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.

★ 186 ⑂ 57 👁 14

Available at:
`github.com/mdbartos/pysheds`

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

★ 111 ⑂ 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 Institue 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
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Dr. Nancy Love
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Dr. Valeriy Ivanov
@ University of Michigan
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