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IFORS NEWS

INTERNATIONAL FEDERATION OF OPERATIONAL RESEARCH SOCIETIES

FROM THE PRESIDENT

Janny Leung <jannyleung@um.edu.mo>

I am writing this message on the seventh day of the Lunar New Year, traditionally known as "People's Birthday", so let me wish everyone a Happy Birthday!

The Lunar New Year is a time for family gatherings (similar to Thanksgiving and Christmas). Everyone in the family hurries back to the hometown for a reunion with parents, grandparents and relatives. Many people also take advantage of the week-long public holiday to go on family vacations as well. With no more Covid19 restrictions, it is estimated that a record-breaking 9 billion person-trips will be made in China over this 2024 Spring Festival! The seventh day of the new year is the "return" peak travel day, with over 2 million passengers taking flights, over 15 million passengers taking train journeys and almost 300 million travelling by road, to prepare to return to work next week.

The enormity of the scale of the "Spring Festival Travel" truly boggles the mind. To most people, it seems impossible to arrange for hundreds of millions of people to get to their right destinations at the right time. But to us operational researchers, we should neither be surprised nor frazzled. We know that with data analytics, good forecasting and advance planning, the logistics of this massive transport operation can be optimised. Indeed, planning began months earlier. Big data analytics provided forecasts of the origin-destination demands for various transport modes. Hundreds of thousands of additional flights, train-trips and bus-trips were planned into the schedule, and all the necessary equipment and crew were mobilised. Students and essential workers were given priority for advance ticket purchase. Motorways were made toll-free to smooth traffic flows. Weather and road conditions were broadcasted continually. With all the preparations and robust planning, despite unusually bad weather (freezing temperatures, sleet and snow storms) affecting much of the country in the days leading up to the new year, things went relatively smoothly.

As operational researchers, we should feel very proud that our expertise is a key contributor to the efficiency and effectiveness of critical operations, not just for special events, such as the Spring Festival Travel or the Hajj Pilgrimage or the Olympic Games, but also for the myriads of systems that support our everyday lives. Most people have little idea of the complexity of the global supply chains that deliver food, fuel and essential materials to all of us daily. One Chinese translation of the word "logistics" is literally "working diligently in the background". Perhaps we do our job too well, so that few problems arise, and our good work goes unrecognized!

As we begin this new year, I want to show my appreciation to all operational researchers that are working diligently to make our lives easier! But I also want to encourage all of you to come forward from the background, and actively explain to the general public the importance and contribution of our work, so that operational research gets the recognition that it deserves.

May I wish you all the best for the Year of the Dragon!

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FROM THE EDITOR IN CHIEF

Antonio Mauttone <mauttone@fing.edu.uy>

Welcome to the March issue of the IFORS Newsletter!

We begin a new year with some changes in our teams and the format of our publication. After several years serving in the IFORS Newsletter, Sue Merchant is leaving her position as Co-Editor of the OR Impact section. We thank all her dedication, which has contributed to showing the impact of the discipline by reporting practical and successful applications. Moreover, from this edition onward we will publish more compact reports in the Conferences section, intending to balance the content of the whole publication. We thank the efforts made by the section Editor, Gerhard-Wilhelm Weber, and by the articles' authors toward this goal. Moreover, in this issue, we announce the results of the election of IFORS President and Vice-President for the 2025-2027 term. Congratulations to Héctor Cancela and Rina Schneur, who will be responsible for running the institution in the following years.

The March issue of the IFORS Newsletter includes content related to its regular sections. In the OR and Development section, a colleague from the Norwegian School of Economics reports a project aimed at reducing greenhouse gas emissions in the Panama Canal. The goal is attained by adopting just-in-time arrival strategies at a bottleneck. These strategies are supported by a scheduling optimization model which provides guidelines to arrival vessels to reduce speed, and therefore, reduce emissions. In the Tutorial section, a colleague from Oklahoma State University explains the basic concepts of Benders decomposition. By using a facility location problem example, the author states the main theoretical concepts of the methodology and provides practical guidelines that allow for implementing an efficient solution method. In the OR Impact section, several authors from Canada and Morocco report a successful application of OR methodologies to improve the supply chain management of phosphate, a mineral needed for fertilizer production. Several scheduling, mining, and transport operations were optimized by using both heuristics and exact methods, and integrated with the existing information system. As an essential part of the whole process, the authors highlight the relevance of the meetings organized with several stakeholders to increase their confidence in the new methodology developed.

Moreover, the Conferences section reports 20 events worldwide on OR and related disciplines, while the Book Review section reports on the volume "Optimization Methods - Introduction to the classic, nature-analogous and neural optimization methods". We close this issue with an obituary remembering Prof. Theodor John Stewart.

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

IFORS President and Vice-President 2025-2027

CONGRATULATIONS to Prof. Héctor Cancela who has been nominated and duly elected as President of IFORS for 2025-2027. CONGRATULATIONS also to Dr. Rina Schneur who has been nominated and duly elected as Vice- President of IFORS for the same term. We look forward to IFORS' continual success under their leadership!

President 2025-2027 – Prof. Héctor Cancela (Uruguay)

Héctor Cancela holds a PhD. degree in Computer Science from the University of Rennes 1, INRIA Rennes, France (1996), and a Computer Systems Engineer degree from the Universidad de la República, Uruguay (1990).

He was the Head of the Operations Research Department of the Universidad de la República between 1997 and 2004, and later Dean of the Engineering School of the same university (2010-2015). His research interests are centered in network models and stochastic models, applied jointly with optimization methods for solving problems in different areas (reliability, communications, transport, production, biological applications, agricultural applications, etc). He has published more than 100 full papers in international journals, indexed conference proceedings and book chapters. He has supervised more than 20 Ph.D. and M.Sc. thesis.

He is an associated editor of the journals International Transactions in Operations Research (ITOR), RAIRO-Operations Research (RAIRO-OR), Mathematical Methods of Operations Research (MMOR), Computational and Applied Mathematics (COAM), and member of the editorial board of the journals Pesquisa Operacional (Brazil), CLEI electronic journal, and Ingenieria de Sistemas (Chile).

He is a member of AUDIIO (Asociacion Uruguaya de Informática e Investigación de Operaciones – the Uruguayan Operations Research and Computing Society), and participated as representative of AUDIIO at IFORS. He was a member of the board of ALIO (Asociación Latino Ibero Americana de Investigación Operativa) for several periods, as Secretary, Vice-president and President. He has been involved in the organization of several CLAIO (Latin-Iberoamerican Conference on Operations Research) and ELAVIO Latin American Summer School on Operations Research).

Vice-President 2025-2027 – Dr. Rina Schneur (USA)

Rina Schneur is an Operations Research scientist and has focused her career on applying analytics methodologies to industry problems. She was a Dir. of Business Analytics at Verizon, Sr. manage at Sabre Technologies and did her Post Doc. at the Math. Dept. of IBM Research Center. Rina also served on Verizon's energy board. In 1999 Rina co-founded Emptoris Inc., a procurement solution provider, and served on its advisory board for ten years. Rina served on INFORMS' board for seven years, as VP Meetings and President. She has been the IFORS VP representing NORAM since 2022. She also co-founded and has since been serving on the Informs ProBono analytics committee. Rina is currently leading and active with various grass roots and philanthropic organizations. Rina graduated from The Technion with a BSc. In Engineering and from MIT with a MSc and PhD in Engineering and Advanced Analytics with focus on Network Optimization.

Section Editor: **Mario Guajardo** <mario.guajardo@nhh.no>

Reducing GHG emissions of vessels throughout their journey to the Panama Canal

Gabriel Fuentes <gabriel.fuentes@nhh.no>, Department of Business and Management Science, NHH, Helleveien 30, 5045

Introduction

The Panama Canal (PC), an important node in the global maritime network, is a main contributor to the economic development of Panama. Moreover, its importance is not only economical but also environmental. By offering a shortcut between the Atlantic and Pacific Oceans, the Canal diminishes global shipping distances, which inherently reduces greenhouse gas (GHG) emissions. Nevertheless, the question arises on how to further minimize these emissions and transform the Canal from a passive role to become an important driver towards a net-zero emissions maritime industry. In this article, we propose a scheduling system that leverages the Canal's unique position and traffic volume to optimize vessel transit and reduce GHG emissions.

Background

The maritime industry is currently experiencing an important transformation, aligning its efforts towards emissions reduction in accordance with the objectives of the Paris Agreement, specifically its target to limit global warming to 1.5 degrees Celsius. Notably, shipping, along with aviation, was initially excluded from the Paris Agreement, despite the fact that shipping accounts for 2.89% of global anthropogenic emissions (IMO,2020). In response to the goals set by the Paris Agreement, the International Maritime Organization (IMO), the regulatory authority for maritime activities, presented an updated Greenhouse Gas (GHG) strategy (2023), setting an ambitious target for the shipping industry to achieve net-zero emissions by or around 2050.

The IMO's strategy to reduce GHG emissions is not prescriptive; it does not dictate specific methods for achieving decarbonization. Instead, it encourages a blend of technical, economic, and operational measures. Among the technical solutions, fitting vessels to use clean fuels appears to be the most promising approach for aligning with the decarbonization trajectory towards net-zero (International Maritime Organization, 2023). However, in the short to medium term, there are challenges in scaling up the production of sufficient clean fuel to meet the demands of such an energy-intensive industry. Recognizing the need for immediate action, the strategy suggests that operators can initially adopt operational solutions to begin halting the trend in emissions, while gradually preparing the infrastructure necessary for implementing capital intensive technical solutions.

One cost-effective operational measure that can reduce emissions with low burden of implementation is the adoption of Just-In-Time (JIT) arrival strategies (Lindstad et al. 2011). This concept is based on the principle that a vessel's emissions are exponentially related to its speed. By minimizing idle time at ports—a phenomenon known as "rush to wait" — and reducing speed during sea transit, ships can achieve fuel savings and consequent emission reductions. In the most optimistic estimates, this approach could lead to a reduction of up to 20% in emissions in certain market segments (Jia et al. 2017).

Despite the simplicity of this concept, implementing JIT arrival strategies has proven challenging due to the complexity of coordinating ports across different countries and establishing a centralized system for scheduling vessel arrivals to optimize speed reduction and emission savings. Additionally, there are barriers to implementation stemming from misaligned economics incentives among the various stakeholders involved (Rehmatulla and Smith, 2015).

The role of bottlenecks and Canals in implementing JIT systems

Considering these limitations, a question arises: what if JIT implementation is managed by a bottleneck, such as a canal, instead of ports? The immediate implication is that a bottleneck, due to its centralized authority, could have the necessary control for scheduling implementation. Secondly, some of the unaligned incentives caused by traditional wording in shipping contracts might be mitigated given the nature of bottlenecks as passages that cannot be overtaken (Rodrigue, 2004). A discussion on how a bottleneck could mitigate unaligned incentives is presented by Fuentes and Adland (2023).

A JIT scheduling model for the Panama Canal to reduce emissions

To explore the benefits of implementing JIT at a bottleneck, we developed a scheduling optimization model for the PC aiming to minimize the emissions of vessels throughout their journey to the PC. The high volume of vessel traffic in the PC – approximately 13,000 vessels annually – suggests that a unified system could mitigate emissions. Should the PC adopt a JIT system, considering its specific scheduling rules and limitations, our model would guide vessels from as early as their departure from the preceding port up to 24 hours before arrival at the Canal, a concept presented in Figure 1. To assess the potential emissions reductions achievable through our proposed model, we established a benchmark for the emissions of vessels transiting the Canal. Our methodology involves a three-step approach: firstly, estimating the current emissions of vessels transiting the Canal via vessels geolocation big data; secondly, calculating their waiting times and their schedule order at the Canal; and finally, developing an optimization model that retrospectively uses this data to propose a schedule aimed at reducing emissions from the Canal. The idea is to quantitatively present the impact of implementing a JIT system in the PC.

Numerical results

Our model indicates that the PC could reduce emissions by 1.7% in the most conservative case and up to 5.2% in more optimistic scenarios. These results are based on limiting the speed reduction instruction to the leg of the vessels before transiting the Canal. >>

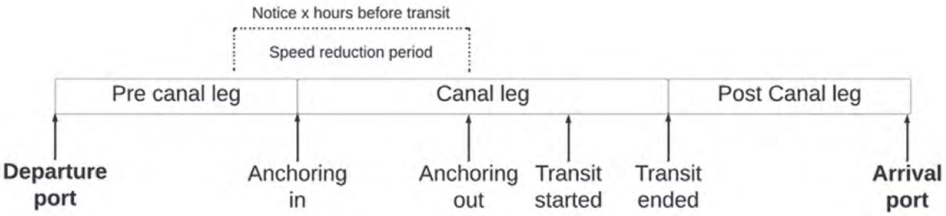

Figure 1: JIT strategy principle. Source: Fuentes and Adland (2023)

>> Therefore, we infer that a scheduling system that also considers the leg after crossing the Canal, i.e., by reducing speed from the Canal to a destination port, could further reduce emissions. An important finding from the benchmark, highlighted in Figure 2, is that the route from Busan in South Korea to New York/New Jersey, passing through the Canal, has the highest emissions reduction potential of those transiting the Canal. Consequently, an initial strategy could be to introduce a JIT system with coordinated implementation on this route and the ports connected by it. This strategy could be considered as an element of a green corridor, a concept developed by the Getting to Zero coalition (2021), where zero or low emissions vessels could operate efficiently.

