Operational Research as a resilient technology

How OR reacts and adapts to disruptive changes and future challenges

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EURO Practitioners Forum
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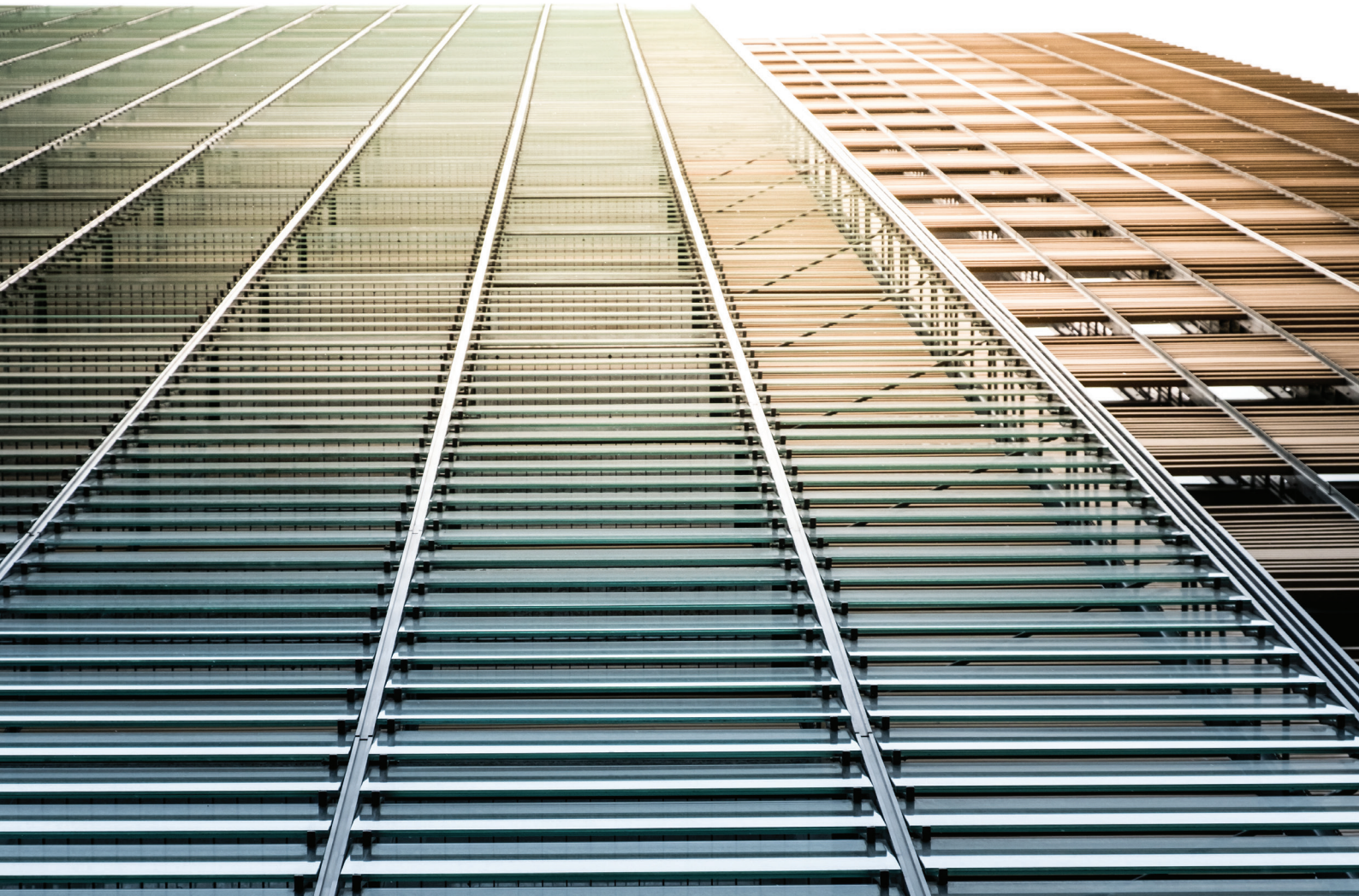

EURO THE ASSOCIATION OF EUROPEAN OPERATIONAL RESEARCH SOCIETIES | EURO PRACTITIONERS' FORUM

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Sponsors

Many thanks to all the sponsors of this event that has been entirely financed through their generous contributions.

Keynote talks

How to cope with the recent new challenges in gas transport

Klaus Spreckelsen

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During the last year the situation regarding gas supply has fundamentally changed in Germany and all of Europe. The sources of supply have moved significantly from east to west on short notice.

