stream *"International Aspects of OR", during EURO 2018*. The role of *LiBerated Social Entrepreneur* in Developing and Emerging Countries consists of a social entrepreneur which is using business metrics such as profit, revenue and stock exchanges, to sustain social impact in order to change the systems in the developing economies. We studied the dynamics and differences between developing and developed countries to introduce the novel approach, based on modern *OR-Analytics* and Economics. We apply *Game* and *Max-Flow - Min-Cut Theories, Schumpeter's creative destruction* and *Adam Smith's diversification model* for the business plan. As a result, Berat, based on his thesis' business model presented at the Middle East Technical University, started *Qzenobia* [2], a mobile application that runs as a refugee portal: refugees submit data to the application via questionnaire and search for opportunities, verified news privatized based on their answers. Commercial entrepreneurs are generally oriented to business metrics like profit, revenues and return. Instead, social entrepreneurs are non-profits or a blend with for-profit goals, generating returns to society. In DCs, a social entrepreneurship has been uncommon.

There are *3 million registered* and *2 million irregular refugees* in Turkey. We strongly believe that refugees could lead towards a better life of their families and to contribute to economic and social development in their new country. *QZenobia* is a mobile application that runs as a "refugee hub", based on *"Refugee Big-Data Analytics"*.

▲ From left to right: Willi (first) and Berat (forth) among participants of EURO 2018.

With *QZenobia*, refugees can submit their data to the application via "questionnaire" and search for opportunities such as verified news, refugee portal, jobs and digital registrations in the host country. The application collects refugee data such as: *who?, what?, where?, which skills are given?, which income are given?,* and *what are their market dynamics?,* so that consulting projects with monthly updated data analytics became introduced into the host country's market, and provided to the economy, given the refugees' permissions.

We found out that 9% of refugees looking for a job knows C++ programming skills, wage increase from 800 Turkish Lira, which was the case at the beginning of migration, increased even to 1400 Turkish Lira among refugees in the major cities such as Ankara, Istanbul and Izmir. Due to the financial conditions, refugee women's participation in the labor force increased whereas, culturally, men are expected to bring home the money; this has now practiced (with consent) differently for women to help the family in migration. Last but not least, we have contributed a positive change to the over 1.5-million refugees' community in Turkey with collected-data analytics that we provided.

Berat is a migrant from Macedonia. The Syrian refugee community consists of migrants under temporary protection in Turkey and they cannot be granted refugee status because of the fact that Turkey has signed the 1951 Refugee Convention (UNHCR, 2018). As a result of careful preparations, our concept of *Liberated Entrepreneur* led by me, *Berat*, and my team members *Yelda Güngör, Miraç Aknar, Sıla Kurşun and İhsan Erol Sabancı* have been honored to become the first *Liberated Social Entrepreneurs* which we became as the outcome of

the business model and won many international awards [3-6]: *Social Impact Award,* Global Student Entrepreneur Awards – Entrepreneurs' Organization, Toronto, Canada (among 56 country winners); *Young Transatlantic Innovation Leaders Initiative Fellowship,* German Marshall Fund of US and U.S. State Department; *National champion of Turkey,* **Global Student Entrepreneur Awards – Entrepreneurs;** *Top 11,* invested for accelerator program at *"Collective Global Accelerator London"* (among 5000 tech-driven social startups globally); and *Top 20,* MIT Enterprise Forum *"Innovate for Refugees"*; Jordan [7].

Our project is honored to be supported by the *Advisory Board:* Gerhard-Wilhelm Weber, Poznan University of Technology, and METU, Ankara; *Mert Yildiz,* LSE, economic advisor, Foresight Consultancy; *Ömer Faruk Akarca,* Entrepreneurs' Organization Turkey member, Galata Business Angels - to take our startup to a next level for achieving highest standards in serving our peoples in the Middle East and on earth.

Multivariate Adaptive Regression Splines (MARS), Conic MARS (CMARS) and its *Robust* version *RCMARS* have shown their potential for **Big-Data** and, recently, **Small-Data** (cf. [8]). With that *OR-Analytics* toolbox, we aim to further support our project. In addition to these new and emerging technologies, further exchange on emerging questions of *ethics, sustainable development, societal complexity* and *education* with scholars and new friends from *EURO 2018* will certainly have an important impact on our future research and application. We very much hope for future learning, discussion and collaboration, especially, at the occasion of *EURO 2019* in Dublin, Ireland (https://www.euro2019dublin.com/), and are looking forward to it! 🌍

▲ Refugees, picture by Altan Gokcek.

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Self-Directed Learning and Study Groups

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Learning how to learn is often more difficult than learning itself: some people prefer a theoretical approach and others a more practical one. Self-directed learning is "a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating their learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies and evaluating learning outcomes." OR analysts in DWP use self-directed learning to build their knowledge of OR techniques, via an interactive study group. This approach was not consciously followed; the format that developed organically has (post hoc) parallels with the idea of self-directed learning.

The group meets bi-monthly and sessions are one hour, split 50:50 by 'learning' and 'doing', with a strong focus on learning interactively through examples – catering for both theoretical and practical learners. There are normally 10-15 attendees present. A one-hour session is roughly as follows: technique introduction (15 minutes); basic theory (15 minutes); technique practice (25 minutes); discussion and feedback (5 minutes). Sessions aim to give a good foundation on which somebody could build with further research in their own time.

Some topics covered include: the shortest path problem/Dijkstra's algorithm, multiple-criteria decision analysis (MCDA), game theory, system dynamics, and rich pictures. These were all selected by the session facilitator and a variety of delivery methods were used: the game theory session used board games to explain the key concepts, theory and tactics in an interactive (play) setting; the rich picture session involved group work to map various systems; and several sessions have used semi-populated spreadsheets to implement techniques. Facilitators develop their own resources and examples to deliver sessions; in most cases the session facilitator is not an 'expert' and delivers the session in order to further their own understanding of a subject, or to learn something new and share this.

Feedback and evaluation suggests that the following have led to its success: curiosity- rather than expert-led learning; basic technique introduction/theory; interactive, practical examples; and non-prescriptive topics. Whilst the group's format developed organically, it gathered momentum, engaged core attendees and delivers successful learning outcomes. The group format described here has since been successfully implemented in other Government departments, suggesting it has its merits as a model. The reflections in this article are therefore the culmination of the self-directed learning process it has embodied.

Could your organisation benefit from setting up such an interactive study group? It could prove a cost-effective way to develop new OR skills, and in the process potentially enhance working relationships and in-house networks. The approach to learning and development described could be particularly useful for organisations with a community of early career operational researchers, whether practitioners or academics, and who do not have access to local/regional experts and/or the funding to run or attend more traditional training courses. This learning approach therefore has the potential to empower in particular operational researchers in developing countries.

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[1] Knowles, M.S. (1975). *Self-Directed Learning: a guide for learners and teachers.* New York: Associated Press. 🌐

◼◼ Book Review

Prediction Machines

Hans W. Ittmann <hittmann01@gmail.com>, University of Johannesburg

Artificial Intelligence (AI) has been developing for years, with the initial excitement about the potential possibilities, going as far back as the 1950s. A period of disillusionment followed. However, AI has now entered a critical stage in its development and adoption. Today AI is everywhere. It's in the phone you use, in the car you drive, it is in hospitals, banks, and all over the media. This has been made possible by improved techniques such as machine learning and deep learning, as well as the massive growth in available data and the increase in computer processing power. All of these have enabled AI to be deployed far more extensively than ever before. AI is about to fundamentally change businesses. How is this all going to pan out in future? Leaders, decision-makers as well as technologists, such as operations researchers, need to take note of these developments and the impact it could have.

The authors of *Prediction Machines,* all three prominent economists, have been close to many applications of AI. This has assisted them to focus on how this technology affects business strategy. Their first major insight was that AI does not actually contribute intelligence but instead, a critical component of intelligence, namely *prediction.* AI is a prediction technology, predictions are inputs to decision making, and economics provides for a prefect framework for understanding the trade-offs underlying any decisions. This is how the book, *Prediction Machines* came about, to form a bridge between the technologists and the business practitioner.

AI seemingly does the impossible but facing these can be nerve racking. What does AI mean for any business? How should companies go about setting strategies, how should governments design their policies, and how should individuals plan in a radically changing world? In the face of such uncertainty, the authors recast the rise of AI as a drop in the cost of predictions.

There are several examples given where the price of something became so cheap that is was used with abandon. Light, the Internet and autonomous vehicles are such examples. Using AI to predict the authors believe will follow a similar route. Buying books from Amazon is presented as such an example. Currently when one buys a book from Amazon the business model is shopping-then-shipping. At the same time Amazon's AI offers suggestions, based on past buying patterns, of items it predicts the buyer will want to buy. At present these suggestions are not very accurate. Imagine if the predictions can be improved to the point where it becomes profitable for Amazon to ship the item before receiving an order. Their business model will then change to shipping-then-shopping and both Amazon and the client will benefit! This point has not been reached yet. For this to happen improved predictions are needed. More data is needed to train the AI better, etc. etc.

What is presented in the book is not a recipe for success in the AI world. Instead trade-offs are emphasized. It is clearly stated that more data means less privacy, more speed means less accuracy and more autonomy means less control. No best strategy is provided. The best strategy for any company is dependent on how it weighs each side of every trade-off. *Prediction Machines* provides the structure for identifying the key trade-offs and how to evaluate the pros and cons to reach the best decisions.

The book is structured into five separate sections each reflecting a layer of impact from AI, namely, (1) *Prediction,* (2) *Decision Making,* (3) *Tools,* (4) *Strategy* and (5) *Society.* This represents the five layers of a pyramid that is built from the foundations of prediction all the way up to the trade-offs for society. Each section consists of one or more chapters, many examples are used to illustrate and explain concepts while each chapter is concluded with key-points, or summaries of what is contained in the chapter.

