

# IFORS

International Federation of Operational Research Societies

NEWS

## From the President

### IFORS: Looking Back and Forward

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We are approaching the end of the year, which makes us all think about the major events that took place in 2019. The professional and the personal ones, of course. Personally, I think about my first year as IFORS President and about what we have achieved in these months. I have worked closely with the Administrative Committee (AC) and together we have organized the work among us assigning responsibilities and each of us has started understanding the current situation, creating contacts, initiating activities and making plans for the future. The Developing Countries Committee, the IFORS Newsletter, the registration of IFORS as international organization in Switzerland, the revision of the IFORS website, the publications. I am grateful to the AC, a wonderfully diversified group of generous colleagues who represent our wonderfully diversified community, and I take the opportunity of this end-of-the-year editorial to express my gratitude to them, on behalf of us all.



About publications, a very important item of the IFORS portfolio of activities, I am glad to say I am, we are, proud of ITOR (International Transactions in Operational Research), the IFORS journal, which is doing amazingly well, with an impact factor which has been regularly increasing in the last few years and was 2.341 in 2018 (the impact factor for 2019 is not available yet), not far from that of the most prestigious journals of our community. ITOR has an experienced and committed editor-in-chief, Celso Ribeiro, and a strong editorial board. It is attracting an increasing number of submissions and the quality of the papers published in ITOR is excellent. The high level of quality reached by ITOR is indicated also by the fact that, for the first time next year, during the IFORS2020 in Seoul, prizes will be awarded to the authors of the best papers published in ITOR.

To summarize, 2019 has been a good year for IFORS and I am confident next year will be even better. In fact, 2020 is a very important year for IFORS as we will have in Seoul our triennial conference, the 22nd Conference of IFORS. This is the first IFORS conference to be held in Asia since the 15th conference in China 20 years ago. It is an exciting opportunity to bring together Operations Researchers from the field in Asia, where our discipline has experienced vigorous and rapid growth, and colleagues from all regions of the world. IFORS 2020 offers a unique opportunity to network with Operations Research analysts, industrial users of Operations Research, and academic and industry experts from all parts of the globe. The Program and the Local Organizing Committee are working hard to make this conference unforgettable. Let me remind the readers of this newsletter that the deadline for abstract submission is January 17, 2020. I encourage you to check the web site of the conference (<http://www.ifors2020.kr/>) for more information. I look forward to seeing you in Seoul.

Let me finally wish you and your families a great 2020, that I hope will fulfil all your wishes. 🌍

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### Editorial Box

## From the Editor

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

It is so wonderful to present the December issue of IFORS Newsletter -2019. Thanks to the whole IFORS team for giving me the responsibility of Editor-in-Chief of IFORS Newsletter from December issue 2019. I wish to extend lot of thanks to Luciana for her contributions to IFORS Newsletter as Editor-in-Chief until now and all other Editor-in- Chiefs in the past whose efforts and commitment made us stand here now.

This issue starts with message from IFORS president Grazia Speranza where she seems to be proud of the past performances while looking back and she is also very ambitious of the future activities of IFORS while looking ahead. The issue then brings you the sections on OR Impact with article "Automated Airport Staff Scheduling at Swissport International Ltd." and the article on "Solving Integer Optimization Problems with ZIMPL and SCIP" in Tutorial section. Both the articles show the applicability of OR models in real life situations. We have a call for papers in OR for Development section. The feature on "WORAN: the Women in OR and Analytics Network" describes recently established new Special Interest Group (SIG): the Women in OR and Analytics Network (WORAN). Hans Ittman has brilliantly summarized the book (edited) "Essentials of Business Analytics – An Introduction to the Methodology and its Applications" on Book Review section. News on Summer School "Operational Research for Value-based Health Care" held at University of Lisbon, Portugal is inspiring. In the section of conferences held, we present the seven events in various cities of the world. This issue also brings you the obituary to an OR expert Shabbir Ahmed. We have a call for hosting IFORS 2026.

Wish you all Merry Christmas and Happy New Year 2020



## OR Impact

Articles demonstrating direct benefits from implementing OR studies

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## Automated Airport Staff Scheduling at Swissport International Ltd.

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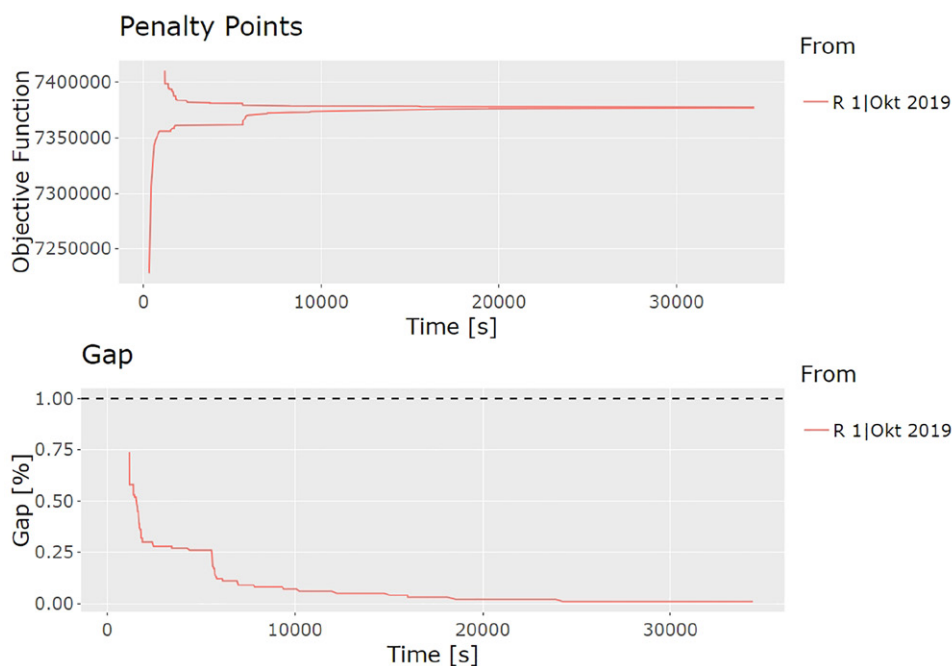


### Project Overview

Swissport International Ltd. is the world's leading provider of airport ground services and air cargo handling, with 66,000 employees and a consolidated operating revenue of 2.99 billion euros in 2018. Swissport provided ground services for some 282 million passengers in 2018, and handled roughly 4.8 million tons of air freight in 115 cargo warehouses worldwide. At the end of June 2019, Swissport was active at 310 airports in 49 countries, on behalf of some 850 aviation customers.

Airport ground handling involves a broad range of tasks, including passenger services like check-in, gate handling and transfer, and ramp services like baggage management, aircraft handling, and aircraft servicing and cleaning. Swissport employs at its main airports up to 2500 people with hundreds of different work skills and shift duties, and a multitude of contract types. Monthly staff planning is highly complex and expensive, and usually requires extensive manual work by specially trained personnel.

Swissport decided more than 10 years ago to start to try to optimize these sophisticated planning processes with the help of an appropriate software solution. Evaluation of the commercially available staff rostering tools showed that no software was able to satisfactorily solve the complex large-scale planning problems at Swissport.



In 2007, Swissport launched a strategic R&D cooperation with the Zurich University of Applied Sciences Institute of Data Analysis and Process Design (IDP), with the aim of developing innovative high-performance software for automated staff rostering that is capable of solving Swissport’s challenging planning problems. In addition, the tool needed to be sufficiently general and flexible to be usable in other companies and industries with complex rostering problems.

This collaboration, called Auto-Roster, started as a Swiss national research project and has continued as a strategic long-term cooperation between ZHAW and Swissport, with an aim to continually adapt, extend, improve and deploy the developed optimization tool.

### Employee Scheduling

This generally comprises three main phases: (1) task generation and shift construction, (2) rostering, (3) real-time dispatching. Phase 1 includes demand modeling, task generation, shift design, and demand covering. Phase 2 is the main rostering phase where daily shifts are assigned to individual employees. It consists of the days-off planning and shift assignment tasks, and generates a detailed monthly staff schedule which is communicated to the employees several days before execution. Phase 3 deals with the real-time planning and control tasks on the day of operational execution.

The Auto-Roster project mainly focuses on Phase 2 which represents the most complex, expensive and sensitive planning task at Swissport. The amount of work involved in rostering at Swissport can be illustrated with reference to the initial situation at Zurich Airport, the pilot site for the project. At project start, the rostering department comprised 20 planners who worked almost exclusively on rostering the over 2000 employees at Zurich Airport which corresponds to around 400 working days per monthly plan.

Major innovations and challenges for the Auto-Roster software came from a dynamic, demand-driven planning policy which does not rely on repetitive shift patterns rolled out over a long-term horizon, and from a rostering approach which attributes high importance to individual employee preferences. Human

planners typically achieved a 95% wish fulfillment rate, and it was imperative that an automated solution also met this rate.

### Methodology

In contrast to most commercial rostering tools, which are generally based on stochastic search metaheuristics, Auto-Roster relies significantly on Mixed Integer Linear Programming (MIP), combined with various other optimization techniques, including decomposition and relaxation, pre- and post-processing, and a variety of heuristic procedures.

Approaching large-scale real-world rostering problems by MIP techniques is innovative and challenging, since computation times are typically far beyond any acceptable limits. Developing “good” MIP formulations to reduce solver computation times was one of the most important and challenging parts of the Auto-Roster project, and required deep knowledge in combinatorial optimization, polyhedral combinatorics, and graph theory. The project was several times close to failing due to intractable MIP models and could only be continued thanks to mathematical breakthroughs leading to powerful new MIP formulations

Other major challenges came from feasibility issues, since most real-world planning instances at Swissport are infeasible at first. Finding and explaining infeasibilities is intrinsically complex, and a variety of algorithmic approaches had to be developed to master these issues.

The current Auto-Roster optimization engine (without front- and back-end) comprises some 25,000 lines of MIP code and 30,000 lines of Java code. The largest MIP instances contain around 1 million integer variables and 0.5 million constraints, and can typically be solved within 20 - 70 hours with relative MIP optimality gap  $\ll 0.5\%$ . The relative MIP optimality gap corresponds to the percentage deviation of the best objective function value found so far from the best objective bound resulting from the Branch-and-Cut MIP solver process. For an illustration, see Fig.1, which shows the convergence of the decreasing objective function curve (measured in penalty points associated to the current solution) and the increasing objective lower bound, together with the associated MIP gap.