New sources, for example, LNG, which will arrive in northern Germany, has to be transported to the industrial areas in the south. This results in massive changes of flow patterns, which for several reasons are difficult to change. We will report on the challenges that came up and the solutions implemented.

Biography

Klaus Spreckelsen studied physics in Bochum. After a short excursion into the IT sector, he has been working in the energy industry since 2004, first at Eon-Ruhrgas, later at Open Grid Europe (OGE). He worked in capacity management and network planning and now works in network control. There he mainly takes care of topics with a physical and mathematical focus and green gases (H2 and CO2).

OR challenges related to the electricity system transition: a glance at some latest modelling and solving advances

Sandrine Charousset-Brignol

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The European carbon reduction targets are calling for significant changes in our electricity system. These changes, especially the emergence of a high share of intermittent renewable energy sources in the energy system, create new challenges. In particular, the volatile character of generation from renewable energy sources and the dependency on weather conditions increases the need for flexibility. Moreover, climate change will also deeply impact the electricity system, both on generation and consumption sides. In this talk, we will show how we are accounting for these evolutions in European electricity system models and present some recent advances related to solving solutions, as well as forthcoming challenges for the OR community.

Biography

Sandrine Charousset-Brignol is a researcher at OSIRIS since 1996. She is member of the PGMO's (The Gaspard Monge Program for Optimization and operational research) executive board and in charge of The Optimization and Energy Research Initiative. She has been

working in the Optimization group of the 'Optimization simulation risks and statistics for energy markets' department of EDF R&D since 1996. In the 90s, she developed models for the unit commitment problem. When the electricity market opened in 2001 in France, she began to work on risk management problems together with market modeling. From 2006 to 2009 she headed a research group focused on statistical approaches around the forecasting of wind power, hydro inflows and energy prices. She then headed the 'optimization' group for 5 years before creating and taking in charge the PGMO when it was created by EDF and the FMJH (Fondation Mathématique Jacques Hadamard). She has managed a research group of 20 researchers for 6 years.

Using airline planning software to schedule nurses when COVID hit Sweden

Daniel Roth

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The Nurse Scheduling problem is a classical optimization problem studied in academia and of course addressed daily across the world. Mostly, this planning problem is solved manually and done very similarly from month to month. But what do you do when the COVID-19 pandemic turns everything on its head with the care units expanding drastically, and work time rules completely change? The Karolinska hospital in Stockholm, Sweden, and Jeppesen, normally working with airlines, teamed up to tackle this very challenge. In just a few days, the team went from initial discussions to publishing completely new schedules for the nurses.

Biography

Daniel Roth was born in Malmö, Sweden, and moved to Gothenburg 2000 to study Computer Science and Engineering at Chalmers Technical University. He was trained to be a platoon medic during his military service and worked in the E.R. at the hospital in Malmö before and during his education at Chalmers. In 2006 he received a master in Biomedical Engineering.
The last 14 years, Daniel has been working at Jeppesen Systems, a Boeing subsidiary, in Gothenburg and is part of the Solution Consulting team. He is an avid Malmö FF fan, likes to run and spend time with his wife and two kids.

Managing uncertainty and preparing for disruptive changes in financial services industry

Antti Korhonen

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The presentation discusses optimization solutions for strategic financial decision-making and enterprise-wide risk management in financial institutions. The software is a sophisticated prescriptive analytics solution based on a stochastic dynamic optimization approach and solves highly complex real-world financial planning problems under uncertainty. The application is an integrated platform for banking, insurance, pension funds, wealth management and multinational financial groups.

The software computes dynamic, multi-period financial strategies with concrete action plans that fulfill diverse management goals, priorities and regulatory requirements. The strategies help institutions to prepare simultaneously for multiple economic and financial market scenarios in uncertain operating environments. The computed forward-looking strategies lead to considerable improvements in performance when compared with more traditional approaches. This improvement in performance becomes particularly noticeable in exceptionally difficult and turbulent operating environments.

Biography

Antti Korhonen, CEO, Ph.D. (Econ.), MBA (Chicago). Dr. Korhonen has extensive experience in the financial services industry including commercial banking, insurance and investments. He has served as a Director at the Financial Supervision Authority and Advisor to the Board at the Bank of Finland. He is a docent at two universities where he has been teaching courses in the field of quantitative finance. He has also served ten years as Secretary General of the Eurobanking Group for OR professionals in banking.