Prediction is defined as the process of filling in missing information. It takes information one does not have, called "data" and uses this data to generate information one does not have. The seemingly mundane process of filling in this missing data can make prediction machines seem magical. The goal of machine learning is operational effectiveness which is different than the goal of statistics. These prediction machines rely on data which is costly to collect. There is training data for training the AI, input data that is fed to the algorithm within the machine to enable predicting, then feedback data to improve the accuracy of the prediction. Machines and humans have distinct strengths and weaknesses in the context of prediction. The appropriate division of labour between these two are described through a very useful taxonomy of prediction.

In the second section, that deals with decision making, the role of prediction as an input into *decision making* is discussed together with another important component namely judgment. The difference between the two is clearly outlined. Prediction facilitates decisions by reducing uncertainty while judgment assigns value in the form of a payoff, a utility, reward, or profit. Prediction machines increase the value of judgement. It is shown that prediction is not a decision, it is only a component of a decision. One also needs judgment, action, outcome and the three types of data defined earlier. The value of judgment is dealt with in detail as well as the role humans play in the process.

A well know example, for operations researcher, from World War II is used to illustrate the limits in the ability of machines to predict human judgment. Bombers were lost during the war and, using the data of bombers that returned, the question was could the bombers be better
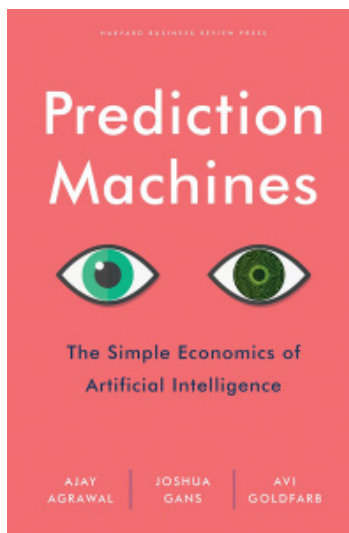
armoured to reduce the loses? The bullet holes in the bombers that returned were the data. Were these the obvious places to better protect the planes? The expert came up with a counter intuitive solution – protect the places without bullets! The planes that did not return were most probably hit in these areas and they proved fatal! Machines are thus not good at predicting for rare events. In problem situations, where there is a high level of complexity, the ability of humans and machines to deal with these are highlighted. Humans tend to go for "satisficing" solutions, i.e. solutions that are not optimal but good enough. It will take a huge amount of practice to get machines to deal with such situations.

The section on AI *tools* focus on how to design prediction machines to perform specific tasks. It shown that that work flows will have to be decomposed to enable the allocation of tasks to a machine. The same applies for decisions that will have to be decomposed. For jobs, which are a collection of tasks, the implementation of AI tools to perform the job will imply: AI tools may augment jobs; AI tools may contract jobs; AI tools may lead to the reconstitution of jobs; and AI tools may shift the emphasis on the specific skills required for a job.

Section four deals with *strategy*. As shown by the Amazon example AI could have such a profound impact that it will transform the business or industry. In these circumstances it is critical that the C-suite of a company or organization gets involved.

In all AI interactions and debates the following questions, on how AI will affect *society,* keep being raised. These are discussed in section 5:
- Will there still be jobs? *Yes.*
- Will this generate more inequality? *Perhaps.*
- Will a few large companies control everything? *It depends.*
- How will countries react in terms of policies, people's privacy and security to give their domestic companies a competitive edge? *Some will.*
- Will the world end? *You still have plenty of time to derive value from the book.*

Prediction Machines is a pathbreaking book. It is well written, insightful and practical. It focuses on what strategists, managers and those developing these prediction machines, really need to know about the AI revolution. Taking a very realistic perspective on the technology the reader is given an in-depth insight of how AI will affect the economy and how firms, industries, and management will be transformed by AI. From this it is clear the impact of AI will be profound.

OR Society in Focus

40 years of the Austrian Society of Operations Research (OEGOR)

Gustav Feichtinger <gustav.feichtinger@tuwien.ac.at>

The Austrian Society for Operations Research is celebrating its 40th anniversary at this year's annual conference:
Friday, 23.11.2018 from 13:00 (registration starting from 12:15)
Vienna University of Economics and Business (Club room in the "Library and Learning Center")
Welthandelsplatz 1, 1020 Vienna

We will remind of 40 years OEGOR, but the keynote talks will also be devoted to important future topics.
+ Richard Eglese (Lancaster University): Looking back and looking ahead
+ Luis Baringo Morales (Universidad de Castilla - La Mancha): Decision making under uncertainty in power systems via stochastic programming and robust optimization
+ Walter Gutjahr (University of Vienna): Finding Fair Solutions - Challenges in Inequity-Averse Optimization

OEGOR was founded formally on 23 October 1978 under the chairmanship of Dr. Ing. Mandl (Institute for Advanced Studies, Vienna). In the following years Prof. Harhammer (IBM) was able to set up diverse working groups and good international relations, culminating in the organization of the EURO VI conference 1983 in Vienna.

Under Prof. Burkard (Graz University of Technology), relations with the Swiss OR Community were expanded and in 1987 the first joint annual meeting of ÖGOR and SVOR (the swiss OR society) took place. Further joint meetings of the two societies followed. Another milestone for OEGOR - at that time led by Prof. Feichtinger (Vienna University of Technology) - was the organization of a joint meeting of the two German OR companies DGOR and GMOeOR, the Swiss OR Association SVOR and the OeGOR in 1990. At that time - with more than 1200 participants - it was the largest Central European conference with almost a third of East European Operations Researchers among the participants.

Under the chairmanship of Prof. Pflug (University of Vienna), there was a strong growth in the number of members in

▲ National and international representatives at OEGOR's 30 years celebration.

the early 1990s and the scientific journal "Central European Journal of Operations Research and Economics" (CEJORE) was established. The funding brought the ÖGOR to the limit, and could only be ventured together with our sister companies from the Czech Republic, Slovakia, Hungary, Slovenia and Croatia. The journal was consolidated under the chairmen Prof. Leopold-Wildburger (University of Graz) and Prof. Luptacik (then Vienna University of Technology). Until today Prof. Leopold-Wildburger leads the journal, later renamed "Central European Journal of Operations Research" (CEJOR) as the editor in chief.

During the tenure of Prof. Hartl (University of Vienna), there was a modernization of the ÖGOR administration around the turn of the millennium. The website of ÖGOR was set up, and mailings such as the ÖGOR News were carried out electronically. In 2002, the OR 2002 conference was successfully held in Klagenfurt. Under Prof. Bomze (University of Vienna) the administration could be further modernized. For the first time a sponsor for the ÖGOR prize was won. During the tenure of Prof. Rauner (University of Vienna), a solid contractual basis for CEJOR magazine could be established together with Springerand the journal was included in the Science Citation Index in 2009. Chaired by Prof. Reimann (University of Graz), the association's statutes were renewed in 2014 and in the OR 2015 conference, organized by Prof. Pflug, was successfully held in Vienna. 🌐

50 Years of the Brazilian Society of Operational Research (SOBRAPO)

Nelio Domingues Pizzolato <ndp@puc-rio.br> **Annibal Parracho Santanna**<annibal.parracho@gmail.com>

The Brazilian Society of Operational Research (SOBRAPO) was founded shortly after completion of the First Symposium of Operational Research (OR), which has occurred in 1968. Given the inexistence of any previous experience, the first Symposium was publicly called by newspapers ads and the first program was previously organized with few technical

communications, including an extended report of Petrobras, the Brazilian State Oil Company. Thus, the Society has completed 50 years of continuous existence and its 2018 Symposium was called the 50th Symposium, which is an extraordinary accomplishment in our country. >>

▲ Participants of the L Brazilian Symposium on OR, in celebration to the 50th aniversary of the Brazilian OR Society – July 2018, Rio de Janeiro.

>> The first Symposium was held in the Aeronautics Technological Institute (ITA) in São José dos Campos-SP, organized by the leading action of three groups: a few professors from the organizing institution; others from the State University of São Paulo; and a number of professionals from Petrobras, the first Brazilian company to organize OR into practice. Petrobras introduced new models in the managerial processes of buying, especially on the spot market and distributing fuel in Brazil.

Along these five decades, SOBRAPO has had 19 presidents whose names are listed in its home page at: <www.sobrapo@sobrapo.org.br>. Affiliated to IFORS (International Federation of Operational Research Societies) and ALIO (Asociación Latino-Ibero-Americana de Investigación Operativa), SOBRAPO is quite active in its participation on international institutions and by directly publishing and enhancing expertise. It maintains contact with the whole world in general, helping to disseminate, in conferences and journals, the scientific production of Brazilian researchers. Internally, SOBRAPO is a member society of the Brazilian Society for Scientific Enhancement (SBPC).

SOBRAPO publishes two scientific periodicals: Pesquisa Operacional and Pesquisa Operacional para o Desenvolvimento (PODES). Articles in Pesquisa Operational are published in English, filling three issues a year, being indexed in the International Abstracts in Operations Research, and published on-line in SciELO since 2002. Pesquisa Operacional para o Desenvolvimento was created in 2009 to publish on-line texts in Portuguese and in Spanish emphasizing applications of Operational Research. Editors of Pesquisa Operacional along the last decades have been Roberto Diéguez Galvão, Paulo Oswaldo Boaventura Neto, Horacio Hideki Yanasse and Reinaldo Morabito. Among the topics more frequently covered in the most recent volumes of Pesquisa Operacional we may list: container loading problems, cutting and packing, efficiency evaluation, facilities location, economic forecasting, genetic algorithms, graphs characterization, GRASP procedures, interior point methods, multicriteria methods, quality control, and reliability assessment.