## Implementation

The Auto-Roster software is fully implemented and in operational use at all three major airports in Switzerland, namely Zurich, Geneva and Basel. Other airports in Europe are currently preparing for deployment, and the roll-out is being continuously expanded. Zurich Airport is one of Swissport's most complex airports in terms of staff rostering, and operational implementation of the software in the various planning units took several years.

Currently, a total of 57 internal customers are using Auto-Roster. Since planning units often have different policies regarding their rostering processes, software roll-out is generally challenging and laborious. A detailed understanding of the business needs and a close cooperation with the involved planners and employees is indispensable.

The preparatory work for the introduction of the Auto-Roster software generally includes a comprehensive analysis and cleanup of the existing planning processes and data situation. Along with the implementation, all associated business processes must be thoroughly redesigned or adapted, and the personnel involved must be carefully re-trained.

Years of experience with the Auto-Roster deployment have shown that, after a demanding transition period of a few months, customers generally express great satisfaction and trust in the software, fully align their planning processes with it, and report on substantial operational and financial benefits.

## Business Impact

Auto-Roster has become one of Swissport's most important operational planning instruments. At the strategic level, top management decided that the software should be rolled out further to other stations within Europe. In addition, the process optimizations developed in connection with Auto-Roster should be transferred to other stations as best practices.

A recent comprehensive study of the personnel planning processes at all Swissport stations in Switzerland, carried out by an external consulting company, concluded that Auto-Roster is of central importance for Swissport and has a significant business impact. The study also emphasized that the tool is indispensable in the current planning environment, and there are hardly any alternative tools with similar functionality, performance, and flexibility.

The Auto-Roster software generates considerable financial savings for Swissport. Part of the financial impact can be quantified by comparing the rostering department's post-implementation workload with the original workload.>> Planning effort can often be reduced by up to half, and associated personnel costs are reduced accordingly. At the three Swissport stations in Switzerland, the annual savings from rostering effort reduction alone amount to around \$1



million.

Besides reduced planning expenses, Auto-Roster has numerous other impacts that also bring substantial operational and financial benefits, including the following:

- Shift scheme optimization (phase 1), based on Auto-Roster's sophisticated rough-cut planning capabilities, eliminates wasted shift times and reduces operational personnel costs.
- New employment contract models can be evaluated and optimized by means of rough-cut algorithms.
- Proactive optimization of employee and contract mix improves alignment of demand and supply.
- Improved roster quality, fairness, and robustness.
- A broad range of options for defining personal preferences, wishes, and lifestyles allows employees to design their individual work plans in great detail.
- A very high and stable wish fulfillment rate of 95 - 100% leads to high employee satisfaction.
- Shorter planning processes allow roster releases closer to execution, reducing time and cost effort for intermediate adaptations.
- Standardization and maintenance of informal planner know-how reduces dependence from individual planners.
- Possibility to implement innovative rostering approaches such as shift bidding.

## Challenges

Various managerial, technical and operational challenges had to be overcome during the 12-year cooperation. We mention the following:

- As a non-standard, long-term, costly, complex, and risky R&D project, this collaboration required strong commitment, confidence, courage, patience and personal trust from all stakeholders including Swissport's top management.
- A multitude of constraints from industrial regulations, labor contracts and workplace agreements had to be implemented, taking into account regional and group specific differences and ever-changing operational conditions and requirements specifications.
- Detailed modelling of employee preferences was difficult and required the study of hundreds of informal employee files and notes to understand and formalize individual wishes.
- Computational performance is an ongoing challenge, since current computation times are at the limit of the strictly defined operational deadlines. Improvements typically require deep mathematical and algorithmic research.

## Further Business Opportunities

The Auto-Roster software can easily be transferred to other customers and industries, since business rules, mathematical models, and algorithms are designed on a generic abstraction level. This opens up a variety of new business opportunities for the profitable application of the Auto-Roster tool. 🌐

# Solving Integer Optimization Problems with ZIMPL and SCIP

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## 1 The SCIP Optimization Suite

The SCIP Optimization Suite consists of five integrated programs designed to model and solve a large variety of mathematical optimization problems:

- the modeling language Zimpl [Koc04]
- the simplex-based linear programming solver SoPlex [Wun96]
- the constraint integer programming solver SCIP [Ach09], which can be used as a fast standalone solver for mixed-integer linear and nonlinear programs and a flexible branch-cut-and-price framework,
- the automatic decomposition solver GCG [GL10]
- the UG framework for parallelization of branch-and-bound solvers [Shi18].

The whole suite is free to use for non-profit academic research under the ZIB ACADEMIC LICENSE and can be downloaded in source code at <https://scip.zib.de>. It comes with several extensions for more problem-specific classes such as the award-winning Steiner tree solver SCIP-Jack [GKM+17] or the mixed-integer semidefinite programming solver SCIP-SDP [GPU18].

This tutorial shows how to model and solve a *single-source capacitated facility location problem* using ZIMPL and SCIP.

## 2 The Facility Location Problem

Optimal Facility location problems (FLP) are well-known in operations research, see, e.g., [Aik85, BC89]. The question is to locate a set of facilities or resources, to minimize the cost of satisfying a set of demands.

Here, we will focus on the *single source capacitated FLP* (SSCFLP) [DJ93], as follows:

$$\begin{aligned}
 & \min \sum_{j \in J} f_j y_j + \sum_{i \in I, j \in J} c_{ji} x_{ji} \\
 \text{s.t.} \quad & \sum_{j \in J} x_{ji} = 1 && \text{for all } i \in I \\
 & \sum_{i \in I} d_i x_{ji} \leq s_j y_j && \text{for all } j \in J \\
 & (x, y) \in \{0, 1\}^{|J \times I|} \times \{0, 1\}^{|J|}
 \end{aligned} \tag{SSCFLP}$$

$I$  and  $J$  denote the index sets of costumers and facilities. Every facility  $j \in J$  has opening costs  $f_j$  and an assigned binary variable  $y_j$  indicating whether the facilities is open ( $y_j = 1$ ) or closed ( $y_j = 0$ ). To every costumer  $i \in I$ ,  $|J|$  binary variables  $x_{ji}$  are assigned, indicating whether costumer  $i$  is assigned to facility  $j$  ( $x_{ji} = 1$ ). In SSCFLP, every costumer has to be served by exactly one facility. Every costumer requests a demand  $d_i$  and every facility provides a capacity  $s_j$ . Thus, the sum of satisfiable demands of all costumers connected to a facility  $j$  is bounded by  $s_j y_j$ . The objective is to minimize the opening costs for all facility  $f_j$  and the costs  $c_{ji}$  for linking a facility  $j$  to a costumers  $i$ .

## 3 Building the ZIMPL Model

First we have to translate the mathematical model (SSCFLP) into a format that SCIP can read. You can find example data-files at <https://github.com/GregorCH/scipoptsuite-tutorial>. They are based on the OR library [oB] data set used by [GS14]. There are 36 instances, ranging from 16 to 100 facilities and 50 to 1,000 customers. Each instance is described in one file (extension .dat), with the following format:

- the first line contains the number  $|J|$  of facilities and  $|I|$  of customers
- the next  $|J|$  lines contain, for each facility  $j \in J$ , the index  $j$  itself, the cost coefficient  $f_j$  to open  $j$  and its supply  $s_j$ .
- the next  $|I|$  lines list the demand of each customer  $i \in I$ , one per line.
- the remaining  $|I| \times |J|$  lines list the costs  $c_{ji}$  to link facility  $j$  to customer  $i$ .

The task is to write a ZIMPL file that combines the data source and the mathematical model.

We start by opening a file `sscflp.zpl` with a text editor. ZIMPL uses the intuitive notions of “sets” and “parameter(s)” to refer to given data of an instance. The naming of the individual parameters is close to the mathematical model (SSCFLP).

Listing 1: Reading input data with ZIMPL

```
param datafile := "cap61.dat";
param NJ := read datafile as "1n" use 1;
param NI := read datafile as "2n" use 1;

set J := { 1 .. NJ };
set I := { 1 .. NI };
```

The first param is the name of the data file that we want to process. This parameter is used in all subsequent data processing step, with the advantage that the ZIMPL model can be reused for the other data files by changing only this datafile parameter or even just giving it on the command line. The next two lines contain the statements to read the number of facilities and customers into ZIMPL parameters NJ and NI, respectively. Here, the command `use 1` specifies how many lines of the data file should be read in, in this case, only the first line. Finally, we use those two parameters to declare two sets J and I, which we use as index sets for remaining data to be read in.

Listing 2: Reading input data with ZIMPL continued

```
param s[J] := read datafile as "<1n> 2n" skip 1 use NJ;
param f[J] := read datafile as "<1n> 3n" skip 1 use NJ;

param d[I] := read datafile as "<1n> 2n" skip 1 + NJ use NI;

param c[J * I] := read datafile as "<1n,2n> 3n" skip 1 + NJ + NI;
```

We parse the supply of each facility into a new ZIMPL parameter `s[J]` that is indexed over the set J of facilities. Note that the very first line of the data file does not contain facility information. Therefore, the read command is executed with the `skip 1` statement, which tells ZIMPL to skip the first line, followed by another `use` statement. Similar read directives are used to declare the opening costs `f[J]` per facility, the demand `d[I]` per customer, and the connection costs `c[J * I]`. Note that this parameter can be conveniently declared over the cross-product of the two individual sets of facilities and customers, to denote all possible combinations of facilities and customers.

The second part of `sscflp.zpl` uses the data to build the corresponding instance of the mathematical model.

Listing 3: Model Declaration in `sscflp.zpl`

```
var x[J * I] binary;
var y[J] binary;

minimize cost: sum <j,i> in J * I : c[j,i] * x[j,i] + sum <j> in J : f[j] * y[j];
subto assign : forall <i> in I : sum <j> in J : x[j,i] == 1;

subto capacity : forall <j> in J : sum <i> in I : d[i] * x[j,i] <= s[j] * y[j];
```

First, binary variables `y[J]` are declared, which encode the decision which facility to open, and the decisions `x[J*I]` indexed by the cross-product `J*I` to connect customers and facilities. The next step is to express the objective function. In our case, we want the “cost” associated with opening and connecting facilities minimized. We express the opening and connection costs by summing over the sets of facilities and the product of facilities and customers. Finally, two types of constraints are declared by use of the `subto` keyword, followed by the (arbitrary) names `assign` and `capacity`. These names will appear as constraint name prefixes in the translated instance in LP format. Both declarations use a `forall` statement, which causes ZIMPL to create one constraint of type `assign` per customer in I and one constraint of type `capacity` per facility in J.