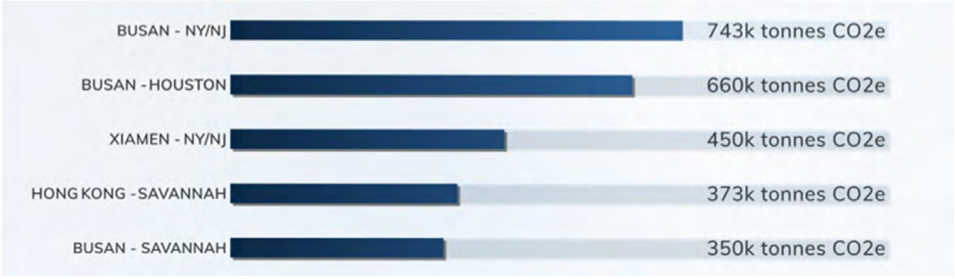

Figure 2: Top 5 emitting routes connected by the Panama Canal from January 2019 to December 2021

To emphasize the impact of waiting times and their interaction with vessel emissions, a follow-up to this research led to the development of a dashboard (Figure 3) hosted in https://stats.mtcclatinamerica.com. This platform displays statistics, which are based on the data collection methods developed for this study and are updated weekly. The concept behind this open-access dashboard is to instigate questions relevant to the role of operational efficiency in reducing greenhouse gases (GHG), and to encourage collaboration.

A solution that is future oriented

While more efficient use of fuel has been under study before, some may ask, what is the relevance of reducing fuel consumption and emissions in a future where more clean energy is expected to be used. It is important to recognize that, even in a scenario where cleaner fuels are prevalent, any increase in vessel speed will inherently demand more energy, regardless of the energy source. This underscores the continued need for operational efficiency, even with the adoption of cleaner fuels.

While fuel efficiency is important, the next natural step is to model the JIT implementation under the environment of a green corridor. That would entail a system where clean fuel infrastructure is in place, vessels are energy efficient driven by their transits schedule. All that modeled with their respective legislation, social and safety considerations. The model should instruct tactical decisions for the green corridor to minimize emissions in line with the Paris agreement decarbonization path while taking due consideration of the operational complexity derived from these tactical decisions.

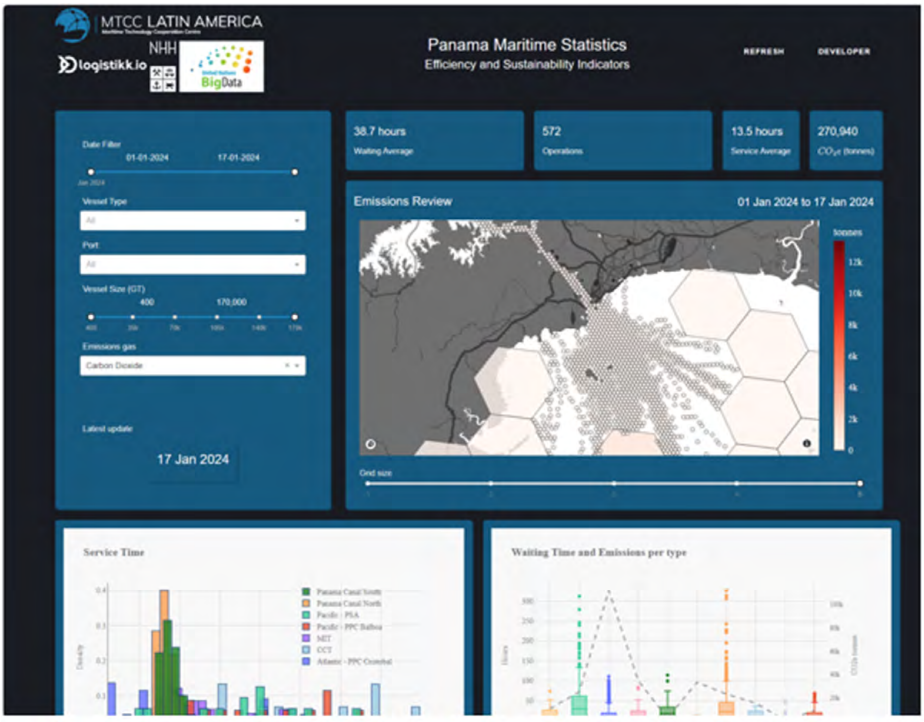

Figure 3: Dashboard for Efficiency and Sustainability indicators in Panama territorial waters

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A Brief Tutorial on Benders Decomposition

Austin Buchanan <buchanan@okstate.edu>
Oklahoma State University
Industrial Engineering & Management
354 Engineering North, Stillwater, OK, 74078 - 1010, United States

To illustrate Benders decomposition, consider the k-median problem in which we are tasked with locating k facilities to satisfy customer demands at minimum cost. We denote the set of candidate sites by J and the set of customers by I.

The cost to assign customer $i \in I$ to (a facility at) site $j \in J$ is denoted c_{ij}.

We can express the k-median problem as the following mixed integer program (MIP), where y_j is a binary variable that equals one if we use site j, and x_{ij} is a binary assignment variable indicating if customer i is assigned to site j. Ultimately, however, it is safe to relax the x variables to be continuous.

$$\min \quad \sum_{i\in I}\sum_{j\in J} c_{ij}x_{ij} \tag{1a}$$
$$\text{s.t.} \quad \sum_{j\in J} y_j = k \tag{1b}$$
$$\sum_{j\in J} x_{ij} = 1 \qquad \forall i \in I \tag{1c}$$
$$0 \le x_{ij} \le y_j \qquad \forall i \in I,\ j \in J \tag{1d}$$
$$y_j \in \{0,1\} \qquad \forall j \in J. \tag{1e}$$

How well does this MIP work in practice? For instances with 1,000 sites and 1,000 customers, the associated LP relaxation can often be solved in a few minutes with commercial solvers, while the MIP takes a little longer. As the instances grow larger, we will eventually run out of RAM. How can we deal with this? One possibility is to use Benders decomposition.

Suppose that we have already decided the facility locations, i.e., we have fixed $y = \bar{y}$ for some $\bar{y}$ that satisfies $\sum_{j\in J} \bar{y}_j = k$ and $\bar{y}$ binary (or continuous 0-1). Then, problem (1) (or its LP relaxation) reduces to the subproblem:

$$\Phi(\bar{y}) = \min \quad \sum_{i\in I}\sum_{j\in J} c_{ij}x_{ij} \tag{2a}$$
$$\text{s.t.} \quad \sum_{j\in J} x_{ij} = 1 \qquad \forall i \in I \tag{2b}$$
$$0 \le x_{ij} \le \bar{y}_j \qquad \forall i \in I,\ j \in J. \tag{2c}$$

If $\bar{y}$ is binary, then subproblem (2) asks to assign each customer i to its "closest" opened facility. Even if $\bar{y}$ is fractional, an optimal x can still be found efficiently by solving $|I|$ knapsack problems, one for each customer i:

$$\min \left\{ \sum_{j\in J} c_{ij}x_{ij} \;\middle|\; \sum_{j\in J} x_{ij} = 1,\ 0 \le x_{ij} \le \bar{y}_j\ \forall j \in J \right\}.$$

This can be done efficiently, e.g., by using a sorting algorithm.

Next, we write the dual of subproblem (2). Associate a dual variable α_i to each assignment constraint (2b) and a dual variable β_{ij} to each (upper) bound constraint (2c). This gives:

$$\max \quad \sum_{i\in I} \alpha_i + \sum_{i\in I}\sum_{j\in J} \bar{y}_j\beta_{ij} \tag{3a}$$
$$\text{s.t.} \quad \alpha_i + \beta_{ij} \le c_{ij} \qquad \forall i \in I,\ j \in J \tag{3b}$$
$$\alpha_i \text{ unrestricted} \qquad \forall i \in I \tag{3c}$$
$$\beta_{ij} \le 0 \qquad \forall i \in I,\ j \in J. \tag{3d}$$

By strong duality, it has the same objective value $\Phi(\bar{y})$ as the primal problem (2).

We are now ready to give the Benders reformulation of the k-median problem (1), where z is a new variable used to represent the objective function (1a).

$$\min \quad z \tag{4a}$$
$$\text{s.t.} \quad z \ge \Phi(y) \tag{4b}$$
$$\sum_{j\in J} y_j = k \tag{4c}$$
$$y_j \in \{0,1\} \qquad \forall j \in J. \tag{4d}$$

Note that constraint (4b) involves the nonlinear (but convex) function $\Phi(\bar{y})$.

To solve this problem, we can take a cutting plane approach in which constraint (4b) is initially omitted, and linear inequalities are added as needed to approximate it. That is, our (initial) Benders main problem is:

$$\min \quad z$$
$$\sum_{j\in J} y_j = k$$
$$y_j \in \{0,1\} \qquad \forall j \in J.$$

Given a feasible solution $(\bar{y}, \bar{z})$ to the main problem (or to its LP relaxation), we may generate a Benders cut by computing a feasible (preferably optimal) solution $(\bar{\alpha}, \bar{\beta})$ to the subproblem's dual (3) and then imposing the following constraint in the main problem:

$$z \ge \sum_{i\in I} \bar{\alpha}_i + \sum_{i\in I}\sum_{j\in J} y_j\bar{\beta}_{ij}, \tag{6}$$

or equivalently

$$z \ge \sum_{i\in I} \bar{\alpha}_i + \sum_{j\in J} \left(\sum_{i\in I} \bar{\beta}_{ij} \right) y_j. \tag{7}$$

Observe that the right-hand-side of constraint (6) is simply the subproblem's dual objective in which the dual *variables* now take *fixed values*, and the *values* of $\bar{y}$ variables revert back to being *variables*. We repeat this process (i.e., solve main problem, then solve subproblem's dual[1], then add cut) until convergence.

Further Reading

We have seen a simple Benders decomposition approach for the k-median problem. A (slow) Python implementation is available at: https://github.com/ AustinLBuchanan/kmedian_Benders. For best results, one needs a careful implementation and/or a different Benders reformulation [3, 4, 5, 8].

When Benders is applied to other problems, *feasibility cuts* may also be needed [1], not just the *optimality cuts* that were discussed here in inequality (6). Variants of Benders decomposition have also been developed for problems in which the subproblem is no longer a linear program [2, 6, 7].

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[1]Alternatively, one may solve the primal subproblem and retrieve associated optimal dual multipliers from the MIP solver. Note that $\bar{y}$ will typically be quite sparse, implying that most x_{ij} will be fixed to zero in the subproblem. This can be exploited.

OR IMPACT

Section Editor: **John Ranyard** <jranyard@cix.co.uk>

Optimising OCP Group's Moroccan Phosphate Supply Chain

Er Raqabi El Mehdi*[1], Himmich Ilyas[5], Beljadid Ahmed[1], Bennouna Mohammed Ali[7], Bennouna Rania[7], Boumahdi Salah-Eddine[7], Boussaadi Latifa[7], El Hachemi Nizar[2,4], El Hallaoui Issmaïl[1], Fender Michel[2], Guellaf Hichame[7], Jamali Anouar[7], Mahboubi El Miloudi[7], Metrane Abdelmoutalib[6], Rakhis Ilyas[7], Si Hammou Nabil[7], Soumis François[1]

[1]Maths and Industrial Engineering Department, Polytechnique Montréal and GERAD, Montréal, Canada
[2]Africa Business School, Mohammed VI Polytechnic University, Benguerir, Morocco
[3]Africa Initiative, Mohammed VI Polytechnic University, Benguerir, Morocco
[4]Mohammadia School of Engineers, Mohammed V University, Rabat, Morocco
[5]National Institute of Statistics and Applied Economics, Rabat, Morocco
[6]National Institute of Applied Sciences, Khourigba, Morocco
[7]OCP Group, Casablanca, Morocco.

Corresponding Author: Er Raqabi El Mehdi <el-mehdi.er-raqabi@polymtl.ca>

Introduction

There is a growing demand for mineral fertiliser to support agricultural food production, particularly in the developing world. Morocco holds 70% of global supplies of phosphate rock reserves, a crucial element for fertiliser production. Consequently the Moroccan government has established the largest agricultural hub in Africa to exploit these reserves. This is led by the state owned OCP Group, which mines phosphate rock and manufactures phosphoric acid and fertiliser products. The OCP Group has established the Mohammed VI Polytechnic University (UM6P) as a charitable foundation to support its decision making, which is now a leading African research institution.

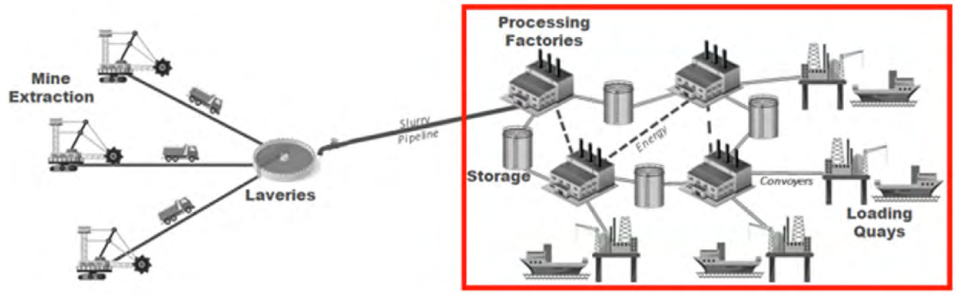
The OCP Group already supplies a large portion of the African demand for fertilizer and this market is expected to grow substantially. However price is a major concern for the poorer countries, leading to pressure for price reductions in the medium and longer term. Research by UM6P has shown that linking the fertiliser formula to the intended soil type leads to a greater efficiency (known as precision farming) but this also leads to an increase in the number of products sold. The OCP Group is facing these challenges by making a commitment to minimise mining and manufacturing costs and by optimising distribution costs of their products.

OCP Group has five main sites (Jorf, Khouribga, Safi, Boukraa, and Benguerir) represented by red dots in Figure 1. It specializes in phosphate mining and the production and export of phosphate products including raw phosphate, phosphoric acid, and phosphate fertilizers. In 2022, the group's turnover reached $8.83 billion (reference 1).

