

Machine Learning powered large-scale flood forecasting

Job Information	
Position Title	Postdoctoral Researcher in Flood Forecasting
Category	Postdoctoral Visitor
Supervisor	Prof Usman T Khan
Unit	Civil Engineering
Location	Keele Campus, York University, Toronto Canada
Background	
<p>We are seeking to hire a post-doctoral visitor (PDV) to join Prof Usman T Khan’s research team (https://utkhan.info.yorku.ca/) at York University. The successful applicant will work closely with a team members in Prof Khan’s lab and international research partners to build a large-scale, operational, open-access, real-time flood forecasting system using a variety of Machine Learning (ML) techniques.</p> <p>The position will be based at the Bergeron Centre for Engineering Excellence at York University in Toronto, Canada (remote-work options may be possible in some cases). The successful applicant will be part of the interdisciplinary iWater Research Group and have access to high-performance computing equipment to complete their research.</p>	
Overall Purpose of Postdoctoral Position	
<p>As a team member in the research project the PDV will build on existing work in Prof Khan’s research lab to create an operational flood forecasting system that harnesses the power of ML to improve the ability of current practitioners in local governments, conservation authorities, and industry to predict and prepare for flood events.</p> <p>More specifically, the PDV, in collaboration with the larger research team, will be responsible for the following tasks and activities:</p> <ul style="list-style-type: none"> • Advance ML-based flood forecasting by scaling up the current research to include large-scale spatial characteristics from a diverse range of watersheds • Address the perceived limitations of ML’s “black box” (uninterpretable) approach by investigating novel methods of “interpretable” AI which are constrained by physical laws • Develop a standardised framework of best practices for ML-based flood forecasting models, including model performance comparison • Deploy a web-based platform that will translate ML-based flood forecasting research into tools for practitioners and other researchers 	

Key Responsibilities

- Compile a detailed literature and systematic bibliometric review of existing ML-based flood forecasting models to determine extent of current practices in the field
- Use publicly available hydro-meteorological data (from North America and Europe) to develop and deploy ML-based flood forecasting models, with a focus on distinct hydrological and climactic characteristics
- Investigate how emerging interpretive ML methods can be applied to the developed models including linking the spatial properties of the watersheds to model architecture and performance, using state-of-the-art ML methods that incorporate spatio-temporal data into trained models
- Collate the lessons learned and outcomes from model development into a set of recommended best practices ML-based flood forecasting, and to propose a standardised framework for large-scale ML-based flood forecasting
- Work closely with research partners to develop and deploy the web-based flood forecasting platform

Skills and Qualifications

Educational Qualifications	Applicants should have a doctoral degree in Civil, Environmental or Water Resources Engineering, Hydrology, or other closely related disciplines.
Training/Experience Required	<p>Applicants should be proficient in:</p> <ul style="list-style-type: none"> • Data analytics, quantitative analysis • Python (including TensorFlow, Panas, Matplotlib, Geopandas) • Familiarity with large-scale hydro-meteorological global datasets • Managing large datasets and configuring APIs, FTPs, etc. • Conducting spatial and temporal analysis • Best practices in ML and implementing ML pipelines • Preparing scientific visualisations; web development a bonus <p>Applicants should have:</p> <ul style="list-style-type: none"> • A strong publication record in high calibre journals • Excellent written and oral communication skills • Experience in presenting highly technical research to a diverse audience

Terms and Conditions

This postdoctoral position based in Civil Engineering will be 1 year in length. There will be the possibility of renewal for an additional period of 1 year.

Salary: \$45,000 to \$55,000/year (More information about benefits can be found at:

<https://www.yorku.ca/gradstudies/postdoctoral-fellows/>)

PDVs will complete York's Individualized Development Plan:

<https://www.yorku.ca/gradstudies/idp-postdoc/>

How to Apply

To apply for this position, please submit the following documents:

1. A cover letter (1 to 1.5 pages long), which describes:
 - a. your motivation for applying to this research project;
 - b. your background and skills and how they can contribute to this research project;
 - c. your motivation for joining the team;
2. A detailed and up-to-date CV
3. Contact information for two referees (who will only be contacted if short-listed)

Please submit all documents as a single *.pdf file by email to Prof Usman T Khan at usman.khan@lassonde.yorku.ca with the subject "*PDV Flood Forecasting*". Applications will be reviewed starting **15 October 2022** until the position is filled. Qualified applicants will be invited for a brief online interview. Only those applicants selected for consideration will be contacted. The anticipated start date is **1 December 2022** or shortly thereafter.