For this tutorial, we focus on the most basic instructions of ZIMPL for reading data and constructing mathematical optimization models. Please refer to the reference manual of ZIMPL at <https://zimpl.zib.de/download/zimpl.pdf> for a complete overview of key words, operators, and further examples of the ZIMPL modeling language. The example models of the reference manual are contained in the examples directory of the ZIMPL source code.

#### 4 Solution of the Model with SCIP

After the creation of our SSCFLP instance, we would like to know its optimal solution. To this end, we use SCIP, the Mixed Integer (Non-)linear Program solver of the SCIP Optimization Suite. By typing `scip` into the command line, we open its interactive shell. The welcome message includes version information for SCIP, SoPlex, and some external packages that SCIP has been compiled with.

Listing 4: SCIP welcome screen

```

SCIP version 6.0.2 [precision: 8 byte] [memory: block] [mode: optimized] [LP solver: SoPlex 4.0.2] [GitHash: e639a0059d]
Copyright (C) 2002-2019 Konrad-Zuse-Zentrum fuer Informationstechnik Berlin (ZIB)

External codes:
Readline 7.0      GNU library for command line editing (gnu.org/s/readline)
SoPlex 4.0.2     Linear Programming Solver developed at Zuse Institute Berlin (soplex.zib.de) [GitHash: b8833cd3]
CppAD 20180000.0 Algorithmic Differentiation of C++ algorithms developed by B. Bell (www.coin-or.org/CppAD)
ZLIB 1.2.11      General purpose compression library by J. Gailly and M. Adler (zlib.net)
GMP 6.1.2        GNU Multiple Precision Arithmetic Library developed by T. Granlund (gmplib.org)
ZIMPL 3.3.9      Zuse Institute Mathematical Programming Language developed by T. Koch (zimpl.zib.de)
    
```

SCIP can directly read ZIMPL files, so there is actually no need to run ZIMPL itself. First, we need to specify the input data of our problem instance, e.g., cap61.dat, by specifying a parameter as we would do if run ZIMPL itself.

Listing 5: SCIP set ZIMPL input

```

SCIP> set reading zplreader parameters "-D datafile=cap61.dat"
    
```

Afterwards, we use the read command followed by the file name of our ZIMPL file.

Listing 6: SCIP read command

```

SCIP> read sscflp.zpl

read problem <sscflp.zpl>
=====

original problem has 816 variables (0 bin, 816 int, 0 impl, 0 cont) and 66 constraints
    
```

SCIP displays the number of variables and the number of constraints of this problem instance. In order to solve the instance, we execute the optimize command.

Listing 7: SCIP optimize command

```

SCIP> optimize

presolving:
(round 1, fast) 1 del vars, 0 del conss, ... 0 upgd conss, 0 impls, 162 clqs
(round 2, exhaustive) 1 del vars, 0 del conss, ... 66 upgd conss, 0 impls, 162 clqs
(0.0s) probing: 51/815 (6.3%) - 0 fixings, 0 aggregations, 0 implications, 0 bound changes
(0.0s) probing aborted: 50/50 successive totally useless probings
presolving (3 rounds: 3 fast, 2 medium, 2 exhaustive):
1 deleted vars, 0 deleted constraints, 0 added constraints, 0 tightened bounds ...

0 implications, 882 cliques
presolved problem has 815 variables (815 bin, 0 int, 0 impl, 0 cont) and 66 constraints
 16 constraints of type <knapsack>
 50 constraints of type <setppc>
transformed objective value is always integral (scale: 0.0125) Presolving Time: 0.03

time | node | left | LP iter | ... | dualbound | primalbound | gap
Q 0.0s | 1 | 0 | 0 | ... | 0.000000e+00 | 9.504702e+05 | Inf
0.1s | 1 | 0 | 106 | ... | 8.655387e+05 | 9.504702e+05 | 9.81%
s 0.1s | 1 | 0 | 106 | ... | 8.655387e+05 | 9.459285e+05 | 9.29%
.....
u 0.1s| 1 | 0 | 165 |...| 9.326158e+05 | 9.326158e+05 | 0.00%
0.1s| 1 | 0 | 165 |...| 9.326158e+05 | 9.326158e+05 | 0.00%

SCIP Status      : problem is solved [optimal solution found]
Solving Time (sec) : 0.08
Solving Nodes    : 1
Primal Bound     : +9.326157500000000e+05 (5 solutions)
Dual Bound      : +9.326157500000000e+05
Gap              : 0.00 %
    
```



The solution process returns with an optimal solution for our problem instance after a fraction of a second. Let's have a closer look at the output to understand how SCIP solves the problem to optimality. SCIP always starts by presolving with the goal to derive a more compact and solvable formulation of the input model.

After presolving, the solution process continues with the actual branch-and-cut search. A periodic output informs about the effects of the different algorithmic components. The column primalbound displays the objective value of the currently best known solution. The first solution is found at the very top of the output, followed by another two improving solutions. The column dualbound keeps track of the global lower bound. In the first row of the output, the trivial lower bound of 0.0 is displayed, which is immediately tightened by the initial LP relaxation. In the subsequent steps, the dual bound is tightened further through the separation of cutting planes, whose number is displayed in the column cuts.

In this example, primal and dual bounds quickly converge. SCIP does not even need to start branching to solve this instance.

A non-exhaustive list of further important commands are

- the `help` command to display the available options
  - the `display ...` menu to display various problem information and solving statistics
  - the `write ...` command to save the best solution in a file
  - the `set` command to enter the parameter settings menu
- The SCIP interactive shell is closed by the `quit` command.

**Remarks:** For a detailed description of the main branch-and-cut algorithm used by SCIP see [Ach07]. SCIP is constantly improved and extended by new components. For an overview of the recent algorithmic enhancements see [GBE+18].

In order to learn more about the different compilation options, please visit our online documentation <https://scip.zib.de/doc/html>.

## 5 Outlook

This was only a small glimpse of what the SCIP Optimization Suite can do. It is a great framework for specialized models and algorithms with bindings for C, C++, GAMS, AMPL, Python, Java, and Julia. Give it a try!

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# CALL FOR SUBMISSIONS

IFORS is pleased to announce that this long-standing Prize will be awarded again during its 22nd triennial conference in Seoul, Korea, on 21-26 June 2020. The winner will receive a grand prize of US\$4,000 and the runner-up a prize of US\$2,000. The competition aims at promoting the practice of OR in developing countries. Past winners and finalists include works that have improved health, wellness, education, public investments and other issues in Africa, Asia and Latin America.

Note the submission process has been simplified with respect to previous years. It will consist of two stages, where the first requires a short summary – more details given below.

## First Stage

Entries should be submitted by email to the Chair of Judges by 1st October 2019. Each entry should comprise a maximum 5 page summary of the work specifying title, authors and affiliations, and including the following sections: (i) Context/Problem description; (ii) Methodology/Solution approach; (iii) Results/Impact; (iv) Timeline (when the project started, when the solution was implemented, how long it has been used, eventual future plans); (v) Involvement of local researchers (specifying the geographical region of the application if it has not been specified in previous sections); (vi) Others, if the authors would like to highlight something else, and a list of References if citations have been used through the text.

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

It is expected that, to a large extent, the work must have been conducted after 18th December 2016 (deadline of the previous competition).

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

## Initial Evaluation

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

## Second Stage

Entrants who are successful in the Initial evaluation will be invited to submit, by 18th December 2019, a full-length manuscript of up to 25 pages describing their work in

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

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

## Selection of Finalists

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

## Final Stage

Finalists will present their work in a special session of the competition at the IFORS Triennial conference (Seoul, Korea, June 21-26, 2020). The winner and runner-up will be selected based on the previous stages and their oral presentation. At least one author of each finalist team is expected to attend the IFORS conference banquet to receive their prizes.

## Dissemination

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

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

### Mario Guajardo

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

## Important Dates


Submission deadline summary (first stage):

October 1, 2019

Submission deadline full paper (second stage):

December 18, 2019

Finalists will be notified by: January 31, 2020

Date of oral presentation: June 22, 2020 



# WORAN: the Women in OR and Analytics Network

**Dr Annunziata Esposito Amideo**, Lecturer in Business Analytics  
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<https://people.ucd.ie/annunziata.espositoamideo>

The Operational Research Society (ORS) has recently established a new Special Interest Group (SIG): the Women in OR and Analytics Network (WORAN). The aim of this group is to set up a strong, self-supporting network targeted at the future as well as the current generation of women in OR with better conditions within both academia and industry. But what is the rationale underpinning the establishment of such a network within the ORS?

MSc dissertations in OR and Analytics from LSE, Cardiff and Loughborough looked at both males and females within the OR environment, both in academia and industry, which reported the work/life conflict, how being a woman within this field can affect career progression as well as ultimately reaching senior positions. One of the recommendations was to build a network: a first meeting took place in Lancaster during the 2018 ORS conference, celebrating the 60th anniversary of the OR Society. This has been followed by the establishment of the WORAN committee. The committee is currently composed of Dr Frances O'Brien (Chair of WORAN, Associate Professor in OR at Warwick Business School), Dr Annunziata Esposito-Amideo (Secretary of WORAN, Lecturer in Business Analytics at UCD Quinn School of Business), Dr Kathy Kotiadis (Reader in OR at Kent Business School), Dr Nadia Papamichail (Senior Lecturer in Information and Decisions Systems at Alliance Manchester Business School) and Gillian Groom (Technical Training Specialist at Minitab). Ruth Kauffman OBE (previous President of the ORS and currently chair of the EURO Working Group on



OR in Practice) acts as adviser for WORAN. This highlights a certain diversification within the committee given that members are affiliated either with academia or industry and that they are at different stages of their careers. This is the diversity that WORAN aims to celebrate (new members are welcome, men included!).

