

ABHIRAM MULLAPUDI

Curriculum vitae (October 7, 2026)

I develop machine learning and cyber-physical systems to optimize urban water system operations and build resilience against extreme weather.

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POSITIONS

2025–

Lead Data Scientist at Inframark

Lead Inframark's data science team and work with product, executive leadership, and utility operations to build the machine learning models behind its digital water products.

Key Highlights:

- **Platform Machine Learning:** Lead the design and development of Inframark's shared ML platform, covering data ingestion, model training, deployment, and retraining.
- **Chemical Dosing Optimization:** Deployed ML-based dosing control for phosphorus removal and chlorine disinfection across multiple utilities. The chlorine residual model in production predicts the residual to within ± 0.10 mg/L; the phosphorus system pairs a 1D-CNN effluent forecaster with a dose optimizer and detects sensor drift from model residuals before it causes compliance misses.
- **Inflow & Infiltration Detection:** Lead the development of a system that detects and quantifies I&I in collection systems from pump station and in-network sensor data, attributes wet-weather flow to specific pipe segments, and ranks rehabilitation candidates by projected I&I volume reduction. For a client in Georgia, this approach has reduced the network area flagged for infiltration investigation by 60%.

2023–2025

Senior Data Scientist at Xylem

Developed the machine learning platform for Xylem's digital water products.

Key Highlights:

- Led the development of statistical and machine learning methods for time-series filtering and anomaly detection, used for predictive maintenance and plant operations.
- Built an MLOps platform on Flyte that Xylem's product teams used to train, deploy, and maintain their models. The same platform ran large SWMM simulations at scale on AWS clusters for optimization studies and model development.

2020–2023

Hydraulic Control and Optimization Engineer at Xylem

Built machine learning and data engineering systems for Xylem's wastewater network optimization products, used daily by utility operators.

Key Highlights:

- **Simulation Platform:** Maintained a SWMM simulation platform used for master planning and for developing control strategies.
- **Model Calibration:** Developed a calibration method that generates inflows to a SWMM network from observed hydrological data, a more accurate way of representing flow generation than SWMM's built-in hydrology module. Wrote a custom pollutant-based tracer analysis that estimates travel times from each subcatchment to the calibration points.
- **Control Logic Development:** Designed control logic that coordinates storage and release across distributed stormwater assets, including BMPs, to improve treatment and shave peak flows.

- **Real-Time Control:** Helped develop a real-time controller for an in-line storage site in a combined sewer system. During wet weather it closes the site's gates to hold flow in the existing pipes. Wrote the control logic and reviewed the complete implementation on the site controller.
- **Time Series Forecasting:** Developed a 1D-CNN model that combines NOAA rainfall forecasts with near-real-time flow measurements to predict 24-hour inflow to wastewater treatment plants.
- **Geospatial Time Series Analytics:** Built a 1D-CNN interpolation framework for spatially distributed river level data, used for environmental monitoring and regulatory compliance reporting.
- **Anomaly Detection:** Designed a real-time processing system, built on symbolic programming and statistical methods, that detects network irregularities across 600+ concurrent data streams.
- **Product Analytics:** Built a module for running Xylem Vue's analytics at scale. It cleans sensor data and selects rainfall events by frequency and intensity so that analyses use representative storms.
- **Operational Dashboards:** Built dashboards that put model output in front of operators and the public, including predictive treatment plant inflow for operators and the City of Richmond's **public CSO notification map**. Built the analytics and backend behind the Richmond map.
- **Backend Management:** Maintained the real-time services, ETL scripts, and internal databases behind Xylem Vue's Wastewater Network Optimization Solution, and worked with the integrations team to build ingestion pipelines for MQTT sensor feeds.

EDUCATION

2017–2020	Ph.D. in Civil Engineering at the University of Michigan, Ann Arbor, USA <i>Statistical Learning Approaches for the Control of Stormwater Systems</i> Advisor: Dr. Branko Kerkez
2015–2017	M.Sc.Eng. in Civil Engineering at the University of Michigan, Ann Arbor, USA
2011–2015	B.Tech. in Civil Engineering at Amrita Vishwa Vidyapeetham, Coimbatore, India

PROGRAMMING AND SCIENTIFIC COMPUTING

- **Programming Languages:** Python, C/C++, SQL, MATLAB, Bash, $\text{\LaTeX}$
- **Machine Learning and MLOps:** PyTorch, TensorFlow, JAX, scikit-learn, MLflow, Flyte
- **H&H Modeling and Process Control:** EPA-SWMM and pyswmm (maintainer), EPANET, SUMO, GIS (QGIS, ArcGIS)
- **Cloud Computing:** AWS, Google Cloud, and Azure for building backend systems
- **Embedded Systems:** Developer of Open-Storm's **perfect-cell**, open-source firmware for cellular environmental sensor nodes. Experienced with EAGLE and Cypress modules for custom hardware design.