Optimal Pricing under macroeconomic shock and unstable customer behavior in e-commerce

Vladimir Fux

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In this talk, we will introduce the algorithmic landscape deployed for pricing at Zalando, the leading European online fashion company. Our main components consist of a forecasting system that models (future) data based on transformer models and an optimization approach based on MIP. We will discuss how our systems navigated the initial shocks of the pandemic and also the Ukraine war. While our system proved to be resilient to the shocks, we needed to invest more work during the transition from the pandemic to the post-pandemic period. For some changes a fast reaction was necessary both on business processes and algorithmic solutions sides, and keeping the right pace with those was the key.

Biography

Vladimir Fux is a Lead Data Scientist at Zalando SE, where he is working on decision support tools for pricing domains. Prior to this he defended his PhD in Institute Mines-Telecom, worked as a Postdoctoral researcher in Technical University of Munich and as Applied Scientist in Zalando. He is interested in Operations Research, Game Theory and Auction Theory topics and currently is focusing on Pricing and Stock optimization problems in the area of e-commerce.

Abstracts of contributed talks

Energy system planning in times of change – a hierarchical and multi-objective approach for sustainable investment planning

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The ongoing energy transition presents significant challenges for the design of future energy systems. As decentralized and renewable technologies gain prominence, the complexities of long-term energy expansion planning continue to grow. Disruptive events, such as political crises, can dramatically alter assumptions about power prices and fossil fuel availability, requiring adjustments to existing investment plans. In order to ensure robust planning under varying economic and political conditions, it is critical to employ efficient solution algorithms capable of performing scenario-based calculations.

As an illustration of these challenges, we present a district heating expansion problem in Berlin, represented by a large-scale mixed-integer linear program. The full-scale model spans 25 years at 4-hour resolution, featuring hundreds of millions of variables and constraints, and while it may not be immediately solvable by commercial MIP solvers, our proposed hierarchical algorithmic framework can effectively tackle the complexity of the problem. The framework consists of three levels: investment, seasonal planning, and unit commitment. Our approach involves solving coarser models to obtain variable fixings for more refined models, which we create by relaxing constraints and aggregating time steps through extended time periods and representative days.

Incorporating economic and environmental goals is another crucial aspect of designing resilient energy systems. Thus, we consider the objectives of cost, CO_2 emissions, and heat generated by combined heat and power plants, recognizing the trade-offs between these objectives as particularly significant. To provide decision-makers with a range of efficient solutions, we approximate the Pareto front using an algorithm based on the Epsilon-constraint method. Our approaches enable us to identify long-term investment planning strategies and to highlight the trade-offs between different economic and environmental objectives. In particular, we demonstrate that minor increases in cost can result in substantial reductions in CO_2 emissions, making a significant contribution to the decarbonization of heating in Berlin.

Biography

Janina Zittel is a seasoned expert in sustainable energy network optimization. With a background in climate modeling, she joined the Zuse Institute Berlin in 2014. Currently she is head of the EnergyLab at the Research Campus MODAL and serves as deputy head of the Algorithmic Intelligence Methods department. Over the past decade, Janina has tackled a diverse range of planning and operational challenges in various energy systems, from natural gas transport to district heating. She uses algorithmic intelligence to create software that assists decision makers in making efficient and sustainable decisions for energy systems planning and operations.

Multi-energy systems design and operations in response of climate change policies

Matteo Pozzi

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The energy industry is undergoing a dramatic transformation, mostly caused by the introduction of increasingly stringent decarbonization policies to face the climate change crisis, that represents without doubts one of the largest and most significant societal challenges worldwide.

While renewable energy sources are installed and fossil fuel combustion-based processes are decommissioned or retrofitted, the actual target scenarios are extremely hard to design due to the fact that the traditional boundaries between gas, electricity, heat and mobility are no longer representative due to the increasing importance of sector coupling/integration.

Leveraging on Optit's consolidated experience in the District Energy sector, we will present how OR is being used by Utilities and Energy Companies to improve day by day operations in view of uncertain conditions, but also how the design of future scenarios (and indeed decisions on investments and policies) and long-term planning can benefit from OR-based models. Real life examples from our collaboration with Italian, EU and US companies (and the UN) will be reported, to highlight both cross-cutting trends and local approaches to ensure digital and analytics innovation unlocks new opportunities to foster sustainability and resilience, improving economic and environmental impacts.

