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Séminaire du CIRRELT Seminar

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STOCHASTIC PACKING PROBLEMS FOR CAPACITY PLANNING IN LOGISTICS: MODELS AND SOLUTION METHODS

Abstract: Given that logistics activities are often subcontracted, the transportation of goods along an international network entails negotiations with third party logistics firms to book the needed capacity, represented in number of bins of various types and costs to use over a given planning horizon. In this context, bin packing models offers a useful tool to address capacity planning problems. However, these models cover only partially the capacity planning processes ([3], [4]). In this talk, we introduce the stochastic variants of the classical Bin Packing problem, which explicitly take into account the uncertainty related to the availability and costs of bins and demand to be consolidated into the bins. We show how to model the uncertainty by means of a two-stage stochastic programming formulation. The first stage selects the set of appropriate bins given a point estimate of the future items one will need to pack, while the second stage concerns the packing of the items one discovers at operation time into the bins contracted initially plus, eventually, the extra bins that must be secured at the premium price to perform the operations. To efficiently address the proposed model, we develop a progressive hedging based meta-heuristic that includes a number of algorithmic enhancements, in terms of fixed-cost adjustment and soft variable fixing, as well as into the information exchanges and the consensus update process. The results of extensive experiments are used to evaluate the efficiency of the proposed methodology and of the impact of volatility in the spot market (availability and cost of bins) on the capacity planning.

[1] Crainic T.G., Gobbato L., Perboli G., Rei W., Woodruff D., Watson J-P (2014). Bin Packing Problem with uncertainty on item availability: an application to Capacity Planning in Logistics. Procedia - Social and Behavioral Sciences, 111, pp. 654-662.

[2] Crainic T. G., Gobbato L., Perboli G., Walter R. (2014). Stochastic Capacity Planning: a multiple recourse formulation. Proceedings of LOT 2014 conference, Molde, Norway, September 2014.

[3] Crainic T.G., Perboli G., Tadei R. (2012). Recent Advances in Multi-dimensional Packing Problems. In: New Technologies - Trends, Innovations and Research, Constantin Volosencu (editor), pp. 91-110, Intech, Rijeka. Available from: http://www.intechopen.com/books/new-technologies-trends-innovations-and-research/recent-advances-in-multi-dimensional-packing-problems.

[4] Perboli G., Gobbato L., Perfetti F. (2014). Packing Problems in Transportation and Supply Chain: New Problems and Trends. Procedia - Social and Behavioral Sciences, 111, pp. 672-681.

[5] Perboli G., Tadei R., Gobbato L. (2012). The Multi-Handler Knapsack Problem under Uncertainty, European Journal of Operational Research, 236, pp. 1000-1007.

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JEUDI / THURSDAY

23 octobre 2014 / October 23rd, 2014
10h00

Salle / Room 5441
Pavillon André-Aisenstadt
Université de Montréal

Ouvert à tous / Open to all

Organisateur / Organizer
Teodor Gabriel Crainic

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