



GROUPE D'ÉTUDES ET DE RECHERCHE
EN ANALYSE DES DÉCISIONS

OPERATIONS RESEARCH & DATA SCIENCE PH.D. SCHOLARSHIP

Keywords: local search-based metaheuristics, vehicle routing, large-scale optimization, machine learning

PROJECT MOTIVATION & GOALS: Local search algorithms are widely used to solve large-scale combinatorial optimization problems, but their efficiency is often constrained by the computational cost of evaluating moves, especially in complex routing applications such as postal delivery, where instances can involve tens of thousands of customers. In this project, we aim to leverage machine learning techniques to accelerate local search by reducing the number of costly move evaluations. Specifically, we will investigate two complementary approaches: (1) training predictive models to estimate the quality of a move before performing a full evaluation, allowing the algorithm to prioritize promising candidates, and (2) using learned policies to suggest moves that are more likely to lead to high-quality solutions. This research builds on recent advancements in machine learning-assisted optimization, where surrogate models and learned heuristics have been shown to improve search efficiency in large-scale problems. By integrating these techniques, we seek to develop novel hybrid optimization methods capable of handling real-world postal routing challenges with unprecedented scalability and performance.

CONTEXT: The project will be carried out in collaboration with Giro (www.giro.ca), the world-leading developer of optimization solutions for public transit and postal routing. The student will be based at the GERAD in Montreal (Canada). The thesis will be supervised by Professors Guy Desaulniers (Polytechnique Montréal) and Jorge E. Mendoza (HEC Montréal). The student will receive a scholarship of 28k CAD/year during the first 4 years (the expected duration of a Ph.D. thesis in Canada). Additional funding may become available via excellence scholarships (e.g., from the schools, the research center, and the provincial or federal governments). The student can enroll in either of the following Ph.D. programs: [industrial engineering](#) or [mathematics](#) at Polytechnique Montréal, or [business administration](#) at HEC Montréal.

DESIRED QUALIFICATIONS: The ideal applicant possesses strong computer programming skills and inside knowledge of operations research and machine learning tools, including math- and metaheuristics (especially local search-based), and supervised and reinforcement learning. The applicant should also be able to communicate comfortably in English and hold a master's degree in operations research, management science, industrial engineering, or applied mathematics.

CONTACT: Interested applicants should email Pr. Guy Desaulniers (guy.deaulniers@polymtl.ca) and Pr. Jorge E. Mendoza (jorge.mendoza@hec.ca) with the following attachments: an up-to-date CV, transcripts for both the undergraduate and the Master's program, and the name and contact information of two professional references. Please use "[GIRO] Ph.D. application – postal routing" for the subject of the email. The position will be open until filled. The student is expected to start the program in the Autumn 2025 semester.