Biography

Matteo Pozzi, following a MSc in Physics and a Diploma in International Relations, started a career as Management Consultant in Italy and the UK. Partner and CEO of Optit since 2010, he has been leading the company (spin-off of the Operations Research team of the University of Bologna) from start-up phase to becoming a leading Italian player in the development of Decision Support Systems based on forecasting, data analytics, simulation and optimization models, with significant operations across the EU and the USA. Thanks to the distinctive offering in the District Energy industry, Matteo is currently Vice Chair of DHC+, Innovation, Knowledge & Technology platform of Brussel-based Euroheat & Power.

Predictive analytics in the presence of structural changes: the natural gas example

Milena Petkovic, Janina Zittel

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The EU liberalized the gas market in 2005. Consequently, with short-term planning of more market participants the natural gas market is less predictable. The main task of transmission system operators (TSOs) is to fulfill all transport demands, ensuring the security of supply safely and efficiently. Since the gas in the pipes travels relatively slow with an average velocity of approximately 25km/h, a high-precision short to mid-term forecast of supplies and demands is essential for the efficient and safe operation of the complex natural gas transmission networks and distribution systems.

In 2022, the gas supply market in Europe, especially Germany, endured significant structural changes. Having the majority of supply shifted from east to west and north, the TSOs had to adapt quickly and find solutions to ensure the security of supply in unprecedented scenarios.

In this talk, we will present the robust, high-precision forecasting system developed in the joint project of Open Grid Europe, one of the largest TSOs in Germany, and Research Campus MODAL. We will elaborate on how the system accommodated fundamental changes in the gas flow time series benefiting from underlying LP and MIP models. Furthermore, we discuss how we can make predictive algorithms even more robust and adaptive and what would be the main challenges.

Biography

After years of research in forecasting and optimization in energy production and consumption, **Milena Petkovic** joined Zuse Institute Berlin (Germany) in 2017 as a research associate. She is leading the research groups Predictive methods and Sustainable Energy Planning at Applied Algorithmic Intelligence Methods Department.

Coming from climate modeling, in 2014, **Janina Zittel** joined the Zuse Institute Berlin to work on sustainable energy network optimization. She is a head of the EnergyLab of the Research Campus MODAL, and deputy head of the Algorithmic Intelligence Methods department. Using algorithmic intelligence the authors aim to develop software to make efficient and sustainable use of transport infrastructure.

Mixed-integer linear programming models to optimize residential demand response to dynamic tariffs

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The increasing deployment of distributed generation based on renewable sources is essential to decarbonize the economy, mitigate global warming and, in countries without endogenous fossil resources, reduce the external dependence on energy. The traditional grid, whose operation is based on the supply-follows-load paradigm, is progressively evolving to smart grids that enable a load-follows-supply operation. This evolution is due to the widespread deployment of sensing and control equipment, particularly in the distribution grid, including smart meters at the customer premises offering bidirectional communication with the grid. This technological infrastructure and the amount of data it enables to gather allow for a more efficient grid management. In this setting, all tariff components (energy, power, network use) can become time-differentiated according to the variability of wholesale market prices, renewable energy availability, and grid conditions, thus inducing adequate changes in consumption patterns. Therefore, demand response programs play a key role in the energy transition, offering potential benefits to multiple players: grid operators (contributing to alleviate congestion in distribution networks), retailers (enabling to manage wholesale buying and retail selling prices) and consumers (engaging in demand response actions to reduce the energy bill without jeopardizing comfort). Consumers have a more active role in managing their energy resources, becoming prosumers who should globally optimize exchanges with the grid, load management, local microgeneration (namely rooftop photovoltaics) and storage assets (static and electric vehicle batteries). Consumers react to dynamic tariffs by resetting temperature setpoints or rescheduling appliance operation to profit from lower priced periods, thus balancing the cost and comfort objectives.

This work presents a comprehensive and modular set of mixed-integer linear programming models of appliance operation, which are aimed at being seamlessly incorporated in autonomous Home Energy Management Systems to be implemented in low-cost computers (e.g., a Raspberry pi or Arduino) allowing for the integrated optimization of all energy resources. The models consider different cost objective function components (energy and power costs, and monetized discomfort) as well as ways of dealing with the possible user's discomfort derived from operating appliances out of the habitual periods/settings and/or temperature ranges. The modular models are developed in a building block manner enhancing the versatility of their utilization in overall models with different objectives encompassing the economic and comfort dimensions, including assessing the consumer's flexibility to provide services to the grid, e.g., through aggregators or in the scope of energy communities.

