Joint Seminar CIRRELT, MobilOpt and Canada research chair in integrated logistics

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ROBUST OPTIMIZATION APPROACHES FOR VEHICLE ROUTING UNDER UNCERTAINTY

Abstract: The Vehicle Routing Problem (VRP) is a challenging optimization problem with a wide range of applications in middle- and last-mile logistics. Recent research has addressed innovative models and algorithms to incorporate uncertainty into VRP variants using robust optimization (RO) techniques, which account for factors such as demand fluctuations, traffic conditions, inclement weather, and vehicle breakdowns. Robust VRPs (RVRPs) seek to provide routes that are protected against uncertainties and are therefore less likely to become infeasible or too costly. In this talk, we present the state-of-the-art in RVRPs, considering different types of uncertainty sets, such as cardinality- and knapsack-constrained sets, and the main challenges in designing the robust counterparts of widely used formulations of deterministic variants of the VRP, both with and without time windows. We show how to obtain RO formulations easily using a recently introduced approach based on the linearization of dynamic programming equations. We also describe effective techniques to check robust feasibility in branch-and-cut approaches, considering various types of uncertainty sets, and demonstrate how to modify the labeling algorithm to generate robust feasible routes in branch-and-price approaches for RVRPs. Finally, we present the results of computational experiments using benchmark instances as well as instances obtained from applications in bike sharing systems. Our results indicate the superior performance of the proposed approaches in comparison to other approaches in the literature in terms of solution quality and computation time. They also highlight the importance of generating robust feasible routes for reducing risks and promoting more efficient and resilient logistics operations.

About the speaker: Dr. Pedro Munari is an Associate Professor at the Production Engineering Department of the Federal University of São Carlos in São Paulo, Brazil. He holds a M.Sc. and Ph.D. in Computer Science and Computational Mathematics from the University of São Paulo. His Ph.D. Dissertation earned the prestigious Doctoral Prize for the Best Dissertation from the Brazilian Society of Applied and Computational Mathematics. Dr. Munari has also held visiting scholar positions at the School of Mathematics of the University of Edinburgh (Scotland, UK), and at the School of Industrial and Systems Engineering of the Georgia Institute of Technology (Atlanta, USA). He has coordinated numerous successful research projects with grants from funding agencies and has developed applied projects with several companies in Brazil, with a specific focus on Operations Research and Logistics. His research interests include exact and heuristic methods, with emphasis on the column generation technique, branch-price-and-cut methods, and decomposition techniques for large-scale problems. Additionally, he has made contributions to the field by introducing formulations and solution methods for challenging deterministic, stochastic and robust combinatorial optimization problems, such as vehicle routing as well as cutting and packing problems. Dr. Munari's research has been published in top-tier international journals, including Transportation Science, Transportation Research, EJOR, and Omega (Scholar h-index 19, Scopus h-index 16). https://ulaval.zoom.us/j/61675113826?pwd=RWVZNVQ0NjZwU2M4aFFmcWRjNUF1UT09
Meeting ID: 616 7511 3826 – **Passcode:**789808

MARDI / TUESDAY
9 mai / May 9th
10h00
Pavillon Palasis-Prince
Local / Room
1307

Ouvert à tous
Open to all

Café et viennoiseries

Responsables / Organizers

Leandro Coelho

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