In addition, SOBRAPO hosts annual congresses, the Brazilian Symposiums on Operational Research (SBPO), with an average of five hundred participants and more than three hundred oral and posters'

communications each year. The symposium articles are usually submitted in Portuguese, Spanish or English, but are accepted only after careful refereeing. SBPOs call papers in theoretical research fields such as Mathematical Programming, Combinatorial Optimization, Metaheuristics, Simulation, Statistics, Graph Theory, Multicriteria Decision Analysis and Data Envelopment Analysis. From the applied point of view, the communications include applications to Education, Electric Energy, Finance, Health, Information, Logistics, Military Operations, Networks, Oil and Gas, Quality Control, Production Administration and Transportation, among other sectors.

In 2008, to celebrate 40 years of realizations of the SBPOs, SOBRAPO started offering prizes for the best papers presented, in English, at the Symposium. In addition, every year SOBRAPO awards also a prize for a student or group of students submitting the best Scientific Initiation Work Report. Also, small-term courses are offered for the participants of SBPO. Incidentally, in 1982 SOBRAPO was instrumental in the organization of ALIO, the OR association for Latin America, which has latter incorporated Spain and Portugal as well as all American countries. SOBRAPO has also participated in the organization of Symposiums of Operation Research of the Marine, held in CASNAV and CASOP, research units of the Brazilian Marine.

Among its goals, SOBRAPO also foments the development of regional initiatives around the country. In this direction, it realizes Regional Meetings on Operational Research (ERPO). In its 25th year, SOBRAPO produced a report about the history of OR in Brazil, interviewing all groups professionally or academically involved in OR. This document noted a conflicting tendency between the disappearing trend of professional OR group versus the widespread use of OR tools. In this 50th birthyear this cited tendency became a reality, and OR is taught and used everywhere, while formal groups are hardly found.

Not coincidentally, the widespread development of OR in Brazil has occurred when the post graduate courses became part of the education goals of the country. Official agencies, such as the Institute of Statistics, the Monetary Policies and so on, are assumed to be real and uncontested expressions of these facts. Certainly, OR has brought contributions to the international respectability of Brazil and a value above many others. 🌍

Conferences

AFROS 2018 Conference Tunis July 2nd-4th: Driving forward OR in Africa.

Sue Merchant <suemerchant@hotmail.com>, VP International Activities INFORMS

AFROS, the newly formed African regional OR society, held its very first international conference in Tunis from July 2nd – 4th, and a most successful one it was too, thanks to its excellent organisation by the Tunisian Decision Aid Society (TDAS)!

Delegates (about 120) hailed from 7 African (and several other) countries, and their enthusiasm was infectious. I was especially impressed by the very high proportion of female doctoral students present which I understand mirrors the proportions who are studying OR in Tunisia! The conference was held, rather appropriately, at the Africa Hotel which looked after delegates very well (barring a few small IT connectivity problems); the food in particular was delicious with an excellent range of hot and cold Tunisian buffet dishes available.

The organising team comprised Fouad Ben Abdelaziz (General Chair, from NEOMA France, and President of TDAS); Hatem Masri (Program and Publications Chair from, and supported by, the University of Bahrain); Saleh Ben Abdallah (Financial Chair, from the University of Tunis); and Rimeh El Fayedh (Organising Committee Chair, from the University of Carthage). They were assisted by an international

▲ Delegates listen to one of the plenary talks

programme committee and scientific committee. Everyone involved had worked tremendously hard to pull the event together yet managed to look cool, calm and collected at all times, despite the intense program of papers and plenary talks. The plenary speakers included Mike Trick (President of IFORS) who spoke about 'Business Analytics: Combining Predictive and Prescriptive Analytics to have broad impact'; Samir Elhedhli (University of Waterloo, Canada) who presented on 'Data driven modelling and Optimisation for warehouse analytics'; Imed Kacem (University of Lorraine, France) who described 'Polynomial approximation schemes'; Jim Cochran (University of Alabama, supported

▲ Mike Trick, Fouad Ben Abdelaziz, Jim Cochran, Hatem Masri

by IFORS) who asked 'Are p-values the problem?'; and El-ghazali Talbi (Lille University, France) who spoke about the 'Synergy between metaheuristics and machine learning'. After this session and a brief presentation on my findings from a pre-conference delegate survey on the state of OR in Africa, a panel discussion on the topic of 'Securing the future of OR in Africa' took place. Panel members included Hatem Masri; Mohamed Limam (Deputy Vice Chancellor of Dhofar University, Oman); Jim Cochran; and Serigne Gueye (University of Avignon and ORPA). Thanks to INFORMS (who helped me organise the survey and contributed financially to my attendance) and the assistance of Hatem and Jim we later squeezed in a short brainstorming session on this topic from which a number of useful ideas emerged for the AFROS board to take forward.

EURO, IFORS and the Tunisian Decision Aid society between them provided financial support for the attendance of 62 selected doctoral students to present their papers, many for the first time: as a result, we were treated to a range of most interesting topics. Plans are now in place to select a number of the submitted papers for publication in appropriate recognised journals.

As there were 4 parallel streams I didn't manage to attend all the talks but several titles caught my eye: eg 'Combining Monte Carlo simulation with exact methods to solve a random problem of collecting infectious healthcare waste'; 'Optimisation of robotised tasks for the UV treatment of diseases in horticulture'; 'Switching regime risk spill-over in global financial markets'; 'Planning, exploitation and management of stocks in the cashew nut sector in Senegal'; 'A skewed general variable neighbourhood search for solving the battery swap station location-routing problem with capacitated electric vehicles'. >>

>>In addition, there was a whole session devoted to OR & Education with speakers Hans Ittmann (South Africa), Jim Cochran (USA), Maseka Lesaoana (South Africa) and Emna Ammari (Tunisia) covering topics such as the current state of OR in Africa, how to design an undergraduate honours programme in OR, the development of OR in Africa, and a bibliometric analysis of OR/MS in Africa, which indicated where OR/MS research was most prolific in the continent. It is hoped that all the slides will be placed on the AFROS website so they can be accessed by a wider audience. In the afternoon of the final day of the conference a doctoral workshop, intended for doctoral students at the early stage of their dissertation research, was run by Fouad Ben Abdelaziz and Jim Cochran.

During the conference Hatem kindly arranged for delegates a short tour of the key local ancient sites which was fascinating and taught us much about the great works of Hannibal and Hadrian as well as demonstrating the beauty of the country (and illustrating some local traffic flow problems- a challenge for transportation algorithms!). The other big social event was the delicious conference dinner which started a little late owing to another competing event (something to do with football!). To add to the atmosphere the dinner was accompanied by a 3-piece local band which

had delegates clapping along to the infectious rhythms of the songs.

Bernie Lindner (AFROS' Secretary, standing in ably for the President of AFROS who was sadly unable to join us at short notice) gave us a quick run-down on the progress of the recently formed AFROS before setting off to backpack his way round the country. It was great to hear that AFROS has now been formally registered in South Africa, and that plans are afoot to run a second AFROS conference in about 2 years' time, possibly in Cape Town.

The last session of the conference was devoted to presentations of awards and certificates: Hatem Masri presented some important TDAS awards then Mike Trick presented members of the organising team with IFORS certificates and thanked them for an excellent conference. Then, to our surprise, Hatem and Fouad presented Mike, Jim and Sue with certificates for their assistance in launching AFROS and supporting its first conference.

Congratulations to all those involved for working so very hard to produce such a stimulating and enjoyable conference! We look forward to the next one. 🌍

EURO 2018 Celebrated in Valencia - Beyond Fourth Decade of EURO Conferences on OR

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EURO 2018, The *29th European Conference for Operational Research* in the series of *EURO conferences,* the largest and most important conference for Operational Research and Management Science (OR/MS) in Europe, with more than 40 years of history since its first edition in Brussels in 1975, was held and so much enjoyed in Valencia, Spain, last July 8-11, 2018. Up-front, we would like to say that those sunny days of *EURO 2018* will forever be remembered as days of scientific excellence, of an amazing organizational care, of the beauty of Spain and the Mediterranean Sea, and of a great friendship.

The success of this *EURO* conference was made possible because of the perseverance, great dedication and hard-work exerted by the Organizing Committee (http://euro2018valencia.com/organization-committee/) headed by its co-chairs from the two hosting universities – *Prof. Dr. Ramon Alvarez-Valdes* from *Universitat de Valencia,* and *Prof. Dr. Ruben Ruiz* from *Universitat Politecnica de Valencia,* and the concerted effort, immense devotion and care of the members of the Program Committee (http://euro2018valencia.com/program-committee/) chaired by *Prof. Dr. Greet Vanden Berghe* from *KU Leuven,* Belgium.

The participants were warmly welcomed by Presidents and

🔺 Audience in the Opening Ceremony.

Chairs in a very solemn *Opening Session,* and a following *Welcome Reception* with a local and traditional fireworks display took place, too, in the afternoon and evening of July 8. Particular emphasis should be given to two details of high recognition during the Opening, namely, the *EURO Gold Medal* awarded to *Prof. Dr. Silvano Martello* (University of Bologna, Italy) and the *EURO Distinguished Service Medal Award* handed to *Prof. Dr. Jan Weglarz* (Poznan University of Technology, Poland).

Chairs, Presidentals and University Representatives at the Opening Ceremony.

The four-day conference established a very hospitable frame where participants had the time to meet old and new friends and research intellectuals, and to choose among 15 invited (keynote, tutorial or plenary) speeches and 596 sessions with usually four paper presentations per session. *EURO 2018* was attended by almost 2500 registered participants from 77 countries around the world, with more than 2000 presentations. Being a big conference, two venues were prepared excellently - *Universitat de Valencia (UV)* and *Universitat Politecnica de Valencia (UPV),* together with the spectacular *Valencia Convention Centre,* a futuristic world of modern architecture and hybrid, amphibious life between land and sea.

