MASTER THESIS A practical framework for the electric vehicle routing problem
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Optimizing the usage of available resources within a delivery fleet is an important problem. An efficient solver can save time, money, and the environment. However, the problem is challenging and no exact algorithm for solving large instances within a reasonable computational time exists.

The electric vehicle routing problem (E-VRP) is a well-known NP-hard, optimization problem that seeks to optimize the routing of an electric delivery fleet. It exists in multiple variants, including attributes such as capacity constraints, time windows, and fuel limitations.

To find an optimal solution, multiple difficulties must be managed. Estimating the fuel consumption of electrical vehicles (EVs) is a difficult task as it is heavily influenced by environmental factors, such as temperature and wind direction. As a result, the approximations are inherently uncertain. Further, the optimal set of routes depends on traffic conditions, charger availability, and other unpredictable events.

In this thesis, a framework for solving practically important variants of the E-VRP was developed in collaboration with Iternio Planning AB. It supports customizable costs, whereby each user can construct a personalized objective function. The algorithms used are easily interchangeable to increase flexibility. Further, a web-based user interface was developed in which the quality and properties of a proposed solution can be investigated. The framework fully supports real-world instances, producing solutions with driving instructions and detailed route information.

The presented algorithm is easy to comprehend but still effective at handling a wide range of problem variants. Computational results show promising performance on several benchmarks and problem variants.

Figure 1. A solution to the E-VRP where a set of landmarks in Scania is visited. All vehicles start and finishes in Lund. The blue markers are customers and the green markers are chargers.