▲ Fig 1 Location of OCP Group's Moroccan Sites

The Problem[1]

Phosphate rocks are extracted at the mine and transported by lorry to the treatment plants (Laveries) to be purified and the resultant phosphate slurry is then transported by a 187 km pipeline to the JORF site, as illustrated in Figures 2a, 2b, 2c. Here many chemical treatment processes are carried out to produce a range of products, which are stored in 29 large tanks before being transported by conveyors to 6 quays and loaded on to clients' vessels. Up to 45 raw, semi-finished and finished products are produced and transported and this number is expected to rise to around 75 in the short term.



▲ Fig. 2a From Phosphate extraction to Product Shipping

▲ Fig. 2b The Chemical Treatment Plants

▲ Fig. 2c The Shipping Quays

The Research Challenge

Whilst greedy rule-based scheduling of the various operations was carried out for many years, increases in the number of products and also the complexity of the supply chain meant that the solutions were becoming less and less optimal. Consequently, OCP Group invested heavily in OR tools to integrate and centralise downstream supply chain operations, i.e. Production Scheduling, Inventory Management and Vessel Assignment – the PSIMVA problem. Some years ago, OCP Group had acquired the optimiser Downstream Logistics Planner (DLP) to improve on the greedy rule-based schedules but the increasing size of the problem meant that the DLP took over 10 hours to produce a feasible schedule and so was discarded, with greedy rule-based scheduling continuing. In 2019, with pressures for improved scheduling growing, OCP Group commissioned optimisation experts from Polytechnique Montreal (Poly) to work with local researchers from UM6P. After an initial appraisal, the new team concluded that the DLP optimiser could be used as the basis for improved scheduling, so long as several optimisation and practical challenges could be overcome. An overview of how the optimisation challenges were overcome follows and the practical challenges are summarised in the following section.

Solution Methodology

After an initial appraisal of this immense and complex PSIMVA problem, the team decided to adopt a 4-step approach, which is summarised in Fig 3.

The steps are:

1. Multi-Phase Iterated Local Search (MPILS Tuner). Available state of the art tuners were employed but had to be adjusted to meet the demands of this very complex problem, which also has a very large number of parameters.

2. Integrated Large Neighbourhood Search (ILNS) Metaheuristic. This is a variant of the Large Neighbourhood Search Metaheuristic, which benefits from the symmetry of the problem.

3. Primal Benders Decomposition (PBD Method). A new variant of Benders Decomposition was developed to suit the demands of the problem and to improve optimality.

4. Resilience Re-Optimisation (RRO) Approach. Perturbations are frequent in supply chains, including in this case, several weather and vessel perturbations at the port. For instance, when the weather is bad, the loading of vessels is postponed. Also, there are often delays in vessel arrivals. All these aspects significantly affect the schedules obtained using the MPILS tuner, ILNS Metaheuristic, or PBD method. To remain resilient to perturbations and adapt to changing circumstances and challenges in real-time, the OCP Group needed to design an efficient re-optimization approach. More details are provided in reference 2.

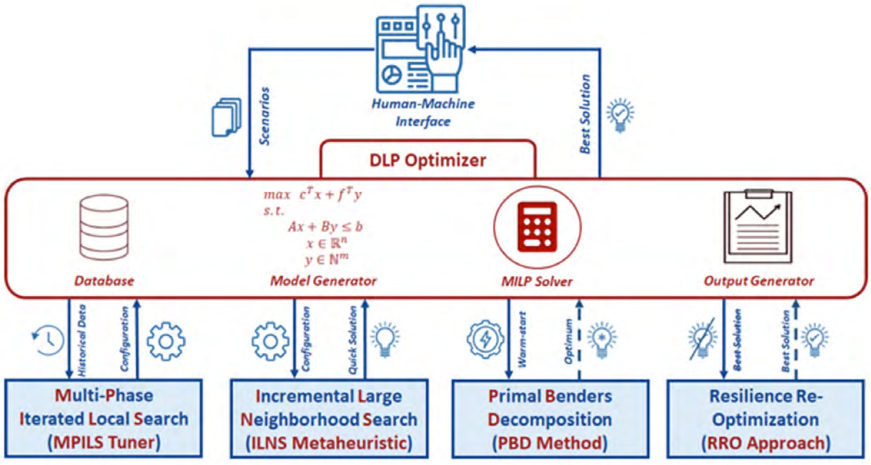


Fig 3. The Four Step Solution

Implementation

The earlier attempt to optimise operations, using the DLP planner, had failed leading OCP planners to prefer to rely on their expertise and to continue to plan as they used to do. So an essential first step was to bring them on board and restore their confidence for this new attempt. Thus, meetings were organised with several stakeholders to explain and convince them that advanced optimization and OR techniques would have a significant impact once implemented effectively. Therefore, to keep OCP end users committed to the project, a working strategy was jointly devised, whereby an incremental prototyping approach was used, with rapid feedback of encouraging developments.

Using the four-step solution approach, satisfactory schedules were developed early by using the MPILS tuner and these schedules were gradually improved via use of the ILNS metaheuristic. Each algorithmic solution corresponds to a work package with fixed delivery deadlines and intermediate milestones. At the end of each work package, an overview of the methodology and the results obtained on PSIMVA instances were presented. After obtaining approval, implementation was conducted first in the laboratory and then in the DLP planner, on-site, for deployment. The timeline of implementation is shown in Fig 4.

Fig 4. The Timeline for Implementation

Once proved, the final system was interfaced with the existing OCP databases to enable it to become a routine tool for the planners. This required converting the data into a structured form; building additional pre- and post- modules and generating user-friendly output for the planners. The prototyping approach and allowing the planners to voice their concerns at each stage, gradually enabled the planners to gain confidence in the new system. Planners with OR knowledge helped, as they were able to validate outputs and convince other planners that using the new system would enable them to become more effective. At the senior level, each half a year, senior managers required justification for continuing the OCP-Poly-UM6P research effort. The approval process was not simple, requiring detailed documentation of research progress. The Poly researcher's reputation and early successes also carried weight in ensuring the continuation of the project. Most importantly, an open and honest dialogue with OCP managers about progress was maintained, including the downs as well as the ups! Every opportunity was taken to demonstrate the huge potential payoffs to the company, including demonstrating the system's possible uses and organizational impact.

Client Endorsement

"OCP Group has committed to sustaining African agriculture and supporting African farmers by supplying phosphate products at the lowest cost. To honour our commitment, we have leveraged our competitive and differentiation advantages through efficient global supply chain design (including significant capacity growth) with integrated operations, reduced cost, improved responsiveness, and higher customer service levels. Furthermore, to support global supply chain management, our group has acquired several tools, including the DLP planner, which have supported our planners in achieving production and supply chain efficiency. Such improvement should contribute to an expected increase of the monthly turnover by more than 20 millions of dollars (in terms of capacity). These encouraging and promising results have led us to extend the use of DLP to other industrial sites and to integrate it with the production management systems currently being deployed."

Mr Hichame GUELLAF, Head of Supply Chain, SBU, Industrial Facility Management

Mr Ilyas RAKHIS, Head of Digital, SBU, Industrial Facility Management

Concluding Comments

The research team comprising optimisation experts from Polytechnique Montreal and local researchers UM6P, together with OCP Group planners and managers, have combined to significantly improve the efficiency of mining phosphate rocks, the manufacture and distribution of resultant agricultural products, thus enabling African farmers to improve the efficiency and quantity of their food production.

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Acknowledgements: This project has been supported by the OCP Group, the Fonds de Recherche du Québec– Nature et Technologies (FRQNT), the Institute for Data Valorisation (IVADO), and the Group for Research in Decision Analysis (GERAD). This support is gratefully acknowledged. Special thanks to El Mansouri Karim from the OCP President's office and the Director of OCP North America for initiating and facilitating the successful collaboration between stakeholders. We also thank Hafnaoui Anass for helping finance the continuation of the project through OCP Research and Innovation.

This article is published here by kind permission of the editor of the Journal of Advanced Analytics (reference 2) and was a finalist in the IFORS Prize for OR in Development, 2023.

[1]The work described here is located at the JORF site, which accounts for around 90% of production.

Section Editor: **Gerhard-Wilhelm Weber** <gerhard.weber@put.poznan.pl>

Cordial thanks to **Assist. Prof. Jinal Parikh** for valuable support in editing this "Conferences" section.

The 2023 Brazilian Symposium on Operational Research (SBPO) in São José dos Campos: Integration of urban mobility and sustainability

Simone Martins <simone@ic.uff.br>

The *55th Brazilian Symposium on Operational Research* (*SBPO 2023*) occurred in *São José dos Campos Technological Innovation Park* from November 6 to 9, 2023 (https://sbpo2023.galoa.com.br/). *SBPO* is an annual event organized by the *Brazilian Society of Operational Research* (*SOBRAPO*) to provide an opportunity for the academic-scientific-professional communities to exchange information, ideas, and perspectives on a wide range of *OR* topics. In 2023, it was organized by *Universidade Federal de São Paulo* (*UNIFESP*) and *Instituto Tecnológico de Aeronáutica* (*ITA*). Several sponsors supported the event: CAPES, FAPESP, CASNAV, Accenture, Matlab & Simulink, Mathworks, Opencadd, Paragon, Linear, Routeasy, and Bauducco.

Participants of *SBPO 2923* in the session in honor of Professor *Horácio Hideki Yanasse*.

São José dos Campos Technological Innovation Park.

Around 550 participants, mainly from Brazil and some from abroad, presented 454 scientific articles in 73 oral sessions and three poster sessions on topics such as *OR* applications, big data and analytics, multi-criteria decision support, computational intelligence, logistics and transportation, simulation, mathematical programming, and graphs. Many participants attended 5 short courses on various *OR* topics: multi-objective optimization, time series forecasting, simulation, machine learning, and stochastic optimization. We had five excellent *plenaries*: *Anderson Rodrigo de Queiroz* from North Carolina State University, *André Ponce de Leon* from Universidade de São Paulo, *Igor Machado Coelho* from Universidade Federal Fluminense, *Maurício G. C. Resende* from Washington University, and *Pascale Aeply Zarate* from the Université de Toulouse. The *panel* about urban mobility with *Flavia Renata Dantas Alves Silva Ciaccia* from Eve Air Mobility and *Leandro Callegari Coelho* from Université Laval brought several issues discussed with the attendants. Furthermore, there were 2 excellent talks from representatives from Routeasy and Accenture. There was a session in honor of distinguished Professor *Horacio Hideki Yanasse*, who also received the *Fellow Prize* from *SOBRAPO* alongside *Adiel Teixeira de Almeida*.

SOBRAPO awarded participants in 4 categories: paper written in English, Scientific Initiation Report (authored by undergraduate students), MSc Dissertation, and PhD Thesis. The authors must submit and present their works at the event to be eligible for the award.

The conference ended with a delightful confraternization dinner with live music, where the prizes were announced. CASNAV gave 2 laptops to the PhD Thesis and Scientific Initiation Report prize winners.

We hope to meet again in *SBPO 2024*, from November 4 to 7, 2024, in Fortaleza, Ceará.

Sobrapo Fellows: *Horácio Yanasse* (2nd), *Nelson Maculan Filho* (3rd) and *Adiel Teixeira de Almeida* (5th) with *SOBRAPO* President *Caroline Maria de Miranda Mota* (4th), *Professors Nei Yoshihiro Soma* (1st) and *Ana Paula Cabral Seixas Costa* (6th).

2024 INFORMS Events (so far!)

With this report, *INFORMS* would like to provide information about its broader events and activities that took place at the very beginning of 2024.

Ashley Kilgore <akilgore@informs.org>

Resoundingly Human

The *INFORMS podcast Resoundingly Human* kicked off a brand-new year of episodes (its seventh year of production!) with an interview featuring the *2024 INFORMS President Julie Swann*. In addition to serving on the *INFORMS* board of directors, *Swann* is the A. Doug Allison Distinguished Professor and Department Head of the Edward P. Fitts Department of Industrial and Systems Engineering at North Carolina State University. In the episode titled, *"New year, new updates! Looking ahead to 2024 with the INFORMS president,"* she shared insight on the upcoming goals and objectives for *INFORMS* this year, as well as challenges she plans on tackling and upcoming *INFORMS* events and activities.



▲ *INFORMS invited speakers in 2024* (left to right): *Julie Swann, Olamide Jolaoso, Aaron Burciaga*

In the lead up to the *INFORMS Analytics Conference* in Orlando, FL this April, the podcast will be highlighting the finalists for the 2024 Franz Edelman Award, comprised of teams from across the globe, who are leveraging advanced analytics to solve the world's most complex problems. Visit www.ResoundinglyHuman.com to learn more and listen to these and other episodes.

INFORMS Insights

The new *INFORMS Insights* webinar series, launched in 2023, is produced monthly and features top leaders in the industry. Speakers share valuable insights and practical career advice on a wide range of topics, including interview and hiring strategies, personal branding, and emerging fields for analytics professionals. With a focus on best practices and real-world examples, these monthly webinars will provide you with actionable insights and tangible skills that you can immediately apply in your career.

So far in 2024, the January episode featured *Olamide Jolaoso*, head of data & analytics, Wema Bank Nigeria, presenting *"Find Your Career Pathway: Gain valuable insights from my experience and learning to find your own data analytics career pathway,"* and then in February, *Aaron Burciaga*, CAP, co-founder, chairman & CEO, DataPrime, Inc., presented *"AI Skills You Need as You Start Your Analytics Career."*

Whether you're just starting out or looking to advance, the *INFORMS Insights: Exploring Industry Career Paths and Experiences* webinar series is the perfect resource for professional development and growth. Visit the *INFORMS Insights* webpage to learn more about the series.

