Mark Stephan Bartlett, Ph.D.
Data Science and ML Practice Lead
The Water Institute
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EDUCATION

Duke University	Durham, NC	Civil and Environmental Engineering	Ph.D., 2016
University of Southern California	Los Angeles, CA	Environmental Engineering	MS, 2009
Brown University	Providence, RI	Civil Engineering	BS, 2005

RESEARCH INTERESTS

Machine learning, data science, applied mathematics, digital transformation, statistics, hydrology, ecohydrology.

PROFESSIONAL EXPERIENCE

The Water Institute	Data Science and ML Practice Lead	2022–Present
Stantec	Lead Data Scientist and ML Engineer	2019–2022
National Institute of Food and Agriculture, USDA	Fellow	2017–2019
Department of Civil and Environmental Engineering, Princeton University	Visiting Postdoctoral Associate	2017–2019
Department of Civil and Environmental Engineering, Duke University	Postdoctoral Associate	2016–2019
	Research Assistant	2011–2016
Carollo Engineers	Professional Civil Engineer	2008–2011
	Engineer/Scientist	2005–2008

PROFESSIONAL SOCIETY MEMBERSHIPS

- American Society of Civil Engineers (ASCE), 2005–Present
- Water Environment Federation, 2005–Present

- Journal Referee, Hydrological Processes, Photosynthetica, Water Resources Research, Geophysical Research Letters, Ecohydrology, 2011–2018
- Duke Toastmasters Club (1312433), 2015–2017
- American Geophysical Union, 2011–2017
- Duke BOLD (Building Outdoor Leaders and Doers), 2015–2017

- Sigma Xi, Associate Member, 2005–2017
- Duke Engineering Graduate Student Council, 2011–2014
- Duke Graduate and Professional Student Council, 2011–2012
- Duke Student health Advisory Committee, 2011–2012

AWARDS AND HONORS

- ACEC Tennessee Survey and Mapping Technology Grand Award for flood prediction with machine learning, 2022

- Civil and Environmental Engineering Outstanding Scholar Award, Duke University, 2017

- Service Award for contributions to the Engineering Graduate Student Council, Duke University, 2017

- Research Spotlight for Water Resources Research article "Framework for event-based semidistributed modeling that unifies the SCS-CN method, VIC, PDM, and TOPMODEL," Eos Earth and Space Science News, 2016

- Outstanding Poster Award, Duke Wireless Intelligent Sensor Networks (WISeNet), 2016

- Integrative Graduate Education and Research Training (IGERT) Fellowship, Duke Wireless Intelligent Sensor Networks (WISeNet), 2015–2016

- Travel grants for the *Consortium of Universities for the Advancement of Hydrologic Science, Inc.* (CUAHSI) Biennial Colloquium, 2014–2016

- Pi Kappa Phi Honor Society, University of Southern California, Los Angeles, CA, 2009

- Sigma Xi, Brown University, Providence, RI, 2005

- Outstanding Student Award in Civil Engineering, Brown University, Providence, RI, 2005

TEACHING EXPERIENCE

Mentor for a group of Data Scientists at Stantec, students, and entry level engineers.

Teaching assistant, Fluid Mechanics, Ecohydrology, Duke University, Durham, NC.

Teaching assistant, Ecohydrology, Princeton University, Princeton, NJ.

Instructor, Fluid Mechanics Laboratory, Duke University, Durham, NC.

COMMUNITY SERVICE

Judge	The North Jersey Regional Science Fair	2018–Present
Young Member Mentor	American Society of Civil Engineers (ASCE)	2016–2017
K-12 Lesson Plan Contributor	Scientific Research and Education Network	2015–2017
Judge	Central North Carolina Science and Engineering Fair	2016–2017
Volunteer	Females Excelling More in Math, Engineering, and Science activity day	2015–2017
Classroom Outreach	Dillard Middle School, Raleigh, NC	2015

NOTABLE PROJECTS

Technical Lead/Lower Mississippi River SmartPort & Resilience Center   Current
U.S. Department of Commerce Economic Development Administration
With grants from The U.S. Department of Commerce's Economic Development
Agency, the State of Louisiana and other partners, The Water Institute of the Gulf is
developing a Lower Mississippi River SmartPort & Resilience Center (SmartPort).
Through the development of a decision support tool to forecast shoaling at port
facilities along the Mississippi River, SmartPort will improve port operations and
benefit a variety of stakeholders who need to understand how sediment builds up in
the Mississippi River. This Real-Time Shoaling Forecast Tool will be coupled with
a suite of weather, river, and road traffic analytics to improve efficiency and help
the region's ports become more resilient in the face of future natural disasters and
economic shocks.