The conference was highlighted by the following *Keynote, Tutorial* and *Plenary Lectures* of *OR* research enthusiasts from all over the world:

Day 1 (Monday) – the **Keynote Lectures**
"Six Decades of Interior Point Methods: "From Periphery to Glory"" by Prof. Dr. Tamás Terlaky (Lehigh University, USA);
"Optimization and Music Data Science" by Prof. Dr. Elaine Chew (Queen Mary University of London, UK);
"Systems Modeling Impacting Policy: The Role Of Group Model Building in Cambodia"
by Prof. Dr. David Matchar (Duke-NUS, Singapore);
"Quantitative Models Embedded in Decision-support Tools for Healthcare Applications"
by Prof. Dr. Pinar Keskinocak (Georgia Tech, USA);
and the **EURO Plenary Lecture**
"The Discrete Charm of Districting" by Prof. Dr. Roger Z. Rios-Mercado (Universidad
Autónoma de Nuevo León, Mexico);

Day 2 (Tuesday) – the **Keynote Lectures**
"Community Structure in Complex Networks" by Prof. Dr. Santo Fortunato (Indiana University, USA);
"Putting Operations Research to Work" by Prof. Dr. Iris F.A. Vis (University of Groningen, the Netherlands);
"MINLP and the Cost of Interpretability in Data Science" by Prof. Dr. Dolores Romero Morales (Copenhagen Business

School, Denmark);
"Integrated Optimization in Public Transportation: Does it Help?" by Prof. Dr. Anita Schöbel (University Göttingen, Germany), and the **IFORS Distinguished Lecture** "*Air Transportation Optimization"* by Prof. Dr. Cynthia Barnhart (MIT, USA);

Day 3 (Wednesday) – the **Keynote Lectures**
"Teaching experiments are condemned to be successful" by Prof. Dr. Maria Antónia Carravilla (University of Porto, Portugal);
"Online Optimization for Dynamic Matching Markets" by Prof. Dr. Patrick Jaillet (MIT, USA);
"The Hazards of Trading Volatility" by Prof. Dr. Carol Alexander (University of Sussex, UK);
the **IFORS Tutorial Lecture**
"Solving Hard Shortest Path Problems with the Pulse Framework" by Prof. Dr. Andrés
Medaglia (Universidad de los Andes, Colombia);
and the **EURO Plenary Lecture**
"Theory can sometimes be useful" by Prof. Dr. Gerhard Woeginger (RWTH Aachen University, Germany).

Please find video records of the presentations under http://euro2018valencia.com/plenaries-and-key-notes/.

The conference *Program* was structured by *Main Areas* (listed at http://euro2018valencia.com/streams_and_areas/), which consisted of valuable *Streams,* themselves composed of *Sessions* and, herewith, the *Presentations.*

The IFORS President Michael Trick introduced Cynthia Barnhart, in the IFORS Distinguished Lecture.

What is more it had several precious **"Satellite Events"** in further beautiful Spanish cities (http://euro2018valencia.com/satellite_events/), and it endorsed a number of **Special Issues** in excellent journals offered to participants and friends (http://euro2018valencia.com/special-issues/).

As it is not possible here to name the vast diversity and splendid prosperity of the entire program, subsequently we recall just a few main impressions by us – while *we highly value all the many precious contributions!*

In fact, one of the most important and well-attended among the sessions during the conference was that on *"Making an Impact"* which gave opportunities to practitioners to explore their challenges and share solutions, try out new techniques, see case studies displaying important applications, exchange ideas and expertise with people in related fields, meet leading academicians and discover what each one can do for each other, and build new network among likeminded professionals. The session was organized by *EURO Working Group on Practice of OR,* the network for OR practitioners in industry, consultancy, government and beyond.

As a novelty in our EURO conferences, EURO 2018 cherished the sincere and important Session *"Women in Science"* (cf. its video under http://euro2018valencia.com/photos_videos/).

Eventually, *ROADEF/EURO Challenge 2018* and, due to E*URO Working Group on Ethics and OR,* the *EthOR 2018 Award* project were conducted... and there was so much more which you can find when browsing through the program https://www.euro-online.org/conf/admin/tmp/program-euro29.pdf.

Other streams organized included sessions on, e.g., Scheduling Practice, Facility Location, Dynamic and Stochastic Scheduling, Results on Benders' Decomposition, Stochastic Models and Queueing, Analytic Hierarchy Process, Multi-Objective Combinatorial Optimization, Continuous Optimization, The Role of Mathematical Optimization in Data Science, Decision Aiding Methods, Quality Management, Supply Chain Analysis, OR in Neuroscience, Machine Learning, Quality Management, Data Envelopment Analysis, Risk Management, Ethics and Societal Complexity, Heuristics, Vehicle Routing Problems, OR for Developing Countries, OR in Forestry, Health Care, Water Management, Systems and Sports, Energy and Education, Renewable Energy, Sustainable Operations, Moments in the History of OR, and much more, offered to interested participants to choose from.

To culminate the conference, the solemn *Closing Session* was held at the *Opera House* (Valencia Convention Centre). It was high-lighted through a further *EURO Awards' ceremony,* and information about **EURO 2019** (Dublin, Ireland; https://www.euro2019dublin.com/) and **IFORS 2020** (Seoul, Korea) was given with presentations disseminated by chairs and representatives. In addition, the members of the committees of EURO 2018 were greatly acknowledged. Our conference was organized by *EURO, the Spanish Statistics and Operations Research Society (SEIO), UV, UPV and ADEIT – Fundacio Universitat Empresa,* and their excellent teams.

So much we learned, so much sun, history, marvelous paella we enjoyed … with so many wonderful humans … **EURO 2018**: an investment into the future of **OR**, and its service in building up our *world of tomorrow* in togetherness and friendliness! 🌍

Report of EUROPT Workshop 2018

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The 16th EUROPT 2018 Workshop on Advances in Continuous Optimization was hosted by the University of Almería, Almería, Spain. The workshop started with a Welcome Reception for the participants on July 11th - on the eve of the two working days of July 12th and 13th. This Workshop continued the line of previous EUROPT workshops: first held in 2000 in Budapest, followed by the workshops in Rotterdam 2001, Istanbul 2003, Rhodes 2004, Reykjavik 2006, Prague 2007, Remagen 2009, Aveiro 2010, Ballarat 2011, Siauliai 2012, Florence 2013, Perpignan 2014, Edinburgh 2015, Warsaw 2016 and Montréal 2017.

The 16th EUROPT 2018 Workshop was a satellite meeting that followed the 29th European Conference on Operational Research, held July 8-11, 2018 in Valencia, Spain (http://euro2018valencia.com/).

Preparations for the 16th EUROPT 2018 Workshop were distributed between a Program Committee and the Local

Organizing Committee, with the latter composed of staff members of the research group TIC-146 Supercomputing – Algorithms, mainly from University of Almería. The compositions of the two committees are presented below:

Organizing Committee:
From the University of Almería: Pilar Martínez Ortigosa - Chair, Leocadio González Casado - Chair, Ester Martín Garzón, Vicente González Ruíz, José Antonio Martínez García, Juan Francisco Sanjuan Estrada, Juana López Redondo, Cristobal Medina López, José Manuel García, Salmerón, Nicolas Calvo Cruz, Miriam Ruiz Ferrández, Savins Puertas Martín, Juan José Moreno Riado, and Francisco José Orts Gómez.

And from the University of Málaga: Eligius M.T. Hendrix, Inmaculada García Fernández, and Gloria Ortega López.

Geographical Distribution of the participants.
The workshop was attended by a total of 121 participants, with the following geographical distribution: Spain: 30, Italy: 20, Germany: 14, Canada: 9, Portugal: 7, France: 6, England: 6, Hungary: 4, Austria: 4, Lituania: 3, Poland: 3, EEUU: 3, Turkey: 2, Argelia: 2, Brasil: 2, Netherlands: 1, Greece: 1, Bulgary: 1, Chile : 1, Brasil: 1 and South Korea: 1.

The 2018 EUROPT Fellow Lecture
The title of EUROPT Fellow is awarded each year to an outstanding researcher in the field. The award is made by the EUROPT Managing Board based on the nominations received from the members of EUROPT.

The 2017 awardee of the EUROPT Fellowship was announced during the workshop: Professor Marco Locatelli, from Università degli Studi di Parma, Parma, Italy received this honour. Professor Locatelli gave the EUROPT Fellow Lecture as a plenary talk.

Marco Locatelli (left) received the EUROPT Fellow Plate from EUROPT Chair Julius Zilinskas (right).

A full list of the EUROPT Fellows is available at:
https://www.euro-online.org/websites/continuous-optimization/europt-fellows/

Scientific Program
The scientific program consisted of 30 parallel sessions comprising 96 talks (20-25 minutes for each talk) and four plenary lectures presented by:
• Coralia Cartis, Associate Professor in Numerical Optimization, Mathematical Institute of University of Oxford. *Optimization with expensive and uncertain data*

- challenges and improvements.
• Angelika Wiegele, Associate Professor at the Mathematics Department, Alpen-Adria-Universität Klagenfurt, Austria. *Algorithmic Approaches for Semidefinite Programming Applied to Combinatorial Optimization.*
• Frédéric Messine, Full Professor, LAPLACE-ENSEEIHT-INPT, University of Toulouse, France. *Mathematical Optimization for Innovative Electromagnetical Designs.*
• EUROPT Fellow 2018, Marco Locatelli, Full professor at the Dipartimento di Ingegneria e Architettura, Università di Parma, Italy. *Trajectory and speed planning by optimization.*

Social Program
In order to ensure some respite from the technical content, and to provide opportunities to network and socialise, the 16th EUROPT 2018 Workshop included the following social events:
• Welcome Reception in the *"LaMarca"* restaurant.
• Lunches for all participants on Thursday and Friday, 12th and 13th July in the Central Canteen of University of Almería.
• Conference Dinner in the Restaurant *"Club de Mar".*
• Guided walking tour of Almeria's downtown.
• Flamenco Dancing Show at *Peña el Taranto,* and end of workshop dinner.