The WORAN committee is now in the process of planning several activities to be established (e.g., mentoring), recruiting new members and looks forward to the next event scheduled close to International Women's Day. The event will take place in London on March 16th, 2020 (details to follow) with one guest speaker confirmed to date: Professor Julia Buckingham CBE, Vice-Chancellor and President of Brunel University London and Chair of the Athena SWAN Review Steering Committee. Please watch this space for further updates: <https://www.theorsociety.com/who-we-are/society-groups/special-interest-groups-and-networks/women-in-or-analytics-network/> and get in touch with the committee members if you want to know more about WORAN and join this initiative! 🌐

## Book Review

### Essentials of Business Analytics – An Introduction to the Methodology and its Applications

**Hans W. Ittmann** <[hittmann01@gmail.com](mailto:hittmann01@gmail.com)>

**Essentials of Business Analytics – An Introduction to the Methodology and its Applications** by B Pochiraju and S Seshadri (Editors), 2019, Springer, pp. 980, ISBN 978-3-319-68836-7, ISBN 978-3-319-68837-4 (eBook), 89.99 Euro (Hardcover), 74.96 (eBook).

One of the major trends over the last number of years that affects organizations in every sector of the economy is the need to move towards more accurate, data-driven insight to achieve effective decision making. Data now have the power to help businesses succeed, however, this can only be achieved through appropriate and proper analysis. Business analytics is no longer a buzzword but an essential capability that provide the necessary means for such analysis. It draws on tools such as operations research, statistics, machine learning, data management and data visualization.

The main objective of **Essentials of Business Analytics**,

as stated by the editors, is threefold namely:

- to fill the void in the graduate-level study materials for addressing business problems in order to pose data questions;
- obtain optimal business solutions via analytics theory; and
- ground the solution in practice.

The book consists of three, almost equal length, sections or parts. Part 1 focusses on Tools while Modelling Methods is the essence of Part 2 and Part 3 contains advanced Applications as well as several case studies.



The first four chapters in Part 1 address all aspects of data, namely, the collecting of data, and issues related to this, data management with specific emphasis on relational database systems, big data management as well as data visualization. In all chapters, and that is the case throughout all chapters in the book, examples and applications are used to illustrate the concepts covered in the specific chapter with online appendices where applicable. For operations researchers these few chapters are of immense importance and very useful since the emphasis in their studies is typically on quantitative techniques and methods, and not so much on data aspects.

The following three chapters in Part 1 are devoted to statistical analysis of data. The statistical methods that are introduced are basic inference, regression analysis and advanced regression analysis. The statistical methodology covered in these chapters are comprehensive. What is very useful are the exercises at the end of each chapter, the references provided as well as the frequently asked questions (FAQs). Furthermore, in each chapter, reference is made to software, typically used in industry, for analysis purposes and these are used in the examples for illustrative purposes. The major software tools used are R, Python, MS Excel, and MYSQL. A final chapter in Part 1 focusses on text analytics.

Simulation and optimization are the two classical OR methods that constitute the subject matter in the first two chapters in Part 2. The concept of simulation is introduced, and this is enhanced to how simulation is used for decision making under uncertainty. The optimization methods covered are linear programming, integer programming and non-linear programming. Various aspects related to using these methods are presented as well as how to use Excel Solver for solving real life problems. Forecasting Analytics is the topic of the third chapter of Part 2. Here again various methods such as exponential smoothing, trend and seasonality and time series are presented and discussed. Ample use is made of examples in each case. The next two chapters in Part 2 cover topics not that familiar to operations researchers, these are Count Data Regression and Survival Analysis.

Machine learning, unsupervised and supervised, is the subject of chapters 15 and 16 in Part 2 respectively. This field has evolved over the last several decades but has become much more prominent recently. A large collection of modelling paradigms—including the unsupervised learning paradigm and the supervised learning paradigm, are discussed in these two chapters. For unsupervised machine learning, methods of projection, clustering, density estimation, itemset mining, and network analysis are covered. Supervised machine learning algorithms can apply what has been learned in the past to new data using labeled examples to predict future events. Again, ample use is made of examples, with the corresponding code showing how the problems are addressed, while exercises are provided at the end of the chapter, as is the case for all chapters.

Deep learning, a rapidly growing area of machine learning, is outlined in the last chapter of Part 2. The aim is to provide an understanding of the concept, discuss various popular deep learning architectures, and provide guidance on how to perform image analysis and text analysis using deep learning.

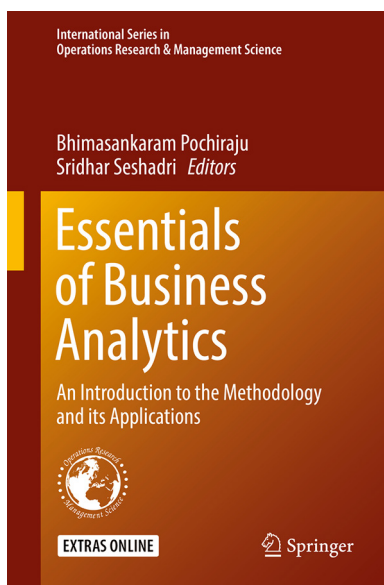
In Part 3 a chapter is devoted to each of the following applications: retail analytics, marketing analytics, financial analytics, social media and web analytics, healthcare analytics, pricing analytics and supply chain analytics. Each of these applications are outlined in detail and various aspects are described in a way which familiarizes one with the application area. Detail on how the tools and modelling methods can be used and applied for each of the applications are outlined. Three case studies from the insurance, airline and media industries respectively are presented. All three provide great insight into how the theory covered in the book can be used for effective and improved decision making.

The final chapters provide an introduction to R and Python, both programming languages, as well as Probability and Statistics. All three of these are extensively used in the examples provided throughout the book.

Apart from the two editors there are a total of 24 collaborators. What is noticeable is that most of these collaborators, as well as the editors, are from institutions in India. It could create the impression that the book is only intended for an Indian audience. This is certainly not the case, academics and practitioners world-wide will find this an excellent textbook while it can serve as a self-study guide for professionals who wish to enhance their knowledge about the field.

Data scientists, statisticians and operations researcher will find this book of value. However, the exposure to OR methods and techniques is limited. For anyone that wants to enhance their knowledge of OR and pursue a career in OR this book is only a start giving valuable understanding and insight into all aspect of data as well as the basics of probability and statistics. However, textbooks covering more advanced OR techniques will be required for those interested.

The **Essentials of Business Analytics** covers a massive amount of material, both in breath and in depth. It is impossible to do justice in a short book review to the material that is the subject of this book. What stands out in all the various chapters is how concepts are introduced in a relatively simplistic way, built upon, enhanced and in a logical manner taken to a more advanced level with increased complexity. As indicated above the book can serve as a comprehensive textbook for graduate students as well as for practitioners. In this regard it is a very useful source, and guide, for brushing up one's know-how of a specific topic or to learn something new. This book is a timely and welcome addition to the growing literature on business analytics. 🌐





## EURO PhD Summer School

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

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▲ Gathering of participants in sunny Lisbon.

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

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

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

The scientific program was set to have an intense program made up of a variety of learning activities, including theory and methods, case studies, software tutorials, experiments and games. Each day was devoted to a different topic with a prestigious internationally known expert. Participants learnt about the current health challenges and the different methodological approaches from **Sally Brailsford** (University of Southampton); >>



>> about how to measure value in health and enable participation from **Carlos Bana e Costa** (University of Lisbon); about implementing simulation in a variety of settings from **Erwin Hans** (University of Twente); about mathematical programming and resource allocation modelling from **Alec Morton** (University of Strathclyde); and finally, **Martin Utley** (University College London) shared his experience in solving real cases by combining different methodologies.

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

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

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



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

The school attracted a broad attention from the community with 45 applications and 32 students accepted. This was a highly international and diverse group, composed of participants from 20 nationalities and located in universities from 14 countries. Participants had the chance of advancing their knowledge of OR, interact with world experts in the field, discuss openly several topics related to health care, and they created a research network of future scholars, planting the seeds from which groundbreaking scientific work may one day stem. Finally, 27 out of the 32 school participants replied to an anonymous survey carried out to collect feedback about the school. The following three key messages were obtained:

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



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

gap with practice by involving and collaborating with health stakeholders and experts, which will help shaping more impactful research. 🌐



## Uncertain Analysis Meets Operational Research – 40 Years of Grey System Analysis Celebrated in Bangkok

**Joanna Majchrzak** <joanna.majchrzak@put.poznan.pl>, **Ewa Więcek-Janka** <ewa.wiecek-janka@put.poznan.pl>, **Rafał Mierzwiak** <rafal.mierzwiak@put.poznan.pl>, **Arkadiusz Borowiec** <arkadiusz.borowiec@put.poznan.pl>



▲ Participants of the 2019 International Congress of GSUA, among them: Professors Sifeng Liu, Yingjie Yang, Zhuo Zhang, Ying Wang, Yicha Zhang, Wenping Wang, Ling Xiao, Rafał Mierzwiak, Tao Liu, Naiming Xie, Yuhong Wang, R.M.Kapila Tharanga Rathnayaka, Chaoqing Yuan, and Ehsan Javanmardi.

The 2019 International Congress of GSUA was held in Bangkok, Thailand, in August 8-11. It focused on current research on grey system theory, system sciences and engineering, rapidly advancing technologies in uncertainty analysis, complex equipment development, management emergency and innovation.

Grey System Theory was developed during the past 40 years. More specifically, in 1982, Professor Deng Ju-Long (Huazhong Institute of Technology, Wuhan, China) published the first research paper, titled "Control Problems of Grey Systems", in the international journal *Systems and Control Letters*, of North-Holland Co. The theory of grey systems has been widely applied to analyses, modeling, prediction, decision making and control, with significant contributions to various systems including, e.g., social, economic, scientific and technological, agricultural, industrial, transportation, mechanical, petrological, meteorological, ecological, hydrological, geological, financial, medical, legal and military ones.

The 2019 International Congress of GSUA was opened by the welcome speeches of Professor Sifeng Liu and Professor Zhuo Zhang.

