

Detailed Program

Tuesday, August 28, 2018

Welcome Reception 17:00 – 20:00

Wednesday, August 29, 2018

Registration 8:30 – 9:00

Wednesday 9:00 – 9:15

Conference Opening

Wednesday 9:00–9:15 EI9

Wednesday 9:15 – 10:15

Invited talk: Louis-Martin Rousseau

Wednesday 9:15–10:15 EI9

Graphical Optimization Models to adress the Multi-Activity Shift Scheduling Problems

Abstract: The shift-scheduling problem was originally introduced by Edie in 1954 in the context of scheduling highway toll booth operators. It was solved a short time later, by Georges Dantzig [6], using a set covering formulation. However, the Multi-Activity Shift Scheduling (MASSP) version of that problem, where one not only needs to schedule when employees are working or resting, but more precisely, what activity they are performing, still remains a challenge. During this invited lecture, we will recall the turning points of this 60-year journey, focusing particularly on the efforts of the last decade to solve MASSPs. We will demonstrate our formal languages can generate Graphical Models that can be used in Integer Program, Constraint Program, Branch and Price and Meta heuristics. We also discuss results on Multi-activity Tour Scheduling Problems and variants with stochastic demand.



***Louis-Martin Rousseau** is a full professor of Operations Research in the Department of Mathematics and Industrial Engineering at École Polytechnique de Montréal. Since February 2016 he holds the Canada Research Chair in Healthcare Analytics and Logistics (HANALOG.ca), which studies complex and/or interconnected logistics problems in the field home care services, cancer treatment, and operating room management. Professor Rousseau pursues research in the field of hybridization of classical operational research techniques (OR) and Constraint Programming (CP), rooted in the field Artificial Intelligence (AI). In 2002 he founded the company Planora that, before its acquisition by JDA in 2012, proposed a scheduling SaaS solution to numerous vertical markets. He is also a fellow Element-AI, which aims to bring artificial intelligence solutions to a broad scope of organizations.*

Coffee Break 10:15 – 10:45

Wednesday 10:45 – 12:25

WS1: University Timetabling

Wednesday 10:45–12:25 EI9

Dennis Holm, Matias Sørensen and Thomas Stidsen. **University Timetable Quality Optimization Using Multi-Objective Integer Programming.**

Helen Kirby-Hawkins. **What time is good for you: To what extent do student perceptions of the time of their activities motivate their attendance behaviours?**

Miguel Sozinho Ramalho. **Constraint Definition in Student Scheduling with Adversarial Behaviour in Mind.**

Daniel Myers and Jay Yellen. **A Multi-Objective Timetabling System That Facilitates Scheduling Across Academic Programs.**

WS2: Nurse Rostering / Personnel Scheduling

Wednesday 10:45–12:25 EI10

Jeffrey H. Kingston. **KHE18: A Solver for Nurse Rostering.**

Sara Ceschia and Andrea Schaerf. **Solving the INRC-II Nurse Rostering Problem by Simulated Annealing based on Large Neighborhoods.**

Chao Li, Pieter Smet and Patrick De Causmaecker. **Polynomial-time Personnel Scheduling with Soft Constraints.**

Pieter Smet. **Constraint reformulation for nurse rostering problems.**

Wednesday 14:00 – 15:00

Invited tutorial: Jeffrey Kingston

Wednesday 14:00–15:00 EI9

Specifying Timetabling Problems: An Ongoing Story

Abstract: The optimization problems found in textbooks are usually easy to specify. The travelling salesman problem, for example, is specified using a simple graph with edge costs. Timetabling problems are much harder to specify precisely, mainly because of the many constraints needed by real-world instances. This tutorial will give a general overview of the specification problem for timetabling: the key issues, some history, the present state of the art, and some thoughts about the future.



Jeffrey H. Kingston is a former Associate Professor and current Honorary Associate of the School of Information Technologies at the University of Sydney. His research interests are algorithms and complexity, and programming languages. He has been studying automated timetabling since 1991.

