

School of Sustainable Engineering and the Built Environment



Saurav Kumar, PhD, PE

Assistant Professor
Texas A&M University

Monday, March 21, 2022

1:30pm – 2:30pm

College Avenue Commons (CAVC) 335

Transforming data, modeling, and decision-making paradigms for water resources management

ABSTRACT: Water resources management relies on data collection and modeling for decision-making. Recent technological developments in environmental sensing and computing have allowed us to rethink the traditional paradigms and methods. This talk will discuss some of our experiments to—acquire novel data, integrate satellite and aerial remote sensing data in water system management at different spatial scales, and develop a framework that enhances the explainability of system-of-systems models.

With the current computing infrastructure, high-resolution and high-frequency satellite data can be leveraged to understand the dynamic performance of distributed pollution mitigation strategies within a watershed. Such dynamic performance metrics can be integrated with numerical models on watershed scales to simulate the fate-and-transport of pollutants better. On a smaller field scale, assimilation of parameters such as evapotranspiration from aerial imaging in numerical models can help reduce complexity and data requirement and instead rely on surrogate parameters. Using this representation, we can construct a series of one-dimensional models to represent field-scale heterogeneity that is often hard to model, even using complex three-dimensional models.

A critical aspect of modeling for water resources is stakeholder trust-building. The explainability of models is crucial to trust-building. However, explainability is often not central to water

systems modeling, particularly when different domains are involved, and system-of-systems models are required. We have developed a *deeply integrated systems* (DIS) modeling framework that combines ideas from probabilistic graphical models with system-of-systems modeling and seamlessly incorporates stakeholder knowledge and emergent model explainability.

BIOSKETCH: Saurav Kumar, Ph.D., P.E., is a TWRI faculty fellow and an assistant professor at Texas A&M AgriLife Research and the Department of Biological and Agricultural Engineering. He is based in El Paso, Texas. There, he leads the water system dynamics modeling and resilience research program. His research program concentrates on holistic water systems modeling with an emphasis on how to integrate remotely sensed data and enable convergence among different domains involved. Saurav's past and current research have been in water resources data acquisition, modeling, analysis, and presentation. He has also developed several web-based platforms for modeling and analysis. He received his doctorate from Virginia Tech and master's degree from a joint program by NTU, Singapore, and Stanford. Before joining Texas, A&M has worked at the University of Texas at El Paso, and in Singapore.