

MATT BARTOS

Ph.D. Candidate

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OBJECTIVE

My goal is to build the next generation of **smart** urban water systems by combining my passion for water resources with the latest advances in low-power sensing, signal processing, and dynamic control.

AT A GLANCE

- 🏗️ Multidisciplinary focus that combines embedded electronics, signal processing, control theory, and hydrodynamics.
- 📄 Proven track record of research with 9 refereed publications in journals such as *Nature Climate Change* and *Scientific Reports*.
- 🎓 Experienced in mentoring, lecturing, and developing innovative classroom curricula.
- ⚡ Creator and maintainer of popular open-source scientific libraries averaging several hundred downloads per month.

EDUCATION

Ph.D. in Civil Engineering

University of Michigan

📅 Sept 2015 – Ongoing

📍 Ann Arbor, MI

- Thesis: *Advancing Urban Flood Resilience with Smart Water Infrastructure*

M.S. in Electrical and Computer Engineering

University of Michigan

📅 Sept 2015 – May 2019

📍 Ann Arbor, MI

- Focus in *Signal & Image Processing and Machine Learning*
- **Selected courses:** machine learning · estimation, filtering and detection · matrix methods · probability and random processes · linear systems theory

M.S.E. in Civil Engineering

University of Michigan

📅 Sept 2015 – May 2019

📍 Ann Arbor, MI

- Focus in *Intelligent Systems*
- **Selected courses:** control systems analysis and design · sensing for civil infrastructure · open channel flow · physical processes of land surface hydrology

B.S.E. in Environmental Engineering

Arizona State University

📅 Sept 2007 – Dec 2013

📍 Tempe, AZ

B.A. in English Literature

Arizona State University

📅 Sept 2007 – Dec 2013

📍 Tempe, AZ

HONORS

Fellowships

- J. Robert Beyster Computational Innovation Fellow (2018)
- *Earth Science Information Partners* Community Fellow (2017)
- Henry Earle Riggs Fellow (2015)
- President's Scholarship (2007)

Grants

- Lab Incubator Awardee, *Earth Science Information Partners* (2018)
- Funding Friday Winner, *Earth Science Information Partners* (2017)

Professional Associations

- Media Relations Officer, *Chi Epsilon*, Arizona State University Chapter (2012)

Certifications

- Engineer-in-Training, State of Arizona (2014)

TEACHING & SERVICE

Graduate Student Instructor

University of Michigan

📅 Sept 2018 – Dec 2018

- Co-instructor for *ENGR100: Robots, Sensors, and Smart Water*.
- Developed lab curriculum focused on embedded systems programming and web development for water resources applications.

Workshop Instructor

Open Storm Workshop

📅 Aug 2017 & Aug 2019

- Taught firmware programming and web infrastructure at two workshops sponsored by the *Consortium of Universities for the Advancement of Hydrologic Science*.

Research Mentor

University of Michigan

📅 Aug 2016 – Dec 2019

- Mentored 5 students through the *Undergraduate Research Opportunities Program*.
- Research projects focused on developing sensor firmware, web applications, and continuous integration services.