Wednesday 15:10 – 16:00

WS3: Timetabling in Public Transportation

Wednesday 15:10–16:00 EI9

Antonio Frangioni, Laura Galli, Samuela Carosi, Leopoldo Girardi and Giuliano Vallese. **A Lagrangian Heuristic for Integrated Timetabling and Vehicle Scheduling.**

Martin Scheffler, Janis Sebastian Neufeld and Michael Hölscher. **Real-life Decision Support for the Locomotive Assignment Problem with Heterogeneous Consists.**

WS4: Timetabling in Healthcare

Wednesday 15:10 – 16:00 EI10

Johannes Maschler and Günther R. Raidl. **Multivalued Decision Diagrams for a Prize-Collecting Sequencing Problem.**

Matthias Horn, Günther Raidl and Elina Rönnberg. **An A* Algorithm for Solving a Prize-Collecting Sequencing Problem with One Common and Multiple Secondary Resources and Time Windows.**

Coffee Break 16:00 – 16:30

Wednesday 16:30 – 18:10

WS5: Production Scheduling

Wednesday 16:30–18:10 EI9

Guido Passage, Marjan Van Den Akker and Han Hoogeveen. **Local search for stochastic parallel machine scheduling: improving performance by estimating the makespan.**

Hagai Ilani, Tal Grinshpoun and Elad Shufan. **Partially Concurrent Open Shop Scheduling with Preemption and Limited Resources.**

Xiyu Li, Alena Otto and Erwin Pesch. **Scheduling products at paced assembly lines with a multiple-piece flow.**

Felix Winter, Emir Demirović, Nysret Musliu and Christoph Mrkvicka. **Modeling and Solving an Automotive Paint Shop Scheduling Problem in production scheduling.**

WS6: Routing Problems / Graph Coloring

Wednesday 16:30–18:10 EI10

Aldy Gunawan, Kien Ming Ng, Vincent F Yu, Gordy Adiprasetyo and Hoong Chuin Lau. **Iterated Local Search Algorithm for the Capacitated Team Orienteering Problem.**

Balázs Dávid and Miklós Krész. **A robust approach for creating similar vehicle schedules in practice.**

Seda Polat Erdeniz and Alexander Felfernig. **Cluster and Learn: Cluster-Specific Heuristics for Graph Coloring.**

Farzaneh Karami, Wim Vancroonenburg and Greet Vanden Berghe. **A buffering-strategy-based re-optimization approach to dynamic pickup and delivery problems with time windows.**

Guided Tour of the Musikverein 18:30 – 19:30

Meeting point at the registration desk at 18:15

Cocktail Reception and Dinner 20:00 – 23:30

Thursday, August 30, 2018

Thursday 9:00 – 10:00

Invited talk: Hana Rudová

Thursday 9:00–10:00 EI9

University course timetabling and International Timetabling Competition 2019

Abstract: University course timetabling belongs to classical problems which have been studied for many years by many researchers. This plenary talk will outline existing research and emphasize new research directions and challenges in this area. It is clear that the organization of international competitions has the high impact on the timetabling research. We intend to discuss the organization of the new International Timetabling Competition (ITC 2019) with the aim to motivate further research on complex university course timetabling problems coming from practice. Our goal is the creation of rich real-world data sets. Thanks to the UniTime timetabling system, we can collect a strong set of data with diverse characteristics which we will discuss in the talk. The key novelty lies in the combination of student sectioning together with standard time and room assignment of events in courses. To make the problems more attractive, we remove some of the less important aspects of the real-life data while retaining the computational complexity of the problems.



Hana Rudová is an associate professor in Computer Science at Masaryk University, Faculty of Informatics in Czech Republic. She works on various problems broadly related to scheduling such as educational timetabling, scheduling for distributed environments or transport planning. Her work concentrates on approaches which allow to solve practical problems such as course timetabling in UniTime system, computer job scheduling in CERIT national infrastructure or data transfer planning for multimedia transmissions in CoUniverse. She has strong relationship with the PATAT conference and its community as the member of the PATAT steering committee and the co-chair and the organizer of the PATAT 2006 conference in Brno, Czech Republic.

