At the Chair of Logistics and Supply Chain Management of TUM School of Management we are looking for a group of interested and qualified student to conduct their

Project Study

on the topic

Clustering of vehicle routing problems with heterogeneous fleet in cooperation with SAP

SAP innovations help more than 400,000 customers worldwide to interact more efficiently and use business insight more effectively. The SAP mathematical Optimization develops modern logistics solutions by using optimization and artificial intelligence methods. Industrial companies worldwide integrate these methods into their applications to plan and optimize the transport business. Particularly challenging are the involved routing procedures that are modelled as Capacitated Vehicle Routing Problems (CVRP). In real-world applications these vehicle routing problems come with two additional challenges: customers are dealing with large-scale scenarios and the fleet typically consists of a limited number of vehicles with different capacities. This version of the CVRP is called Heterogeneous Vehicle Routing Problem (HVRP). A feasible solution to HVRP is given by a set of routes with assigned vehicles, such that all customers are visited, and the capacity constraints of the assigned vehicles are respected. The objective is to minimize the total travel distance of the assigned vehicles. Additionally, it is important from a business perspective that vehicles have a high-capacity utilization.

The goal of this project study is to find out how the restrictions from a limited heterogeneous fleet (especially with a limited number of large vehicles) can best be incorporated into an existing cluster-first, route-second approach for CVRPs. This approach used for large-scale scenarios clusters the original CVRP into disjoint subproblems which are then solved in parallel. The challenge is to find the most efficient assignment of the available vehicles to the clusters. This can be done during the clustering or when solving the clusters in parallel. A first step could be to limit the number of vehicles in a homogeneous fleet CVRP such that the fleet size becomes a limiting factor for the number of visited customers.

Key research tasks:

- Literature review on relevant streams of the research field
- Adjustment of existing CVRP benchmarks to create a HVRP benchmark
- Implementation and testing of several approaches to find the most efficient assignment of the available vehicles to the clusters.
- Interpretation of results

Requirements:

The project study is for students at TUM School of Management with a focus on Operations and Supply Chain Management. The ability to structure the research (e.g., exploration, focusing, validation and detailing), to work independently, as well as analytical skills are required. Experience with Python is a plus. The thesis should be written in English.

Begin: as soon as possible

Advisor: Christoph Kerscher

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