AIR Atmospheric
Innovations
Research

July 29, 2024

Development of Smart Salt Truck Technology for Improved Road Safety and Protection of Salt Vulnerable Areas

Opportunity: Fully Funded M.A.Sc. or Ph.D. Positions
Start Date: Fall 2024 or Winter 2025
Program: Mechanical/Civil/Environmental Engineering, University of Guelph
Application Deadline: Search Continues Until Position is Filled

Overall Project:

This research will bring to market the next generation of smart salt trucks and advance winter road maintenance operations in Ontario and elsewhere with a focus on environmental protection, road safety and new best practices by examining: (1) Mapping of salt vulnerable areas (SVAs); (2) Modelling of micro-climates within an urban environment; (3) Analyzing the relationship between road weather and salt application rates; (4) Optimizing salt usage (direct liquid application and rock salt) for SVAs; and (5) Advancing and evaluating the accuracy/reliability of the new technology. The above objectives sit squarely at the intersection of many important public policies that will define Ontario's economic vitality and quality of life for the people who call Ontario home and will help our road authorities to make informed decisions.

Position Activities:

The applicant will primarily develop, run, and post process the results of the open-source Weather Research and Forecasting (WRF) model. WRF is used to understand the city climate, which is a local set of atmospheric variables that differ from those in the surrounding areas, often slightly but sometimes substantially. For example, in Guelph, hills and valleys, high-rise buildings, and rivers (the Eramosa River and the Speed River flowing through downtown) affect the wind sheltering, shading, ground surface temperature, and humidity. Of particular interest is the location of high and low snow-ice accumulation. The applicant may also contribute to measurements related to smart salt truck development using satellite image analysis, anemometry (wind), thermometry (temperature), radiometry (shortwave and longwave radiation fluxes), and humidity/water observations. The measurements will be used to validate and calibrate the models. The applicant will participate in knowledge dissemination activities such as attending conferences, seminars, workshops, publishing journal articles, distributing open-source software, and more.

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Desired Skills:

The most desired skills involve experimental/numerical competency in environmental 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 Atmospheric Innovations Research (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 an 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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