Environmental and Water Resources Engineering Seminar Series Presents:

Thursday, January 28, 2021, 3:30-4:30pm

How to Build Smarter Stormwater Systems
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Abstract
Cities today face unprecedented water-related challenges due to rapid urbanization, aging infrastructure, and more frequent extreme weather events. In water-abundant regions, cities struggle to manage combined sewer overflows, runoff pollution, and degradation of aquatic habitats. Meanwhile, cities in arid regions must contend with uncertain water supplies while at the same time safeguarding against periodic flash floods. Civil engineers have traditionally responded to these problems by expanding storage and conveyance infrastructure. However, this approach is expensive, and often results in adverse environmental side effects.

Smart stormwater systems offer a new approach for addressing urban water challenges by adaptively reconfiguring infrastructure in real-time to meet operational goals and mitigate adverse impacts. In a future characterized by these systems, networks of sensors will detect and communicate flood events at the neighborhood scale to improve disaster response. Meanwhile, wirelessly-controlled valves, gates and pumps will coordinate water releases across cities to mitigate combined sewer overflows and improve water quality. While these technologies promise to transform the field of water resources management, considerable knowledge gaps remain with regards to how smart water systems should be designed and operated.

This seminar presents foundational work towards building the smart stormwater systems of the future. I will showcase (i) a first-of-its-kind embedded platform for real-time sensing and control of urban watersheds, (ii) new methods for hydrologic state estimation that will enable real-time geolocation of floods and water quality hazards, and (iii) theoretical contributions to the problem of sensor placement that will help guide the design of future in-situ water monitoring networks. Drawing on this work, I will highlight some of the major challenges and opportunities that lie ahead for the development of smart hydraulic infrastructure.

Background
Matt Bartos is an Assistant Professor in the Department of Civil, Architectural, and Environmental Engineering at the University of Texas at Austin. He holds a Ph.D. in Civil Engineering (2020), and an M.S. in Electrical and Computer Engineering (2019) from the University of Michigan. He also holds a B.S.E. in Environmental Engineering (2013), and a B.A. in English Literature (2013) from Arizona State University.

Matt’s research focuses on intelligent and adaptive water infrastructure—a specialization that combines hydraulics, embedded electronics, signal processing, and control theory. Major areas of interest include urban flood mitigation, low-cost water quality monitoring, real-time control of hydraulic infrastructure, and coupled infrastructure systems modeling. He has authored 10 peer-reviewed papers in journals such as Nature Climate Change, Environmental Science & Technology, and Advances in Water Resources. He is also the creator and maintainer of several popular open-source software packages such as the pysheds digital elevation model processing toolkit, and the rrcf streaming anomaly detection library.