



**Development of a novel modeling framework based on weighted kernel extreme learning machine and ridge regression for streamflow forecasting**

**Arvin Samadi-Koucheksaraee, North Dakota State University**

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Via Zoom, Meeting ID: 995 0056 5246 Passcode: 920171

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**Abstract:**

Machine learning (ML) models have been extensively used for hydrologic predictions in recent years. Nevertheless, they still face some limitations, such as the challenge of selecting optimal predictors, analysis of high-dimensional time series, and difficulties in generalizing models across different time horizons. This presentation will emphasize the significance of data preprocessing and the advantages of hybrid ML models over standalone ML approaches in overcoming these limitations.

The presentation will dive deeply into a newly developed hybrid ML modeling framework that aims at enhancing streamflow predictions by integrating both linear and nonlinear characteristics, while separately discussing the development and application of the new framework. In the development phase, insights will be shared on how the combination of Ridge Regression (RR), Locally Weighted Linear Regression (LWLR), and Kernel Extreme Learning Machine (KELM) can enhance multi-step-ahead streamflow predictions. Additionally, an advanced preprocessing approach will be presented, which couples Boruta-XGBoost for feature selection, Multivariate Variational Mode Decomposition (MVMD) for decomposition of input data, and Gradient-Based Optimization (GBO) for parameter adjustment. In the application phase, the hybrid ML modeling framework will be applied to the Upper Turtle River (UTR) watershed in North Dakota for streamflow forecasting across multiple time horizons and its performance will be evaluated.

**Speaker biography:**

Arvin Samadi-Koucheksaraee is currently pursuing his Ph.D. in Civil Engineering at North Dakota State University (NDSU) under supervision of Prof. Xuefeng (Michael) Chu. His research crosses the disciplinary interface between hydrology and information technology. He strives to synthesize computational modeling and numerical analysis with field observations and hydrologic information systems and tailor new hybrid computational models to the needs of hydrologists. Arvin has received several honors, including fellowships from the North Dakota Water Resources Research Institute.

Before embarking on his journey to the USA, Arvin earned a Bachelor of Science and a Master of Science in Civil Engineering, concentrating on Hydraulic Structures and Water Engineering. His academic achievements were complemented by hands-on experience in the industry, where he served as a technical manager and site manager, successfully overseeing a variety of construction projects across Iran.

Outside of official work, Arvin enjoys visiting new places across the world, listening to music, and meeting new people. His passion for travel allows him to explore diverse cultures and landscapes, while his love for music provides a creative outlet and relaxation.