Biography

Carlos Henggeler Antunes holds a PhD in Electrical Engineering (specialization in Optimization and Systems Theory) from the University of Coimbra (UC). He is a Full Professor at the Department of Electrical and Computer Engineering - UC, Director of the R&D institute INESC Coimbra, and member of the coordination committee of the Energy for Sustainability Initiative at UC. His areas of interest include multi-objective optimization, meta-heuristics, multi-criteria analysis, bilevel optimization, applications in energy systems and policies with focus on energy efficiency and demand response. He is co-author of the book Multiobjective Linear and Integer Programming and co-editor of the book Energy and Behaviors (Academic Press, 2019). He is senior editor of Energy Policy.

Maria João Alves holds a PhD in Management (specialization in Operational Research) from the University of Coimbra. She is currently an Associate Professor at the Faculty of Economics of the University of Coimbra, a researcher at the Centre for Business and Economics Research of the University of Coimbra (CeBER) and collaborator at the Institute for Systems Engineering and Computers at Coimbra (INESC Coimbra). Her main research interests include multiobjective programming, bilevel optimization, meta-heuristics, applications in energy systems and decision support systems. She is co-author of the book Multiobjective Linear and Integer Programming (Springer, 2016).

Combining optimization and deep learning for dynamic pricing in renewable energy markets

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The global energy crisis has thrown energy markets into turmoil and the volatility of energy prices has a huge impact on the livelihood of consumers and the operations of businesses, even the performance of national economies. Without a clear picture of energy production and consumption, it is challenging for governments, businesses, and investors to develop long-term energy policies and development plans, especially in the renewable energy sector. On the production end, many factors pertaining to market price, geo-political environment, and climate changes affect the outputs of energy production. These factors also influence the demand from consumers along with other factors such as social acceptance and environmental concerns. Current high price ranges of oil and gas present opportunities for governments, businesses, and investors to find affordable and sustainable energy sources. However, it is more challenging to determine the market price of renewable energy due to its complex demand and supply relationship.

The dynamic pricing model has been employed in retail markets to help businesses understand supply and demand in order to maintain market balance. The effectiveness of dynamic pricing depends on the accuracy of forecasting and careful analysis of the demand, supply, market competition, and production cost. In general, dynamic nonlinear pricing optimization models such as price elasticity of demand (PED) and the price elasticity of supply (PES) are employed.

In renewable energy markets, demand and supply forecasting involve data of various types such as weather profiles and economic conditions. The PED and PES models suffer in their limitations because there is no deterministic model to include weather conditions. In this study, we use statistical learning models to include many factors for better forecasting of demand and supply, which in turn improves the optimization models of dynamic pricing. A real-world dataset from Kaggle.com is utilized to train the deep learning models on both production (supply) and consumption (demand). Because the data is time-series data, we first test the stationary property of the data, then develop deep learning models for production and demand forecasting. PED and PES models are developed to generate the optimal dynamic pricing schedule using the predicted demand and supply.

The results of this study highlight the benefits of combining optimization and learning methods to deal with the situation where there is no deterministic model available to include the important factors of dynamic pricing. Our approach can be applied to other industrial sectors that require dynamic pricing to maintain the market balance, but demand and supply are hard to predict due to the complex business environment.

Biography

Bahram Alidaee received the B.S. in business administration from the University of Tehran in 1975, the MBA from the University of North Texas in 1981, and the Ph.D. degree in mathematical sciences from the University of Texas at Arlington in 1988. He is currently a professor of operations and supply chain at the business school, the University of Mississippi.

Haibo Wang received the Ph.D. degree in business administration from the University of Mississippi in 2004. He is currently Radcliff Killam Distinguished Professor in Decision Science and Operations Research at Texas A&M International University.

Lutfu S. Sua has received his B.S. degree in Industrial Engineering at University of Istanbul, MBA in Business Administration at Troy University, and Ph.D. in Production and Operations Management at the University of Mississippi. He serves as a project expert for multiple European Union programs.

Jun Huang received the Ph.D. degree in business administration from Texas A&M International University in 2014. He is currently an associate professor in Management and Marketing department at Angelo State University.

The intelligent machinery behind airline ground operations

Claude Philippe Medard, Nidhi Sawhney

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We discuss solutions to two business processes performed during Airport/Airline Ground Operations. The first is the challenging task of optimal allocation of Stands and corresponding Tow plans for a large number of aircrafts flying in and out of airports. The second task is the subsequent planning and monitoring of Turnaround processes required for orchestrating all ground handling activities.

