My research group, the Hydro-Intelligence Lab at School of Freshwater Sciences, University of Wisconsin-Milwaukee (SFS/UWM) is seeking three fully funded students at thesis-based students at Master or Ph.D. level (preferred), to join from Spring or Fall 2024.

To apply, please send to me via xinyis@uwm.edu your CV (most importantly, the publication list), unofficial transcript, and your preferred direction/research areas.

Important Note
For Spring 2024, all application materials need to be submitted by Oct. 1, 2023. For Fall 2024, they need to be submitted by Dec. 15, 2023.

We are seeking graduate students with strong programming capabilities/mathematical background and the following skill sets described in each track. We are also enthusiastic to support prospective undergraduates who are interested in our topics. We will also help students with fellowship applications (federal/university level).

- **Remote Sensing/Hydrology Track (Student 1)**: with strong remote sensing background and good understanding and handling skills of Synthetic Aperture Radar (SAR) Imagery. Experience in Artificial Intelligence (AI) and/or hydrology is preferred.
- **Climate change impacts on terrestrial biodiversity Track (Student 2)**: with hydroclimatic and AI/statistic learning background, ecological backgrounds are preferred.
- **Social vulnerability in flood hazards (Student 3):** the same qualification as Student 1 and with an interest in socioeconomic impact of natural hazards.

We particularly welcome prospective students who are interested in one of the following **research areas**:

Near real-time (NRT) flood observation using Synthetic Aperture Radar (SAR) Satellites: We developed the inundation mapping system using SAR data operationally

running for the US and other areas upon request and are now deploying this system to support NOAA's flood monitoring and forecast activities. SAR data has advantages in high spatial resolution (from <1 m to 30 m), and close to 100% weather penetration, which makes it the most-reliable sensor for flood-inundation mapping. Recently, public agency-owned and commercial satellites can provide sub-daily to 6-day revisiting intervals, which is a game-changer for flood observation. This unique product has been used for validating and calibrating dynamic models and rapid disaster response. Based on existing radar physics and statistics, we keep on advancing satellite-based inundation mapping methods by incorporating emergent big datasets, and deep learning approaches. *Activities in this direction are sponsored by* ***NOAA/Infrastructure and Investment and Job Act (IIJA)*** *and* ***NOAA/Inflation Reduction Act (IRA)****.*

Flood risk analysis and numerical modeling: We developed fully distributed hydrological models for long-term water cycle simulation, flood risk analysis, and seasonal and short-term flood forecasts. Our hydrological models have been applied by users over all continents. Currently, we attempt to integrate more artificial intelligence (AI) techniques and big data from satellites into these models, to broaden the capacity at ungauged locations. *Activities in this direction are sponsored by* ***Saudi Arabia National Center of Meteorology****,* ***Milwaukee Metropolitan Sewerage District****, and* ***Housatonic Valley Association****.*

Analysis of flood impact and drivers: Floods threaten human society in many aspects, including residential and food security while flood severity is primarily determined by weather, topography, and the built environment (including infrastructure). Through building AI models and generating some big datasets, we attempt to answer the following questions: 1) To what extent damage could future climate causes through floods? 2) how do different backgrounds (e.g., socioeconomic status, education level, etc.) and law enforcement affect a homeowner's perspective on purchasing flood insurance? And 3) is social equity the key to reducing flood vulnerability? *Activities in this direction are supported by* ***UWM Discovery and Innovation Grant*** *and* ***NOAA Sea grant****.*

Climate change on biodiversity: This is a highly collaborative area being contributed to by my group and other ecological and biogeographic groups. Based on the abundance of remote sensing data, AI techniques, and quantitative techniques, we try to first identify the distribution of species' population and/or estimate their physiological traits, then model their vulnerability to climate extremes and to human activities. Activities in this direction are sponsored by ***NSF and NASA biodiversity grants***.

Facility and Equipment

A Research 1 public university, the University of Wisconsin-Milwaukee (UWM) campus has a long tradition of interdisciplinary research and enjoys formal research relationships with federal agencies, including NOAA, NSF, EPA, USDA, USGS, as well as numerous environmental protection related agencies (e.g. Milwaukee Metropolitan Sewerage District:[MMSD]).

Computational Resources:

UWM HPC Mortimer: The UWM investigator and students are users of the UWM High-Performance Computer (HPC) cluster, Mortimer. They are experienced in handling and archiving large hydroclimatic, remote sensing datasets. Mortimer consists of 2,724 Intel Xeon-based computing cores, two NVIDIA Tesla-based GPU nodes, 11.3 TB of memory (including seven high-memory nodes), and 757 TB of networked RAID-6 storage. In early 2022, Mortimer has been expanded with an additional 1,664 AMD Epyc-based computing cores, two NVIDIA A1100-based GPU nodes, 6.5 TB of memory (including four high-memory nodes), and 1.2 PB of networked RAID-6 storage.). Workstations: The UWM investigator has two additional workstations equipped with two RTX A4000 Graphic cards with 3860 CUDA cores of each. *Public Storage Resources*:

CyVerse: Our lab has permanent access to this NSF supported repository and HPC system for sharing big data products with the public.

Fleets owned by or shared with SFS/UWM

Lake Guardian

Thomas Jefferson

Neeskay