OPEN SOURCE SOFTWARE

- **pystorms** (creator): simulation sandbox with curated scenarios for designing and benchmarking stormwater control algorithms.
- **SWMM** and **pyswmm** (maintainer): EPA’s Stormwater Management Model, the standard model for stormwater systems, and its Python interface.
- **StormReactor** (co-author): integrated modeling of water quality and water balance in EPA-SWMM simulations.
- **rrcf** (contributor): Robust Random Cut Forest algorithm for anomaly detection on streaming data.
- **OpenFloodHub** (creator): an open alternative to Google Flood Hub. Trains a small CNN per stream gauge on that gauge’s history and forecasts the next 12 hours of streamflow, mapped against flood thresholds for Washington, DC.
- **dc-flood-sim** (creator): a city flood model that runs shallow-water physics in the browser on the GPU, built from USGS lidar terrain, OpenStreetMap buildings, and live USGS gauge inflows.

PUBLICATIONS

- 2026 Travis A. Dantzer, **Abhiram Mullapudi**, and Branko Kerkez. *Bayesian Optimization with Unknown Constraints for the Design and Real-Time Control of Stormwater Systems*. Journal of Water Resources Planning and Management, 152(9):04026029, 2026.
- 2023 **Abhiram Mullapudi** and Branko Kerkez. *Identification of stormwater control strategies and their associated uncertainties using Bayesian Optimization*. arXiv preprint arXiv:2305.18630, 2023.
- 2023 Sara P. Rimer, **Abhiram Mullapudi**, Sara C. Troutman, Gregory Ewing, Jeffrey M. Sadler, Jonathan L. Goodall, Ruben Kertesz, Jon M. Hathaway, and Branko Kerkez. *pystorms: a simulation sandbox for the design and evaluation of stormwater control algorithms*. Environmental Modelling & Software, 2023.
- 2022 Brooke E. Mason, **Abhiram Mullapudi**, Cyndee Gruden, and Branko Kerkez. *Improvement of phosphorus removal in bioretention cells using real-time control*. Urban Water Journal, 19(9):992–998, 2022.
- 2021 Brooke E. Mason, **Abhiram Mullapudi**, and Branko Kerkez. *StormReactor: An open-source Python package for the integrated modeling of urban water quality and water balance*. Environmental Modelling & Software, 145:105175, 2021.
- 2020 **Abhiram Mullapudi**. *Statistical Learning Approaches For The Control Of Stormwater Systems*. PhD thesis, University of Michigan, Ann Arbor, 2020.
- 2020 Bryant E. McDonnell, Katherine Ratliff, Michael E. Tryby, Jennifer Jia Xin Wu, and **Abhiram Mullapudi**. *PySWMM: The Python Interface to Stormwater Management Model (SWMM)*. Journal of Open Source Software, 5(52):2292, 2020.
- 2020 **Abhiram Mullapudi**, Matthew Lewis, Cyndee Gruden, and Branko Kerkez. *Deep Reinforcement Learning for the Real Time Control of Stormwater Systems*. Advances in Water Resources, 2020.

- 2019 Matthew D. Bartos, **Abhiram Mullapudi**, and Sara C. Troutman. *rrcf: Implementation of the Robust Random Cut Forest algorithm for anomaly detection on streams*. Journal of Open Source Software, 4:1336, 2019.
- 2018 **Abhiram Mullapudi**, Matthew D. Bartos, Brandon P. Wong, and Branko Kerkez. *Shaping Streamflow Using a Real-Time Stormwater Control Network*. Sensors, 18(7):2259, Jul 2018.
- 2017 **Abhiram Mullapudi**, Brandon P. Wong, and Branko Kerkez. *Emerging investigators series: building a theory for smart stormwater systems*. Environmental Science: Water Research & Technology, 3(1):66–77, 2017.

