Contribution ID: **100** Type: **Apresentação regular**

Bi-objective Pollution Routing Problem with Uncertain Demand and Travel Time

The Vehicle Routing Problem and its many variants have been extensively studied over the years due to the various gains enabled by efficient route planning. However, many routing models consider cost minimization by focusing solely on factors such as distance traveled or the number of vehicles utilized, often neglecting other considerations that affect costs and disregarding the environmental impact of solutions. This fact has motivated the proposal of novel formulations aimed at better capturing the complexities of real-world logistical operations. Moreover, the inherent uncertainty in several factors has led to increasing interest in models capable of handling uncertain data, thereby providing solutions that are more useful in practice. In this presentation, we study the Pollution Routing Problem, a variant of the VRP Problem designed to account for driver wages and fuel consumption costs, and we introduce a bi-objective model that considers environmental impact and operational expenses while accounting for uncertainties in travel times and customer demand. We perform extensive computational experiments on benchmark instances to assess the impact of hedging against uncertainty on solution quality and the Pareto front.

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Session Classification: Session 5.4 - Optimization with uncertainty