Professor Sifeng Liu has been devoted to the research of grey system theory for more than 30 years. In 1980s, he put forward a series of new models and new concepts of grey systems, such as sequence operator (Liu et al., 1986), absolute degree of grey incidence (Liu et al., 1988), and the positioned coefficient of grey number (Liu et al., 1989). Then, in the 1990s, he proposed the so-called buffer operator and its axiom

system (Liu et al., 1991), generalized degree of grey incidence (Liu et al., 1992), grey clustering evaluation model with fixed weight (Liu et al., 1993), the measurement of information content of grey number (Liu et al., 1994), LGPG drifting and positioning solution (Liu et al., 1997), grey-econometrics model (Liu et al., 1996), etc. All of these achievements earned him a great attention and recognition by domestic and foreign counterparts; some results were specially introduced in many experts' monographs (cf. *Sifeng Liu, Yingjie Yang, Naiming Xie and Chaoqing Yuan, Institute for Grey System Studies at NUAA, The Journal of Grey System, vol. 30, no. 2, 2018*).

The 2019 International Congress of GSUA was organized by Institute for Grey Systems Studies (NUAA), College of Economics and Management (NUAA: [www.nuaa.edu.cn](http://www.nuaa.edu.cn)) and Huawei Technologies (Thailand), CO., LTD. International Association of Grey System and Uncertain Analysis (IAGSUA), Grey System Society of China (GSSC) and CSOPEM, supported by China Association of Science and Technology, co-sponsored the 2019 International Congress of GSUA. International Association of Grey System and Uncertain Analysis (IAGSUA: [www.iagsua.org](http://www.iagsua.org)) is a worldwide, non-political organization for spreading the ideas and knowledge, and promoting the application of Grey Systems. The congress gathered researchers to present current research findings and practical experiences from the wide community which is now involved in Grey Systems Theory and Applications, Uncertain Systems, Systems Analysis, Modeling and Simulation, Data Mining, Forecasting and Decision-making, Complex Equipment Development Management, Emergency Management, Technical Innovation and Emerging Industry Development, etc. >>




>> The 2019 International Congress of GSUA was hosted by Nanjing University of Aeronautics and Astronautics (NUAA) and Huawei Technologies (Thailand), CO., LTD.

Topics which were considered during the congress included, but were not limited to: System Analysis, Data Mining and Processing, Grey Systems Modeling and Simulation, Grey Forecasting and Decision Making, Grey Control, Grey System Theory and Applications, Grey Numbers and their Operations, Grey Equations and Grey Matrixes, Sequence Operators and Grey Data Mining, Grey Incidence Analysis Models, Grey Clustering Evaluation Models, Grey Programming, Grey Input-output, Grey Matrix Game Models, Uncertain Systems, Practical Applications of Grey Methods, Artificial Intelligence, Industrial Engineering, Complex Equipment Development Management, Quality and Reliability Management, Cost Management, Risk Management, Project Schedule Management, Supplier Management, Marketing Strategy, Business Process Management and ReEngineering, Emergency Management, Technical Innovation and Emerging Industry Development.

The keynote speeches were delivered by scientists such as Yingjie Yang, Yicha Zhang, Ling Xiao, Rafał Mierzwia, Ying Wang, Tao Liu, Wenping Wang, Naiming Xie, Yuhong Wang, R.M. Kapila Tharanga Rathnayaka, Chaoqing Yuan and Ehsan Javanmardi. The topics focused on the progress in grey systems theory and its application, challenges and significant contributions to general system theory. The speeches of Professor Yingjie Yang (Centre for Computational Intelligence, De Montfort University, Leicester, Leicestershire, UK) and Professor Naiming Xie (Nanjing University of Aeronautics & Astronautics, College of Economics and Management, Nanjing,

China) especially focused on the scientific background for appearance of grey systems theory, characteristics of grey system, comparison of several uncertain systems models and challenges for its further theoretical development and progress in its application.

During the 2019 International Congress of GSUA, plenary lectures took place, opening several fruitful discussions. International Association of Grey System and Uncertainty Analysis (GSUA) awarded the best PhD dissertation in Grey System and Uncertainty Analysis. The winners, namely, Junjie Wang (supervisor: Yaoguo Dang, Nanjing University of Aeronautics and Astronautics, China), Liangyan Tao (supervisor: Sifeng Liu, Nanjing University of Aeronautics and Astronautics), Rafał Mierzwia (supervisors: Władysław Mantura and Ewa Wiecek-Janka, Poznań University of Technology, Poland), >> received a Certificate of recognition by the 2019 Congress of GSUA, and a publication of the abstract in the site Grey Systems Theory and Application (GS: <http://www.iagsua.org/phd-dissertation-award-of-gsua/>). Furthermore, Best Papers of the 2019 International Congress of GSUA were distinguished and announced during the closing ceremony. More and more, approaches, models and techniques based on the grey number analysis are applied in Operational Research, Optimization and Information Science, where they constitute a crucial objective scope for the grey system theory community.

We are looking forward to the next event organized by International Association of Grey System and Uncertainty Analysis. If you are interested in the upcoming events organized by that association, please follow the announcements at its website ([www.iagsua.org](http://www.iagsua.org)). 

## InteriOR-2019: Cheerful OR with the Youth in Medan, Indonesia – 10 Years at the Side of EURO and IFORS Conference Communities

**Herman Mawengkang** <[hmawengkang@yahoo.com](mailto:hmawengkang@yahoo.com)>; **Saib Suwilo** <[saibwilo@gmail.com](mailto:saibwilo@gmail.com)>;  
**Burcu Gürbüz** <[burcu.gurbuz@uskudar.edu.tr](mailto:burcu.gurbuz@uskudar.edu.tr)>

"The 5th International Conference on Operational Research 2019" (*InteriOR-2019*) was held at August 20-23, 2019, at Grand Mercure Medan Angkasa Hotel, in Medan, North Sumatra, Indonesia (<https://indoms-acehsumut.org/the-5-th-international-seminar-on-operational-research-interior-2019/>). The congress of *InteriOR-2019* was jointly organized by the Department of Mathematics Universitas Sumatera Utara, the Indonesian Mathematical Society (IndoMS) Sumatera Utara and Aceh Region and the Indonesian Operations Research Association (IORA) (<https://indoms-acehsumut.org/the-5-th-international-seminar-on-operational-research-interior-2019/>). The conference consisted of about 100 contributions, and it became a Festival of Science, of Colors and of Hospitality!

The opening ceremony was started by ringing a gong which is a traditional method to illustrate commence of an important event in Indonesia. The opening speeches were made by committee members to welcome all the participants and to give a brief introduction to *InteriOR-2019*. Then the ceremony was featured by a

traditional folkdance show in Grand Mercure Medan Angkasa Hotel. The theme of *InteriOR-2019* was "Better Living with Operations Research", providing an opportunity for attendees to discuss about trend topics in wide application areas of OR studies, to exchange ideas and extend their knowledge about new advances in theories and practices of mathematics and, in particular, Operational Research.

Keynote speakers included **Tutut Herawan** (University of Malaya, Malaysia): "Ringed Seal Search for Global Optimization via a Sensitive Search Model", **Burcu Gürbüz** (Üsküdar University, Turkey): "Numerical Approach for Rumor Propagation Model", and **Gerhard-Wilhelm Weber** (Willi; Poznan University of Technology, Poland, and IAM, METU, Turkey): "Modern Water-Resource Management: Application of Novel OR-Analytics Snow Classification on Sentinel 2 Imagery by MARS" and "Classification and Generation of Digital Marble Art (EBRU) by revisiting OR via Deep Learning". During the days of *InteriOR-2019*, Burcu and Willi were Visiting Professors at the university UIN-SU in Medan.



▲ This is Medan, Indonesia! Cheerful InteriOR-2019.

The conference presented a diverse range of plenary, invited and contributed presentations, posters and other types of contributions by academics, students and representatives of government agencies. *InteriOR-2019* was led by *Honorary and International Boards*, including *Prof. Dr. Runtung, Prof. Dr. Kerista Sebayang, Prof. Dr. Herman Mawengkang* (Editor), and *Prof. Dr. Gerhard-Wilhelm Weber*. Tremendous efforts and care were spent by the **Chair** of *InteriOR 2019*, *Prof. Dr. Saib Suwilo* and his team, together with the *Publicity Chair* members. During the closing program, *Professor Mawengkang* gave an intensive speech to share his assessments and impulses with the participants by the end of this successful *InteriOR* conference in its already 5th issue. Besides the scientific excellence of the congress, the participants enjoyed the warm weather, great hospitality, famous cuisine of North Sumatra and the

beauty of Medan, Indonesia, with its rich and diverse cultural elements from near and far. The conference provided a special ambience and international platform, with a particular outreach to Europe and East Asia, to interconnect the attendees and share news on OR studies and OR meetings. The participants of *InteriOR-2019* were informed about, and cordially invited to, the upcoming OR meetings in Seoul, South Korea: *IFORS 2020* ([ifors2020.kr/](https://ifors2020.kr/)) and Athens, Greece: *EURO 2021* (<https://www.euro-online.org/web/pages/421/activities-list>).

The organizers and participants of *InteriOR* conference series are very happy and grateful about **10 years of tradition in fruitful collaboration and deep friendship with the EURO and IFORS conference communities!** 🌍



## Dokt!OR program makes its debut at the OR 2019 in Dresden

**Biljana Roljic** <[biljana.roljic@univie.ac.at](mailto:biljana.roljic@univie.ac.at)>;  
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The annual conference of the German OR society is always a great place to get together with researchers from the international scientific community to discuss a wide variety of topical issues in OR. This year, the OR 2019 conference (<https://tu-dresden.de/bu/or2019/>) was jointly held by the OR societies from Germany (GOR), Austria (ÖGOR), and Switzerland (SVOR) and took place from September 3rd to September 6th, 2019 in Dresden, Germany.

The scientific program consisted of almost 400 presentations in 21 different streams. The conference participants also had the chance to contribute a paper to the conference proceedings, which will be published by Springer in 2020.

The plenary presentations were delivered by **Roman Slowinski** (Poznan University), who gave a delightful lecture on “*Constructive Preference Learning for Multiple Attribute Decision Aiding*”, and by **Claudia D’Ambrosio** (LIX, CNRS - Ecole Polytechnique), who delivered an inspiring talk “*On the Observability of Smart Grids and Related Optimization Methods*”. The semi-plenary presentations were given by **Niels Agatz** (Erasmus University Rotterdam), **Edoardo Amaldi** (Politecnico di Milano), **Roberto Aringhieri**

(University of Torino), **Olga Battaia** (KEDGE Business School), **Eleni Pratsini** (Accenture Technology, Zurich), and **Dolores Romero Morales** (Copenhagen Business School).