The presentation will showcase solution approaches to these highly time-critical operations, both for planning and recovery. The solutions adhere to strict dependency rules as required by operations and provide improved accuracy for Target Off Block Time slot requests to Air Traffic Control (ATC) by incorporating real-time IOT data, ML predictive algorithms for improved duration estimates and Optimization for optimal allocation while balancing multiple objectives. The study was done with a large commercial airline with data from their productive scenarios.

Biography

Claude Ph. Medard is based in Heidelberg Germany, Principal Data Scientist within the Customer Success Global Center of Excellence for SAP Business Technology Platform (BTP). He drives ML & Optimization practice within SAP BTP for the last 13 years. He has worked before at ILOG, Jeppesen / Carmen Systems, and JDA.

Temporary logistic hubs prepositioning for preparedness and response disaster operations

Suhad Al-Natoor, Béla Vizvári

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Large-scale natural disasters have catastrophic consequences for human life. In order to save more lives, humanitarian logistic planning should be performed in preparedness and response stages. The number and the location of the temporary logistic hubs should be prepositioned in the best spatial places in both reachable and isolated areas. The purpose of this study is to develop a robust methodology using a modified version of the maximal coverage location problem to determine the optimal number and location of the temporary logistic hubs. In order to develop accurate and actual methodology, this study employs the concept of the risk of facility status aftermath of the disaster and it uses two types of factors: crime rate that considers as pre-disaster factor and damage degree that considers as post-disaster factor. The objective function of this study is to maximize the total number of demand points that are served within the specified reachable and isolated coverage area. The transportation of the relief items in response stage in both reachable and isolated areas will be served by using truck-drone system (tandems).

Biography

Suhad Rebhi Al-Natoor is a PhD candidate in the industrial engineering department at Eastern Mediterranean University, Northern Cyprus. Her thesis and research focus on operations research / disaster supply chain management / facility location problem–temporary hubs. She is currently working as full time research assistant (scholarship) and has experience of about 4 years in teaching and research. She finished the program with honour degree. She published the following paper: 'Design and preparation of mass production system for protective items in the European Union (EU) for the case of serious pandemics', and two other papers are ready to publish: 'Optimization Models for Hubs in Natural Disasters-Emergency Logistics. A Literature survey' and 'On location of temporary hubs for post-disaster supply along a river'. Her future research will be focused on rescuing the victims under debris in case of natural disasters using internet of things and artificial intelligence. She attended 3 online-conferences related to humanitarian logistics, and she is peer reviewer in PLOS ONE and ANNALS. She attended different training courses.

Prof. Dr. habil. Béla Vizvári is an academic researcher from Eastern Mediterranean University, currently he is working as distinguished scientist at EMU. He has contributed to research on the topics: Grid & Linear programming, optimization modeling and operations research, integer and mixed integer programming. His author's Google h-index is 21, i10 index is 41 and he has 1960 citations and 145 journal papers. Previous affiliations of Béla Vizvári include Hungarian Academy of Sciences and Bilkent University. He is currently a supervisor of many PhD and master students in EMU. Furthermore, he is one of the members of the editorial board of Annals of Operations Research.

Leveraging Deep Learning models to estimate travel time durations over large evolving networks

Ruggiero Seccia

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While solving Vehicle Routing Problems (VRPs) it is essential to know how long it will take to reach a specific location on a map from a given starting point. Estimating travel time durations over a map implies estimating durations over each road segment and over each turn derived from moving from one edge to another edge. Having a better estimation of the travel time needed to reach locations while solving the VRP would lead to great benefits by providing more robust and efficient schedules with fewer time-window violations and/or more customers per schedule.

In this talk, we investigate how we can leverage realization data of trucks moving over a network to train a deep learning model able to predict travel time durations for each edge and turn in the network. This task, however, is extremely challenging because of:

- Lack of data defining the exact path traveled by a vehicle. Usually, models for predicting travel time durations are fitted using GPS observations of vehicles moving over the network sampled with a certain frequency. This implies that we need to reconstruct the most likely path travelled by a truck that connects two consecutive GPS pairs.
- Lack of methodologies to clearly split travel times between edge travel times and turn costs.
- Travel time durations are usually time-dependent, meaning that their value can change over time (e.g., because of traffic jams at specific times of the day). However, to efficiently solve the shortest path problem, we might need to decompose the congested and uncongested parts of the travel time duration.
- Finally, noise in the GPS observations, which makes the overall predictive task even more challenging.

