

## Postdoctoral position at Polytechnique Montreal, Montreal, Canada

**Topic:** Machine learning for enhanced hydrodynamic and flood impact modelling in cold-region rivers

**Keywords:** machine learning, hydraulic/hydrodynamic modelling, river ice modelling, hybrid models.

**Project summary:** Climate change is increasing the frequency and intensity of floods, emphasizing the need for better flood prediction systems that can forecast flood extent, magnitude, and timing. Short-term, real-time predictions are crucial for emergency response, while long-term forecasts help with planning and adaptation. Hydrodynamic models are vital tools for predicting flood dynamic characteristics like depth and velocity. In cold regions like Canada, hydrodynamic models need to be coupled with river ice models to account for the impact of ice processes on flooding. However, simulating large-scale fluvial systems with high accuracy is prohibitively expensive. A promising solution is to integrate these physics-based hydrodynamic models with machine learning (ML), which can improve speed and accuracy. The project will focus on advancing current hybrid hydrodynamic/ML techniques to handle future uncertainties, respect physical consistency and maintain interpretability.

### Qualifications:

- Doctoral degree in Civil Engineering, Mechanical Engineering, Applied Mathematics, Computer Science, or related fields, completed within the last 4 years.
- Strong hands-on experience with machine learning techniques and tools, particularly in deep learning.
- Knowledge and relevant experience in computational and numerical methods and their application to fluid flow and hydrodynamic problems is desired.
- Proficiency in programming languages such as Python and C/C++, along with experience in machine learning libraries is required. Knowledge of High-Performance Computing (HPC) techniques, particularly GPU programming, is an asset.
- Excellent command of English, with demonstrated ability in scientific writing.
- Strong publication record in relevant fields.

### Work environment:

The successful candidate will work under the joint supervision of Professors [Julie Carreau](#) and [Ahmad Shakibaeinia](#) and will be part of the "Canada Research Chair in Computational Hydrosystems" at **Polytechnique Montréal**. Polytechnique Montréal, part of the Université de Montréal, is one of Canada's largest engineering schools, renowned for its extensive research scope in engineering. With state-of-the-art facilities, it stands as one of North America's most vibrant hubs for scientific and technological innovation, attracting professors, researchers, and students from around the globe. We are committed to fostering equality, diversity, and inclusion within our team. We strongly encourage applications from all underrepresented groups, including visible minorities, women, Indigenous peoples, persons with disabilities, and individuals of any gender identity.

### Start date and duration:

March 2025 or soon after. The duration of this position is 1 year, extendable to 2 years (subject to performance and funding availability).

### How to apply:

To apply please fill out this [online form \(click\)](#). Review of applications will start on Nov 15, 2024, and continue until the successful candidate is selected.