Coffee Break 10:00 – 10:30

TS1: Educational timetabling

Thursday 10:30–12:10 EI8

Ahmad Muklason, Andrew Parkes, Ender Özcan, Simon Kingston, Barry McCollum and Paul McMullan. **Hyper-heuristics for Solving a Multi-objective Examination Timetabling Problem.**

Bernd Bassimir and Rolf Wanka. **Probabilistic Curriculum-based Examination Timetabling.**

Eyjólfur Ingi Ásgeirsson and Þórhildur Gunnarsdóttir. **An Integer Programming Formulation for the Music School Timetabling problem.**

Alexander Steenson, Ender Özcan and Andrew Parkes. **Solving a Demonstration Timetabling Problem.**

TS2: Task / Project Scheduling

Thursday 10:30–12:10 EI9

Emil Karlsson, Elina Rönnberg, Andreas Stenberg and Hannes Uppman. **Heuristic enhancements of a constraint generation procedure for scheduling of avionic systems.**

Güner Orhan, Mehmet Akşit and Arend Rensink. **Designing Reusable and Run-Time Evolvable Scheduling Software.**

Christos Valouxis, Christos Gogos, Panayiotis Alefragis, George Theodoridis and Nikolaos Voros. **Constraint Programming Modeling for the Task Scheduling Problem with Data Storage at MPSoCs.**

Florian Mischek and Nysret Musliu. **A Local Search Framework for Industrial Test Laboratory Scheduling.**

TS3: Timetabling in Healthcare

Thursday 10:30–12:10 EI10

Irving van Heuven van Staereeling, René Bekker and Cornelis Allaart. **Stochastic Timetabling Techniques for Integrated Optimization of Catheterization Laboratories and Wards.**

Christopher Nikolaus Gross. **Long-term workload equality on duty schedules for physicians in hospitals.**

Toni Ismael Wickert, Alberto F. Kummer Neto and Luciana S. Buriol. **An integer programming approach for the physician rostering problem.**

Thiago A. O. Silva, Wim Vancroonenburg and Greet Vanden Berghe. **Approximate dynamic programming for patient admission scheduling.**

Thursday 14:00 – 15:00

Invited talk: Johannes Gärtner

Thursday 14:00–15:00 EI9

Scheduling Matters – Some Potential Requirements for Future Rostering Competitions from a Practitioner's View

Abstract: Scheduling algorithms have made impressive advances. Many objectives can be reached within reasonable runtime, as the previous International Nurse Rostering Competitions (INRCs) showed. As usual, these improvements have raised practitioners' expectations, who, in this case, are consultants and researchers in working time and shift scheduling.

This paper highlights potential additional requirements in two areas and provides input for possible future rostering competitions. Firstly, some requirements regarding scheduling objectives are raised that are important for people – because it is not sufficient to simply fill rosters, and income, health, safety and well-being are heavily influenced by work schedules. It is therefore necessary to include rules that consider specific features of shifts and sequences of work (e.g., average hours per week). Secondly, a vision of a meta-requirement is raised. It is not enough to fulfill the specified requirements as effectively as possible. In a real-life setting, quite often requirements can be changed. Consequently, it would be advantageous to understand which schedule requirements cause bad solutions in order to be able to identify possible changes that encourage better solutions.



Johannes Gärtner is CEO of Ximes GmbH, a company offering software and consulting services regarding workforce/working hours issues for clients in a wide variety of industries. XIMES was founded in 1997 by Johannes Gärtner und Sabine Wahl, and has offices in Vienna and Erlangen. Additionally, Johannes Gärtner is Adjunct Associate Professor at TU Wien and was a Board Member of the Working Time Society. His main research interests in timetabling include rotating workforce scheduling, shift design, break scheduling, and software/tools for workforce scheduling.

Invited tutorial: Andrea Schaerf

Thursday 15:00–16:00 EI9

Simulated Annealing and its application to timetable problems

Abstract: Simulated Annealing (1983) is recognised as the oldest metaheuristic technique in the scientific literature. Despite its age, it is still very popular in academic publications and practical applications. In this tutorial, we review the basic components of Simulated Annealing and we discuss and classify its uncountable variants, some of which gained their own names and metaphors (Great Deluge, Threshold Accepting, ...). In addition, we show the application of Simulated Annealing to some timetabling problems and discuss its results on available benchmarks.



Andrea Schaerf received his PhD in Computer Science from 'Sapienza' University of Rome in 1994, where he has been Assistant Professor from 1996 to 1998. From 1998 to 2005 he has been Associate Professor at University of Udine, where starting 2005 he is Full Professor. His main research interests are: Scheduling and Timetabling Problems, Local Search & Metaheuristics for Combinatorial Problems, and Problem Specification Languages and Tools. Starting February 2015 he is the Head of the Bachelor and Master Programs in Management Engineering at University of Udine.

