Project: Urban Transportation Emissions and GHGs; Technologies and Behavioral Shifts Towards Zero Emissions

The opportunity

Koch's (Prof. Bob Koch) and EML (Prof. Mahdi Shahbakhti) research labs and the University of Alberta, Department of Faculty Engineering invite applications for full-time Ph.D., or MSc position.

As a research team member, you will be exposed to an exciting interdisciplinary research environment investigating urban mobility decarbonization pathways in a cold climate city. You will develop tools to capture the effects of changes in traffic patterns in extremely cold winters on energy consumption and criteria air contaminants. It could stem from changes in behaviour, individual choices, and compromised road conditions.

The other part is multifaceted requiring interdisciplinary collaboration with researchers, data and methods, and models from areas related to traffic engineering, emission inventory analysis, air pollution dispersion modelling, greenhouse gas and energy consumption modelling, covering quantitative experimental and numerical simulation as well as applying qualitative methods. You will work with a team of scientists from SFU (Prof. Vahid Hosseini, CREATE lab) and project partners of the City of Edmonton, Government of Alberta, CASA, AMTA, AAC, and Iteris.

The project

The study is to fill a significant knowledge gap in understanding and quantifying the real-world energy consumption, greenhouse gas emissions (GHGs), and criteria and non criteria air contaminants (CACs) of the most recent transportation technologies (advanced clean diesel, modern internal combustion engines, hybrid electric, plug-in hybrid electric, electric), emerging technologies (advanced electric, hydrogen fuel cell), transportation processes (connected and autonomous vehicles) in cold climate cities or under extreme winter events. Cold and prolonged winters and severe cold episodes alter vehicle emissions and energy consumption in many ways due to reduced functionality of the powertrain, the low conversion efficiency of vehicle exhaust after-treatment systems, the energy required for powertrain warmup and continuous heating (e.g. battery heating), cabin heating, and choice of transportation mode (increased private car and reduced public transit, reduced cycling). The situation exists in many Canadian cities, northern regions, and indigenous communities. The project selects the City of Edmonton as a case study, but the project results apply to most Canadian cities, provinces, and territories. The project uses a combination of state-of-the-art modelling tools, a large set of data, advanced machine learning techniques, and a comprehensive, integrated modelling approach

to understand and quantify emissions of the transportation sector in Canada.

Required Qualifications – General
- Degrees in mechanical, civil engineering, or closely related fields <u>recently</u> graduated or <u>soon</u> to be graduated;
- Keen interest and/or experience (coursework, research, and/or industrial background) in traffic and transportation studies, energy modeling, and environmental impact assessment;
- Past experiences in data analytics and machine learning;
- Working knowledge of GIS, maps, and handling geospatial data;
- Meeting the University of Alberta's admission requirements;
- Proven ability to work independently and in a collaborative team environment;
- Strong <u>communication skills</u> to work with project partners;
- Open to Canadian citizens, permanent residents of Canada, and international students;
- Members of <u>underrepresented</u> groups are encouraged to apply;
- Ability to produce research deliverables on a scheduled timeline of milestones;
- Self-motivated and able to work independently;
- Ability to learn rapidly and integrate new skills;
- Willingness to take ownership of all modelling tasks of a project;
- Have exceptional organizational, troubleshooting, interpersonal, and leadership skills and the ability to work effectively with a diverse team;
- The anticipated start date is immediate; the position will remain open until filled;

How to apply
- Check your eligibility (MSc, Ph.D.) with the University of Alberta's admission requirements;
- Contact: Prof. Bob Koch (bob.koch@ualberta.ca) and submit a CV highlighting the qualifications;
- Indicate in the email which position you are applying for (MSc, Ph.D.);
- All received emails will be reviewed. Only shortlisted candidates will be contacted for further screening. **Please avoid sending reminders.**