Special issue of the Journal of Global Optimization
Selected papers presented at EUROPT 2018 will be considered for peer-reviewed publication in a special issue of JOGO entitled *Special Issue on Advances in Continuous Optimization on the occasion of EUROPT 2018.* Papers are required no later than 15th November 2018.

Sponsors
The scientific and social programs of the workshop would not have been possible without the generous support of the sponsors of the workshop, and we extend our thanks and appreciation to them: EUROPT working group, University of Almería, Department of Informatics, University of Almería, Cajamar, Diputación de Almería, CeiA3, Junta de Andalucía.

The 17th EUROPT 2019 Workshop will be held at the University of Strathclyde, Glasgow and will be organised by Edmondo Minisci. 🌐

EWG-ORD 2018 Workshop:
OR Window Towards Sustainable Development

Milagros Baldemor <milagros_baldemor@yahoo.com.ph>, **Begoña Vitoriano** <bvitoriano@mat.ucm.es >
Gerhard Wilhelm-Weber <gerhard.weber@put.poznan.pl>

"Operations Research for Sustainable Development: Establishing Policy and Measuring Goal Attainment" was the theme of the *EWG-ORD 2018 Workshop* which was held at the *Complutense University* of Madrid, Spain, during July 5-7, 2018 (http://eventos.ucm.es/16639/detail/ewg-ord-2018-workshop.html). This workshop was a satellite event of the *EURO 2018 International Conference,* which took place in Valencia, Spain, during July 8-11, 2018 (http://euro2018valencia.com/).

The mission of the *EURO Working Group on Operational Research for Development (EWG-ORD)* (https://www.euro-online.org/web/ewg/29/ewg-ord-euro-working-group-on-operations-research-for-development) is to:
• disseminate state-of-the-art knowledge and to support research in OR for (sustainable) development,
• assist in uniting the ORD communities in Europe organized under the umbrella of EURO,
• support preparation, refereeing and editing of publications,
• establish regular information channels and regular meetings,
• involve industrial organizations and users of optimization in the activities listed above,
• provide a vivid exchange between scientific experience and the enthusiasm of the youth,
• encourage the maturation of a common and developing Europe, and
• deepen the peace and friendship within Europe and throughout the world.

The *EWG-ORD 2018* workshop aimed to bring together Operational Researchers who have utilized OR tools to address problems on sustainable development such as education, health, water, economy, agriculture, environment, energy, disaster management and climate change. The aim is to benefit all nations of the world, not just the developing ones. The local organizer, Complutense University of Madrid's UCM-HUMLOG research group (Decision Aid Models for Logistics and Disaster Management-Humanitarian Logistics-), is very well-known internationally for its enormous academic and practical OR experience related to the developmental subjects of our event.

With more than 40 attendees from more than 20 countries, this year's workshop featured 25 contributed papers, a practicum (workshop), and 2 distinguished invited talks. Together, the participants explored more than 11 of the 17 *Sustainable Development Goals* adopted by the United Nations to end poverty, to protect the planet, and to ensure prosperity for all.

The ten facilitated sessions, with up to four presentations per session, were:
• *Electricity Models for Sustainability,*
• *Clean Water, Sanitation and Life Below Water,*
• *Industry, Innovation and Infrastructure,*
• *Quality Education,*
• *Evacuation and Disaster Planning,*
• *Sustainable Cities,*
• *Supply Chain and Logistics,*
• *Models for Sustainable Development,*
• *Health and Well-being for People, and*
• *Clean Energy.*

Each paper presentation was enriched by the comments of one assigned participant, called *Reactor,* and by further questions from other interested researchers.

During the opening session, **Dr. Claudia Cristina Rave** from Fluir.D.Lab Laboratorio de Decisión, Columbia, gave an invited talk on *"Scheduling vs Prioritization Assessment for Infrastructure Public Investment: A Case Study, Regional Road Network of Antioquia, Columbia".* A second invited talk was given by **Prof. Zilla Sinuany-Stern** of Ben-Gurion University of Negev, Israel, on *"OR Modeling of Preparedness for an Earthquake Disaster".*

A workshop on *"Operational Research for Today and Tomorrow: Mentoring research ideas"* was given by the Co-Chairs of the Scientific Program Committee of the workshop, **Prof. Gordon Dash** and **Prof. Nina Kajiji**, both from University of Rhode Island, USA (see photos).

After the closing session on the second day, a dinner took place to unite the participants and paper presenters, and allow them to discuss among themselves future collaborations. On July 7, the Local Organizing Committee with its Chair, **Prof. Begoña Vitoriano** (see photo) from the host university, escorted the participants on a most enjoyable trip to Toledo, Spain, for them to see the beauty and ambiance of historical Spain (see photo). The care and hospitality that the local OC provided to their guests from all over the world were very sincere and truly outstanding. The support of the workshop sponsors – Complutense University of Madrid (UCM), the Interdisciplinary Mathematics Institute of UCM, the Statistics and Operational Research Society of Spain (SEIO), and the University of Rhode Island (USA) – fostered the great scientific and social success of *EWG-ORD 2018.*

The workshop was celebrated in peace, friendship and readiness to serve the international community. Participants and the interested community are invited to submit to a Central European Journal of Operations Research *(CEJOR)* special issue prepared on the occasion of the *EWG-ORD 2018 Workshop*. The support, guidance and encouragement of Honorary Chair of *EWG-ORD, Dr. Elise del Rosario* (Manila, Philippines) contributed hugely to the success of the workshop.

In the Closing Session, *Gerhard Wilhelm-Weber* welcomed the participants to attend *EURO 2019*, Dublin, Ireland (https://www.euro2019dublin.com/), and to actively contribute to its program in streams and sessions. 🌐

Balikesir Hosts OR Meeting Which Exceeds the Limits

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"The International Conference on Applied Mathematics in Engineering (ICAME'18)" was successfully held in Burhaniye, Balıkesir, Turkey, during June 27-29, 2018 (http://icame.balikesir.edu.tr) with attendance of participants from all over the world. Burhaniye, Balıkesir, is located in a very ancient and beautiful part of the *Aegean* region.

The conference was hosted by *Balıkesir University* and technically supported by IJOCTA (http://ijocta.balikesir.edu.tr) under the leadership of the Chair *Prof. Dr. Necati Özdemir* (Department of Mathematics, Balıkesir University, Turkey), This event provided an excellent academic platform for researchers to present their latest research and emerging findings of applied mathematics in the fields of engineering, physics, chemistry, biology and statistics. The field of Operational Research, as a recognized and popular key technology, played a central role in many of the scientific presentations and in the discussions.

A total of 224 presentations were successfully presented by participants from 15 different countries, i.e., Algeria, Argentina, Bulgaria, Germany, India, Libya, Morocco, Nigeria, Portugal, Saudi Arabia, South Africa, Turkey, United Arab Emirates, United Kingdom and United States of America.

The special sessions with the themes of their chairs were:
- Prof. Dr. Gerhard-Wilhelm Weber (Faculty of Engineering Management, Chair of Marketing and Economic Engineering, Poznan University of Technology, Poland, and IAM, METU, Turkey) together with Prof. Dr. Ahmet Şahiner (Department of Mathematics, Süleyman Demirel University, İsparta, Turkey) on *Modelling & Optimization*.
- Prof. Dr. Mehmet Kemal Leblebicioğlu (Department of Electrical and Electronics Engineering, Middle East Technical University, Turkey) on *Control Theory & Applications*. 🌐

- Prof. Dr. Dumitru Baleanu (Department of Mathematics, Çankaya University, Turkey) on *Fractional Calculus with Applications in Biology*.
- Prof. Dr. Hossein Jafari (Department of Mathematics, University of Mazandaran, University of South Africa) on *Numerical Methods in Fractional Calculus*.
- Prof. Dr. Guo-Cheng Wu, (Neijiang Normal University, China) on *Discrete Fractional Calculus with Applications*.
- Prof. Dr. Dumitru Baleanu (Department of Mathematics, Çankaya University, Turkey) on *New Fractional Derivatives and Their Applications*.
- Prof. Dr. Hüseyin Merdan (Department of Mathematics, TOBB University, Turkey) on *Nonlinear Dynamical Systems and Chaos*.
- Prof. Dr. Hasan Bulut (Department of Mathematics, Fırat University, Turkey) on *Analytical and Numerical Methods for Solving Nonlinear Partial Differential Equations*.
- Prof. Dr. Alireza Khalili Golmankhaneh (Islamic Azad University, Iran) on *Fractal and Fractional Calculus*.

These contributed to the exchange of information and planning of *OR* collaboration between researchers in interdiciplinary areas of emerging and future work. Furthermore, the significant session of *round table discussion* widened the horizons of the young scientists with details of recent developments in trending topics.

The following is a list of the **Plenary Speakers** with the topics of their given talks:

- *Prof. Dr. Albert C. J. Luo* (Department of Mechanical Engineering, Southern Illinois University Edwardsville, United States of America): "Towards infinite countable bifurcation trees of period-m to chaos in nonlinear dynamical systems with saddle-nodes"
- *Prof. Dr. J. A. Tenreiro Machado* (Department of Electrical Engineering, Polytechnic Institute of Porto, Portugal): "Fractional Calculus: Fundamentals, Concepts and Some Applications"

- *Prof. Dr. Jordan Hristov* (Department of Chemical Engineering, University of Chemical Technology and Metallurgy, Bulgaria): "Exponential and Related Non-Singular Memories: What is following after that in modelling technology?"

