



PhD in Large-Scale Hydrology

— Focus on Computational Methods

Full-time

Working with:

Juliane (Julie) Mai

Earth and Env. Science

University of Waterloo

We invite applications for a PhD position in Large-Scale Hydrology with an emphasis on computational and data-driven methods rather than traditional hydrological expertise. This position will focus on developing and applying computational approaches to tackle complex problems in large-scale hydrology, such as hydrological modeling, flood risk assessment, water resource management, and climate change impacts on water systems. You will use Machine Learning based and process-based models to identify drivers of streamflow generation on a large scale.

Location

Department of Earth and Environmental Science located on the main campus of the University of Waterloo in Waterloo, ON, Canada; in-person

Key Responsibilities

As a PhD student the group led by Nandita Basu under supervision by Julie Mai, you will have the opportunity to:

1. Develop and apply advanced [computational methods and models](#) for large-scale hydrological analysis.

2. Utilize [machine learning](#), data assimilation, or other computational techniques to improve hydrological models and predictions.
3. Improve [hydrologic processes](#) and process understanding in models.
4. Work with [large datasets](#) from remote sensing, climate models, and in-situ measurements.
5. Develop components of [open-data portal](#) [HydroHub.org](https://hydrohub.org) to facilitate communication of simulation results and make models available to users.
6. Develop [automated workflows](#) used on the open-data portal to enable users to obtain model setups, calibrated models, and simulations of multi-model ensembles.
7. Collaborate with a [multidisciplinary team](#) including hydrologists, environmental scientists, and computational experts.
8. Present research findings in academic journals and [conferences](#).



Develop and advance hydrologic models on a continental scale and develop open-data portals to automate model generation and communication of model simulations

Required Qualifications

- * Master's degree (or equivalent) in computer science, applied mathematics, environmental engineering, or related field. Highly motivated and qualified applicants seeking a Master's degree might also be considered.
- * Strong background in computational methods, including machine learning, statistical modeling, high-performance computing, data assimilation, and/or open-data portal generation.
- * Programming skills in languages such as Python (highly preferred), bash (preferred), Fortran, C/C++, R, MATLAB, or similar.
- * Solid understanding of software development principles, version control systems, and debugging techniques.
- * Excellent problem-solving skills and the ability to troubleshoot complex code-related issues.
- * Excellent communication and writing skills in English.
- * Self-motivated with a strong commitment to delivering high-quality results within designated timelines.

Preferred Qualifications

- * Familiarity with hydrological concepts or environmental science is advantageous but not required.

- * Experience working with large-scale modelling projects in domains such as engineering, environmental science, or physics, dealing with large datasets.
- * Familiarity with parallel computing concepts and optimization techniques for distributed computing environments.
- * Experience with cloud computing platforms and infrastructure (e.g., Google Earth Engine, AWS, Azure, Google Cloud, SLURM).



Contribute to the existing open-data portal [HydroHub.org](https://hydrohub.org)

Opportunities and Support

- * Mentorship by leading experts in hydrology and computational science.
- * Access to high-performance computing resources and large datasets.
- * Opportunities to attend conferences and publish in leading journals.
- * Opportunities for professional development and career advancement.
- * Dynamic, collaborative, and dynamic work environment with a focus on innovation and technological advancement.
- * Opportunity to make meaningful impact on environmental conservation.

Application Materials

- * CV with relevant academic and research experience.
- * Cover letter detailing your interest in large-scale hydrology and computational methods as well as pointing to highlights of previous coding projects in relevant fields.
- * Transcripts of academic records.
- * Please fill this [Google Form](#) to be considered as an applicant.

How to apply

Please submit your application as a single PDF to [Julie Mai](#). Please include “PhD position in Large-Scale Hydrology” in the subject line for any email communication.

Applications will be reviewed as they are received. The positions will remain open until filled. We thank all applicants for their interest, however, only those individuals selected for an interview will be contacted. For further information about the position, please contact [Julie Mai](#).

We encourage applications from candidates with diverse backgrounds and perspectives.