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

Project Study

on the topic

Solving heterogeneous vehicle routing problems with minimum utilization constraints 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, the vehicle 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 the basic 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, as planners are typically working on a day-to-day basis, their goal is to find a plan where vehicles are highly utilized, e.g., their capacity is utilized by 90%. They rather allow not to visit a customer on a day than to send out a vehicle that shows low utilization.

The goal of this project study is to incorporate the additional challenging attributes of a heterogeneous fleet and minimum utilization constraints into a Mixed Integer Linear Programming (MILP) model. Part of the investigation involves exploring how to harmonize the two objectives—minimizing distance and maximizing the number of served customers—while addressing the additional challenges presented by the diverse fleet. The study aims to identify an effective heuristic approach to solve the modelled problem.

Key project tasks:

- Literature review on relevant streams of the research field
- Implementation and testing of adjustments
- Case study based on self-modified CVRP benchmarks
- 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.

Earliest begin: as soon as possible

Supervisor: Nicolas Kuttruff

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