The social program of the conference started with a get-together at the campus of the TU Dresden. On the first evening of the conference, the mayor of Dresden welcomed the conference participants with drinks and pretzels in the beautiful stairwell of the city hall building. The exquisite conference gala dinner took place at the Taschenbergpalais located in the old-town of Dresden.

Every two years, the German OR society awards one of its members with the prestigious GOR scientific award. This year, the prize was awarded to **Rüdiger Schultz** (University of Duisburg-Essen) to honor his vast achievements in the area of stochastic programming and his contributions to the OR community. The laudatio was given by **Werner Römisch** (Humboldt-Universität zu Berlin) in the opening session of the conference and was followed by a keynote lecture by the awardee, during which he provided compelling insights into his field of expertise.





▲ Presentations and discussions at the Dokt!OR workshop.

The German OR society makes a great effort to support young researchers in their career. In this spirit, prizes were awarded for the best Master and PhD theses of the past year, and – for the first time – the GOR Young Researchers Award was granted to distinguish outstanding journal papers in the field of OR. The full list of awardees as well as information on their contributions can be found on the website of the German OR society (<https://www.gor-ev.de/auszeichnungen-der-gor>). In this regard, the conference participants of the OR 2019 had the chance to attend special sessions dedicated to the presentation of these distinguished works.

During the *OR 2019*, a new program, called *Dokt!OR*, was introduced to the annual OR conference. It is tailored towards PhD students and participation amounted to 32 persons. This unique stream goes beyond the scope of a scientific program. It offers additional training opportunities for junior research associates in the form of varied workshops. Moreover, the program provides networking opportunities within a casual environment, helping to establish an informal cross-university network among eager participants new to the field of operations research.

As TU Dresden was hosting the *OR 2019* conference, **Jörn Schönberger** and his staff organized the first *Dokt!OR* program in exemplary fashion. They took part in the technical program as moderators, speakers, and mentors, while additionally accommodating any of the participants' requests regarding the social programs. The *Dokt!OR* sessions were distributed over the conference days and they were organized as special streams that started each afternoon and proceeded into the evening hours.

A special get-together was organized for *Dokt!OR* participants during the first conference day. The program organizers and chair of the GOR, **Anita Schöbel**, held a welcoming speech during which they outlined the goals and expectations of this newly introduced stream. In total, three extensive workshops

exclusive to the *Dokt!OR* program were held. One of the workshops covered university didactics, where multiple experienced lecturers discussed their teaching techniques during a so-called "speed geeking" session. Each lecturer had their own space where they gave a presentation and answered questions. The audience split up into groups and embarked from lecturer to lecturer. Another workshop that took place addressed

academics as a career. The participants had the opportunity to ask renowned professors questions on work related topics within the scientific field, funding possibilities, and good practices for road-mapping a PhD study. A final workshop, supplementary to the latter one, took upon the matter of career planning. In the course of this lecture, a representative of the "Deutscher Hochschulverband" elaborated on post-PhD career prospects.

Even though the combination of the *OR 2019* conference and the *Dokt!OR* program was organized on a tight schedule, the participants did not miss out on exploring the city of Dresden. A guided city walk revealed the historic significance and cultural heritage of Dresden. The tour guides emphasized the reconstruction of the city post WW2 and future economic and social prospects. This truly informative and enjoyable promenade was complemented by an amusing evening out feasting, drinking, and playing pool.

Overall, the *Dokt!OR* program's debut was outstandingly organized and indisputably successful. The participants were invited to contribute to the program by continuously sharing their experiences and providing feedback. This openness instilled a sense of community among the participants and stimulated them to meet the program's objectives by means of a joint effort.

The OR conference closed with announcements for the *IFORS 2020* conference in Korea (<http://www.ifors2020.kr/>) and the *EURO 2021* in Athens. Next year, the *OR 2020* conference will take

place from September 8th to September 11th at the TU Braunschweig, Germany (<https://www.or2020.de/>).

We want to thank Jörn Schönberger, his chair, and all people from the TU Dresden, who were organizationally involved, for hosting the *OR 2019* conference and the first *Dokt!OR* program. 🌐



▲ The participants of the OR 2019 received conference themed chocolates

# OR61 3-5 September 2019 at the University of Kent at Canterbury - Observations and Impressions – 35 Years after Graduation

Kerry Turner <kerry.l.turner@googlemail.com>



▲ Plenary Lecture: Erhan Erkut inspiring us to improve our OR teaching.

I guess I'd say Operational Research is in my blood. I graduated in 1984 with a Maths degree from Lancaster University, UK. I chose to do Operational Research courses as a part of my first degree and then stayed on to do a Masters in Operational Research graduating in 1985. *Graham Rand, Mike Pidd, Dave Worthington and Peter Checkland* were my mentors. I was born lucky!

I worked and honed my analytical skills on a wide range of business problems with an equally wide range of clients during 20 years in mainstream consulting. For the last 15 years I've been independent, applying my OR skills to systems other than business, and, for the last year focussing on bringing OR skills (especially problem structuring and decision making) to children. I'm enrolled on a PhD at the *University of Hull* to evaluate the impact of systems thinking on children's thinking skills and I'm working closely with the ORS's "OR in Schools" programme.

I was privileged to apply for and to be awarded an assisted place for OR61 (<https://www.theorsociety.com/what-we-do/events-conferences/annual-conference/or61-annual-conference-2019/>), which covered my conference fees and accommodation. This is yet another example of the ORS's commitment to helping students, which includes free student membership of the society. A big thank you to the ORS (<https://www.theorsociety.com/>) for giving me this opportunity. Unfortunately, I didn't realise it included being a journalist and reporting on my experiences! So here goes...

I attended OR60 at Lancaster University and it was marvellous to be back at my alma mater for so many reasons. However, despite this high bar, OR61 surpassed

OR60 and exceeded my expectations with:

**A packed and highly varied programme** including 5 streams dedicated to systems thinking, superb conference facilities on a beautiful campus and great food and entertainment. The level of choice of streams meant that we were all able to tailor make our own unique conference experience outside the plenary sessions. This makes this report a report on my conference, which could have been substantially different to yours!

I attended presentations on topics as diverse as exam grades, plastic, the UNs sustainability goals, Theory U, Eradicating Failure Demand, the new OR apprenticeship and my own contribution on Climate Change. The vast range of streams meant smaller audiences and a greater opportunity to ask questions.

The **Making an Impact workshops** were an OR61 innovation which worked really well. These provided more time and an opportunity to understand by doing. Of the one's I attended, my personal favorite was *Dennis Sherwood's* impressive 3 hour workshop "How to be Creative", where we really worked our observation skills. I also enjoyed *Philip Jones* and *Niki Jobson's* (both DSTL) workshop on "Use of Systems Thinking Concepts and Methods in OR" especially the game where we attempted to lower a tube made of rolled flipchart paper to the floor.

**Fascinating plenaries** included a stirring high energy opening (with a high dose of humour) on "Optimising the teaching of OR – Yesterday and Tomorrow" presented by *Erhan Erkut*.





▲ IFORS President Grazia Speranza (sitting in the middle, right side) discussing in the Women in OR session.

The President's medal talks were all ground breaking – I was pleased to see the honour going to my personal favorite, *Martine Wauben* of the Ministry of Justice, for a super energised talk on “*The Safety Diagnostic Tool: Harnessing Operational Data to make Prisons Safer*” and the final day highlight, *Grazia Speranza*.

Like many senior figures in the OR world, **Prof. Grazia Speranza** wears many hats, and we saw at least two of those hats during her plenary talk. She started off in IFORS-mode, and as current President of IFORS, and former EURO President, you could hardly blame her for giving her talk an international feel. We learnt about many of IFORS' activities and just how the various regional groupings knit together.

Then we moved onto the core of her talk on Kernel Search. (Core... did you see what I did there? Whilst this is clearly a highly technical field, *Grazia* managed to pitch the talk at just the right level, and even those not versed with the intricacies of mixed integer linear programming (MILP) problems could follow easily. She stepped through the development of her

work and clearly explained how each step moved things forward and the improvements that each iteration brought. Although the testing had been done on benchmarking datasets, it was clear that kernel search would have much wider uses, and this was reflected in the questions from the audience at the end.

The main purpose of any conference is conferring.....which is about **bringing people together to exchange views**, or in today's parlance, networking! Much of this exchange occurred outside the formal presentations in the breaks, meals and recreational activities, which provided spaces and buffet style food to really encourage this. I was fortunate to be reunited with OR colleagues throughout my OR career including my first university lecturers, my first boss, colleagues from the wider systems thinking community and my current supervisor (*Gerald Midgley*, Hull). I also made lots of new contacts, I'm sure the start of new collaborations.

I was amongst the last to leave, taking advantage of the wonderful array of local Kent cheeses and wine, at the wine and cheese party which rounded off the proceedings.



▲ OR61: Delegates playing The Common Good game.

I look forward to yet more stimulation, inspiration and innovation at OR62 which was announced will be next September 2020 at the University of Nottingham (<https://www.theorsociety.com/what-we-do/events-conferences/annual-conference/>). Another opportunity to:

- Stay current with the latest developments in OR and analytics,
- Network with big names, peers and early careers people,
- Knowledge-share and Profile-build through presenting work,
- Build skills at workshops such as the Making an Impact stream. 🌍



# ORSSA Celebrates a Happy Birthday in Cape Town – 50 Years Anniversary of The Operations Research Society of South Africa

**Lieschen Venter** <lieschenventer@gmail.com>; **Stephan Visagie** <svisagie@sun.ac.za>

The Operations Research Society of South Africa (ORSSA) (<http://www.orssa.org.za/wiki/>) was delighted to celebrate its 50th birthday at its 48th Annual Conference held at the Vineyard Hotel in Newlands, Cape Town, during September 8-11 this year (<http://www.orssa.org.za/wiki/pmwiki.php?n=Conf>. ORSSA). Approximately 100 delegates came together to remember the half century since the Society's first general meeting, reminiscing with old friends and meeting new ones. The conference was hosted by the Western Cape Chapter of the Society and the Local Organizing Committee consisted of faculty from the Department of Logistics at Stellenbosch University.

Prof. Grazia Speranza, the current IFORS President, joined the celebrations as one of the Keynote Speakers, while ORSSA's oldest and one of the founding members, Prof. Gerhard Geldenhuys, emeritus professor of Applied Mathematics at Stellenbosch University, joined as another. Prof. Erwin Pesch from Germany's University of Siegen presented the conference tutorial.