For more information on *INFORMS events in 2024*, visit the Events Calendar.

500 Statisticians and Operational Researchers met at *Spanish National Congress SEIO2023* in Elche!

Mercedes Landete <landete@umh.es>, **José Luis Ruiz** <jlruiz@umh.es>

A year and a half after our last edition, the city of Elche hosts the 40th edition of the *Spanish Conference on Statistics and Operations Research* (*OR*) and the 14th *Public Statistics Conference* during November 7-10, 2023, www.seio2023.com. The city of Elche is an ancient city with three properties registered in the UNESCO World Heritage, the Historical Palmeral, the Misteri d'Elx and the Pusol Museum. The congress is organized by *the University Research Institute "Center of Operations Research (CIO)"* of the *Miguel Hernández University of Elche* and by the *Spanish Society of Statistics and Operations Research* (*SEIO*). The *Public Statistics Conference* has been organized with the help of the *National Institute of Statistics* and the *Valencian Institute of Statistics*.

Data Science is a multidisciplinary field that uses principles, methods and algorithms from mathematics, statistics, optimisation, and computer science to extract information and knowledge from data sets. Their proper analysis allows us to make optimal decisions with benefits for society. *SEIO 2023* is presented as a forum for scientific-technical exchange, open to society and business.

In this 40th edition of the congress we have had almost 500 participants from 14 autonomous communities and abroad who presented 405 scientific papers in 102 oral sessions and 2 poster sessions. >>

SEIO 2023: *Opening Session.*

Social event: flamenco singer *El Niño de Elche.*

>> Among the 102 oral sessions from national and international experts from the academic world, industry, public health, and administration we have the luxury of 3 exceptional plenaries, *Marco Antonio López Cerdá* from the University of Alicante, *Kerrie Mengersen* from the QUT in Australia and *Lilli Japec* from Statistics Sweden. We also highlight the session for the *SEIO 2022 Medals*, professors *Ángel Corberán* and *Ricardo Cao*, and the sessions in honour of distinguished professors such as *Miguel López Díaz*, *Stef Tijs* and *Jesús Pastor*. We are pleased with a joint session of the *SEIO* and the *Galician Society for the Promotion of Statistics and OR* and another joint session of the *SEIO* and the *Portuguese Association for Operational Research*.

This year we have had 13 students who have been candidates for the *Ramiro Melendreras* award granted by the R*amiro Melendreras Foundation* and *SEIO*. The award-winning student was *María Alonso Pena* for her work entitled *"Analyzing animal escape data with circular nonparametric multimodal regression"*.

Regarding the social programme, we had a performance by the local flamenco singer *"El Niño de Elche"*, a tasting of traditional snack (*"horchata y fartons"*), a guided tour of the centre of Elche with entry to the Festa Museum and a performance of a fragment of the play *"Misteri d'Elx"*, registered in the UNESCO World Heritage.

Slovenian OR Society organized its *17th International Symposium: SOR'23* in Bled, Slovenia

Lidija Zadnik Stirn <lidija.zadnik@bf.uni-lj.si>, **Samo Drobne** <samo.drobne@fgg.uni-lj.si>

The *17th International Symposium on Operations Research in Slovenia* (*SOR'23*, https://sor.fov.um.si/) was a joint project of the Slovenian Society *INFORMATIKA*, Section *Operations Research* (*SSI-SOR*), the *University of Maribor*, Faculty of Organizational Sciences (UM, FOS), and the *University of Ljubljana*, Faculty of Mechanical Engineering (UL, FME). The symposium took place from September 20-22, 2023, in Bled, Slovenia.

SOR'23 is part of the traditional biannual series of international *OR* conferences and was first organized by *SSI-SOR* in Slovenia in 1993. The aim of the conferences is to promote knowledge about *OR* to strengthen the intellectual and social capital that is essential for maintaining *OR*'s identity.

The Opening Speech of *SOR'23* was given by the President of *SSI*, *Niko Schlamberger*; the Vice Dean of *UM FOS*, *Andrej Škraba*; the former President of *EURO*, *Marc Sevaux*; the Manager of *EURO*, *Sarah Fores*; the President of the *Croatian Society for Operations Research* (*CRORS*), *Tea Šestanović*; the former President of the *German Operations Research Society* (*GOR*), *Alf Kimms*; and the President of *SSI-SOR*, *Lidija Zadnik Stirn*, who referred to the 30th anniversary of *SSI-SOR*, its activities during these years and the 30th anniversary of the first international symposium on *OR* organized by *SSI-SOR* in Slovenia. More on this topic can be found in the article (*Zadnik Stirn* and *Drobne* in Proceedings of *SOR'23*).

Plenary Speakers at *SOR'23* were *Marc Sevaux* (Université

Opening Ceremony.

Bretagne Sud, France), *Suresh P. Sethi* (The College of Texas at Dallas, USA), *Mirjana Pejić Bach* (University of Zagreb, Faculty of Economics and Business, Croatia), *Victor Magron* (Institute of Mathematics in Toulouse, France), and *Andrej Kastrin* (University of Ljubljana, Faculty of Medicine, Slovenia).

The 96 Presentations were given in plenary sessions (5), and in eight Special Sessions:
Applications of *OR* in Agribusiness (8), Applications of OR in Industry and Engineering (4), Artificial Intelligence in Business (4), Discrete Optimization Methods and Models for Real-World Problem Domains (15), >>

>> Game Theory (5), Industry & Society 5.0: Optimization and Learning in Human and Industrial Environments (9), Social Innovations in Aging Studies Supported by *OR* Models (7), Unraveling the Business Models of Sharing Economy by Applying Methods of OR and Statistics (3);
and six other Sessions:
Econometric Models and Statistics (4), Human Resources (5), Finance and Investment (8), Location and Transportation, Graphs and their Applications (7), Mathematical Programming and Optimization (5), and Multicriteria Decision Making (7). (The number of presentations in each session is given in brackets.)

▲ Celebrating 30 Years of *SSI-SOR* (from the left to the right): *Sarah Fores* (*EURO* Manager), *Marc Sevaux* (former *EURO* president), *Petra Gorjanc* (UM FOS, chair of *SOR'23* OC), Mirjana Kljajić Borstnar (UM FOS, co-chair of *SOR'23* PC), *Vesna Čančer* (UM FOS), *Lidija Zadnik Stirn* (president of *SSI-SOR*, chair of *SOR'23* PC), *Niko Schlamberger* (president of *SSI*), *Samo Drobne* (secretary of *SSI-SOR*, co-chair of *SOR'23 OC*), *Janez Povh* (UL FME).

During the Closing Session, *Lidija Zadnik Stirn* invited the authors to submit extended versions of the *SOR'23* papers for publication in special issues of Mathematics (MDPI), Central European Journal of Operations Research (CJOR), Business Systems Research (BSRJ), and Informatica (https://sor.fov.um.si/publications/). On behalf of *EURO*, *Sarah Fores* announced the two highlights of the international *OR*, namely *EURO 2024* and the 50th anniversary of *EURO*, which will be celebrated at *EURO 2025* in Leeds, UK.

Proceedings of *SOR'23* (https://www.drustvo-informatika.si/sekcije-drustva?stran=publikacije-sor) contain 96 papers by 198 authors from Slovenia, Croatia, Hungary, Serbia, the Slovak Republic, the Czech Republic, Poland, Spain, Turkey, the USA, France, Germany, Italy, Austria, Israel, Pakistan, the Republic of North Macedonia, the Netherlands and the United Kingdom.

▲ In the old town of Kranj.

In addition, the proceedings contain an introduction (Preface) with statistical data on *SOR'23*, a historical overview of *SSI-SOR*, a list of authors and more.

The high-level scientific and professional sessions were complemented by two social events: an excursion to the old town of Kranj and a gala dinner to celebrate the 30th Anniversary of *SSI-SOR* at the *Lectar Inn* in Radovljica, as well as a piano concert by active symposium participant and outstanding pianist *Tadeusz Trzaskalik*. Both events provided an opportunity for further exchange, as the three-day event against the backdrop of Bled (see *SOR'23* highlights at https://sor.fov.um.si/sor23-highlights/) was certainly a highlight for *OR*, with the awareness that we had a successful *OR* event.

▲ At the piano concert.

As collaboration with members of *OR* societies around the world strengthens and enriches *OR* researchers and professions in their mission for new challenges to make the world a better place, *SSI-SOR* will continue the established activities and even try to expand them, which is a welcome challenge for *SSI-SOR*.

Emerging Domains of *OR*: *6th Annual TORS Conference 2023* in Hammamet, Tunisia

Taicir Loukil <torsasso@gmail.com>

The Tunisian Operational Research Society (*TORS*) aims to share and exchange knowledge in the field of OR in Tunisia and to promote theoretical developments and applications in its domains. This is performed by: Supporting education, training, research and practices in this field; Organizing conferences and workshops in national and international levels to enhance and promote exchange of knowledge, collaborations and interactions between researchers and industrials; Establishing and maintaining scientific cooperation with national and international institutions and other operational research societies; Providing professional consultancy services to decision-makers from industry and administrative fields.

The 6th *International Conference of TORS* aimed to share and exchange knowledge in the field of *OR* and to promote collaborations and interactions between researchers and industrials. https://torsconference.wixsite.com/tors22. >>

>> It was held on December 18-20, 2023, in the beautiful city Hammamet, Tunisia. The conference hosted 109 participants from Tunisia, France, Canada, Algeria, United Arab Emirates, Qatar and UK, and consisted of 40 presentations, spanning a wide range of topical themes and six plenary talks. It is the collective efforts of all presenters, session chairs, scientific and organizing committee members which led to a smooth and enjoyable conference.

The six plenary sessions presented by high scientific level keynote speakers were:
Prof. Jacques Teghem (University of Mons, Belgium): *"A bi-objective approach to reschedule new jobs in an one machine scheduling model"*, *Prof. Oualid Jouini* (University of Paris-Sacaly, France): *"Stochastic models for the optimization of modern call centers"*, *Prof. Walid Klibi* (KEDGE Business School, France): *"Fostering Robustness in Supply Chain Design: A unifying framework for future opportunities"*, *Prof. Anissa Frini* (University of Québec, Canada): *"Temporal MCDA methods for sustainable decisions under uncertainty"*, *Prof. Fatma Gzara* (University of Waterloo, Canada): *"Analytics for smart city logistics"*, *Prof. Samir Elhedhli* (University of Waterloo, Canada, Junior Faculty and Graduate Student Workshop): *"Emerging Opportunities in OR and Industrial Engineering"*.

▲ The participants at the *Closing Ceremony.*

▲ Some members of the *Organizing Committee* (left to right): *Dr. Wiem Daoued, Prof. Hela Moalla, Prof. Taicir Loukil* (President of *TORS*), *Dr. Sameh Chtourou, Dr. Aida Kharrat, Prof. Ahmed Frikha, Prof. Diala Dhouib, Dr. Ines Kanoun, Dr. Bassem Chaker, Dr. Mohamed Ali Elleuch, Dr. Maroua Mallek, Prof. Mohamed Ayman Boujelbene* (former President of *TORS*).

TORS 2023 Price was awarded to three best works, evaluated by the sessions chairman based on seven criteria: Quality of talk, Quality of the discussion, Quality of slides, Quality of the short paper, Originality of the work, Subject relevance, Respect of time.

The conference was supported by the research laboratories *MODILS* (Modeling and Optimization for Decisional, Industrial and Logistic Systems) and *OLID* (Optimization, Logistics and Decision Support). We thank our main sponsors for their technical/financial support: *IFORS, EURO, INFORMS Bahrein, AFROS, University of Sfax, University of Carthage,* and *CCK* (*Computation Center Khawarizmi*). For more information about *TORS*, please visit www.tors.tn.

HELORS 2023: Hellenic Operational Research Society could finally meet in presence in Athens, Greece

Isaak Vryzidis <i.vryzidis@uniwa.gr>, **Nikolaos Matsatsinis** <nmatsatsinis@tuc.gr>

The *Hellenic Operational Research Society* (*HELORS*), after the successful organisation of the *31st European Conference of EURO* took place in a hybrid format in Athens (July 2021), has organised with the *Department of Civil Engineering* of the *University of West Attica* the *9th International Symposium* and *31st National Conference on Operational Research* in Egaleo, Athens on June 29-30 and July 1, 2023. It is the first conference of HELORS organized on-site since the beginning of the COVID-19 crisis. The conference took place in the University of West Attica at the conference center of the Ancient Eleonas Campus in Egaleo, within the boundaries of the historic olive grove of Athens, where the ancient Athenian philosophers taught.

▲ *Athens*: the Acropolis of Athens and Odeon of Herodes Atticus.

In *HELORS 2023* (http://eeee2023.uniwa.gr/), more than 170 authors and co-authors from 18 countries participated by submitting papers. The conference program, organized in 21 sessions, contained 83 talks on several areas of Management and Engineering Science, covering conceptual, methodological and empirical aspects of *OR*. A booklet containing one-page abstracts of all presentations can be downloaded from http://eeee2023.uniwa.gr/Book of Abstracts_HELORS 2023.pdf.

▲ Group photo of *HELORS 2023* participants.

On the occasion of the conference, a special issue of the *Operational Research: An International Journal* (*ORIJ*: https://www.springer.com/journal/12351). and a special issue of the International Journal of Decision Support Systems (IJDSS) were launched, with a submission deadline of November 30, 2023, for both.

Highlight of the conference was the ceremony for the *'Gold Medal of Operational Research'* of *HELORS* awarded to P*rofessor Christos H. Papadimitriou*, who is the Donovan Family Professor of Computer Science at Columbia University in the USA. It is a tradition for the *HELORS* awards ceremonies to take place at the beginning of the conference and for the laureate to give a keynote lecture on his research work. *Professor Christos H. Papadimitriou* is a theoretical computer scientist and his keynote speech focused not only on his outstanding achievements in the theory of algorithms and complexity, and its applications to the study of databases, optimization, AI, the Internet, game theory, evolution, and the brain, but also on current research interests and projects.

