PhD student call :

We are currently recruiting a graduate student at the PhD level to pursue research on online optimization for renewable power system operations. We invite applications for a PhD position at Polytechnique Montréal, located in Montréal, Canada.

Title : Second-order methods for online convex optimization with time-varying constraints : performance analysis and applications to renewable energy systems

Keywords : online optimization, regret analysis, Newton's method, renewable power systems, optimal power flow

Project description : Renewable electric power grids are complex systems integrating many components. They now include dispatchable large-scale renewables, e.g., hydroelectricity, non-dispatchable inverter-based renewables, e.g., wind or solar farms, and distributed energy resources (DERs, e.g., residential solar panels, electric vehicles, etc.), in addition to the more standard loads, conventional generators. Optimally dispatching the power generation to supply loads while meeting all electric network constraints is a hard task given : i) the fast timescale on which non-dispatchable renewables operate, ii) the inherent uncertainty of renewables, and iii) the large number of interacting components within the grid. Hence, novel mathematical methods must be developed to address these challenges and to allow for safe, reliable, and efficient operations of modern power grids.

In this project, online optimization algorithms based on Newton's method will be formulated. Several power system operation settings will be considered, e.g., time-varying constraints, distributed optimization, and limited feedback. The objectives of the thesis are to characterize the performance of the proposed algorithms and to investigate the use of these approaches in modern power systems.

Research group : The candidate will join a research group consisting of students and researchers at all levels (bachelor, master, PhD and postdoctoral fellows) who are working on the design of mathematical methods using a blend of optimization and machine learning for decision-making in renewable power systems. The research group is affiliated with international research centres focused on operational research and artificial intelligence, the GERAD and Mila, respectively.

Program : PhD (4 year-program).

Academic units : Department of Electrical Engineering, Polytechnique Montréal.

Supervisors : Prof. Antoine Lesage-Landry.

Required background : The candidate should have an undergraduate and a Master's degree and in Electrical Engineering, Applied Mathematics or any other relevant field and have strong expertise in mathematical modelling, optimization, and programming (e.g., Python, Julia) in addition to in power systems.

Funding : $24,000/year stipend.

Starting date : As soon as possible (Winter 2024, Summer 2024, Fall 2024).

Application : If interested in this position, please send your CV, cover letter, and recent transcripts to Professor A. Lesage-Landry : antoine.lesage-landry@polymtl.ca. Please indicate *Polytechnique : Online Optimization for Power Systems* in the subject line of your e-mail.