Coffee Break 16:00 – 16:30

Thursday 16:30 – 18:10

TS4: University Course Timetabling

Thursday 16:30–18:10 EI8

Britta Herres and Heinz Schmitz. **Decomposition of University Course Timetabling - A Systematic Study of Subproblems and their Complexities.**

Can Akkan and Ayla Gulcu. **A Bi-Criteria Simulated Annealing Algorithm for the Robust University Course Timetabling Problem.**

Luis M Torres and Ramiro Torres. **Automated Course Timetabling at Escuela Politecnica Nacional.**

Stephen Ward, Joseph Foraker and Nelson Uhan. **Resilient Course and Instructor Scheduling in the Mathematics Department at the United States Naval Academy.**

TS5: Employee Scheduling

Thursday 16:30–18:10 EI9

Wei Wu and Atsuko Ikegami. **A pattern-based staff scheduling model and applications for part-time employees.**

Petra Vogl and Roland Braune. **Combined activity selection and skilled staff scheduling for the Red Cross blood donation services.**

Arjan Akkermans, Gerhard Post and Marc Uetz. **Solving the Shifts and Breaks Design Problem Using Integer Linear Programming.**

Lucas Kletzander and Nysret Musliu. **Solving the General Employee Scheduling Problem.**

TS6: Sport Timetabling

Thursday 16:30–17:20 EI10

John H. Drake and Paul Dempster. **A two-phase heuristic approach to English football fixture scheduling over the holiday period.**

David Van Bulck, Dries Goossens, Jörn Schönberger and Mario Guajardo. **RobinX: an XML driven classification for round-robin sports timetabling.**

Conference Banquet 20:00 – 23:00

Friday, August 31, 2018

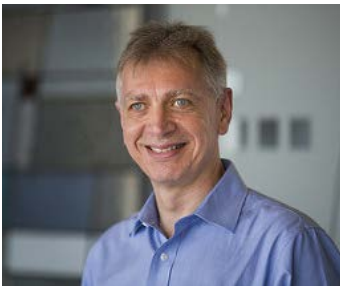
Friday 8:30 – 9:30

Invited talk: Pascal Van Hentenryck

Friday 8:30–9:30 EI9

Optimizing Mobility Services

Abstract: The availability of massive data sets, combined with progress in communication technologies, connected and automated vehicles, and analytics, has the potential to transform mobility for entire population segments. This talk reviews this opportunity, from its potential societal impact, to the development of new mobility services, and the science and technology powering them. In particular, the talk presents recent developments in on-demand multimodal transit systems and community-based trip sharing on real case studies, focusing on the underlying design, scheduling and routing problems.



Pascal Van Hentenryck is the Seth Bonder Collegiate Professor of Engineering at the University of Michigan. He is a professor of Industrial and Operations Engineering, a professor of Electrical Engineering and Computer Science, and a core faculty in the Michigan Institute of Data Science. Van Hentenryck's current research is at the intersection of optimization and data science with applications in energy, transportation, resilience, and computational social science.

Coffee Break 9:30 – 10:00

Friday 10:00 – 11:15

FS1: Nurse Rostering

Friday 10:00–11:15 EI9

Emir Demirović, Nysret Musliu, Peter J. Stuckey and Felix Winter. **Solution-Based Phase Saving and MaxSAT for Employee Scheduling: A Computational Study.**

Jeffrey H. Kingston, Gerhard Post and Greet Vanden Berghe. **A Unified Nurse Rostering Model Based on XHSTT.**

Jeffrey H. Kingston. **Modelling History in Nurse Rostering.**

FS2: Timetabling in Airline Industry

Friday 10:00–11:15 EI10

Geert De Maere, Jason Atkin and Elizabeth M. Argyle. **Dynamic Programming With Strengthened Dominance for the Multi-Runway Sequencing and Allocation Problem.**

Bahadir Zeren, Ender Özcan and Muhammet Deveci. **Crew Pairing Optimization using Hyper-Heuristics.**

Jason Atkin, Christofas Stergianos, Elizabeth Argyle and Geert De Maere. **Pruning for the QPPTW airport ground movement algorithm.**

Friday 11:15 – 11:35

Conference Closing

Friday 11:15–11:35 EI9

Lunch 11:35 – 12:30

Social trip to Wachau 12:30 – 20:30

Meeting point at the registration desk at 12:30