PUBLICATIONS

Journal Articles

- **Bartos, M.** & Kerkez, B. (2019c). Hydrograph peak-shaving using a graph-theoretic algorithm for placement of hydraulic control structures. *Advances in Water Resources*, 127, 167–179. doi:10.1016/j.advwatres.2019.03.016
- **Bartos, M.**, Mullapudi, A., & Troutman, S. (2019). rrcf: implementation of the robust random cut forest algorithm for anomaly detection on streams. *Journal of Open Source Software*, 4(35), 1336. doi:10.21105/joss.01336
- **Bartos, M.**, Park, H., Zhou, T., Kerkez, B., & Vasudevan, R. (2019). Windshield wipers on connected vehicles produce high-accuracy rainfall maps. *Scientific Reports*, 9(1). doi:10.1038/s41598-018-36282-7
- Habibi, H., Dasgupta, I., Noh, S., Kim, S., Zink, M., Seo, D.-J., ... Kerkez, B. (2019). High-resolution flash flood forecasting for very large urban areas. *Journal of Hydroinformatics*, 21(3), 441–454. doi:10.2166/hydro.2019.100
- **Bartos, M.**, Wong, B., & Kerkez, B. (2018). Open storm: a complete framework for sensing and control of urban watersheds. *Environmental Science: Water Research & Technology*, 4(3), 346–358. doi:10.1039/c7ew00374a
- Mullapudi, A., **Bartos, M.**, Wong, B., & Kerkez, B. (2018). Shaping streamflow using a real-time stormwater control network. *Sensors*, 18(7). doi:10.3390/s18072259
- **Bartos, M.**, Chester, M., Johnson, N., Gorman, B., Eisenberg, D., Linkov, I., & Bates, M. (2016). Impacts of rising air temperatures on electric transmission ampacity and peak electricity load in the United States. *Environmental Research Letters*, 11(11), 114008. doi:10.1088/1748-9326/11/11/114008
- **Bartos, M.** & Chester, M. (2015). Impacts of climate change on electric power supply in the western United States. *Nature Climate Change*, 5(8), 748–752. doi:10.1038/nclimate2648
- **Bartos, M.** & Chester, M. (2014b). The conservation nexus: valuing interdependent water and energy savings in Arizona. *Environmental Science & Technology*, 48(4), 2139–2149. doi:10.1021/es4033343

Working Manuscripts

- **Bartos, M.** & Kerkez, B. (2019a). *Guided sensor placement in drainage networks using Gramian optimization*. Water Resources Research (in preparation).
- **Bartos, M.** & Kerkez, B. (2019d). *Real-time digital twinning of urban stormwater systems using an implicit hydraulic solver with Kalman filtering*. Environmental Modelling & Software (in preparation).

Selected Talks

- **Bartos, M.** & Kerkez, B. (2019b). Hydrograph peak attenuation using a graph-theoretic algorithm for optimal placement of hydraulic control structures. World Environmental & Water Resources Congress 2018, Pittsburgh, PA.
- Burgess, A., **Bartos, M.**, & Tan, A. (2019). Increasing the use and value of earth science information. Amazon Web Services Public Sector Summit, Washington DC.

EMPLOYMENT

Research Scientist

Arizona State University

 Dec 2013 – Aug 2015

Supervisor: Dr. Mikhail Chester

- Full-time researcher for the *Sustainable Urban Systems Lab*.
- Performed research in life-cycle assessment, climate modeling, hydrologic modeling, and risk analysis.
- Authored and published three articles in high-impact journals.

Lab Assistant

SILC Learning Support Services

 June 2008 – Jan 2013

Supervisor: Dr. Andrew Ross

- Provided technical assistance to students in the *School of International Letters and Cultures* at Arizona State University.

SOFTWARE



pysheds

Simple and fast watershed delineation in python.

★ 185 📄 57 👁 14

Available at:

github.com/mdbartos/pysheds



rrcf

Implementation of the *Robust Random Cut Forest* algorithm for anomaly detection on streams.

★ 110 📄 37 👁 11

Available at:

github.com/kLabUM/rrcf



perfect-cell

General purpose firmware for cell-enabled PSoC motes.

★ 12 📄 8 👁 5

Available at:

github.com/open-storm/perfect-cell



superlink

Implementation of the SUPERLINK hydraulic solver.

★ 4 📄 1 👁 1

Available at:

