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

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Université Laval | Canada research chair in integrated logistics

Asymmetric Multi-depot Vehicle Routing Problems: Valid Inequalities and a Branch-and-cut Algorithm

Abstract: We present a generic branch-and-cut framework for solving routing problems with multiple depots and asymmetric cost structures, which determines a set of cost-minimizing (capacitated) vehicle tours that fulfill a set of customer demands. The backbone of the framework is a series of valid inequalities with corresponding separation algorithms that exploit the asymmetric cost structure in directed graphs. We derive three new classes of so-called D_k inequalities that eliminate subtours, enforce tours to be linked to a single depot, and impose bounds on the number of customers in a tour. In addition, other well-known valid inequalities for solving vehicle routing problems are generalized and adapted to be valid for routing problems with multiple depots and asymmetric cost structures. The framework is tested on four specific problem variants, for which we develop a new set of large-scale benchmark instances. The results show that the new inequalities can reduce root-node optimality gaps by up to 67.2% compared to existing approaches. Moreover, the complete framework is very effective and can solve instances of considerably larger size than reported in the literature. For instance, it solves asymmetric multi-depot traveling-salesman-problem instances containing up to 400 customers and 50 depots, whereas to date only solutions of instances up to 300 customer nodes and 60 depots have been reported.

Reference: uit het Broek, M. A. J., Schrotenboer, A. H., Jargalsaikhan, B., Roodbergen, K. J., Coelho, L. C., Operations Research, 2021. https://doi.org/10.1287/opre.2020.2033

About the speaker: Albert Schrotenboer is an Assistant Professor of Transport and Logistics at the Operations, Planning, Accounting and Control Group, School of Engineering, of the Eindhoven University of Technology, the Netherlands. He obtained a BSc, MSc, and PhD in Operations Research at the University of Groningen, the Netherlands. His research focusses on practically inspired optimization problems in the area of transportation and logistics, either originating from new developments in the transition towards renewable energy (offshore wind farms, hydrogen), or originating from new concepts in city logistics, warehousing, maintenance, and inventory control. Albert is particularly interested in the development of new methodology required to solving such optimization problems. He has been a visiting research scholar at Georgia Institute of Technology and Loyola University Chicago. His research is internationally recognized and led to publications in, among others, Operations Research, Transportation Science, and Transportation Research Part C: Emerging Technologies.

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Meeting ID: 852 3832 4025 Passcode: 584931

Mercredi / Wednesday

17 mars / March 17th

10h00

Ouvert à tous
Open to all

Responsables / Organizers

Maryam Darvish - Leandro Coelho

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