▲ The award-winning *Professor Christos Papadimitriou* with the President of *HELORS*, *Professor Nikos Matsatsinis*, and the Chair of the Conference, *Professor Isaac Vrizidis* (left to right).

The Program Committee and the Organizing Committee were chaired by *Isaak Vryzidis* and co-chaired by *Dimitrios Em. Alexakis* and *Vassilios C. Moussas*. The social program included dinner in a typical restaurant of the Mikrolimano Natural Port, one of the finest places in Piraeus with a lot of restaurants and cafeterias.

The *Hellenic Operational Research Society* (*HELORS* - www.eeee.org.gr) was founded in 1963, with the objective of promoting the study and applications of *OR* methodology, for the benefit of the Hellenic economy and society. *HELORS* is a member of the *'Association of European Operational Research Societies - EURO'* within *IFORS*, the *'International Federation of Operational Research Societies'*. In 1984, the Macedonia-Thrace annex was founded, aiming primarily at the growth of *Operational Research* in the greater area of Balkans and at an improved organization and communication of the members of Northern Greece.

In the sixty years since its inception, *HELORS* has evolved into a scientific entity with an important presence in the scientific and economic life of the country, with hundreds of members that stand out for their theoretical background, their entrepreneurial endeavors, and their professionalism. Our members are mainly engineers, mathematicians, economists, etc. Over 35% of the members hold an MSc in Operational Research / Business Administration, and 40% hold a PhD. The rest are PhD candidates, postgraduate students, and undergraduate students.

During these years, our society presents a wide range of activities. Among them, *HELORS* publishes in collaboration with Springer, the scientific journal *'Operational Research'* with IF 2022: 2,7, in which we invite you to consider submitting your valuable work. *HELORS* has organized in various Greek cities thirty-one (31) National Conferences, of which the last nine (9) are international conferences, and six (6) *Balkan Conferences on Operational Research* (BALCOR). It has organized the *12th International Conference on Operational Research of IFORS* in Athens (June 1990), the *European Conference EURO XX* in Rhodes (July 2004) and the *31st European Conference of EURO* in Athens (July 2021).

▲ Keynote lecture from *Professor Christos H. Papadimitriou*.

Converging OR Paths in Commodities and Financial Markets Analysis: *68th EWGCFM* in Abu Dhabi, capital of the United Arab Emirates

Giorgio Consigli <g.consigli@ku.ac.ae>, **Yerkin Kitapbayev** <yerkin.kitapbayev@ku.ac.ae>,
Rita Laura D'Ecclesia <rita.decclesia@uniroma1.it>

The *68th EWGCFM meeting* organized by the Department of Mathematics of the College of Arts and Sciences of Khalifa University, Abu Dhabi, UAE, on December 6-8, 2023, had as main objectives:

o Providing an international forum for the exchange of information and experience on financial and commodity markets' modeling;
o Encouraging research in financial modeling (new techniques, methodologies, empirical studies, software, etc.);
o Stimulating and strengthening the interaction between finance theory, modeling approaches, and the practice of decision-making in commodity and financial markets;
o Establishing new research directions with a strong multidisciplinary emphasis based on recent results in *OR*, applied mathematics, statistics, machine learning and computer science.

▲ Some moments during the *68th EWGCFM*.conference: a) Conference Dinner; b) *Stavros Zenios* during the keynote speech; c) *Giorgio Consigli* and *Bruno Dupire* attending one session; d) *Rita D'Ecclesia* during the Opening Speech.

The Conference Chair, *Dr. Giorgio Consigli*, was supported by the coordinators of the conference, *Dr. Mohammad AlKhaleel, Dr. Adriana Gabor, Dr. Berihu Teklu Gebrehiwot, Dr. Yerkin Kitapbayev* and *Dr. Jorge Passamani Zubelli*.

The *68th EWGCFM meeting* offered a rich scientific program, three keynote speeches, and a young scholars competition, covering a variety of subjects in asset pricing, stochastic modeling, machine learning, asset-liability management, climate finance, optimization, etc. (https://www.ctl.ae/adrio1-ewgcfm68).

The meeting gathered 65 participants from 15 countries, with 98 paper submissions, from which 40 were selected for presentation and incorporated into 15 sessions.

Selected papers will have the chance to be published in two different special Issues: one on *Commodity and financial markets' analysis* in *IMA Journal of Management Mathematics*, Oxford University Press, Online ISSN 1471-6798, and the other on *Recent findings in Risk Measurement and Management*, in *Decision in Economics and Finance* journal, Springer.

The *EWGCFM group* is grateful to the authors and scholars for providing valuable scientific discussions that greatly contributed to the richness of the conference.

Machine Learning NeEDS Mathematical Optimization A quick browse at the *Autumn 2023* talks

Emilio Carrizosa <ecarrizosa@us.es>, **Dolores Romero Morales** <drm.eco@cbs.dk>,
Nuria Gómez-Vargas <ngvargas@us.es>, **Thomas Halskov** <tha.eco@cbs.dk>

The *Online Seminar Series "Machine Learning NeEDS Mathematical Optimization"* is 100% virtual and takes place on Mondays, 16.30-17.30 (CET). This seminar series is an activity from the *EU H2020 MSCA RISE NeEDS project*, branding the role of *Operational Research* in Artificial Intelligence with the support of EURO, https://www.euro-online.org.

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

o > 100 speakers from > 20 countries,
o > 2000 people from > 90 countries subscribed to the mailing list to receive weekly updates,
o > 20,000 views on the playlist at NeEDS YouTube Channel and IMUS YouTube Channel.

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

Prof. Emilio Carrizosa, IMUS-Instituto de Matemáticas de la Universidad de Sevilla,
Prof. Dolores Romero Morales, Department of Economics of Copenhagen Business School,
Nuria Gómez-Vargas, PhD student at IMUS-Instituto de Matemáticas de la Universidad de Sevilla,
Thomas Halskov, PhD student at Department of Economics of Copenhagen Business School.

Program *of the Online Seminar Series "NeEDS Mathematical Optimization"* (October 2023-December 2023):

October 2, 2023: Opening of Season 6 by *Prof Anita Schöbel* (President of *EURO*),
Prof Mike Baiocchi (Stanford University, USA) and *Prof Jordan Rodu* (University of Virginia, USA)

October 9, 2023: YOUNG session with *Caroline Spieckermann* (Technical University of Munich, Munich, Germany), *Miaolan Xie* (Cornell University, USA), Quan Zhou (Imperial College London, UK)

October 23, 2023: *Prof Daniel Kuhn* (EPFL, Switzerland)

October 30, 2023: *Prof Yael Grushka-Cockayne* (University of Virginia, USA)

November 6, 2023: *Prof Adam Elmachtoub* (Columbia University, USA)

November 13, 2023: *Prof Martin Schmidt* (Trier University, Germany)

November 20, 2023: *Prof Emilia Gomez*, Joint Research Centre, European Commission & Universitat Pompeu Fabra, Spain

November 27, 2023: *Prof Jordi Castro* (Universitat Politecnica de Catalunya, Spain)

December 4, 2023: *Prof Eystein Jansen* (Vice-President of the ERC)
Prof Bilge Atasoy (Delft University of Technology, The Netherlands)

Joint Australian workshop in optimization and computational mathematics - WOMBAT and *WICO* meeting *OR* in beautiful Sydney

Mareike Dressler <m.dressler@unsw.edu.au>, **Nam Ho-Nguyen** <nam.ho-nguyen@sydney.edu.au>,
Quoc Le Gia <qlegia@unsw.edu.au>, **Dmytro Matsypura** <dmytro.matsypura@sydney.edu.au>,
Lindon Roberts <lindon.roberts@sydney.edu.au>

The *Discipline of Business Analytics* and *School of Mathematics and Statistics of the University of Sydney* were pleased to host the *annual Workshop on Optimisation, Metric Bounds, Approximation and Transversality* (*WOMBAT*) and *second biennial Workshop on the Intersections of Computation and Optimisation* (*WICO*), from 11 to 15 December 2023.

▲ *WOMBAT/WICO 2023* attendees (left), and the *WOMBAT* mascot in attendance (a toy wombat; right).

WOMBAT and *WICO* are initiatives of the *Mathematics of Computation and Optimisation* (*MoCaO*) special interest group of the *Australian Mathematical Society*. Held together for the first time, our aim was to bring together researchers from the areas of optimization, operational research, and computational mathematics interested in the cross-fertilization of ideas.

The *WOMBAT/WICO joint workshop* had 64 registered participants, 31 contributed talks and 5 plenary talks. We were privileged to have keynote presentations on a wide array of topics:

o *"Public transport network optimisation"* - *Andreas Ernst* (Monash University),
o *"Optimization-based estimation of tail probabilities in complex systems with uncertainty"* - *Georg Stadler* (New York University),
o *"New Perspectives on Deriving Compact Extended Formulations for Optimization Problems with Indicator Variables"* - *Fatma Kılınç-Karzan* (Carnegie Mellon University),
o *"Robust mixed finite element methods for the Biot-Stokes interfacial coupling"* - *Ricardo Ruiz-Baier* (Monash University),
o *"Problem decomposition in biobjective optimisation"* - *Andrea Raith* (University of Auckland).

We are grateful to the *Discipline of Business Analytics and School of Mathematics and Statistics of the University of Sydney* for financial and administrative support, as well as the *Sydney Mathematical Research Institute* (*SMRI*) for additional administrative support.

The 2023 International Congress on Grey System and Uncertainty Analysis Jointly with the *37th National Conference on Grey Systems*, Celebrated in Zhengzhou, Henan Province, China

Joanna Majchrzak <joanna.majchrzak@put.poznan.pl>**, Rafał Mierzwiak** <rafal.mierzwiak@put.poznan.pl>,
Naiming Xie <xienaiming@nuaa.edu.cn>

The *2023 International Congress on Grey System and Uncertainty Analysis* Jointly with the *37th National Conference on Grey Systems* was hosted by the *International Association of Grey Systems and Uncertainty Analysis* (*GSUA*), *Chinese Society of Optimization and Overall Planning and Economical Mathematics* (*CSOOPEM*). The congress and conference were organized by College of Information and Management Science (*Henan Agricultural University*) and supported by Institute for Grey Systems Studies (*Nanjing University of Aeronautics and Astronautics*).

▲ The participants of *The 2023 International Congress on Grey System and Uncertainty Analysis* Jointly with *The 37th National Conference on Grey Systems*.

The position of General Chair of the Congress was represented by *Xiaolei Jie* (President of Henan Agricultural University, CN) and *Sifeng Liu* (President of GSUA and Professor of Northwestern Polytechnical University, CN). The position of International Program Committee Chairs was hosted by *Professor Ying Yang* (Institute of Artificial Intelligence, De Montfort University, UK) and *Professor Naiming Xie* (Institute for Grey System Studies, Nanjing University of Aeronautics and Astronautics CN). The group of Co-Chairs included *Bingjun Li, Ewa Więcek-Janka, Qishan Zhang, Camelia Delcea, Kejia Chen, Wenping Wang, Xinping Xiao, Yaoguo Dang, Kapila RMT Rathnayaka* and *Rafał Mierzwiak*.

During September 22-24, 2023, the research results related with Grey Data Analysis and AI, Data Science and *Operational Research*, Big Data and Grey Systems, Future Development of Grey System Theory were discussed. In this 37th edition of the conference, almost 350 participants took part in 7 thematical session and special session in which the Grey System and Big Data Analysis were considered. The Nominating Committee for Excellent papers awarded 26 papers.

The next *Congress* and *Conference on Grey System* is scheduled at June of 2024.

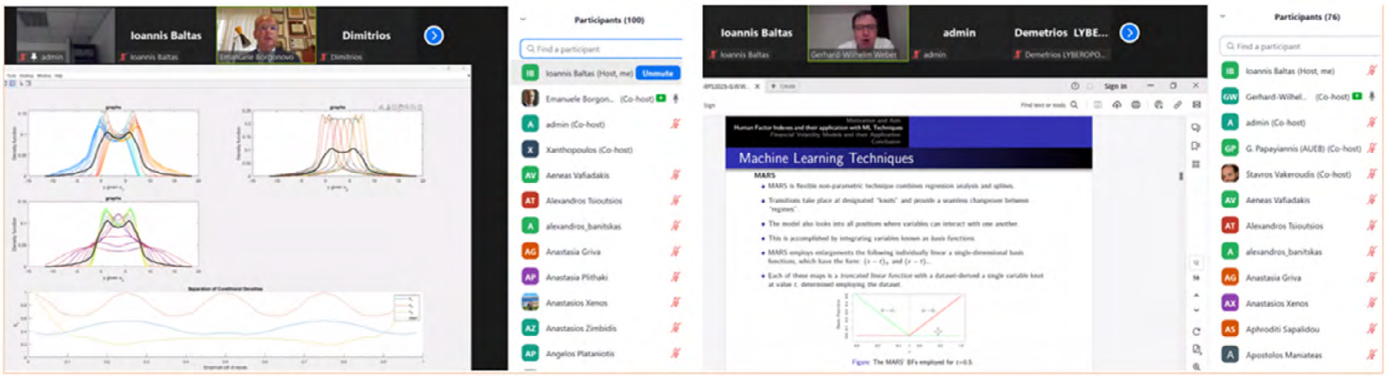
Enjoying *OR* and Stochastic Mathematics in Athens and Online: *20th Summer School in Risk Finance & Stochastics RFS-2023*

I. Baltas <jmpaltas@aegean.gr>, **G. Kouretas** <kouretas@aueb.gr>, **G. Papayiannis** <gpapagiannis@aueb.gr>,
A. Tsekrekos <tsekrekos@aueb.gr>, **S. Vakeroudis** <svak@aueb.gr>, **S. Xanthopoulos** <xanthos@aegean.gr>,
A.N. Yannacopoulos <ayannaco@aueb.gr>, **A. Zimbidis** <aaz@aueb.gr>

The *20th Summer School in Risk Finance and Stochastics*, Athens, Greece, September 4-8, 2023, was organized by the Athens University of Economics and Business (AUEB), Departments of (a) Statistics, (b) Accounting & Finance, (c) Business Administration, and the Laboratory of Stochastic Modeling and Applications (Department of Statistics, AUEB), in collaboration with the University of the Aegean, Departments of a.) Financial & Management Engineering, and b.) Statistics & Actuarial-Financial Mathematics.

