Ph.D. in administration
ML/AI assisted optimisation for solving large-scale optimisation problems

Several Ph.D. students are sought as part of a research program investigating the use of machine learning (ML) and artificial intelligence (AI) to improve the algorithms used for solving large optimization problems. We will explore several ways of integrating ML into optimization algorithms, for example by using an AM model to create a quality initial solution or using an AM model to efficiently guide the optimization process. We will mainly use aircrew optimization problems as a benchmark for the developed methods.

Project description

Successful candidates will carry out a research project in one or more of the following areas:

- Training ML models for prediction tasks linked to the airline industry.

- Integrating ML with optimization algorithms used to solve large-scale problems (branch-and-price, column generation, Benders decomposition, etc.).

- Developing and improving optimization algorithms for large-scale problems, such as *Integral simples using decomposution* (ISUD) and *Dynamic constraint aggregation* (DCA).

Successful candidates might implement optimization algorithms into existing optimization software coded in C/C++ (depending on the project). Python will be used to develop ML models.

Candidate skills

Candidates must have completed a master's degree in a relevant field (operations research, machine learning, applied mathematics, etc.). Furthermore, the ideal candidate has the following qualities :

- Creativity
- Autonomy
- Analytical skills
- Interest for operations research and ML
- Computer science skills
- Ability to code in either C, C++, or Python, and willing to learn the other languages.
- Asset: Research experience in operations research and/or ML

Future career opportunities

Selected candidates will become experts in ML and OR, two fields currently in high demand in Montreal. Furthermore, a growing number of companies are looking to leverage their data to improve their optimization processes. Finally, ML-assisted OR is a hot topic in academic circles. Future career opportunities

Conditions

Selected candidates will receive a bursary of 24 000$ per year.

Contact

Interested candidates are invited to submit a CV and an academic transcript to quesnel.frederic@uqam.ca.