The program featured a special parallel stream where the Society's new book was launched. "Operations Research in South Africa – The first 50 Years" was compiled by Prof. Hennie Kruger of North West University and Prof. Jan van Vuuren of Stellenbosch University and contains a concise history of Operational Research in South Africa from its local inception until 2018. Various authors each presented the different chapters from the book as delegates indulged in the Society's rich history. The rest of the program consisted of 24 parallel streams on various topics, including the prestigious National Student Competition. During this competition, the best final undergraduate year project and master's degree thesis is awarded with the Gerhard Geldenhuys Medal and Theo Stewart Medal, respectively. This year, the top final year project was submitted by Anika Brundyn, under supervision of Dr. Sheetal Silal from the University of Cape Town. The top master's degree thesis was submitted by Jean-

Pierre van Niekerk under supervision of Prof. Fanie Terblanche from North West University.

As always, the social program provided welcome times of respite for the academics as they indulged in birthday celebrations. A cocktail mixer took place at the majestic Kirstenbosch Gardens where delegates participated in creating infographics depicting the Society's rich personal network. The Gala Banquet was hosted in the Vineyard Hotel ballroom where more awards were conferred. A recognition award to an upcoming member of ORSSA of age 35 or below (who is not a full-time student) for excellence in OR practice was awarded to Colin Phillips from Discovery Limited, a South Africa-based financial services group. A recognition award to a non-member of ORSSA for outstanding contributions, typically over a long period of time was awarded to Prof. Chris Swanepoel from the University of South Africa.

The Tom Rozwadowski medal is the Society's premier award and has been awarded on an almost annual basis since 1971. The medal is awarded for the best-written contribution to Operations Research made by a member of the Society during the previous year. This medal was awarded to Berndt Lindner, Ryno Brits, and Prof. James Bekker along with Prof. Jan van Vuuren. The winning paper titled "Tradeoffs between levelling the reserve margin and minimising production cost in generator maintenance scheduling for regulated power systems", was published in Electrical Power and Energy Systems.

As always, the delegates had a wonderful time networking, learning, sharing, and indulging in 50 years' nostalgia. The 2020 conference is set to take place near Johannesburg during September and readers are encouraged to look out for the call for papers and registration. It will be great to see everyone there! 🌍



▲ The cover for the ORSSA book launched at the Society's 50th birthday celebration.

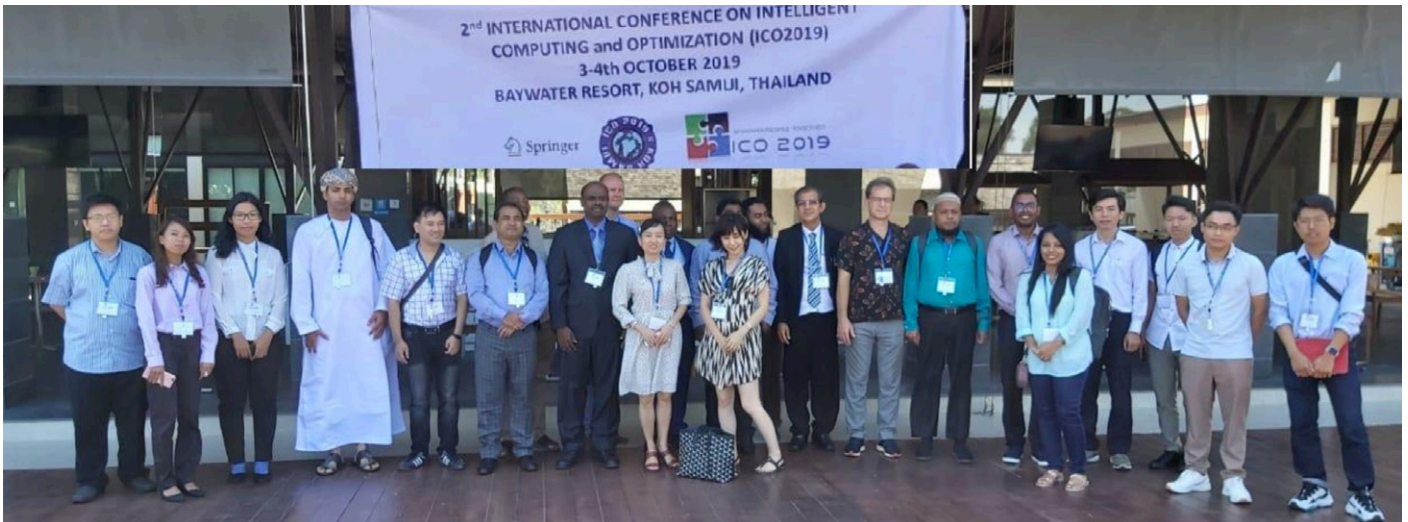


▲ Photos 1 and 2 shows Colin Phillips and Chris Swanepoel receiving their awards from ORSSA president, Danie Lötter. The 3rd photo shows Prof. Jan van Vuuren receiving the Tom Rozwadowski medal on behalf of the winning paper's authors which also included Dr. Lindner and Prof. James Bekker.



# 2nd IC on Intelligent Computing and Optimization - 8 Years after Launch of Industry 4.0 ICO 2019 - Koh Samui, Thailand

Joshua Thomas <joshua.j.thomas@gmail.com>; Pandian Vasant <pvasant@gmail.com>



▲ Here is ICO 2019, Koh Samui.

On October 3-4, 2019, the focused *second International Conference on Intelligent Computing and Optimization* was celebrated in Koh Samui, Thailand (<https://www.icico.info/>). It was a two-day event, with more than 50 attendees from 12 countries. The conference, chaired by *Professor Pandian Vasant* and *Professor Ivan Zelinka*, brought together renowned experts from all around the globe. The success of this ICO2019 conference was made possible because of the perseverance; dedication and hard-work exerted by the Organizing Committee (<https://www.icico.info/committe>) headed by its co-chairs, by ICO committee members, Technical PC members and Programme Committee members.

The event combined parallel sessions, which focused on particular hot topics such as robotics, image recognition, Operational Research, machine learning, deep learning, medical engineering, learning analytics, intelligent transportation, optimization algorithmic models, electronic digital farm, solar and renewable energy. *Prof. Dr. Ivan Zelinka* states that "the scientific level was really outstanding throughout the whole conference", with all the speakers, senior and young, constantly keeping the interest of the audience, maintaining the momentum since the very first lecture by *Prof. Dr. Pandian Vasant*, and with session chairs and attendees contributing to fruitful discussions after each talk.

The main theme of this event was the development of intelligent computational methods through innovative technologies with efficient optimization strategies. The stream dedicated to this topic had to be split into two different days with six parallel sessions. This is a clear evidence of the importance of **Industry 4.0** research today. *Professor Zelinka* gave a remarkable talk on the recent progress in the self-organizing migration algorithm (SOMA) with applications in control and design of complex systems. He explained the use and development of new algorithms

and their effective use in modern cyber security and computer commercial games.

In addition, the conference organization, together with the sponsors, offered four prizes: one for best oral presentation and three for best papers, the latter ones elected by all the session chairs. The winners were announced at the award ceremony, that was held on the last day, by *Prof. Vasant* and committee member *Dr. J. Joshua Thomas*, witnessed by *Prof. Zelinka*. The **Best Oral Presentation Award** was granted to *Seong-Hyeong Lee*, from the Dong-A University, Busan, South Korea, for his talk titled "*Structural design of an LMU using approximate model and satisfying trade-off method*". The three **Best Papers Awards** were handed out to *Hnin Aye Kwin* from University of Information Technology, Yangon, Myanmar, for the paper "*Neural machine translation on Myanmar language*"; to *Tham Vo* from Lac Hong University, Dong Nai, Vietnam, for the paper "*A novel system for related keyword extraction over a text stream of articles*", and to *Shyala Sharmin* from Chittagong University of Engineering and Technology, Bangladesh, for the paper "*Developing an empirical robotic framework to established bidirectional eye contact*".

To conclude the conference, a solemn *Closing Session* was held at the Bay Water Resort Koh Samui, Main Hall. It was highlighted that there were offers to submit papers to *special issues* of excellent journals and chapters to a *book*; here authors may further present their research works:

[https://www.mdpi.com/journal/applsci/special\\_issues/applied\\_optimization\\_clean\\_renewable\\_energy](https://www.mdpi.com/journal/applsci/special_issues/applied_optimization_clean_renewable_energy), <https://www.springer.com/journal/40305>, <https://cis.ieee.org/publications/t-fuzzy-systems/tfs-special-issues>, <https://onlinelibrary.wiley.com/journal/14678640>, <https://www.igi-global.com/publish/call-for-papers/call-details/4366>. Information was given about *ICO 2020* that will take place Bangkok, Thailand, through presentations disseminated by the chairs. Committee members received constructive feedback for future improvement.



▲ Welcome: Professor Zelinka with his keynote speech, and Professor Vasant.

In addition, the members of the committees of *ICO 2019* were greatly acknowledged. So much we learned, so much fun, stories, marvellous gala dinner (<https://bit.ly/31Oy85V>) we enjoyed with many wonderful humans. *ICO 2019*: an investment into the future and service in building up our world of tomorrow in togetherness and friendliness.

The *ICO 2019* committee has elected the following persons for the keynote speakers for **ICO 2020**:  
*Professor Jose A Marmolejo* (Mexico); *Professor Elias Munapo* (South Africa); *Professor Vladimir Panchenko* (Russia); *Professor Emi Yuda* (Japan); *Professor Joshua Thomas* (Malaysia).

*Special Session Chairs for ICO 2020* will be: *Professor Elias Munapo*, North West University, South Africa; *Professor Vladimir Panchenko*, Russian University of Transport, Russia; *Professor J. Joshua Thomas*, KDU Penang University College,

Malaysia; *Professor Jose Antonio Marmolejo* and *Professor Roman Rodriguez*, Mexico; *Professor Mohammed Moshul Hoque*, Chittagong University of Engineering & Technology, Bangladesh; *Professor Bazeer Ahamed B, Balaji*, Institute of Technology & Science, India; *Professor Mohammad Shamsul Arefin*, Chittagong University of Engineering and Technology; *Professor Igor Litvinchev*, Nuevo Leon State University, Mexico; *Professor Kharchenko Valeriy*, Federal Scientific Agroengineering Center VIM, Russia; *Professor Ala Al-Janabi*, Ahmed Bin Mohammed Military College, Qatar.

