

# **The vehicle routing problem and its application in telecommunications network optimization**

**Bui Thu Hien**

**Abstract:** This thesis investigates the Vehicle Routing Problem (VRP) and its application to optimizing telecommunications network operations. While traditionally applied to logistics, the VRP framework offers a powerful mathematical model for addressing resource allocation and routing challenges inherent in network maintenance and service deployment. This research proposes a novel adaptation of the Capacitated VRP to model the scheduling of field technicians for the installation, repair, and maintenance of network nodes. The objective is to minimize total operational travel costs while satisfying time windows and service-level agreements. A hybrid metaheuristic algorithm, combining a genetic algorithm with local search techniques, is developed to solve the resulting NP-hard optimization problem. Computational experiments using real-world data from a major telecom provider demonstrate that the proposed approach significantly reduces travel distances and response times compared to current manual scheduling practices. The findings confirm that VRP-based optimization can enhance operational efficiency, reduce carbon footprint, and improve service reliability in telecommunications networks.

**Keywords:** Vehicle Routing Problem, Telecommunications Network Optimization, Routing Optimization, Network Design