Abhiram Mullapudi

Curriculum vitae (August 6, 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

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

Key Highlights:

- **Platform Machine Learning**: Leading the design and development of Inframark's shared ML platform, covering data ingestion, model training, deployment, and retraining, so a model built for one plant can be deployed at any client utility.
- **Chemical Dosing Optimization**: Deployed ML-based dosing control for phosphorus removal and chlorine disinfection across multiple utilities. The chlorine residual model in production at Augusta, GA predicts residual to within $\pm$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**: Leading 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.

2023–2025 **Senior Data Scientist** at Xylem

Designed and shipped machine learning models 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.

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:

- **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.
- **Operational Dashboards**: Built dashboards that put model output in front of operators and the public, including predictive treatment plant inflow and public-facing Combined Sewer Overflow event tracking.

- **Backend Management**: Maintained the real-time services, ETL scripts, and internal databases behind Xylem Vue's Wastewater Network Optimization Solution.

Education

2017–2020 **Ph.D.** in Civil Engineering at the University of Michigan, Ann Arbor, USA
Statistical Learning Approaches for the Control of Stormwater Systems
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, 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