WORKSHOPS AND SPECIAL SESSIONS

- 2024 *From Code to Flow: Python-based Hydraulic Modeling*
Led a webinar hosted by the Water Distribution Systems Analysis Graduate Student Group on modeling stormwater systems in Python and combining machine learning with physical models.
- 2023 *Technical Workshop: Building the Next Generation of Intelligent Urban Water Systems: A Hands-on Workshop on Digital Twin-based Solutions*
Organized and led a workshop session at ASCE’s World Environmental & Water Resources Congress on building digital water systems.
- 2022 *Moving towards an open urban water modeling paradigm: perspectives from academia and industry*
Organized a special session at the Urban Drainage Modeling conference on the role of open-source software in urban water modeling.
- 2022 *UDS-RTC 101: A hands-on workshop on the real-time control of urban drainage systems*
Organized and led a pre-conference workshop at the Urban Drainage Modeling conference on the real-time control of urban drainage systems.
- 2017, 2019 *CUAHSI Open Source Urban Hydrology Sensor Bootcamp*
Co-organized and led a three-day workshop on the use of Open-Storm’s sensing stack for the monitoring and control of stormwater systems.

CONFERENCES

- 2024 **Abhiram Mullapudi**, Nick Mills, and Richard Loeffler. *Forecasting treatment plant influent using physics-informed convolutional neural networks*. 14th IWA Specialized Conference on the Design, Operation and Economics of Large Wastewater Treatment Plants, August 2024.
- 2024 **Abhiram Mullapudi** and Branko Kerkez. *Identification of stormwater control strategies using Bayesian Optimization*. 16th International Conference on Urban Drainage, June 2024.
- 2024 **Abhiram Mullapudi**, Nick Mills, and Richard Loeffler. *Physics-informed deep-learning model architecture design for time-series forecasting*. World Environmental & Water Resources Congress, May 2024.

- 2023 **Abhiram Mullapudi**, Adam Erispaha, Bailey Johnston, and Sohil Manjiyani. *Real-time monitoring and predictive maintenance of urban water networks using digital twins*. World Environmental & Water Resources Congress, May 2023.
- 2022 **Abhiram Mullapudi**, Caleb Buahin, and Ruben Kertesz. *A software framework for automating hydroinformatics-based workflows for real-world applications*. World Environmental & Water Resources Congress, May 2022.
- 2022 **Abhiram Mullapudi**, Brooke E. Mason, Jennifer Wu, Constantine Karos, Branko Kerkez, Caleb Buahin, and Bryant E. McDonnell. *Enhancing the pollutant modeling capabilities of EPA-SWMM using PySWMM and StormReactor*. International Conference on Water Management Modeling, March 2022.
- 2021 Brooke E. Mason, **Abhiram Mullapudi**, and Branko Kerkez. *Extending SWMM’s water quality toolbox*. World Environmental & Water Resources Congress, May 2021.
- 2021 Jennifer Wu, Caleb Buahin, Bryant E. McDonnell, **Abhiram Mullapudi**, and Ruben Kertesz. *PySWMM v1.0 release: Advancing the Python interface to stormwater management for now and into the future*. International Conference on Water Management Modeling, March 2021.
- 2020 Brooke E. Mason, **Abhiram Mullapudi**, and Branko Kerkez. *Improving pollutant removal with real-time control of stormwater networks*. Borchardt Conference: 25th Triennial Symposium on Advancements in Water & Wastewater, March 2020.
- 2019 Sara C. Troutman, Sara P. Rimer, **Abhiram Mullapudi**, and Branko Kerkez. *A benchmarking library for making smart stormwater research accessible*. American Geophysical Union Annual Meeting, 2019.
- 2019 **Abhiram Mullapudi**. *Real-time monitoring and control of stormwater systems*. Urban Flooding Open Knowledge Network, November 2019.
- 2019 **Abhiram Mullapudi**, Sara P. Rimer, Sara C. Troutman, and Branko Kerkez. *A benchmarking framework for control of smart stormwater networks*. Watermatex, September 2019.
- 2019 Sara C. Troutman, **Abhiram Mullapudi**, Sara P. Rimer, and Branko Kerkez. *A benchmarking framework for evaluating the performance of control algorithms in smart stormwater networks*. International Joint Conference in Water Distribution Systems Analysis & Computing and Control, September 2019.
- 2019 Sara P. Rimer, **Abhiram Mullapudi**, Sara C. Troutman, and Branko Kerkez. *A benchmarking framework for smart stormwater systems*. World Environmental & Water Resources Congress, June 2019.
- 2019 Sara C. Troutman, **Abhiram Mullapudi**, Gregory Ewing, Branko Kerkez, Wendy Barrott, and Christopher Nastally. *Open-Storm Detroit dynamics*. Water at Michigan, June 2019.
- 2019 Sara P. Rimer, **Abhiram Mullapudi**, Sara C. Troutman, and Branko Kerkez. *A benchmarking framework for control and optimization of smart stormwater networks*. Proceedings of the 10th ACM/IEEE International Conference on Cyber-Physical Systems — ICCPS ’19, 2019.