The following is a list of **Invited Speakers** with the topics of their given talks:

- *Prof. Dr. Carla M. A. Pinto* (Department of Mathematics, Polytechnic Institute of Porto, Portugal): "On recent applications of non-integer order models to biological systems"
- *Prof. Dr. Mehmet Kemal Leblebicioğlu* (Department of Electrical and Electronics Engineering, Middle East Technical University, Turkey): "Observability, Controllability and Identifiability Problems in Some Unmanned Air, Sea and Underwater Vehicles",
- *Prof. Dr. Ekrem Savaş* (Rector, Uşak University, Turkey): "Some New Sequence Spaces".

The rich scientific program was also matched by the well-thought out social program. A Gala Dinner featured folk dances and good food in the BUBYO Hotel. The organizers were models of hospitality and generosity as they led the participants in a visit to spectacular Cunda Island (Ayvalık).

Throughout the days of the conference, *Burcu* (Prof. Gürbüz) also served to represent *Operational Research*, and she was available to give further information to the conference attendees regarding *OR* events, such as *EURO* and *IFORS*.

The conference was a remarkable opportunity to discuss the connection between different branches of science, engineering and *Operational Research* and to establish collaboration with other researchers from different universities in a very friendly environment. The participants of *ICAME'18* were informed about the next edition of the conference, *ICAME'20*. 🌐

INFORMS International in Taiwan - A Better World Through OR, Analytics and AI

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2018 INFORMS International Conference was held on June 17-20 2018, in *Taipei City* located in beautiful *Taiwan* Island. The conference was a great gathering with more than 800 participants from academia and industry spanning 30 countries. The theme of the conference was "*A Better World Through OR, Analytics and AI*" and the participants discovered trends in analytics, big data, deep learning and artificial intelligence. The conference homepage http://meetings2.informs.org/wordpress/2018international/ offers a variety of information on the entire symposium. Up-front, we should mention two novel elements: the exciting competition "*Future Finance and Healthcare Hackathon*" which started even before the regular conference program; and, the "*Women in Technology at INFORMS Taipei*" event which consisted of a panel and dinner.

In the **Plenary Lectures**, *Prof. Dr. Christopher Tang* (University of California-LA, Anderson School of Management, Operations and Technology Management, Los Angeles, CA, USA) discussed *"Making Supply Chain Transparent for a Better World: Information and Analysis"* and *Prof. Dr. John Buzacott* (York University, Toronto, ON, Canada) presented the ways of *"Improving the Manufacturing Systems by Understanding the Variability"*.

The **Keynote Speakers** presented insightful information regarding OR, Analytics, and AI:

Prof. Dr. John Birge (University of Chicago, Booth School of Business, Chicago, IL, USA) *"The Value of OR in Network Analysis"*;

Prof. Dr. Richard Larson (Massachusetts Institute of Technology, Cambridge, MA, USA) *"The Services Industries: Some Insights Provided by Operations Research"*;

Prof. Dr. David Yao (Columbia University, IEOR Department, New York, NY, USA) *"AI, Risk and Analytics - Rethinking SCM"*;

Prof. Dr. Oleg Gusikhin (Ford Motor Company, Dearborn, MI, USA) *"Smart Production of Smart Vehicles"*;

Prof. Dr. Guillermo Gallego (HKUST, Kowloon, Hong Kong) *"Asymptotically Optimal Policies for Multi-Item Joint Inventory and Dynamic Pricing Control with Stockout-based Substitution"*;

Prof. Dr. Radhika Kulkarni (SAS Institute Inc., Cary, NC, USA) *"Machine Learning, Artificial Intelligence and Optimization: Opportunities for Inter-Disciplinary Innovation"*;

Prof. Dr. Shmuel Oren (University of California-Berkeley, Berkeley, CA, USA) *"Smart Markets for a Smart Electricity Grid"*;

Prof. Dr. Lam Khin Yong (NTU-Nanyang Technological University, Singapore) *"The Entrepreneurial University: Integrating Knowledge and Innovation for Impact"*;

Prof. Dr. Edward Kaplan (Yale University, Yale School of Management, New Haven, USA) *"Operations Research and Public Health"*;

Prof. Dr. San-Cheng Chang (School of Big Data Management, Soochow University, Taipei, Taiwan; The Ex-Premier of Republic of China) *"From Open Data to Digital Economy"*; and,

Prof. Dr. Sriram Raghavan (IBM Research, New Delhi, India) *"Transforming Industries and Professions through AI, IoT and Blockchain"*.

The conference also included Tutorials, Industry Tracks, Invited Clusters, Invited Sessions and Special Sessions. These covered a wide range of topics including Machine Learning, Big Data Analytics, Supply Chain 4.0, Digital Revolution, Artificial Intelligence, Smart Manufacturing, Smart Healthcare, and Smart Agriculture. The technical sessions helped to broaden and deepen the knowledge of OR/MS, and to initiate collaboration opportunities.

One of the Invited Clusters, called *"Data Mining"*, was organized by *Gerhard-Wilhelm Weber (Willi)*; it included *Tülin Inkaya's* presentation *"A Data Mining Based Forecasting Methodology"* and his own presentation: *"Relationship between Investors' Neural-Behavioral Responses and Finance by Identifying Coupled Systems of Stochastic Differential Equations, Using MARS"*.

The *Social Program* was one of the unique features of the conference. The *Reception* and *Gala Dinner* provided a great opportunity for the participants to experience the traditional arts, handcrafts and food, as well as to socialize and network. In the Gala Dinner, the performances of Sichuan face-changing opera and traditional Taiwanese Aboriginal dance were remarkable. The organizing committee also arranged special tours to visit some of the hidden gems of Taipei such

as *Jiufen, Shifen* and *Tamsui*.

A warm **thanks** goes to both the *Organizing* and the *Program Committees* and to all the people from *INFORMS*, who spent so much dedicated time and tremendous work to organize this successful conference. The enormous efforts of the team of OC Chair *Professor Grace Lin* (Asia University Taichung, Taiwan), alongside the PC Chairs *Prof. Dr. Kathryn E. Stecke* (Naveen Jindal School of Business, University of Texas at Dallas, USA) and *Prof. Dr. Chung-Yee Lee* (Office of Institutional Research, HKUST, Hong Kong, China) in receiving and hosting the guests, and in facilitating future collaboration at all levels between scientists and practitioners from all over the world, will always remain associated with *2018 INFORMS International Taipei*.

One example of this spirit of togetherness is Plenary Lecturer *Prof. Dr. Christopher Tang* providing valuable material to *IFORS Developing Countries Online Resources*. Last but not least, *Willi* found so many open minds and hearts during *2018 INFORMS International Taipei* when discussing our **EURO** activities, especially *EURO 2018* in Valencia and *EURO 2019* in Dublin. The *2019 INFORMS International* will be held in Cancun, Mexico (http://meetings2.informs.org/wordpress/2019international/). 🌎

# ➕ ECCO XXXI - CO 2018: A joint meeting for the European combinatorialists

Silvano Martello <silvano.martello@unibo.it>

Almost 100 participants from Australia, Austria, Belgium, Canada, Chile, China, France, Germany, Hungary, India, Iran, Israel, Italy, Malta, Norway, Poland, Portugal, Qatar, Russian Federation, Spain, Switzerland, Turkey, United Kingdom, and USA got together for ECCO XXXI – CO 2018 (https://ecco2018.euro-online.org/) from June 14 to June 16, 2018 at the Pérolles II Campus of the University of Fribourg in Fribourg, Switzerland. This was a joint conference of the European Chapter on Combinatorial Optimization (ECCO), chaired by Silvano Martello, and CO, a series of combinatorial optimization conferences that started in the UK in 1977, coordinated by Bo Chen, Chris Potts, and Vitaly Strusevich. The scientific program included around 70 talks on several aspects of combinatorial optimization, covering both theory and application.

Four plenary lectures were delivered by
- Yves Crama (HEC, Liège) on *Reformulations of nonlinear binary optimization problems;*
- John B. Gauci (University of Malta) on *Super-connectivity and super-edge-connectivity of graphs;*
- Christos H. Papadimitriou (University of California at Berkeley) on *A computer scientist thinks about the brain;*
- Daniel Kuhn (École Polytechnique Fédérale de Lausanne) on *From Data to Less Data to Decisions.*
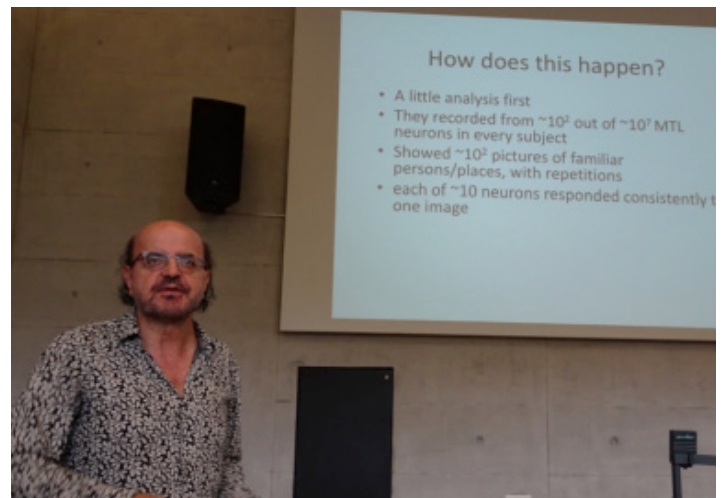
🔺 Plenary lecture of Christos H. Papadimitriou (Photo by Van Dat Cung)

The Program Committee and the Organizing Committee, both chaired by Bernard Ries, crafted a wonderful social and academic programme. The social program included a welcome cocktail at the theatre Equilibre in the city center, a guided tour of the famous chocolate factory of Cailler, and a visit to Gruyères and its 13th-century Château. The gala dinner took place at the restaurant Auberge de la Halle in Gruyères.

The EURO Working Group on Combinatorial Optimization, ECCO (European Chapter on Combinatorial Optimization - http://ecco.grenoble-inp.fr) was formed in 1987 by C. Roucairol, D. de Werra and A. Rinnooy Kan. ECCO has since gathered researchers working in the different fields of operations management, logistics, production scheduling, location and distribution problems, resource allocation, flexible manufacturing, and metaheuristics – to name a few. Since 1988, the group has been bringing researchers together each year to discuss the latest advances in combinatorial optimization.