The *Summer School in Risk Finance and Stochastics* is an annual academic gathering that started in 2003 on Samos island, as an attempt to bring together practitioners, students and academics both young and senior to present, reflect and discuss certain aspects of the fascinating field of Stochastic Mathematics and its close connection with Risk, Finance and Insurance. Over the years the location of the school was moved to various places (depending on funding and circumstances) however, our rendezvous was always punctual and anticipated by all. This year the school was organized in a hybrid format (both in Athens & e-mode).

This year, the school was focused on a wide variety of areas, each one represented by illustrious keynote speakers: (i) *"Explainability, Interpretability and Sensitivity Analysis for Financial Machine Learning"* by *E. Borgonovo* (Universita Bocconi, Milano), (ii) *"Construction and pricing of Insurance-linked securities tied to natural disasters"* by *K. Burnecki* (Wroclaw University of Science & Technology), (iii) *"Topological Data Analysis Ball Mapper in Finance"* by *S. Rudkin* (The University of Manchester), (iv) *"Condensation and Metastability for Zero Range Processes"* by *M. Loulakis* (NTUA), >>



▲ Snapshots of the *Summer School*: lectures by *E. Borgonovo* (left) and *G.W. Weber* (right).

>> (v) *"Time-series and Cross-sectional Commodity Return Predictability"* by *A. Sakkas* (AUEB), and (vi) *"Statement of Mutual Interaction between Finance and Human Factors by Various Types of Indicators"* by *G.W. Weber* (Poznan University of Technology, Poznan). Further topics that were presented and discussed include, among others, *portfolio theory*, *risk management* and *decision making* under uncertainty in Finance & Insurance, as well as an interesting interaction with a panel of experts from the *Hellenic Actuarial Society*.

The *Summer School* was very well attended with more than 100 participants who showed their interest and actively participated in a lively round-table discussion in the form of oral questions. Further details on the *e-summer school* are available on the official school's website: https://sites.google.com/view/ss-risk-finance-stochastics/overview.

27th POC Seminar – SPOC 27 "Recent progress and interesting facts about the Simplex Algorithm" Celebrated at ESSEC Executive Campus, in Paris

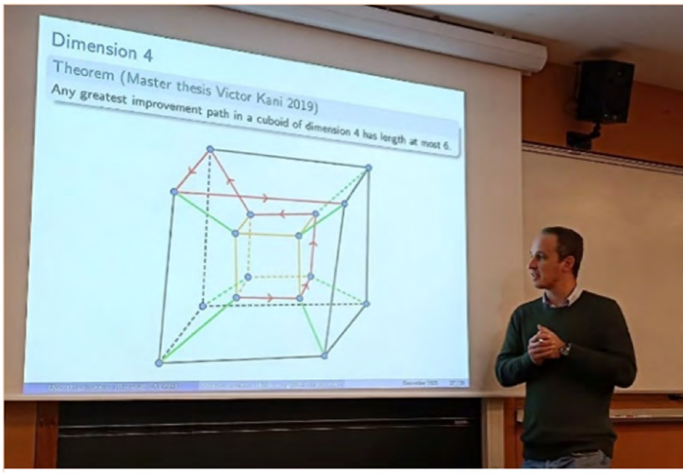
Emiliano Lancini <emiliano.lancini@lamsade.dauphine.fr>, **Diego Delle Donne** <delledonne@essec.edu>

The *POC* group (*Polyhèdres et Optimization Combinatoire*) is a research group transversal to various French research laboratories which welcomes academic researchers and industry professionals brought together by the interest towards polyhedral aspects of combinatorial optimization problems. Every year, the group organizes two seminars (*SPOC*) that delve into topics synergistic with its core themes. Additionally, the group is involved in the organization of *JPOC* and *ISCO* biannual conferences.

The topic of this edition of *SPOC* was *"Recent progress and interesting facts about the Simplex Algorithm"* and it included four talks of distinguished experts in the field: *Prof. Xavier Allamigeon* (INRIA / CMAP, École Polytechnique, France), *Prof. Daniel Dadush* (CWI Institute, Netherlands), *Prof. Sophie Huiberts* (CNRS / LIMOS, France) and *Prof. Quentin Louveaux* (Institut Montefiore, Université de Liège, Belgium). Even after more than 50 years, the *Simplex* algorithm is a topic of great interest and discovery, being an essential algorithm to tackle a wide range of real-life *OR* problems. Our speakers shared their insights, recent findings, and perspectives on this algorithm with four remarkable presentations.

The day started with *Prof. Dadush*'s talk, titled *"Interior point methods are not worse than Simplex"*, who provided valuable insights about the running time bounds for interior point methods, in contrast with the classical simplex method that always admits an exponential bound.

The morning session closed with *Prof. Louveaux*'s presentation, who in the search of bounds for the number of iterations of the simplex algorithm, provided a brilliant discussion about the possible lengths of monotone paths followed inside polyhedra.



▲ *Quentin Louveaux*, analyzing *Simplex*'s paths.

▲ *Emiliano Lancini*, *Diego Delle Donne*, *Daniel Dadush*, *Sophie Huiberts* and *Xavier Allamigeon* (left to right).

After lunch, *Prof. Allamigeon* proposed a delightful discussion about the long-standing question of determining if the theory of self-concordant barriers can provide a method with strongly polynomial complexity. He showed in his presentation, that none of the self-concordant barrier interior point methods is in fact strongly polynomial.

The journey was closed by an inspiring presentation by *Prof. Huiberts*, putting focus on the fact that even being the most important algorithm for solving linear programming problems in practice, we still do not completely understand the reasons for this algorithm to be so efficient (it takes exponential time in the theoretical worst case but only linear time in practice). She stated a keen discussion about the state-of-the-art failing to be a proper scientific theory and what needs to happen before we can finally hope to achieve this goal.

The seminar was proudly organized by *Prof. Emiliano Lancini* (LAMSADE) and *Prof. Diego Delle Donne* (ESSEC) and kindly supported by the generosity of *GDRRO, ESSEC, POC* and *LAMSADE*.

Research advances of *OR* and Industrial Engineering: *ODSIE 2023* Istanbul, Turkey, online

A. Mirzazadeh <a.mirzazadeh@aut.ac.ir>**, Zohreh Molamohamadi** <zmmohamadi@gmail.com>,
Gerhard-Wilhelm Weber <gerhard.weber@ put.poznan.pl>

▲ *ODSIE 2023* (from left to right): *a)* Chairs and Co-Chair: *Prof. A. Mirzazadeh*, *Dr. Erfan Babaee Tirkolaee* and *Dr. Nadi Serhan Aydın*; *b)* Coordinators: *Ms. Leila Chehreghani*, and *Dr. Zohreh Molamohamadi*; *c)* Steering Committee: *Prof. A. Mirzazadeh*, *Dr. Erfan Babaee Tirkolaee*, *Dr. Babek D. Erdebilli*, *Prof. Mehmet Alper Tunga*, *Prof. Janny M.Y. Leung*, *Prof. Gerhard Wilhelm Weber*, *Prof. Josef Jablonsky* and *Prof. Taicir Moalla Loukil*.

The *International Conference on Optimization and Data Science in Industrial Engineering 2023* (*ODSIE 2023*; cf. https://odsie2023.refconf.com/) was held in virtual mode on November 16-17, 2023, to provide a platform to transfer information, experience, and research findings of the recent theoretical and practical achievements of optimization and data science in *OR* and industrial engineering in both research and industry, with the scientific support of various universities.

The *Conference Chairs* were *Prof. A. Mirzazadeh* and *Dr. Erfan Babaee*, and the *Co-Chair* of the Conference was *Dr. Nadi Serhan Aydın* (https://odsie2023.refconf.com/page_98.html). The *Coordinators* of the conference were *Ms. Leyla Chehrghani*, and *Dr. Zohreh Molamohamadi*. *ODSIE 2023* was supported by *Istinye University*, Istanbul, Turkey, in particular by *Prof. Erkan Ibiş*, *Prof. Hatice Gülen* and *Prof. Mehmet Alper Tunga* (https://www.istinye.edu.tr/en).

ODSIE 2023 conference provided useful scientific programs, such as workshops, keynote speeches, PhD. thesis competition, and papers presentations panels, which covered a variety of subjects in optimization, decision making, data science, Internet of Things, etc.

ODSIE 2023 gathered 794 participants from 50 countries, with 311 paper submissions, from which 124 were selected for presentation and incorporated into 21 panel sessions (https://odsie2023.refconf.com/page_125.html).

Some of the selected papers will be published in Springer's CCIS book series, indexed in Scopus, SCImago, EI-Compendex, etc., and some others will be considered for possible publication in peer-reviewed Journals (https://odsie2023.refconf.com/page_110.html). The conference committees were from 27 countries and 22.5 percent of the authors were from Turkey.

The *OC* of *ODSIE 2023* is grateful to the authors and researchers for providing valuable scientific discussions that has greatly contributed to the richness of the conference.

▲ *ODSIE 2023*: A Snapshot from the *Closing Ceremony*.

Celebrating the Inaugural Success: *ICBAP 2024 – International Conference on Business Analytics in Practice*, University of Sharjah, UAE

Ali Emrouznejad <a.emrouznejad@surrey.ac.uk>, **Panagiotis Zervopoulos** <pzervopoulos@sharjah.ac.ae>, **Ilhan Ozturk** <iozturk@sharjah.ac.ae>

The *International Conference on Business Analytics in Practice* (*ICBAP*) 2024, held in Sharjah, United Arab Emirates, from January 8 to 11, was a landmark event in the academic arena, fostering a vibrant exchange of knowledge, innovation, and collaboration among scholars, practitioners, and policymakers globally. Guided by distinguished organizers (*Prof. Ali Emrouznejad*, *Prof. Panagiotis Zervopoulos*, *Prof. Ilhan Ozturk*), the conference showcased the collective expertise and dedication of institutions like the College of Business Administration (CoBA) at the *University of Sharjah* (UoS) and the Centre for Business Analytics in Practice (CBAP) at the *University of Surrey*.

▲ *University of Sharjah: Opening session.*

Under the esteemed patronage of *His Highness Sheikh Sultan Bin Ahmed Al Qasimi*, Deputy Ruler of Sharjah, and President of the University of Sharjah, and with full support from *His Excellency Prof. Hamid M. K. Al Naimiy*, Chancellor of the University of Sharjah, *ICBAP2024* exemplified a commitment to excellence and innovation in business analytics.

Attendees of *ICBAP 2024* benefited from interactive sessions, workshops, and networking events designed to foster cross-disciplinary exchanges and enhance professional development. The conference program was meticulously curated to encompass a diverse range of topics and research endeavours, spanning various disciplines within business analytics, decision support systems, digital supply chain logistics, the application of AI and sustainability analytics and Net Zero. The conference provided a comprehensive platform for scholars and practitioners to exchange knowledge and insights, fostering advancements in the field of business analytics and beyond.

▲ *Organizers and Keynote speakers: Ali Emrouznejad, Shuang Ren, Soumyadeb Chowdhury, Vincent Charles, Ilhan Ozturk, Panagiotis Zervopoulos* (right to left).

ICBAP 2024 boasted an impressive lineup of invited speakers and panellists, offering diverse perspectives and expertise from around the globe. Notable *keynote addresses* included sessions on *generative AI for business operations and social transformation*, as well as *AI-enabled emotional analytics for boosting business performance*. The conference also featured engaging panel discussions, such as the one focused on *harnessing AI and business analytics for sustainable innovation and improved business insights*, which underscored the importance of collaboration between academia and industry in driving positive change.

As *ICBAP 2024* concluded, its legacy of academic excellence, global collaboration, and institutional leadership continued to resonate within the academic and business communities. Serving as a catalyst for knowledge advancement, innovation, and addressing pressing challenges in business analytics and practice, the conference left an indelible mark on its participants.

The organizers express heartfelt gratitude to all participants whose active engagement and insightful contributions enriched the conference program, fostering a collaborative environment conducive to learning and growth. Special appreciation is reserved for esteemed invited speakers and panellists for their invaluable contributions.

In conclusion, *ICBAP 2024* exemplified the spirit of academic excellence, global collaboration, and institutional leadership. For more information about *ICBAP 2024* and future conferences, please visit its website (https://academyba.com/icbap2024).-

ICCAM 2023 Conference in Mongolia: a Forum for Recent Developments in Mathematics and *OR*

Milagros R. Baldemor <milagros_baldemor@yahoo.com.ph>, **Enkhbat Rentsen** <renkhbat46@yahoo.com>

The *International Conference on Computational and Applied Mathematics 2023*, an international event, took place at the *National University of Mongolia* in the capital city of Ulaanbaatar last September 22-24, 2023. The conference aimed to bring together international researchers in the fields of *Operations Research*, Computational and Applied Mathematics, especially current developments in *OR*.

ICCAM 2023 Conference Organizers and members of the International and Local Committees and Participants.

