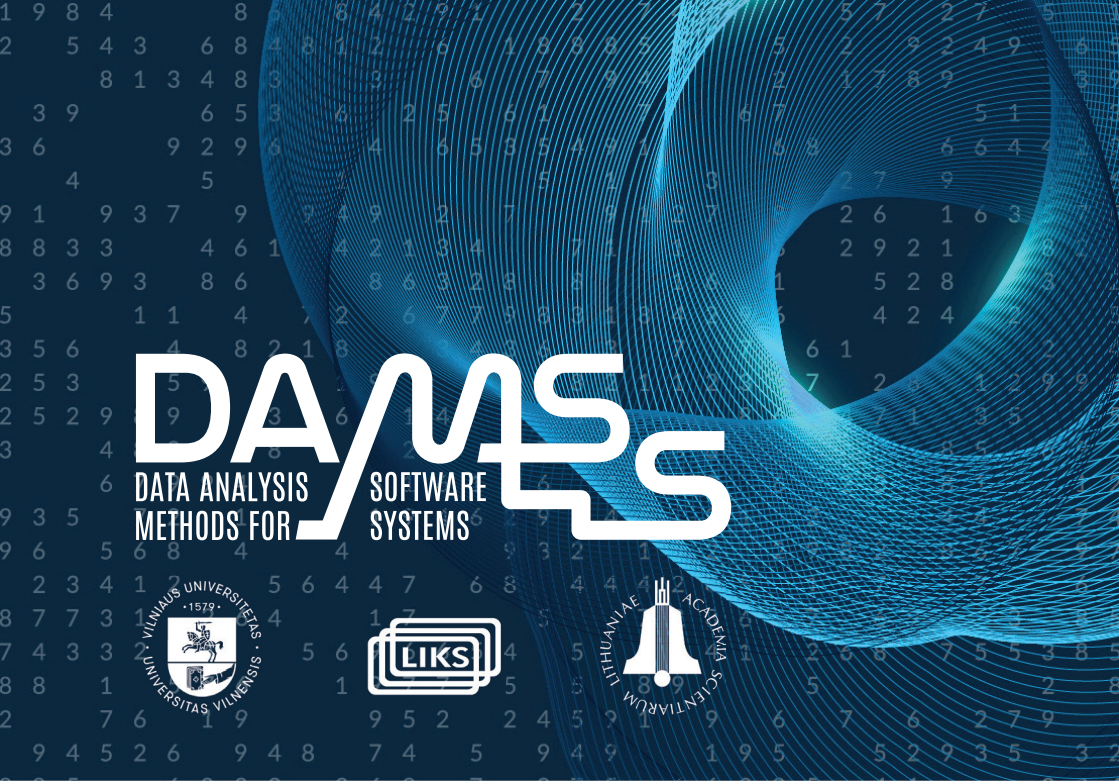

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Robust Facility Location Under Uncertainty in Customer Behavior

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Facility location problems are commonly formulated as mathematical optimisation problems, aimed at determining the best locations for facilities such as stores, warehouses, or factories to effectively meet customer demand within a specified geographic region. These problems are important in various industries, from retail to logistics, as they directly influence operational efficiency, customer satisfaction, and profitability. However, in real-world scenarios, environments are dynamic, and customer behavior is often uncertain or subject to change due to various factors. This uncertainty makes a significant challenge to traditional optimisation methods, which are usually used to find a single optimal solution based on a fixed set of assumptions about customer behavior. Given these complexities, usually, it is better to focus on finding robust solutions that may not be the best for any one specific customer behavior model but ensure profitability across multiple customer behavior models and potential future changes. This research addresses the discrete facility location problem for an entering firm, taking into account uncertainties in customer behavior. A multi-objective approach that integrates the concept of a knee point has been used to determine the robust solution(s) from the set of Pareto-optimal or non-dominated solutions. The heuristic algorithm for multi-objective discrete facility location problems has been developed for finding Pareto-optimal solutions. The algorithm dynamically adjusts the ranks of location candidates based on their fitness. The performance of the algorithm was experimentally investigated by solving different instances of the facility location problem using real geographical and population data.

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