- 2019 **Abhiram Mullapudi** and Branko Kerkez. *Bayesian optimization for control of stormwater networks*. Michigan Institute for Computational Discovery & Engineering Symposium, May 2019.
- 2018 Gregory Ewing, **Abhiram Mullapudi**, Sara C. Troutman, Branko Kerkez, Wendy Barrott, and Christopher Nastally. *LIFT smartwater challenge: Open-Storm Detroit dynamics*. Water Environment Federation's Technical Exhibition and Conference, October 2018.
- 2018 **Abhiram Mullapudi** and Branko Kerkez. *Autonomous control of urban storm water networks using reinforcement learning*. International Conference on Hydroinformatics, July 2018.
- 2018 Branko Kerkez, **Abhiram Mullapudi**, Matthew D Bartos, and Brandon P. Wong. *Characterizing a controllable urban watershed*. International Conference on Hydroinformatics, July 2018.
- 2018 **Abhiram Mullapudi** and Branko Kerkez. *Deep reinforcement learning based autonomous storm water networks*. World Environmental & Water Resources Congress, June 2018.
- 2018 Branko Kerkez, **Abhiram Mullapudi**, Matthew D Bartos, and Brandon P. Wong. *Results from the real-time control of an urban watershed: coordinating outflows to shape flows and water quality*. World Environmental & Water Resources Congress, June 2018.
- 2017 Sara P. Rimer, **Abhiram Mullapudi**, and Branko Kerkez. *Using Agent-Based Modeling to Enhance System-Level Real-time Control of Urban Stormwater Systems*. American Geophysical Union Annual Meeting, December 2017.
- 2017 Branko Kerkez, **Abhiram Mullapudi**, and Brandon P. Wong. *A modeling framework for the real-time control of distributed stormwater assets*. Research and Education Conference for the Association of Environmental Engineering & Science Professors, June 2017.
- 2017 **Abhiram Mullapudi**, Matthew Lewis, Cyndee Gruden, and Branko Kerkez. *Real-time control of storm water using reinforcement learning*. IWA Conference on Instrumentation, Control and Automation, June 2017.
- 2017 **Abhiram Mullapudi**, Matthew Lewis, Cyndee Gruden, and Branko Kerkez. *Control of large scale storm-water networks using reinforcement learning*. The Multi-disciplinary Conference on Reinforcement Learning and Decision Making, June 2017.
- 2017 **Abhiram Mullapudi**, Matthew Lewis, Cyndee Gruden, and Branko Kerkez. *Real-time control of storm water using reinforcement learning*. World Environmental & Water Resources Congress, May 2017.
- 2017 Branko Kerkez, **Abhiram Mullapudi**, and Brandon P. Wong. *An optimization and simulation framework for smart stormwater systems*. World Environmental & Water Resources Congress, May 2017.
- 2016 Branko Kerkez, **Abhiram Mullapudi**, and Brandon P. Wong. *Toward city-scale water quality control: building a theory for smart stormwater systems*. American Geophysical Union Annual Meeting, December 2016.

PROFESSIONAL SERVICE

- Vice-chair of the Emerging and Innovative Technologies subcommittee, American Society of Civil Engineers' World Environmental & Water Resources Congress.
- Organizing Committee Member at NeurIPS Gaussian Processes Workshop 2024.
- Peer reviewed research for the following journals:
 - *HardwareX*
 - *IEEE-CDC 2020*
 - *Journal of Hydrology*
 - *Water Resources Research*
 - *Journal of Hydroinformatics*
 - *Water Science and Technology*
 - *Journal of Open Source Software*
 - *Journal of Computing in Civil Engineering*
 - *Journal of Irrigation and Drainage Engineering*
 - *Journal of Water Resources Planning and Management*
 - *Environmental Science: Water Research & Technology*

AWARDS

2018	Grand Prize Winner, LIFT Intelligent Water Systems Challenge
2013, 2015	Academic Excellence, Amrita Vishwa Vidyapeetham

MEDIA COVERAGE

- 2018 LIFT Challenge: **Grand Prize Winner**
- NSF Science Nation: **Smart stormwater solutions for aging infrastructure**