presents YoungWomen4OR in:

WISDOM

WOMEN IN SOCIETY: DOING OPERATIONAL RESEARCH AND MANAGEMENT SCIENCE

EURO THE ASSOCIATION OF EUROPEAN OPERATIONAL RESEARCH SOCIETIES

WISDOM

"Machine Learning and Operations Management"

Join us for a coffee and a chat!

What: EURO WISDOM Forum YoungWomen4OR Talks[1]

Where: Zoom - Register in this Google Form https://forms.gle/mb144VbsY2fp2TBG6 to receive the Zoom link - The webinar is going to be recorded and made available afterwards.

When: Friday, May 17th, 15:00 – 16:00 (Central European Summer Time)

Webinar Format

- Introductions/Webinar etiquette
  - Dr. Vanesa Guerrero, Universidad Carlos III de Madrid, Spain – 5 minutes.
- Machine Learning and Operations Management – YoungWomen4OR Talks, each 10 minutes:
  - *Consequences of Long Lead Time - Empirical Evidence of Adverse Effect of Delay on Effort in Court Systems* – Shany Azaria
  - *Solving inventory routing with transshipment and substitution under dynamic and stochastic demands using genetic algorithm and deep reinforcement learning* – Fatima Ezzahra Achamrah
  - *Explainable and fair machine learning by means of mathematical optimization* – Kseniia Kurishchenko
- Meeting the challenges - Overview/Current Challenges, synergies with existing work
  - Prof. Coralia Cartis, University of Oxford, United Kingdom – 10/15 minutes
- Moderated open discussion with Coffee and Networking – 15 minutes

YoungWomen4OR Speakers

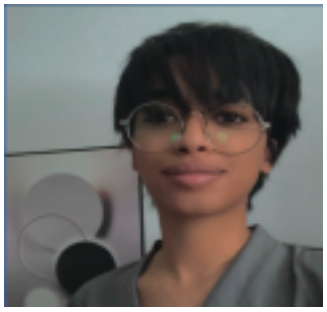
Shany Azaria, *University of Toronto, Canada*

Title: Consequences of Long Lead Time - Empirical Evidence of Adverse Effect of Delay on Effort in Court Systems

Abstract: This work presents a methodological approach that employs data analysis to investigate the adverse operational effects of congestion, as observed within a court system setting. Central to this study is the premise that prolonged lead time leads to the generation of additional tasks, consequently

[1] WISDOM is a forum to support, empower, and encourage the participation of all genders in Operational Research and Management Science. It is an initiative supported by EURO, the Association of European Operational Research Societies. Please visit: https://www.euro-online.org/web/pages/1654/wisdom

increasing congestion by consuming additional processing resources. We coin this phenomenon 'the congestion vortex'. To delve into this subject, we merge two distinct datasets obtained from the Israeli court system, and utilize two instrumental variables to mitigate the issue of reverse causality between effort and lead time. Our results indicate that for each additional month a case lingers in the system, there is a higher probability for additional workload initiated by the customers of the process. Additionally, we observe that the average effort exerted by a judge on these supplementary tasks rises in correlation with lead time. Furthermore, extended lead time also increases the likelihood of a case concluding with a judgment on its merits, which further increases judicial effort.



Fatima Ezzahra Achamrah, *University of Sheffield, United Kingdom*

Title: Solving inventory routing with transshipment and substitution under dynamic and stochastic demands using genetic algorithm and deep reinforcement learning

Abstract: In this presentation, I will explore key findings and implications derived from a research study I conducted and published as part of my PhD. This study delves into a two-tiered supply chain structure, featuring a manufacturing entity that produces a variety of products and distributes them through its central warehouse to a set of customers. The problem is modelled as a dynamic and stochastic inventory routing problem (DSIRP) that considers two flexible instruments of transshipment and substitution to mitigate shortages at the customer level. A new resolution approach, based on the hybridisation of mathematical modelling, Genetic Algorithm and Deep Reinforcement Learning is proposed to handle the combinatorial complexity of the problem at hand. Tested on the 150 most commonly used benchmark instances for single-vehicle-product DSIRP, results show that the proposed algorithm outperforms the current best results in the literature for medium and large instances. Moreover, 450 additional instances for multi-products DSIRP are generated. Different demand distributions are examined in these experiments, namely, Normal distribution, Poisson distribution for demand occurrence, combined with demands of constant size; Stuttering Poisson distribution and Negative Binomial distribution. In terms of managerial insights, results show the advantages of promoting inventory sharing and substitutions on the overall supply chain performance.

Kseniia Kurishchenko, *Copenhagen Business School, Denmark*

Title: Explainable and fair machine learning by means of mathematical optimization

Abstract: In this presentation, I give an overview of my Ph.D. dissertation about enhancing explainability and fairness in Machine Learning (ML) via the Mathematical Optimization approach. The use of ML to aid Data-Driven Decision-making is increasing dramatically. The wide availability of ML algorithms brings important advantages, such as the improved accuracy of decisions and the reduction in the resources required to make them. Despite excellent accuracy, state-of-the-art ML tools are effectively black boxes that complicate model trustworthiness and may provide unfair outcomes. In my Ph.D. dissertation, I address this issue and model the trade-off between accuracy and transparency.

Subject matter expert:

Prof. Coralia Cartis, *University of Oxford, United Kingdom*

Dr. Cartis is Professor of Numerical Optimization in the Mathematical Institute, University of Oxford and Turing Fellow of the Alan Turing Institute for Data Science. She received her Ph.D. degree in Mathematics from University of Cambridge in 2005 and subsequently served as a EPSRC Postdoctoral Researcher in the Numerical Analysis Group at the University of Oxford. From 2006 to 2007, she worked as a Research Scientist at STFC Rutherford Appleton Laboratory and as Lecturer (tenured Assistant Professor) at the School of Mathematics at the University of Edinburgh from 2007 to 2013. In 2005, she received the Leslie Fox Prize (second place) for her Ph.D. research. In 2019, she received the Mathematical Programming Computation Best Paper Prize for her work about a derivative-free Gauss-Newton method and, the INFORMS Simulation Society Outstanding Paper Prize in 2021 for her work about a convergence rate analysis of a stochastic trust-region method. Dr. Cartis was elected to the 2023 Class of SIAM Fellows and as EUROPT - the EURO Working Group on Continuous Optimization- Fellow 2023. Furthermore, she was a plenary speaker at the 16th EUROPT Workshop on Advances in Continuous Optimization in 2018 and a plenary speaker at the 31st EURO Conference. She is an Editorial Board member of SIAM Journal on Optimization, SIAM Journal on the Mathematics of Data Science, IMA Journal of Numerical Analysis, Mathematical Programming, Optimization Methods and Software and Mathematics of Computation. Her research interests are in nonlinear optimisation algorithm analysis and implementation, especially complexity/global rates of convergence, and in diverse

applications of optimisation from climate modelling to signal processing and machine learning.