A special issue of *Discrete Applied Mathematics* on "New progress in Combinatorial Optimization" (open to all ECCO and CO members) was launched, with a submission deadline of December 1, 2018.

ECCO has a tradition of conferences being held in charming locations: the latest conferences (2000 onwards) were held in Capri, Bonn, Lugano, Molde, Beirut, Minsk, Porto, Limassol, Dubrovnik, Jerusalem, Malaga, Amsterdam, Antalya, Paris, Munich, Catania, Budapest, Koper, and Fribourg.

The next ECCO conference, organized by John Gauci, will take place in Sliema (Malta), from May 30 to June 1, 2019. Sliema is an attractive small city by the sea with a dazzling view of the city of Valletta. The plenary speakers will include Martin Charles Golumbic, Fred Glover, and Maria Grazia Speranza. 🌐

Human Factors in a Contemporary Organization - XXXI International Seminar of Ergonomics - Fostered by OR

Krzysztof Hankiewicz <krzysztof.hankiewicz@put.poznan.pl>, **Gerhard-Wilhelm Weber** <gerhard-wilhelm.weber@put.poznan.pl

Whenever in the past organizers prepared *International Ergonomics Seminars*, they tried to create an opportunity for exchanging experiences between practitioners and theoreticians dealing with various areas of ergonomics. They had great success in broadening the issues of ergonomics discussed in previous years. The city of Poznan was chosen for the 2018 Seminar, in the hope that its location would make it an accessible and an attractive venue for people from both Poland and from abroad. This hope was fulfilled, as described below. So, the *31st International Seminar of Ergonomics was organized by Poznan University of Technology – Faculty of Engineering Management, Polish Ergonomics Society - Poznan Branch*, and *Malopolska Higher School of Economics*, endorsed by *Federation of the European Ergonomic Societies* and *International Ergonomics Association* (for further details please visit http://www.iset.poznan.pl/). *The conference venue* was *Poznan University of Technology* Lecture and Conference Center (known from EURO 2016). Please find the detailed list of *Organizers* and of *Advisory Board*, including **Krzysztof** (*Dr. Hankiewicz*), at http://www.iset.poznan.pl/organizatorzy_en.htm.

The common theme *"Human factors in a contemporary organization"* allowed for an approach that included diverse issues of ergonomics and safety, but which are not limited to professional activity. It shows the interdisciplinary character of contemporary issues in science which require simultaneous actions in diverse directions to create a synergistic effect that will help to solve the issues in question, both theoretical and practical. Here are some statistics about the seminar's success: it was attended by more than 100 participants from 10 different countries (Iran, Germany, Great Britain, Hungary, Italy, Netherlands, Poland, Portugal, Slovenia and Turkey); there were 5 keynote speakers in plenary sessions; over 50 presenters in 8 section sessions and a poster session; an additional student session – *Conference of Young Adepts of Ergonomics*; and a workshop.

The keynote *speakers were*:
- Dr. Rafał Michalski (Wrocław University of Science and Technology, Poland): *"Application of Hidden Markov Models to Ergonomics"*;
- Prof. Dr. Gerhard-Wilhelm Weber (Poznan University of Technology, Poland; coauthors: Dr. Semih Kuter, Prof. Dr. Zuhal Akyürek): *"Addressing Some Global Challenges with Earth-observing Satellite Data, New OR-Analytics and the Human Factor"*;

- Dr. Gyula Szabo (University of Szeged, Hungary): *"Added value of ergonomics to manage hazardous materials"*;
- Prof. Dr. Leszek Pacholski (Poznan University of Technology, Poland): *"Prospective changes of relation: human factor technology in vehicles manufacturing companies"*;
- Prof. Dr. Dave O'Neill (Chief Executive of the Institute of Ergonomics & Human Factors, UK): *"Certification of ergonomists"*.

Over the years of the different editions of the seminar, the organizers tried to expand the publishing possibilities. In 2018, selected peer-reviewed papers will be published electronically (ePdf) by DesTech; they will be submitted for indexation, among others to Clarivate Analytics (formerly Thomson Reuters Web of Science). What is more, as an expression of the insertion of modern methods of *Operational Research* into this year's international seminar, and into ergonomics in general, a special issue of the Central European Journal of Operations Research *(CEJOR)* was arranged. Both authors of this article will be the guest editors, and paper submission is open to both conference participants and interested members of the international community.

Through the *31st International Seminar of Ergonomics*, and its subsequent publications, the following fields of Ergonomics and OR (among others) have been and are the subject of investigation and utilization:

- *Man in enterprise of digital economy,*
- *Ergonomics and challenges of robotization and AI,*
- *Man in modern, knowledge-based economy,*
- *Ergonomics in information processes and organization management systems,*

- *Human factor in organizational systems of lean production,*
- *Human factor in organizing concepts on agility of enterprises,*
- *Human factor and innovation and technological entrepreneurship of organizations,*
- *Man in pro-quality management of organizations,*
- *Development of human professional skills and employee training processes as key factor to competitiveness and business success of an organization,*
- *Ergonomic awareness of employees and its shaping,*
- *Safety culture in contemporary and future organizations,*
- *Continuous improvement of work safety,*
- *Ergonomic criteria in occupational risk assessment,*
- *Dissemination of ergonomic standards of working conditions,*
- *Work of older, disabled or yet disadvantaged people in contemporary and future organizations.*

Gerhard-Wilhelm Weber (Willi) was one of the plenary speakers (see above), in fact *Willi* actively participated in lively discussions following many presentations at the seminar, and gave feedback and advice on the basis of his knowledge about *OR research* in the *EURO* and worldwide *OR* communities. It was with pleasure that he introduced *EURO* to the participants and invited old and new friends to actively take part in our conferences, such as *EURO 2019* in Dublin (https://www.euro2019dublin.com/), which we are now preparing.

The innovative and peaceful days of science and friendship in Poznan, supported by wonderful hospitality, will always be remembered with a spirit of thankfulness, motivation and inspiration! 🌍

The 61st Meeting of EWGCFM in Medieval Kaunas, Lithuania

Audrius Kabašinskas <audrius.kabasinskas@ktu.lt> (Kaunas University of Technology)
Gerhard-Wilhelm Weber < gerhard.weber@put.poznan.pl> (Poznan University of Technology)

The *61st Meeting of EURO Working Group for Commodities and Financial Modelling* took place in Kaunas, Lithuania on May 16-18, 2018.

The EURO Working Group for Commodities and Financial Modelling (EWGCFM) conference, #ewgcfm2018, brought together experts from the fields of financial modelling, statistics and economics, decision-making analysis and methods, FinTech and Blockchain, LittleData to BigData in finance and investment, game theory and mathematical economics, banking, insurance, pension planning, pricing and hedging of derivatives, credit and systemic risk, the application of OR methods in finance, etc. Kaunas city hosted the EWGCFM conference for the first time, whilst this is the second time that the conference has been held in Lithuania (following Vilnius, 2001).

The conference attendees came from more than 10 countries (Lithuania, Italy, Czech Republic, Germany, Poland, South Africa, Canada, United States, Austria, Taiwan and Slovakia). The welcome address was given by the president of Kaunas Chamber of Commerce, Industry and Crafts, dean of the Faculty of Mathematics and Natural Sciences, Kaunas University of Technology, president of EURO Working Group for Commodities and Financial Modelling and chair of the Lithuanian Operational Research Society. Over the three day period, there were three plenary speakers (Milos Kopa, Gerhard-Wilhelm (Willi) Weber and Stan Uryasev), two invited speakers (Georg Pflug and Andrius Adomonis) and seven conference sessions with more presented and discussed. With 36 presenters, the conference exceeded the average size of past EWGCFM conferences.

According to Google analytics, the conference webpage ewgcfm2018.ktu.edu has been visited 1258 times, since its launch in December 2017. People from more than 60 countries followed the link to the webpage at least once. Excluding Lithuania the top 10 audience was from Italy (7,31 %), Czech Republic (6,84 %), Germany (3,34 %), Poland (3,18 %), South Africa (2,94 %), Canada (2,86 %), United States (2,78 %), Austria (2,70 %), Taiwan (2,38 %) and South Korea (1,99 %). Top 10 of information sources (excluding direct and google/bing searches) are: conference-service.com/referral (21%), facebook.com/referral (16%), researchgate.net/referral (10%), ifors.org / referral (9%), t.co/referral (8%), euro-online.org/referral (7%), karlin.mff.cuni.cz/referral (5%), zimbra.polymtl.ca/referral (4%), mail.google.com/referral (4%), Newsletters/email (3%) and easychair.org/referral (3%).

Papers from topics discussed during the conference can be submitted to a special issue of the *Central European Journal of Operations Research* (IF(2016)=0.659) CEJOR. The deadline for submission is October 15, 2018. Following the regular procedure, papers may also be submitted to the journal *Engineering Economics* (IF(2016)=0.726).

The conference was organized by the Financial Modelling Group from the Faculty of Mathematics and Natural Sciences, Kaunas University of Technology together with EURO Working Group for Commodities and Financial Modelling (http://www.ewgfm.eu/).

The Faculty of Mathematics and Natural Science (FMNS) dates back to 1922 and has evolved to be a leader in physical and technological sciences across the Baltic States. Scientists at FMNS carry out high performance interdisciplinary scientific research in five main areas connected to the sustainable development of science and technologies. FMNS collaborates with partners from both business and industry, as well as the state sector. Scientific activities and partnerships are linked with the creation of unique study programmes in the region and the hosting of exclusive scientific events such as the KTU Big Data School - an international event focused on the development of knowledge and skills in the field of big data. KTU Big Data School 2018 will take place in Kaunas, Lithuania from September 26-28, 2018. This theoretical and practical scientific event aims at updating participants about the most recent advances in the critical and fast developing area of big data. The event concentrates on the deep theoretical background and improving skills during practical workshops. More information is available at https://bigdataschool.ktu.edu.