*ICO 2019* chairs and committees sincerely thank *Prof. Dr. Janusz Kacprzyk* and *Dr. Thomas Ditzinger* for their marvellous contribution in publishing *ICO 2019* conference proceedings as a book in Springer Nature (<https://link.springer.com/book/10.1007/978-3-030-33585-4>). 🌐



▲ Award Ceremony: Left: Hnin Aye Kwin; Middle: Moshul Hoque; Right: Tham Vo - with Chair Prof. Vasant.





# INFORMS 2019 Annual Meeting: Welcome to Seattle!

Ashley Kilgore <akilgore@informs.org>



▲ Plenary: Gary Kaplan, Seeking Perfection - Reflections on the Journey.

A record number of operations research and analytics professionals, academics, students and more traveled to Seattle, Washington, for the 2019 INFORMS Annual Meeting, held October 20-23, to explore the latest research and developments, discuss leading best practices, and celebrate award-winning applications (<http://meetings2.informs.org/wordpress/seattle2019/>). This year's meeting saw tremendous growth not just in attendee numbers, which reached a new high at 7,330 – 1,100 more attendees than the previous year – but with 98 session tracks and a total number of 1,550 sessions available. In addition, 230 posters were prepared and presented at the meeting, featuring nine special flash sessions, which allowed audiences to participate in rapid-fire sessions followed by Q&A with each individual presenter.

This year's **plenary sessions**, held Monday-Wednesday of the meeting, featured speakers from leading organizations and universities across the country. During Sunday's plenary talk, "Seeking Perfection: Reflections on the Journey," **Gary Kaplan**, chairman and CEO of the Virginia Mason Health System, shared the more than 17-year journey to transform his organization and its culture. *Kaplan* walked attendees through the entire process, from confronting early challenges and resistance to change, to the ultimate adoption of the lean management system, and hardwiring in these new systems to ensure sustainability.

"The Parametric Self-Dual Simplex Method - A Modern Perspective," the plenary session held on Monday by **Robert Vanderbei**, professor of operations research and financial engineering at Princeton University, explored the parametric self-dual simplex method (PSD), its definition and history, and its continued value throughout the years from an educational perspective and in the world of applications. In particular, *Vanderbei* discussed two application areas, portfolio selection and LAD-LASSO problems, and how

using the PSD method can have a significant impact.

In his plenary, "Planning Transportation Capacity at Amazon," **Russell Allgor**, Chief Scientist of WW Ops and AMZL at Amazon, discussed how the organization balances many unique scheduling factors, such as Amazon Prime customers, Prime Now, facility locations, inventory placement, same-day and two-hour delivery, and more, all which must be managed while continuing to satisfy customer needs as the number of shipped packages continues to grow and delivery times continue to decrease.

In addition, there were a number of keynote sessions representing groundbreaking applications in O.R. and analytics in areas that included healthcare, the fight to alleviate poverty, renewable energy and carbon footprint reduction. A number of INFORMS award winners also held their reprise presentations during the Annual Meeting, including the *Wagner Prize*, the *Franz Edelman Award* and *UPS George D. Smith Prize*.

Attendees gathered together for a special *INFORMS Awards Ceremony* on Sunday evening to celebrate the winners of several INFORMS awards. These included the *INFORMS President's Award*, which recognizes important contributions to the welfare of society, and was awarded to **Dimitris Bertsimas** of the Massachusetts Institute of Technology; *John von Neumann Theory Prize*, which is presented to a scholar or scholars who have made fundamental, sustained contributions to theory in OR/MS, and was awarded to **Jong-Shi Pang** of the University of Southern California and **Dimitris Bertsimas** of the Massachusetts Institute of Technology; and the *George E. Kimball Medal*, which recognizes distinguished service to INFORMS and the profession of OR/MS, and was awarded to **Peter C. Bell** of Western University and **Edward Kaplan** of Yale University.



All students registered for the meeting were invited to attend the *Student Awards Ceremony* where the Chapters/Fora Committee announced the winners of the *Student Chapter Annual Awards*, *Judith Liebman Award*, and *INFORMS Undergraduate Scholarship Awards*.

During the *INFORMS Member Meeting*, attendees were provided an opportunity to mingle and meet with the INFORMS staff. Following opening remarks from *INFORMS 2019 President Ramayya Krishnan*, recognition of the *2019 INFORMS Fellows Class* and the *INFORMS Volunteer Service Award* recipients, and the introduction of the *2020 INFORMS Board of Directors*, **Melissa Moore**, Executive Director of INFORMS, shared updates on several INFORMS programs and other milestones of the past year, as well as a look ahead to what's to come. Among these, submissions to *INFORMS 16 journals* continue to increase, as do published pages. INFORMS will host the *inaugural INFORMS Conference on Security* in February 2020 in Monterey, CA.



▲ Plenary: Robert Vanderbei on the Parametric Self-dual Simplex.



▲ Togetherness: at INFORMS 2019 Seattle.

INFORMS has also received several new endowments, one of which will fund the establishment of new *Donald P. Gaver Early Career Excellence in Operations Research Award*.

In spring 2020, INFORMS will be launching the *Analytics Capability Evaluation* program to train professionals to help organizations start or mature their analytics capability.

Also in 2020, INFORMS will celebrate the **25th anniversary** of its founding. In 1995, the *Operations Research Society of America (ORSA)* was merged with *The Institute of Management Sciences (TIMS)* to create *The Institute for Operations Research and the Management Sciences (INFORMS)*. Since then, INFORMS has grown tremendously while continuing to share the impact of O.R. and analytics on the world around us, and highlight the incredible work of our members.

INFORMS unveiled a brand new video during the

meeting. Participants were challenged to create videos meant to introduce the field of O.R. and analytics to undergraduate students in an interesting, relatable and inspiring way. The *Virginia Tech INFORMS Student Chapter* was selected as the winner of the competition, and their video served as inspiration for a professionally produced video that debuted at the meeting. Meeting attendees had the opportunity to give back to their host city Seattle during the meeting, as **INFORMS Pro Bono Analytics** partnered with the Seattle-based nonprofit organization, **FareStart**, to assemble hygiene kits and make “no-sew” blankets for homeless students in Seattle. *FareStart* is an organization providing support to young people who are working to overcome homelessness and obtain a job in the field of food services and culinary arts. Attendees took time out of their busy meeting schedule to assemble 200 hygiene kits and make 35 blankets, which were distributed to students in need in Seattle. 🌍



▲ Plenary: Russell Allgor on Planning Transportation Capacity at Amazon

# CALL FOR PROPOSALS TO HOST THE IFORS 2026 TRIENNIAL CONFERENCE



**I F O R S**

International Federation of Operational Research Societies

IFORS has grown worldwide in terms of total membership, number of member national societies and the profession and practice of Operational Research. The Triennial Conference has been a key factor in this growth and is IFORS' most important single event.


Purpose of the IFORS Triennial Conference:

- provide a means for exchange of information on Operational Research topics between nations;
- provide exposure to IFORS on a rotating basis among the major geographic regions where IFORS has member societies
- encourage the establishment of national Operational Research societies;
- promote the development of specific parts of Operational Research, for example, to ensure a balance or to open up new fields
- 

## **Preparing a Proposal to Host the IFORS Conference**

Letters of Intent for undertaking a Triennial Conference must be received by the IFORS Secretariat by February 14, 2020. The full written proposal will be due two months later, on April 15, 2020. Please contact the Secretary of IFORS to obtain the current Meetings Manual ([secretary@ifors.org](mailto:secretary@ifors.org)) that prescribes the requirements for the proposal. We present a brief description here.

The proposal to become a Host Society must include the following information:

- a. Identify alternative sites for the meeting in the host country, the respective advantages, facilities, and accommodations at these sites, including meeting rooms and living quarters, typical room rates at the conference hotel, and availability of nearby low-cost housing for student attendees. Propose an approximate date for the conference.
- b. Identify members and backgrounds of members of the Local Organizing Committee who will have responsibility for planning and managing the conference.
- c. Include a rough draft budget, identifying the proposed conference fees.
- d. Provide adequate assurances that IFORS will not be subject to any financial losses because of selection of a particular host country, and will be able to achieve an appropriate financial return from the conference (See the IFORS Manual for more on this topic). A letter from the President of the Society must accompany the Proposal that acknowledges this fiscal responsibility.
- e. Reasons for holding an International Conference in the particular country in the light of IFORS objectives stated above. 



## Shabbir Ahmed 1969-2019



Andrew, Shabbir, and I started in 2000 and we all three became good friends. I'd written the piece for INFORMS Journal on Computing because I'm the INFORMS Computing Society Chair and a close friend of Shabbir's. It would be easy to confuse Dr. Shabbir Ahmed's career achievements with a checklist of INFORMS' most prestigious awards. His dissertation research conducted at the University of Illinois won the Dantzig Dissertation Award in 2000. After joining the School of Industrial and Systems Engineering at Georgia Tech in 2000, he quickly won a prestigious National Science Foundation CAREER award on his way to accumulating a stunning array of research and service awards. His research contributes profound insights into the theory and practice of optimization, especially in stochastic integer programming (SIP). SIP, simply stated, lets a modeler solve integer programs over many time periods as conditions evolve. While a natural and powerful modeling paradigm, the resulting models are extremely hard to solve. Shabbir led SIP from its infancy to a major research area.

Shabbir's overwhelming research success, though, just served to amplify some of his biggest strengths: his kind and gentle nature, his generosity, and his natural ability to mentor and empathize with absolutely everyone around him. Shabbir was universally loved by his colleagues worldwide, but more than that, he was sincere, down-to-earth, and fun. (If you think he didn't love his fair share of 70s and 80s rock music, especially Judas Priest, you got another thing comin'.) Shabbir was extremely proud of his PhD students, who are themselves leaders in the field. The authors started their careers at the same time as Shabbir and grew up together. It's rare to have a contemporary as a role model, but Shabbir humbly showed us that it is possible to be productive and exhibit an impressive work ethic while still being firmly dedicated to family and community. His leadership by example affected many in our field in a most positive manner, and it is especially in that way that his legacy will endure.



<https://www.isye.gatech.edu/news/shabbir-ahmed-appointed-deans-professor-and-stewart-fellow>

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