Contribution ID: **105** Type: **not specified**

Integrating Global Sensitivity Analysis into Bayesian Optimization for Tactical Decision Support in Transport Logistics

Transport logistics facilities such as less-than-truckload terminals require fast and robust tactical decisions under uncertainty, for example regarding task scheduling, resource allocation, and terminal configuration. Since detailed simulation experiments are computationally expensive, surrogate-assisted optimization methods provide an important basis for decision support.

This contribution presents and compares strategies for integrating global sensitivity analysis into Bayesian optimization for simulation-based decision support in transport logistics. Gaussian process surrogate models are combined with sensitivity measures to guide sequential optimization, including variable screening, candidate generation, soft search space reduction, and sensitivity-informed acquisition strategies.

The approaches are evaluated in a multi-objective logistics setting involving throughput, waiting times, resource utilization, and process efficiency. The comparison focuses on optimization performance, computational efficiency, and interpretability, demonstrating the potential of sensitivity-guided Bayesian optimization for more targeted tactical decision-making.

Special/ Invited session

Classification

Both methodology and application

Keywords

Bayesian Optimization, Global Sensitivity Analysis, Transport Logistics Simulation

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Track Classification: Uncertainty quantification and computer experiments