A workshop on mathematical solutions in business and industry (ESGI) usually takes place in the second week of June in Palanga, a Baltic Sea beach resort of Lithuania. This is a unique event in Lithuania and the Baltic States during which a team of researchers dedicate one week to solve real-world industry problems using mathematical methods. In 2018, the event attracted 5 companies and 30 participants from different countries and institutions. More information is available at http://mathforbusiness.ktu.edu.

After his plenary lecture, Willi kindly invited attendees to the upcoming EURO conferences: EURO 2018 in Valencia (http://euro2018valencia.com/) and EURO 2019 in Dublin (https://www.euro2019dublin.com/). 🌍

ICEST 2018 Opens Doors to OR Opportunities

Milagros Baldemor <milagros_baldemor@yahoo.com.ph>, **Gerhard Wilhelm-Weber** <gerhard.weber@put.poznan.pl>

The 3rd Conference on Computer, Environment, Agriculture, Social Science, Health Science, Engineering and Technology (ICEST2018) with the theme **"A Spectrum of Maritime Advancement in Science, Technology and Opportunities"** paved the way for its neighboring countries in the field of Operational Research as it was held last May 4-6, 2018, at the Garuda Plaza Hotel, Medan, Indonesia.

Author Mila (on the right) with conference organizers and paper presenters.

Medan, by hosting various OR conferences in recent decades, has developed strongly to become one of the centers of activity and inspiration of OR within Indonesia, and with an impact on the whole region and worldwide.

The conference *ICEST2018* served as an avenue to promote research results, which could generate solutions to existing problems and mention issues in the different fields. Furthermore, projects of collaboration between the researchers, practitioners and users may open opportunities and facilitate communication between the institutions of learning involved. Interaction between the research enthusiasts could even generate creative ideas and solutions in one way, or studies and new approaches related to their different fields of specialization on the other. Paper presentations related to medicine and agriculture captured the interest of the participants while research presentations on ethics, society and law were the most attended.

The event was highlighted by the keynote speeches of *Prof.*

Jasni Mohamad Zain of Universiti Teknologi Mara, Malaysia, on her topic: *"Conceptual Framework for Lightweight Ciphertext Policy – Attribute-based Encryption Scheme for Internet Devices"*; the topic of *Dr. Tutut Herawan* of Universiti Teknologi Yogyakarta, Indonesia, on *"Substantial Differences Between Fuzzy Set and Soft Set Theories"*; and Dr. Ameilia Zuliyanti Siregar of Universitas Sumatera Utara, Indonesia, who discussed her paper entitled *"The Growth Production Paddy with Legowo Row Planting System and Fish Farming Support of Security Food and Maritime in Indonesia"*. Prof. Milagros Baldemor of DMMMSU, Philippines, was invited as a guest paper presenter being a Keynote Speaker at the 2017 ICEST Conference. Her paper was on the *"Efficiency of LGUs in Northwestern Philippines as to the Attainment of the MDGs"*.

The conference was attended by 160 participants, with 130 paper presenters and 11 poster presenters. As one way of showing warm hospitality, the conference organizers, led by *Prof. Rahmat Sembiring* and *Dr. Ameilia Siregar*, brought the participants to tour beautiful sceneries like Lake Toba and Tomok.

During the days of this scientific conference, *Mila* served as a messenger of our international OR conferences, such as *EURO 2018* in Valencia and *EURO 2019* in Dublin, and our special activities, such as *IFORS Developing Countries Online Resources*. Please find further information about *ICEST2018* at its homepage http://www.icest.net/home.php. 🌍

SEMIRATA-ICST 2018 Levels Up in Operational Research

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"The Role of Science and Technology to Strengthen National Unity and Competitiveness" was the valuable theme of the recently concluded *International Conference on Science & Technology (SEMIRATA-ICST) 2018*, which was held successfully at the Medan Convention Center, Indonesia, on May 4-6, 2018.

The beautiful city of Medan, through its Universitas Sumatera Utara and, especially, the very active research group of Northern Sumatra in Mathematics and Operational Research, established by *Professor Herman Mawengkang,* has contributed enormously to our international OR family and its scientific events.

The traditional conference subjects were focused in the fields of Mathematics and Natural Sciences; formerly they were celebrated as an annual seminar and a meeting of deans and heads of Study Programs in collaboration with 19 State Universities in Western Indonesia. But starting with this year of 2018, the seminar has "leveled up" from national to international, and

▲ The Keynote Speakers with the University Rectors and Conference Organizers

it was renamed as *SEMIRATA International Conference on Science and Technology (SEMIRATA ICST) 2018*. This event aimed to (a) promote the role of science and technology in supporting national unity and competitiveness; (b) discuss research results in the field of Mathematics and Natural Sciences among researchers and stakeholder; and (c) facilitate communications and discussions related to issues, opportunities and actual progress of Mathematics and Natural Sciences to support the advancement of development in Indonesia. For this reason, it also aimed to facilitate collaboration among Operational Researchers and OR stakeholders, and to discuss the development as well as opportunities in the field of research and technology in the mentioned subject areas.

Interaction and communication between the participants from the different regions of Indonesia can generate ideas and research collaborations in an effort to address actual issues related to Science and Education. Research formed from such collaborations will not only help promote national

unity in Indonesia, but also improve self-sufficiency and help the institutions to become globally competitive.

A total of 479 paper presenters attended the conference. Of the 479 papers, 87 were on Mathematics, 84 on Physics, 115 on Chemistry, 123 on Biology and 70 on Education. The conference was highlighted by the keynote speeches delivered by *Prof. Milagros R Baldemor* (Mathematics) of Don Mariano Marcos Hospital State University, Philippines; *Prof. Ishak Ahmad* (Chemistry) of Universiti Kebangsaan, Malaysia; *Prof. Rachel Schwartz* (Biology) University of Rhode Island, USA and *Dr. Tulus I. Nasution* (Physics) of Universitas Sumatera Utara, Indonesia. The Organizing Committee, chaired by *Dr. Nursahara Pasaribu*, believed that the current condition of science and technology in Indonesia, particularly in Mathematics and Natural Sciences, still requires a special attention. Thus, there is a need to hold conferences of this type in order to strengthen national unity and competitiveness in the host country.

During the scientific meeting, Prof. Milagros Baldemor, one of the keynote speakers, provided the organizers and participants with helpful and attractive information about two highlights in our international OR community: *EURO 2018* in Valencia, Spain and *EURO 2019* in Dublin, Ireland. For more information regarding the conference, please refer to the webpage https://ocs.usu.ac.id/semirataicst/. 🌐

Association Governance and Management

Editor's Note: *Since IFORS is an Association of Associations, IFORS News features articles about association governance and management. In this issue, we feature an article from the Business Mirror column (https://businessmirror.com.ph/the-must-do-list-for-association-board-meetings/) of Octavio Peralta who is concurrently the secretary-general of the Association of Development Financing Institutions in Asia and the Pacific (ADFIAP) and the CEO and founder of the Philippine Council of Associations and Association Executives (PCAAE).*

The Must-Do List for Association Board meetings

Octavio Peralta <obp@adfiap.org>

I attend board meetings as part of my work as an association executive. Like many others, I have learned on the job that there is a protocol in organizing, conducting and recording board meetings. Even board members themselves, including chairmen, may not be not aware of such protocol. This is the reason board meetings sometimes

end up unnecessarily long and unruly.

According to Wikipedia, *Robert's Rules of Order* (or simply *Robert's Rules*) is the most widely used manual of parliamentary procedure in the United States. >>

>> Robert's Rules governs the meetings of a diverse range of organizations, including associations, non-profit organizations, professional societies, school boards, and industry chambers, that have adopted it as their parliamentary authority.

The manual was first published in 1876 by US Army Officer Henry Martyn Robert, who adapted the rules and practice of Congress to the needs of non-legislative societies. Although he was in the military, the rules in his book were not based on military rules. The author's interest in parliamentary procedure began in 1863 when he was chosen to preside over a church meeting and, while he accepted the task, he felt that he did not have the necessary knowledge of proper procedure.

Robert's Rules helps boards maintain order by providing a method of conducting meetings in a democratic, orderly and expeditious manner. Orderly meetings effectively uphold the association's objectives based on the bylaws, and protect the rights of the association's members. Each rule is affected by and affects all other rules. The manual contains a comprehensive set of rules that addresses virtually every potential issue in a board meeting.

Below are some guidelines to holding board meetings:
- *How to handle motions:* A member raises his/her hand, is recognized, and makes a motion, while another member seconds it. The chairman restates the motion, members debate on it, the chairman asks for affirmative and negative votes, and then announces the result of the voting.
- *When asking questions:* Member's questions should always be directed to the chairman and not to another member. The chairman is the presiding officer of the meeting.

- *Raising a point of order:* When a member notices a violation of a rule, the rule can be called out without waiting for the chairman to recognize the member who questions it. In such a situation, the member must say, "point of order." The chairman listens to the complaint and makes a ruling on whether there is indeed a violation. If the member disagrees with the chairman's ruling, the member may appeal the decision.
- **How to record minutes:** Minutes of a meeting should be brief and need not reflect every discussion that occurs. The only items that must be noted in the minutes are: (a) the date and time, (b) a list of who were in attendance, (c) a record of motions, seconds, and whether the motion was carried, and (d) reports submitted that may be attached as part of the record.

I encourage associations to consider adopting *Robert's Rules* to their advantage. Every board member has a responsibility to make informed decisions that actualizes the vision and mission of the association. When parliamentary procedure is followed with fidelity, the board process protects everyone's rights while championing the board's work and advocacy.