



GROUPE D'ÉTUDES ET DE RECHERCHE
EN ANALYSE DES DÉCISIONS

OPERATIONS RESEARCH & DATA SCIENCE PH.D. SCHOLARSHIPS

Keywords: mathematical programming, scheduling, assignment, electric buses

PROJECT MOTIVATION & GOALS: Electric buses (EBs) are expected to account for 50% of global sales by the end of 2025, prompting transit agencies to rethink urban transportation systems. According to a recent Bloomberg NEF report, state-of-the-art EBs have a range of 50 to 300 km, yet 75% of European buses travel over 300 km daily. Replacing diesel buses with electric ones raises key operational challenges. This Ph.D. thesis aims to expand the optimization toolbox to address these challenges by developing algorithms for (i) EB scheduling and (ii) EB assignment and charging scheduling with parking constraints. The first focuses on computing valid day-long sequences of trips (STs) that may or may not include charging operations. The second involves assigning these STs to specific EBs—typically over a multi-day planning horizon—while optimizing charging schedules under constraints such as a limited number of chargers, maximum grid power, and depot parking dynamics.

CONTEXT: We are hiring **two** Ph.D. students to contribute to work on this project. The research will be carried out in collaboration with Giro (www.giro.ca), the world-leading developer of optimization solutions for public transit. The students will be based at the GERAD in Montreal (Canada). Professors Quentin Cappart and Guy Desaulniers from Polytechnique Montréal and Jorge E. Mendoza from HEC Montréal will supervise these theses. The students will (each) 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 applicants possess strong computer programming skills, have inside knowledge of statistical analysis and operations research modeling tools and solution methods, including mathematical programming, decomposition techniques (e.g., column generation, Benders), and stochastic programming, and can communicate comfortably in English. Such applicants may hold a master's degree in operations research, management science, industrial engineering, or applied mathematics.

CONTACT: Interested applicants should email Pr. Guy Desaulniers (guy.desaulniers@polymtl.ca), Pr. Quentin Cappart (quentin.cappart@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 – E-buses" for the subject of the email. The positions will be open until filled. The students are expected to start the program in the Autumn 2025 semester.