The forum gathered together more than 116 participants from 15 countries namely USA, Russia, China, Portugal, South Korea, Austria, India, Canada, Mongolia, Philippines, Taiwan, Nepal, South Africa, France and Japan. There was a total of 66 talks from Keynote and Invited Speakers to paper presenters and 27 poster presentations. It also featured world-renowned keynote, plenary and invited speakers like the authors of this article who are also members of the international committee. The conference further served as a springboard for neophyte researchers from the host country. Another highlight of the conference was the 80th birthday celebration of *Prof. T. Zhanlav*, a well-known academician of the Institute of Mathematics and Digital Technology of the Mongolian Academy of Sciences.

ICCAM 2023 conference speakers and participants in front of the *Chinggis Khan Statue* - the landmark of Mongolia.

The event was a very successful one headed by the Conference Chairman, *Prof. Chuluunbaatar* (Mongolian Academy of Sciences) together with the combined effort of the Program Chairs - *Prof. Enkhbat Rentsen* and *Assoc. Prof. Altannar Chinchuluun* (National University of Mongolia), the International Committee Members, the Secretariat and their Local Committee counterparts. It was also initiated by the following organizing institutes - Mongolian Academy of Sciences (MAS), National University of Mongolia (NUM), German-Mongolian Institute for Resources and Technology (GMIT), Institute of Mathematics and Digital Technology of the Mongolian Academy of Sciences and the Mongolian Mathematical Society.

Conference proceedings of high quality *OR* Researches will be published at the "Springer Proceedings in Mathematics and Statistics" series (edited by the general chairman and program chairs). For more information about the conference, please visit http://iccam.mn.

As a wrap-up activity of the conference, the conference attendees were invited to visit the countryside of Mongolia on the 3rd day to witness the rich culture and beautiful sceneries of the country.

ICIAM 2023 Tokyo - Recent Developments in *OR*, Applied and Industrial Mathematics

Burcu Gürbüz <burcu.gurbuz@uni-mainz.de>, **G.W. Weber** <gerhard.weber@put.poznan.pl>

From August 20 to 25, 2023, Waseda University in Tokyo hosted the *10th International Congress on Industrial and Applied Mathematics* (*ICIAM 2023 - Tokyo*) (https://iciam2023.org/), marking a significant milestone in the field. Renowned as one of the most prestigious events in applied mathematics, *ICIAM* serves as a global gathering for experts, researchers, and scholars. The 2023 edition, held in the captivating capital city of Japan, underlined the continued importance and success of *ICIAM* in advancing the frontiers of applied mathematics. The prestigious event, organized by JSIAM, MSJ, and SCJ, united global experts for idea exchange and collaboration. Conducted in a hybrid format, *ICIAM 2023* featured 27 invited talks, an *Olga Taussky-Todd* plenary lecture, six plenary talks, and two public lectures. The diverse program included 477 mini-symposia, nearly 4,000 talks, 1,100 contributed talks, and around 400 poster presentations. The congress was started with an enjoyable *Opening Ceremony* and following a warm welcome address by *ICIAM* President *Prof. Ya-xiang Yuan*, the recipients of the *ICIAM prizes* were announced. 2023 ICIAM Prize winners are:

ICIAM Collatz Prize - *Maria Colombo* (EPFL Lausanne, Switzerland), ICIAM Lagrange Prize - *Alfio Quarteroni* (Politecnico di Milano), ICIAM Maxwell Prize - *Weinan E* (Peking University and Princeton University), ICIAM Pioneer Prize - *Leslie Greengard* (Courant Institute, New York University and Flatiron Institute, Simons Foundation), ICIAM Su Buchin Prize - *Jose Mario Martinez Perez* (University of Campinas, Brazil) and ICIAM Industry Prize - *Cleve B. Moler* (Founder and Chief Mathematician of Math Works, Inc.), and the Olga Taussky-Todd lecture (OTT lecture) was presented by *Professor Ilse C.F. Ipsen* (North Carolina State University, USA).

The logo of *ICIAM 2023*: inspired by the famous origami figure "*Orizuru*", a symbol for the promotion of harmony and goodwill in the world.

Through the careful selection of the *ICIAM 2023* Scientific Committee and the invaluable support of the Tokyo Convention and Visitors Bureau (TCVB), financial assistance was provided for registration fees, accommodation, and travel expenses for approximately 500 participants from various career levels around the world. The co-author *Burcu Gürbüz* (Johannes Gutenberg University Mainz, Germany) is also one of the fellows of the generous grant. She presented her collaborative study *"Modeling and analyzing dengue fever transmission with time delays"* and also served as the chair of the session. The study is open for further investigation closely related to the field of *Operational Research* (*OR*), particularly in the context of infectious disease control and healthcare management.


ICIAM Prize Winners.

ICIAM 2023 - Tokyo expressed gratitude to speakers, *ICIAM* officers, and committees for their contributions. The conference integrated industry sectors with academics from diverse applied mathematics fields, notably emphasizing *OR*. *OR*-related mini-symposia, talks, and posters focused on optimizing complex systems and decision-making processes. Participants engaged in cultural activities in Tokyo, fostering a well-balanced program uniting scientific rigor with cultural immersion. The event provided a dynamic platform for scholars, researchers, and experts to exchange knowledge and form partnerships, appealing to both seasoned professionals and new entrants. Participants were informed about upcoming *OR* events: *3rd International Conference on Applied Mathematics in Engineering* (*ICAME'24*) (https://icame.balikesir.edu.tr/) and *EURO 2024* (https://euro2024cph.dk/).

Mathematical and *OR* Insights at *Dynamics Days Europe 2023* in Picturesque Naples

Constantinos Siettos <csiettos@gmail.com>, **Lucia Russo** <lucia.russo@stems.cnr.it>,
Burcu Gürbüz <burcu.gurbuz@uni–mainz.de>, **G.W. Weber** <gerhard.weber@put.poznan.pl>

The 43rd Dynamics Days Europe 2023 (https://sites.google.com/view/dynamicsdayseurope2023), successfully held at the esteemed Università degli Studi di Napoli Federico II in Naples, Italy, from September 3-8, 2023, under the leadership of *Prof. Constantinos Siettos* and *Dr. Lucia Russo*. This year's event in the historic Saints Marcellino and Festo venue, located in Naples' heart, attracted 400 participants from 50 countries, with significant support for over 40 students and postdocs, particularly from low- and lower-middle-income countries.


Group picture of *Dynamics Days Europe 2023*, Università degli Studi di Napoli Federico II in Naples, Italy.

On the first day of the conference, after a warm welcome address by *Prof. Siettos* and *Dr. Russo, Eckehard Schöll* (TU Berlin, Germany) and *Theo Geisel* (Max Planck Institute for Dynamics and Self-Organization and University of Göttingen, Germany) gave a fascinating historical overview of the *Dynamics Days Europe* conferences. The conference featured 12 plenary speakers from around the world:

Maíra Aguiar (Basque Center for Applied Mathematics, Spain), *Mario di Bernardo* (University of Naples Federico II, Italy), *Stefano Boccaleti* (CNR - Institute for Complex Systems, Italy), *Annalisa Bracco* (Georgia Tech., USA), *Emilio Campana* (National Research Council (CNR) of Italy), *Anne De Wit* (Université libre de Bruxelles, Belgium), *Yannis Kevrekidis* (Johns Hopkins University, USA), *Yuliya Kyrychko* (University of Sussex, UK), *Linda Petzold* (University of California, Santa Barbara, USA),>>

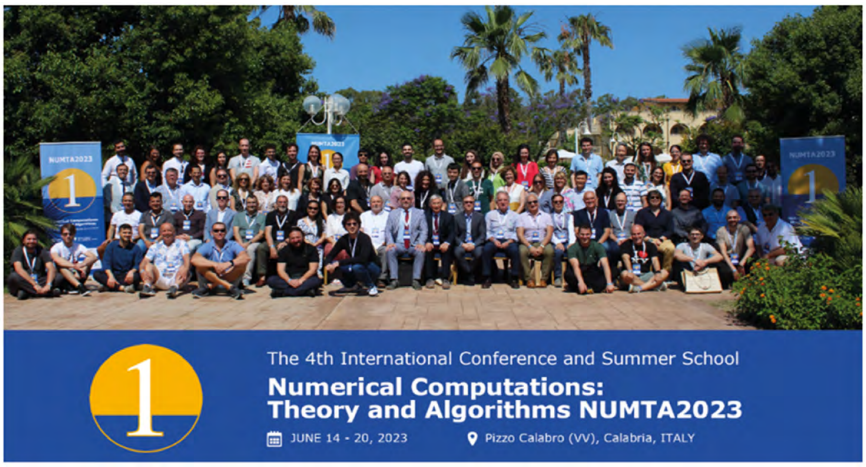
>> *Gianluigi Rozza* (Scuola Internazionale Superiore di Studi Avanzati (SISSA)), *Jens Starke* (Rostock University, Germany) and *Lai-Sang Young* (NYU Courant, USA). Besides these excellent plenary talks, 5 awards were given for *best poster presentations* (sponsored by Chaos, AIP) and 3 awards for *best oral presentations* (sponsored by Cambridge University Press).

▲ Opening from *Prof. Constantinos Siettos* and *Dr. Lucia Russo* at the historical Church of Saint Marcellinus and Saint Festus (Dynamics Days Europe 2023, Naples).

Co-author *Burcu Gürbüz* (Johannes Gutenberg-University Mainz) presented her study on *"An analysis of a reduced model of the Calvin cycle"* and also served as the chair of the session. This study is open to further investigations in the context of *Operational Research* (*OR*), whose perspective lies in the potential for the application of optimization and control techniques to improve the understanding and performance of this biological process. In dynamical systems and nonlinear dynamics, *OR* plays a central role in understanding and designing complex systems. *OR* uses mathematical models and computational techniques to optimize dynamic systems and influence decision making in areas such as resource allocation in biological systems, network control, and dynamic economic modeling-topics that align with *Dynamics Days Europe* discussions. Looking ahead, next year's event, to be held in Bremen, Germany, from July 29 to August 2, 2024, promises another intellectually enriching installment. Attendees were also briefed about upcoming events in the *OR* and mathematical biology communities: *ICAME'24* (https://icame.balikesir.edu.tr/), *EURO 2024* (https://euro2024cph.dk/), and *ICMAS'24* (https://www2.isep.ipp.pt/icmasc/).

Calabria, Southern Italy, 2023: Great success for the 4th *NUMTA*, when Numerical Computation Met *OR*

Dmitri E. Kvasov <kvadim@dimes.unical.it>



The *4th Triennial International Conference and Summer School* NUMTA-2023 *"Numerical Computations: Theory and Algorithms"* was held (in hybrid mode) from 14 to 20 June 2023 at "TUI Magic Life Resort" in Calabria, Italy. It was organized by the Department of Computer Engineering, Modeling, Electronics and Systems Science (DIMES) of the *University of Calabria*, Italy, in cooperation with the *Society for Industrial and Applied Mathematics* (SIAM), USA.

The previous editions of *NUMTA* took place in several beautiful places in Calabria in 2013, 2016, and 2019. The choice of the conference venue is dictated (for all editions of the *NUMTA*) by the organizers' desire to offer participants and their families an *excellent moment of relaxation in a welcoming and friendly atmosphere*.

The goal of all *NUMTA* Conferences is to create a multidisciplinary round table for an open discussion on numerical modeling of nature by using traditional and emerging computational paradigms. Researchers from both theoretical and applied sciences are invited to use this excellent possibility to exchange ideas with leading scientists from different research fields, including *Operations Research* that is one of the important topics of the conference.

Papers discussing new theoretical and experimental results on *Numerical Optimization and Applications* have been particularly solicited (in fact, more than half of the Conference's special sessions were organized on the topics of *Operational Research and Optimization*). Particular attention during the conference was dedicated to *Numerical Optimization* techniques and a variety of issues related to theory and practice of the usage of infinities and infinitesimals in numerical computations. There was a substantial bunch of talks on advanced computational techniques as, for example, the Infinity Computer paradigm successfully used in *Operational Research* as well (see the recent 2022 Springer's volume "Numerical Infinities and Infinitesimals in Optimization" edited by *Y.D. Sergeyev* and *R. De Leone*: in July 2023 the first editor of this book has been awarded the International Constantin Carathéodory Prize for his achievements in the field of global optimization).

Two hundred researchers from more than 30 countries participated in the Conference. *Plenary lectures* and *tutorials* were delivered by scientists who are undiscussed leaders in their research fields: *Luigi Brugnano* (Italy), *Lou D'Alotto* (USA), *Renato De Leone* (Italy), *Kalyanmoy Deb* (USA), *Hoai An Le Thi* (France), *Francesca Mazzia* (Italy), *Panos Pardalos* (USA), *Witold Pedrycz* (Canada), *Yaroslav Sergeyev* (Italy), *Vassili Toropov* (UK), and *Nick Trefethen* (UK).

During this edition of *NUMTA*, as happened in previous events, the *NUMTA Research Awards* for excellence in research and the *Young Researcher Prize by Springer* have been awarded. The winners of the major prize were *Francesca Mazzia* (University of Bari, Italy) and *Lou D'Alotto* (City University of New York, USA) who have delivered their Awards Winning Plenary Lectures. The Young Researcher Prize was assigned to *Davide Stocco* (University of Trento, Italy).

The organizers invite all participants of previous NUMTA conferences and all readers of this newsletter to participate in the next edition of NUMTA which will hopefully be organized in 2026.