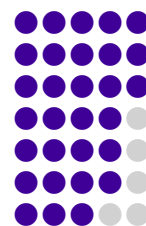
github.com/mdbartos/superlink

- **Bartos, M.** (2018). Automated sensor firmware generation using sensorML. Earth Science Information Partners Winter Meeting 2018, Bethesda, MD.
- **Bartos, M.** & Kerkez, B. (2018). Security of smart water systems: challenges, opportunities and best practices. World Environmental & Water Resources Congress 2017, Minneapolis, MN.
- **Bartos, M.,** Park, H., Zhou, T., Kerkez, B., & Vasudevan, R. (2018). Vehicles as ubiquitous precipitation sensors: enhanced rainfall maps using real windshield wiper observations. 13th International Hydroinformatics Conference, Palermo, Italy.
- Kerkez, B., Mullapudi, A., **Bartos, M.,** & Wong, B. (2018). Characterizing a controllable urban watershed: using web services to control and coordinate stormwater flows. 13th International Hydroinformatics Conference, Palermo, Italy.
- **Bartos, M.,** Park, H., Zhou, T., Kerkez, B., & Vasudevan, R. (2017). Vehicles as sensors to improve urban mobility and water infrastructure. Mcubed symposium, Ann Arbor, MI.
- **Bartos, M.** & Ritchie, A. (2017). A graph partitioning approach for controller placement in dendritic networks. Michigan Institute for Data Science Third Annual Symposium, Ann Arbor, MI.
- **Bartos, M.,** Wong, B., & Kerkez, B. (2017a). Open-storm: a wireless platform for real-time sensing and control of urban watersheds. World Environmental & Water Resources Congress 2017, Sacramento, CA.
- **Bartos, M.,** Wong, B., & Kerkez, B. (2017b). High resolution flash flood forecasting using a wireless sensor network in the Dallas—Fort Worth metroplex. American Geophysical Union 50th Annual Fall Meeting, New Orleans, LA.
- **Bartos, M.,** Wong, B., & Kerkez, B. (2016a). An urban flash flood warning system based on real-time sensor data. Consortium for the Advancement of Hydrologic Sciences Biennial Symposium, Shepherdstown, WV.
- **Bartos, M.,** Wong, B., & Kerkez, B. (2016b). High resolution sensing and control of urban water networks. American Geophysical Union 49th Annual Fall Meeting, San Francisco, CA.
- **Bartos, M.,** Chester, M., Johnson, N., Gorman, B., & Eisenberg, D. (2015). Impacts of climate change on electric transmission capacity and peak electricity load in the United States. American Geophysical Union 48th Annual Fall Meeting, San Francisco, CA.
- Chester, M., Fraser, A., **Bartos, M.,** Eisenman, D., Pincetl, S., Bondank, E., ... Tseng, T. (2015). Extreme heat vulnerability and urban energy use. International Society of Industrial Ecology, Surrey, UK.
- **Bartos, M.** & Chester, M. (2014a). Assessing climate change impacts on electric power generation in the western interconnection. American Geophysical Union 47th Annual Fall Meeting, San Francisco, CA.
- Reyna, J., Chester, M., & **Bartos, M.** (2014). Life cycle assessment of ecosystem services: Phoenix building stock. Central Arizona-Phoenix Long-Term Ecological Research Project, 16th Annual All Scientists Meeting, Scottsdale, AZ.
- **Bartos, M.** & Chester, M. (2013). The conservation nexus: valuing interdependent water and energy savings in Phoenix, Arizona. American Geophysical Union 46th Annual Fall Meeting, San Francisco, CA.

COMPETENCIES

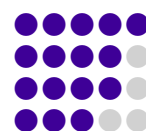
Core competencies

Signal processing
Open channel hydraulics
Surface water hydrology
Linear algebra
Control theory
Embedded systems
Web infrastructure



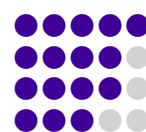
Programming Languages

Python
C
MATLAB
JavaScript



Hydrodynamic modeling

EPA SWMM
EPANET
VIC
HEC RAS



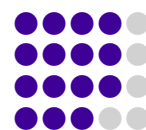
Embedded Platforms

Cypress PSoC
Arduino



Dev Ops

Amazon Web Services
UNIX Shell
Git
Jenkins



REFERENCES

Dr. Branko Kerkez
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Dr. Mikhail Chester
@ Arizona State University
✉ mchester@asu.edu

Dr. Nancy Love
@ University of Michigan
✉ nglove@umich.edu

Dr. Valeriy Ivanov
@ University of Michigan
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