



April 25, 2022

Improved Multi-Scale Urban Physics Modeling

Opportunity: Two Fully Funded Ph.D. Positions

Start Date: September 2022 or January 2023

Program: Mechanical/Civil/Environmental Engineering, University of Guelph

Application Deadline: Search Continues Until Positions are Filled

Overall Project:

A multi-institutional project is formed that brings multiple universities, industries, government ministries, and municipalities together. The proposed project will improve prediction accuracies of building performance and climate processes through multi-scale and multi-physics coupled modelling. The project strategically partners with key stakeholders involved in climate action planning and implementation. Hence, the project outcomes will assist cities and municipalities across Canada in developing and implementing short-term and long-term Green House Gas (GHG) emission mitigation and climate adaptation strategies and actions that will accelerate the efforts by the Canadian Government to achieve the net-zero buildings GHG emission target.

Ph.D. Positions Primary Activities:

The Ph.D. applicants will primarily develop, validate, and disseminate open-source urban physics models at building and neighborhood scales. Focus will be made on aspects of urban physics modeling that are not rigorously represented in standard simulation tools. Example topics are inclusion/optimization of alternative/renewable building energy systems (e.g., photovoltaics, energy storage, wind, heat pump, and envelop thermal/aerodynamic properties), indoor/outdoor vegetation, hydrology, feedback interaction of indoor/outdoor environments, and economics analysis. Long-term building related GHG emission mitigation measures will be evaluated for different Canadian climates (Pacific Maritime, Cordilleran, Prairie, Boreal, Taiga, Arctic, South-Eastern, and Atlantic Maritime Climate Regions). To run the urban physics models for future climates in the next 50-80 years, downscaling of regional and global climate data products will be performed.

Ph.D. Positions Secondary Activities:

The Ph.D. applicants will support other research activities in a larger context of research performed by team members. These include supporting 1) laboratory and field measurements of

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weather/climate related thermo-fluid variables (e.g., wind, temperature, humidity, etc.), 2) high fidelity modelling using Computational Fluid Dynamics (CFD), 3) data science and machine learning techniques, and 4) development and execution of meso-scale weather/climate models with improved urban physics parameterizations. The Ph.D. applicants will also participate in knowledge dissemination activities such as conferences, seminars, workshops, publishing journal articles, distributing open-source software, and more.

Desired Skills:

The most desired skills involve experimental/numerical competency in thermo-fluids, mathematics, physics, statistics, and ability to do programming and analyze large datasets. Historically, applicants with core engineering or science degrees, especially related to thermo-fluids, have fitted in the AIR lab programs very well. Experimental skills in anemometry, thermometry, imaging, data-logging, and signal processing are advantageous. Knowledge in Python, C, C++, and/or Fortran programming is an asset. Scientific documentation (papers, theses, and presentations) in the AIR lab should be prepared using LaTeX.

Equity, Diversity, and Inclusion (EDI):

Applicants will be recruited considering EDI best practices to ensure a transparent, open, and standard process that is fair to all. The AIR lab promotes the inclusion of gender, racial, visible, indigenous, and other minority trainees. Equity-seeking groups are encouraged to apply.

About University of Guelph:

The University of Guelph, situated on treaty lands and territory of the Mississaugas of the Credit of the Anishinaabek Peoples, is the third largest employer in Guelph, a city of approximately 130,000 people, located about an hour drive west of Toronto, Ontario. University of Guelph is a top-ranked comprehensive university in Canada with an enrolment of more than 30,000 undergraduate and graduate students across over 40 academic units. University of Guelph is a unique place, with transformative research and teaching and a distinctive campus culture. People who learn and work here are shaped and inspired by a shared purpose: To Improve Life.

Application Process:

For further information, applicants can contact Dr. Amir A. Aliabadi at aliabadi@uoguelph.ca. Please provide your 1) CV, 2) research statement, 3) unofficial transcripts, 4) sample publications, and 5) contact list of 3 references. Potential applicants will be invited to participate in a 3-step interview process. To be considered, they also need to simultaneously apply to the University of Guelph following this link: <https://www.uoguelph.ca/engineering/grad/application-process>. Details about the AIR lab are available via www.aaa-scientists.com.

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