Workshop *POP23* on Future Trends in Polynomial Optimization, *LAAS-CNRS*, Toulouse, France

Didier Henrion <henrion@laas.fr>, **Monique Laurent** <m.laurent@cwi.nl>, **Victor Magron** <magron@laas.fr>, **Jiawang Nie** <njw@math.ucsd.edu>**, Edouard Pauwels** <edouard.pauwels@tse-fr.eu>

The *POP23 workshop* took place on 13-17 November 2023 in the Conference Room of *LAAS-CNRS*, 7 avenue du colonel Roche, 31400 Toulouse, France.

It focused on recent developments in *polynomial optimization* and their timely applications in data science, performance analysis, noncommutative and tensor optimization, dynamical systems and discrete geometry. The scientific programme was structured around tutorial talks during the first half of the week.

The technical programme and the book of abstracts are available at the workshop webpage: https://homepages.laas.fr/henrion/pop23/.

A special issue of the *AIMS* journal Numerical Algebra, Control and Optimization (*NACO*) will be edited, devoted to the theme of the workshop.

The workshop was partly funded by *ANITI* (the Artificial Intelligence Institute of Toulouse), *CIMI* (the Mathematics and Informatics Institute of Toulouse), *GdR MOA* (CNRS working group on the Mathematics of Optimization) and the *POP* (Polynomial OPtimization) team at *LAAS-CNRS*.

XIX Summer School in Discrete Mathematics 2024, Celebrated in Valparaíso, Chile

Andrea Jiménez <andrea.jimenez@uv.cl>, **Marcos Kiwi** <mk@dim.uchile.cl>, **Pedro Montealegre** <p.montealegre@uai.cl>, **Gonzalo Muñoz** <gonzalo.munoz@uoh.cl>, **Víctor Verdugo** <victor.verdugo@uoh.cl>

The *Summer School on Discrete Mathematics* has taken place every year since 2006 at the Institute of Complex Systems in Valparaíso, Chile. It has been a cornerstone event in the Chilean community related to Discrete Mathematics, bringing together students and researchers of Combinatorics, Computer Science, Graph Theory, Algorithmic Game Theory, Optimization, Operations Research, and related areas. Every year the school receives advanced undergraduate and graduate students, most of them from Chile, Latin America, Europe, and the USA. Being an event with a long tradition, we can feel the impact that the school had in creating an Algorithms and Combinatorics community in Chile. Just as an example, many of the current organizers participated in the school as undergraduate students and were attracted to the area; now we are part of the organizing committee as faculty in different Chilean universities.

Over the years, we were honored to host world-renowned experts giving lectures on different key topics. For the 2024 version (8-12 January), we were fortunate to have three wonderful courses by *top-notch speakers*: *Yuri Faenza* (Columbia University): *"Matching Theory and School Choice"*, *Pierre Fraignaud* (CNRS): *"Combinatorial Aspects of Distributed Computing"*, and *Jessica McDonald* (Auburn University): *"Tutte's Flow Conjectures"*.

Each course consisted of five lectures, and an assignment sheet was given after each lecture for the students to solve. Time was given for the students to collaborate and solve the exercises in several rooms existing in the school venue. The summer school had about 50 participants, including students and researchers, and attendance was high throughout the week. The participants were very enthusiastic, asked many questions, and participated in most of the activities. At the end of the week, the organizers gave out prizes to the best handed-in homework. The winners were *Martí Jané Ballerin* (U. de Barcelona), *Antonia Labarca* (U. de Chile), and *Caroline de Paula Silva* (UNICAMP), who got books related to the topics of the school.

▲ Group picture from the *XIX Summer School*.

This year's organizing committee consisted of a team from four different Chilean universities: *Andrea Jiménez* (U. de Valparaíso), *Marcos Kiwi* (U. de Chile & CMM), *Pedro Montealegre* (U. Adolfo Ibañez & CMM), *Gonzalo Muñoz* (U. O'Higgins), and *Victor Verdugo* (Chair, U. O'Higgins). We would like to thank the *Center for Mathematical Modelling* (*CMM*) for providing generous funds for the school's organization. Further information on the summer school and its previous versions can be found on the school's webpage: https://eventos.cmm.uchile.cl/discretas2024/.

"Optimization Methods - Introduction to the classic, nature-analogous and neural optimization methods"

by Ralf Hollstein

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OR-Analytics – Classic, Nature-Analogous and Neural Optimization Methods

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

This book *"Optimierungsmethoden - Einführung in die klassischen, naturanalogen und neuronalen Optimierungen"* by *Ralf Hollstein* cogitates the significant role of optimization across various aspects of life whether it be minimization of cost, resources, risk, processing time, environmental impact, energy consumption, travel time, or it be maximization of profit, engine performance, portfolio, production, sales, and athletic achievements. Extant literature records the utilization of a wide array of methods (including their variants and subvariants), owing to the diverse, complex, intricate, and multifaceted nature of real-world optimization challenges. This book not only adeptly compiles some of these principal optimization methods but also delicately blends theory with practice by presenting its readers with their applications in practice. Although the book adroitly describes various optimization procedures by illustrating them without delving deeply into their theoretical aspects, it deftly directs its readers to the relevant literature explaining them.

This book presents a comprehensive compilation of classic, nature-analogous, and neural optimization methods, and is organized into 4 major parts. *Part I* discusses various types of optimization problems, *Part II* explores classical optimization methods, *Part III* covers nature-analogous optimizations, and *Part IV* elucidates neural combinatorial optimization methods, including optimization of artificial neural networks and machine learning. It also introduces its readers to a novel research area known as Neural Combinatorial Optimization (NCO), initially proposed by *Bello* et al. in 2015 (as referenced by the author in the book). The key advantage of NCO methods vis-à-vis traditional heuristic programming lies in their applicability to practical optimization problems that lack established heuristics using machine learning techniques like TensorFlow modules.

▲ *OR-Analytics* – Classic, Nature-Analogous and Neutral Optimization Methods.

This book which is designed as an introductory guide to the emerging realm of AI-based self-learning optimization algorithms, aims to cater to a diverse set of audience including practitioners, researchers, and scholars engaged in practical optimization as well as students in computer science, mathematics, economics, and engineering.

A brief overview of the book's 27 chapters, translated from German, along with their contents is as follows (with generously cited scholarly references at the end of each chapter):

Chapter 1: Introduction welcomes the readers to various optimization problems applicable to various fields.

Chapter 2: Continuous optimization problems presents examples of continuous optimization.

Chapter 3: Combinatorial optimization problems covers vehicle routing, graph, scheduling and cutting & packing problems

Chapter 4: Linear optimization problems discusses the formulation of linear programming problems and explains how to distinguish between simple linear, integer, mixed-integer, binary and mixed-binary problems.

Chapter 5: Multi-criteria optimization problems addresses multi-criteria optimization with an example from transportation planning through Pareto optimal solution.

Chapter 6: Analytical methods describes various analytical methods like the classic method, the Lagrange method, the gradient method, etc. for optimizing continuous functions.

Chapter 7: Methods for solving combinatorial optimization problems includes various methods like enumeration, branch-and-bound, dynamic programming and other heuristic procedures like the greedy method, local search and the taboo search methods.

Chapter 8: Linear optimization explains the simplex and graphical methods.

Chapter 9: Multi-criteria optimization methods presents two classic solution methods including the weighted sum and the ε-constraint.

Chapter 10: Complexity and heuristic/metaheuristic methods consists of various procedures required to solve complex problems with large input sizes and intricate resource requirements.

Chapter 11: Physics-based algorithms discusses the simulated annealing process, the Threshold accepting method, the Deluge algorithm, etc.

Chapter 12: Evolutionary algorithms explains how to use genetic algorithms which imitate strategies from evolutionary biology to solve combinatorial, continuous and multi-criteria optimization problems.

Chapter 13: Particle swarm algorithms describes how to solve continuous, combinatorial and multi-criteria optimization problems using particle swarm algorithms which are adapted from the flocking behavior of birds.

Chapter 14: Ant algorithms presents different variants and applications of ant algorithms to solve the backpack, assignment, network routing and the shortest common supersequence problems.

Chapter 15: Bee algorithms demonstrates the use of bee algorithms to solve combinatorial and continuous optimization problems. It also illustrates the use of BA algorithm with an example.

Chapter 16: BAT algorithms describes the echolocational analogy of bats used by bat algorithms to solve continuous optimization problems. It shows the application of the modified BAT developed by Osaba et. al. (2016) to address the travelling salesman problem as well as the binary BAT algorithm developed by Sabba and Chiki in 2014.

Chapter 17: Artificial immune systems depicts how some of the many strategies and principles of the human immune system can be imitated to solve complex optimization problems with their applications.

Chapter 18: Overview: Nature-analogous optimizations provides a diagrammatic representation of various nature-inspired optimization methods showing how to select and apply them to various optimization problems.

Chapter 19: Neural networks describes how artificial neural networks are trained to recognize unknown patterns of image, speech, pattern or text recognition.

Chapter 20: Self-encouraging cards describes the Self Organized Map (SOM) learning algorithm and demonstrates its application to the travelling salesman problem.

Chapter 21: Hopfield networks explains the principles of constructing the Hopfield network to solve combinatorial optimization problems along with its application to the travelling salesman problem.

Chapter 22: Reinforcement Learning provides an understanding of the REINFORCE algorithm used to maximize the policy(reward) which is approximated by a neural network and whose weights are optimized using the gradient method. It further elaborates the use of Q and DQN algorithms to determine the maximum reward.

Chapter 23: Optimization methods in deep learning discusses various gradient methods including clipping, momentum optimization, RMSProp optimization and Adam optimization.

Chapter 24: Neural optimization with the pointer network describes the application of the NCO method developed by Bello et al. to solve the travelling salesman problem. Further, the usage and application of the REINFORCE method using the pointer network developed by *Vinyals* et al. (2015) is also described.

Chapter 25: Neural optimization with Transformer presents the REINFORCE method with transformer developed by Kool et al. with its application to the travelling salesman problem.

Chapter 26: Optimization with graphical neural network describes the S2V-DQN algorithm with its application to the travelling salesman problem.

Chapter 27: Program libraries for machine learning provides a brief overview of TensorFlow, an open-source software library for machine learning, developed by the Google Brain Team which is used for modelling and training of neural networks.

This book, thus, provides a thorough understanding of various optimization problems, algorithms, and methods in addition to illustrating their diverse applicability to real-time real-world problems. Given its versatility and extensiveness, it can, therefore, be an enriching resource for anyone who wishes to learn optimization methods without really having to master the language!

Though this book extensively covers various optimization methods, many future scientific, applied, and real-world illustrations and uses can still be explored and pursued further in the vast and quickly emerging domains of modern research including coding theory, cryptography, discrete tomography, remote sensing and other inverse problems, Ito-Taylor calculus, accounting, finance, game theory, logistics, neuroscience, cognitive science, space-time transportation and travel, etc.

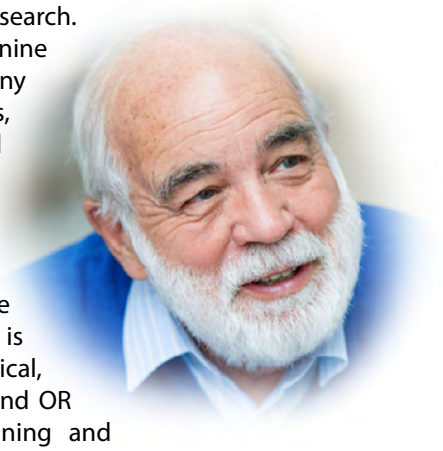
Obituary

Remembering Theodor John Stewart (1943-2023)

Sheetal Silal
University of Cape Town

It is with profound sadness that we mourn the passing of Emeritus Professor Theodor Stewart, who was a Senior Research Scholar in the Department of Statistical Sciences in the Faculty of Science of the University of cape Town (UCT).

Emeritus Professor Stewart, who joined UCT in 1984 as a Professor in the Department of Statistical Sciences, was internationally recognized for his contributions to the field of OR well beyond his retirement in 2008. He served twice as the Head of Department in 1989 and again in 1994 to 1999. Along with holding visiting professorships at various universities in Europe, Prof. Stewart was inducted as a Fellow of the University of Cape Town, a Fellow of the Royal Society of South Africa, a Fellow of the Statistical Association of South Africa, a Fellow and Honorary Lifetime Member of the ORSSA and a member of the Academy of Sciences of South Africa.



With more than 90 peer-reviewed publications in international journals, Prof. Stewart's research focused primarily on fundamental contributions to the broad area of multi-criteria decision analysis with applications in natural resource management, as well as Bayesian statistics, and linear programming and simulation applications in industrial planning. The quality of his research was recognised through the award of the prestigious Tom Rozwadowski Medal by ORSSA on six occasions, the Gold Medal by the International Society on Multiple Criteria Decision Making and the Distinguished Service Medal by the European Association of the Operational Research Societies.

Professor Stewart's dedication to teaching and learning at UCT was reflected in his enormous, enduring contribution, well beyond his retirement, to teaching the theory and practice of operational research. Along with graduating nine doctoral students and many more masters students, Prof. Stewart established the OR undergraduate and postgraduate teaching programme, including the MSc degree in OR in Development in 2005. He said "I believe that there is an important, even critical, role for decision analysis and OR in addressing many planning and development problems in South Africa, but we lack the people to do it".

His impact on teaching and development in OR at a postgraduate level in South Africa was further recognised through the naming of the Theodor Stewart Medal for best master's thesis by ORSSA. Colleagues who worked closely with Prof Stewart will remember him for his commitment to mentorship, with a unique ability to recognize and cultivate the strengths of those he officially and unofficially mentored. He loved an academic discussion and always had the time to impart his wisdom to all. While his passing presents an immeasurable loss to the Department of Statistical Sciences, his legacy lives on through the immensity of the meaning he imparted on the lives of those around him.

Emeritus Professor Stewart is survived by his wife Sheena; his children, Craig, Penny, Grant and Sylvia; seven grandchildren; as well as his extended family and friends.