Practice of OR – sharing experiences, building networks

16 November 2021, 13:00 – 17:00 CET, online

LIGHTNING TALKS SESSION

1. How mathematical optimization provides more effective coordination between air traffic controllers, *Patrick Schittekat, SINTEF*

2. Bringing advanced modelling methods together to solve OR problems: Simulation and reinforcement learning for 3D bin packing, *Yi (Joy) Kuo, DecisionLab*

3. Who should work on Christmas? *Emily Curry, Jeppesen*

4. Managing disruptions in the supply chain with scenario-based optimization, *Juan-Manuel Garcia-López, FICO*

5. Using the 6 Capital Value Framework to incorporate environmental, customer and performance goals: business planning in the water industry *Cicely Striolo, Copperleaf*

6. Building central OR expertise for Deutsche Post DHL, *Baris Cem Sal, Deutsche Post DHL*

DETAILS

1. **Patrick Schittekat: How mathematical optimization provides more effective coordination between air traffic controllers**

Air traffic controllers are responsible for guiding aircraft at airports from and to the runway, and in the air. Their main concern is keeping between each aircraft a minimum separation. To this end, they continuously monitor and adjust traffic by interacting with pilots.

This responsibility is divided by area, e.g. part of the airport or an airspace volume in airspace. This division is essential to make the workload manageable for a single controller but it makes effective coordination more difficult. Often, controllers resort to fixed, easy rules for coordination leading to unnecessary delays.

This talk shows how mathematical optimization can be used to improve ordination.

About Patrick: Patrick Schittekat is Senior Research Scientist at SINTEF. He has 17 years of experience both in the software industry and in research. He obtained his Ph.D. in Mathematics, Optimization for Industrial Applications while starting the Belgian subsidiary of ORTEC. After this, he was a Professor in Operations Management at the Free University of Brussels. His current work focuses on designing real-time optimization techniques.

2. Yi (Joy) Kuo: Bringing advanced modelling methods together to solve OR problems: Simulation and reinforcement learning for 3D bin packing

Microsoft's Project Bonsai was looking to demonstrate and improve the capabilities of their machine teaching solution stack. With Decision Lab's expertise in simulation modelling, our team tackled a variation of the 3D bin-packing problem. By limiting packing list visibility, and fixing item arrival order, we designed a problem setup that matches the real-world bin-packing challenges that make effective optimisation difficult or impossible. This talk will discuss how the bin-packing model supported the improvement of Project Bonsai's simulation integration, as well as facilitated comparison between traditional approaches (such as optimisation or rule-based algorithms) and reinforcement learning approaches to solving classic logistics problem.

About Yi: Yi (Joy) Kuo is a Simulation Developer at Decision Lab. With a background of MSc Business Analytics from UCL, she specialises in data-driven analysis in human behaviour and people interaction via simulation modelling (agent-based modelling, process modelling) and machine learning.

3. Emily Curry: Who should work on Christmas?

Strict Seniority Rostering is a different type of airline crew rostering problem than the Weighted Fairshare model often used in Europe. It is commonly used in North America and in this problem, the roster preferences of a senior crew are infinitely more important than the preferences of a junior crew.

From an optimization perspective it is impossible to solve this problem to optimality. To generate a good solution, we've applied a three-step approach. Firstly, rosters are generated in seniority order, secondly, a feasible solution which satisfies coverage constraints is generated. Finally, the solution is incrementally improved by removing seniority inversions introduced by the second step.

About Emily: Emily Curry works as a Product Owner and Optimization expert in the Rostering Optimization team at Boeing in Gothenburg. Emily has a MSc. in Engineering Mathematics and Computational Science from Chalmers University of Technology. In her work, Emily helps develop the optimizer for the Jeppesen Crew Rostering system which is used by some of the largest airlines in the world.

4. **Juan-Manuel Garcia-López: Managing disruptions in the Supply Chain with scenario-based Optimization**

Raw material price spikes, microchip unavailability, oil and gas supply uncertainty, carbon emissions rights, truck drivers scarcity, water and land overuse, geopolitical changes, electricity price volatility, specialized workers attrition… If neither your industry nor your business are affected by ANY of the above, then you can consider yourself atypically lucky. For all the rest, this presentation will show how Supply Chain managers are using scenarios to prepare for potential disruptions by combining Operations Research plus expert assessment to evaluate their existing Supply Chain networks and to explore resilient alternatives.

About Juan: Juan-Manuel García-López (https://linkedin.com/in/juanmagl) is Senior Associate Partner, Optimization at FICO (makers of Xpress solver), helping clients with Optimization solutions. He has over 25 years of experience working with Optimization software and applications in multiple industries including manufacturing, retail, healthcare, transportation, hospitality and banking.

5. **Cicely Striolo: Using the 6 Capital Value Framework to incorporate environmental, customer and performance goals: business planning in the water industry**

UK water supply companies are facing a growing challenge in optimising to meet the Water Services Regulator (Ofwat) performance requirements and taking consideration for the environment and customers consistently. In this talk I'll discuss how we used the 'six capitals' objective approach to design a framework of models that allow for specific performance targets to be constrained on during optimisation, enabling our clients to develop business plans and manage their performance with confidence.

About Cicely: Cicely Striolo is based in London and is a Chartered Chemical Engineer and former Lecturer (Teaching) in the department of Chemical Engineering at UCL. During her career in private industry she has worked for Chevron Phillips Chemical Company (CP Chem), PA Consulting and Copperleaf Technology, focusing on creating sustainable solutions and building sustainable strategy frameworks.

6. Baris Cem Sal: Building central OR expertise for Deutsche Post DHL

Deutsche Post DHL (DPDHL) Operations Research team started in 2017 with the vision of creating a better world for our 570,000 colleagues, our millions of customers, our investors and for the globe we live on. This lightning talk is about the story of how we built the team from scratch to 12 scientists and *shifted our organizational mindset* when it comes to Operations Research applications. We will discuss the challenges we faced; our learnings, achievements, impact and vision for the years to come.

About Baris: Baris Cem Sal is the Lead Operations Research Scientist for Deutsche Post DHL Group Data Analytics Center of Excellence. Baris holds a BS degree in Industrial Engineering from Bilkent University/Turkey. Throughout his career he worked on real life Machine Learning and Operations Research cases in different sectors, focusing on forecasting, pricing, inventory optimization, network design, and routing.