At the Chair of Logistics and Supply Chain Management of TUM School of Management, we are looking for an interested and qualified student to conduct his/her

Master thesis

on the topic

Enhancing Customer Selection in Decomposed Multi-Period Vehicle Routing Problems through Innovative Objective Function Formulations

The Multi-Period Vehicle Routing Problem (MPVRP) presents a significant challenge in logistics optimization, where fleets of vehicles need to serve a set of customers over multiple time periods with minimum costs, while adhering to various constraints such as limited resources and minimum vehicle utilization thresholds. The day of delivery to the respective customer is flexible but penalized through additional costs in the event of delays or limited through fixed due dates. A decision must therefore be made each period as to which customers are to be serviced and how these customers are to be allocated to the individual routes. Having a considerable number of customers and several periods quickly turns the problem into a very large optimization problem for which an optimal solution is almost impossible to find.

Decomposing the MPVRP into multiple Single-Period VRPs offers a tractable approach, enabling the optimization of each time period independently. However, the effectiveness of customer selection strategies in each period heavily influences the overall solution quality and operational efficiency. Widely used models such as the prize-collecting VRP (PCVRP) or the Team Orienteering Problem (TOP) consider customer selection, but without focusing on the multi-period approach and merely optimizing the profit of the single-period problem. The goal of this thesis is to incorporate customer selection into the decomposed single-period VRPs, which, on one hand, considers the quality of the single-period solution, but also does not neglect the multi-period approach, for example, by anticipating the incorporation effort of customers into the routes of the upcoming period.

Key project tasks:

- Literature review on relevant fields of study
- Formulation of the emerging decomposed single-period vehicle VRP
- Implementation of different objective function approaches
- Systematic comparison based on a multi-period simulation
- Analysis and interpretation of results

Requirements:

The thesis is suitable for Master in Management and Technology students with a major in operations and supply chain management. The ability to work independently as well as analytical skills are required. Knowledge of mathematical programming and optimization is required. Knowledge of one general-purpose programming language (e.g., Python, Julia, C++) is preferred.

Earliest begin: as soon as possible

Supervisor: Nicolas Kuttruff

Application: Email with curriculum vitae and transcript of records to logtheses.log@mgt.tum.de