In our study, we use approximately 7 million GPS observations of trucks making deliveries in the United States to train a Deep Neural Network model to predict (un)congested travel times over each edge and turn of the map of the North-East United States. We then validate model performance on never-seen-before travels. Furthermore, we validate model performance by creating a new map of the North-East United States with the trained model and compare Origin-Destination travel time predictions obtained with the model-based map (this implies solving a shortest path problem on the new map) with the realized OD pair durations coming from customer data.

Results show great advantages deriving from using deep learning approaches to estimate travel time durations with the Symmetric Mean Absolute Percentage Error reducing by 25% compared to previous values. Interesting to share is also that further analysis on the newly created map showed that the Deep Learning model was able to automatically detect and adjust edge and turn durations on some specific regions where customers were also complaining about current estimation values.

Biography

Ruggiero Seccia is an Operations Research engineer, working within the Math Innovation team at ORTEC. He got his bachelor's degree in "Management Engineering" in 2015 and his Master of Science in "Quantitative methods for supporting decisions" in 2017 both at Sapienza University of Rome. In 2021 he completed his PhD in Operations Research at Sapienza, under the supervision of Prof. Laura Palagi. During his PhD, Ruggiero worked on several research topics from decomposition algorithms for training Deep Neural Networks to applications of Machine Learning for personalized healthcare, just to cite some of them. Moreover, he worked as a visiting scholar at the University of Wisconsin-Madison (US), where he collaborated with Prof. Steve Wright, and he joined the IBM Data Science Elite Team in Munich, Germany, for a research period during his PhD.
Ruggiero is passionate about Mathematics, Optimization and Machine/Deep Learning and takes his energies from working on cutting-edge research projects on these topics. During his free time, he likes to stay up-to-date with the latest discoveries from the Machine Learning and Deep Learning fields and test out some of them with simple case studies.

Improving quality of OR data sets: Detecting and removing data errors that involve superhuman complexity

Inci Yüksel-Ergün[1], Thorsten Koch[1,2], Janina Zittel[1]

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Data is ubiquitous in the age of analytics. The reliability of decisions based on OR studies depends on the underlying data quality. However, identifying pertinent data and assessing its quality is challenging. It is inevitable to employ highly-connected and consistent real-world data sets to model complex decisions. When expert knowledge becomes obsolete with disruptive changes, we require more complex models to comprehend the impacts of these changes.

When conducting projects with industry using highly connected data, we encountered several cases where our analysis detected data errors that were too complex for humans to understand. Examples for our analysis include irreducible infeasible subsystems (IIS) of large mixed-integer programs (MIP) and bottlenecks in highly nonlinear networks. While detecting such errors is a significant achievement, removing them is extremely difficult.

In this presentation, we highlight our insights on data quality improvement. We report our results on data from the German high-pressure gas transport network using methods from data preprocessing and mathematical optimization.

Biography

Inci Yüksel-Ergün joined the Zuse Institute Berlin (ZIB) team as a postdoctoral researcher in 2018. Since then, she has been working on gas network optimization in multi-energy systems and methods for constructing and improving open research data sets, particularly for gas networks. Before joining to ZIB, she was employed in various positions ranging from engineer to department manager at a leading Turkish defense electronics company, where she worked mainly on the design optimization of complex systems and decision-support algorithms development.

Thorsten Koch is Professor for Software and Algorithms for Discrete Optimization at TU-Berlin and head of the Applied Algorithmic Intelligence Methods and the Digital Data and Information for Society, Science, and Culture departments at the Zuse Institute Berlin (ZIB). He has worked in several areas, especially the planning of infrastructure networks, chip verification, mathematics education and integer optimization.
From 2008-2014 he was the coordinator of the FORNE project, an industry collaboration project regarding gas transportation involving five universities and two research institutes. The project received the 2016 EURO Excellence in Practice Award of the European OR Society. From 2013-2019 he was head of the GasLab and the SynLab within the Research Campus MODAL (Mathematical Optimization and Data Analysis Laboratory). The project Optimized Execution of Dispatching conducted together with Germanys largest Gas Transmission System Operator became finalist of the 2020 INFORMS Innovative Applications in Analytics Award.
Currently, his work is focused on developing high-performance parallel methods for solving large-scale structured optimization problems. Such problems arise, for example, in data-driven, real-world analysis and planning of sustainable network infrastructures. This includes high-performance solvers for Steiner Tree Problems in Graphs (STPG) and Quadratic Unconstraint Binary Optimization (QUBO).

Janina Zittel is a seasoned expert in sustainable energy network optimization. With a background in climate modeling, she joined the Zuse Institute Berlin in 2014. Currently she is head of the EnergyLab at the Research Campus MODAL and serves as deputy head of the Algorithmic Intelligence Methods department. Over the past decade, Janina has tackled a diverse range of planning and operational challenges in various energy systems, from natural gas transport to district heating. She uses algorithmic intelligence to create software that assists decision makers in making efficient and sustainable decisions for energy systems planning and operations.

Discussion group topics

How will transportation and logistics change over the next three decades, and how can OR help?

Room 3028

Andy Harrison (Inawisdom), Claude Philippe Medard (SAP)

The session will focus on answering the following three questions:

- What will change and what will drive those changes?
- What challenges will these changes bring?
- How can OR help to address these challenges?

Challenges in planning, investing, and operating resilient energy systems

Room 4027

Janina Zittel (ZIB), Matteo Pozzi (Optit)

Energy systems are currently undergoing disruptive changes. Decarbonization, security of supply and resilience in light of unpredictable events become important drivers on top of the economic goals of energy companies. We will invite questions of the participants on the most pressing questions they currently face in their working environment, to focus on the key challenges that the energy industry is coping with.
In addition, we may discuss:

- What does the term "**resilient** energy systems" mean in your business? What are the planning, investment, and operations decisions that arise from this?
- What approaches you adopt to ensure **security of supply** vs. cost efficiency?
- What is the role of **decarbonization** in the decision making process (on top of compliance with regulatory constraints)?

The OR/Analytics Supply Chain

Room 4359

Ruth Kaufman (Chair of EURO Practitioners' Forum), Susanne Heipcke (FICO)

This conference claims to be full of examples of where and how OR is making a difference in a rapidly-changing world. But actually, OR on its own does nothing. OR can only make a difference through *people*: either through OR professionals who apply OR tools, analysis and thinking directly to the real world situation; or through non-specialists using software designed by specialists to have robust internal workings and foolproof user interfaces.
In this discussion we will look at this from two perspectives:

1. The non-specialist end-user (typically the business problem owner):
    - How do they specify/define what they need
    - How can they procure the right people or the right software
    - How do they know that they have the right people/software
    - What price should they be paying
    - What resources do they need (other than money): senior manager time, operations team time, data, systems interfaces...and how do they know?

- What are the benefits of an in-house team versus consultancy?

And perhaps most important of all

- How can we help them navigate these challenges—because if we can't, OR will never achieve its full potential

2. The OR/Analytics manager:
    - How do we decide what skills mix we need to recruit and retain
    - Are there enough people with those skills 'out there' (and if so, where do we find them)...
    - ...or do we need to train our own; and if so, which are the particular skills or behaviours that we need to focus on, and how do we do it?
    - How do we maintain a healthy pipeline, ensuring that we have the right numbers of professionals at all stages of seniority and experience, at the same time as ensuring staff get sufficient job-satisfaction and feel recognised and rewarded?

Delivering value with OR products in a practical context

Seminar Room

Sander van Aken (Flixbus), Vladimir Fux (Zalando SE)

Having a true business impact with OR models, algorithms and products requires teamwork. OR practitioners often collaborate with clients, internal end-users, software engineers (within or across teams), and business stakeholders. For example, the agile philosophy (http://agilemanifesto.org), think about frameworks as Scrum and Kanban, has proven its value in delivering impactful results in line with (changing) stakeholder requirements in traditional software engineering as well as other fields. From our past and present experiences, OR, and by extension data science and ML, projects tend to have a large degree of uncertainty and potentially lengthy development cycles without the guarantee of having deliverable result.

We want to create a discussion in which we can learn from each other's practices, experiences and ideas, and explore with you what a good OR development cycle may look like. Think about questions like

- How do we deal with risk and uncertainty in the OR model and product development cycle?
- How do we collaborate with stakeholders, which may have a different background and working methodology?
- What defines a good team setup and how does it relate to the development cycle?
- How do we provide sufficient space for innovation, ideation and creativity?
- How do we ensure that what we deliver aligns with stakeholder requirements and has true business impact?
- How can we break delivery of an OR product down into smaller increments?

Maps

Conference venue:

Zuse Institute Berlin (ZIB), Takustraße 7, 14195 Berlin – Dahlem, Germany
http://www.zib.de

Conference dinner: D

eßkultur im Ethnologischen Museum, Takustraße 38/40, 14195 Berlin, Germany
Tel. +49 30 8301 433
https://www.esskultur-berlin.de/taeglich-berlin/gastraum-dahlem/