Data Scientist/Louisiana Watershed Initiative   Current
Louisiana Coastal Protection and Restoration Authority
The Water Institute is providing programmatic and technical support across a range
of LWI activities, including the data and modeling program. The Water Institute,
partnered with researchers from Louisiana State University, the University of Iowa,
and the University of North Florida, leads the LWI project to develop the modeling
methodology and guidance for these "flood transition zones" than ultimately will
enable such analyses in areas beyond Louisiana.

PUBLISHED WORKS

Peer-Reviewed Publications

Hartzell, S., Bartlett, M. S., Inglese, P., Consoli, S., Yin, J., & Porporato, A. (2021). Modeling nonlinear dynamics of CAM productivity and water use for global predictions. *Plant, Cell & Environment*, *44*(1), 34–48.

Bartlett, M. S., & Porporato, A. (2019). Jump processes with deterministic and stochastic controls: Application to irrigation and crop failure risk. *Physical Review E*, *98*(5).

Yu, K., D'Odorico, P., Collins, S., Carr, D., Porporato, A., Anderegg, W., Gilhooly III, W. P., Wang, L., Bhattachan, A., Bartlett, M. S., Hartzell, S., Yin, J., He, Y., Li, W., Tatlhego, M., & Fuentes, J. D. (2019). The competitive advantage of a constitutive CAM species over a C4 grass species under drought and CO2 enrichment. *Ecosphere*, *10*(5), 1–13.

Bartlett, M. S., & Porporato. (2018). State dependent jump processes: Ito-Stratonovich interpretations, transient, and potential solutions. *Physical Review E*, *98*(5).

Parolari, S. P., & Bartlett, M. S. (2018). Stochastic water balance dynamics of passive and controlled stormwater basins. *Advances in Water Resources*, *122*, 328–339.

Bartlett, M. S., & Porporato, A. (2018). A class of exact solutions of the Boussinesq equation for horizontal and sloping aquifers. *Water Resources Research*, *54*(2), 767–778.

Hartzell, S., Bartlett, M. S., & Porporato, A. (2018). Unified representation of the C3, C4, and CAM photosynthetic pathways with the Photo3 model. *Ecological Modeling*, *384*, 173–187.

Hartzell, S., Bartlett, M. S., & Porporato, A. (2018). Similarities in the evolution of plants and cars. *PloS One*, *13*(6).

Hartzell, S., Bartlett, M. S., & Porporato, A. (2017). The role of plant water storage and hydraulic strategies in relation to soil moisture availability. *Plant and Soil*, 1–19.

Bartlett, M. S., Parolari, A., McDonnell, J., & Porporato, A. (2017). Reply to comment: Beyond the SCS-CN method: A theoretical framework for spatially lumped rainfall-runoff response. *Water Resources Research*, *53*(7), 6351–6354.

Bartlett, M. S., Parolari, A., Porporato, A., & McDonnel, J. (2016). Framework for event-based semidistributed modeling that unifies the SCS-CN method, VIC, PDM, and TOPMODEL. *Water Resources Research*, *52*(9), 7036–7052.

Bartlett, M. S., Parolari, A., McDonnell, J., & Porporato, A. (2016). Beyond the SCS-CN method: Theoretical framework for spatially lumped rainfall-runoff response. *Water Resources Research*, *52*(6), 4608–4627.

Bartlett, M. S., Parolari, A., Daly, E., McDonnell, J., & Porporato, A. (2015). Stochastic rainfall-runoff model with explicit soil moisture dynamics. *Proceedings of the Royal Society A*, *471*(2183).

Hartzell, S., Bartlett, M. S., Virgin, L., & Porporato, A. (2015). Nonlinear dynamics of the CAM circadian rhythm in response to environmental forcing. *Journal of Theoretical Biology*, *368*(83–94).

Bartlett, M. S., Vico, G., & Porporato, A. (2014). Coupled carbon and water fluxes in CAM photosynthesis: Modeling quantification of water use efficiency and productivity. *Plant and Soil*, *383*(1–2), 111–138.

Bartlett, M. S., Vico, G., & Porporato, A. (2013). Elliptically symmetric distributions of elevation gradients and the distribution of topographic aspect. *Mathematical Geosciences*, *45*(7), 819–835.

Conference Proceedings and Presentations

Bartlett, M. S. (2022). *Overcoming uncertainty: Confident decisions in the face of climate change*. Water Environment Federation's Technical Exhibition and Conference, New Orleans, LA.

Bartlett, M. S. (2022). *No regrets: Simplifying climate decisions for our resources*. Stantec Innovation Summit, Edmonton, Canada.

Bartlett, M. S. (2022). *Flood predictor: Machine learning for rapid inundation screening*. Floodplain Management Association, Sacramento, CA.

Bartlett, M. S., & Mrad, A. (2021). *Flood prediction: Geospatial analytics and AI*. Scale Databricks Workshop: Geospatial analytics and AI at Scale.

Bartlett, M. S. (2021). *Certainty in uncertainty: Machine learning for science and engineering predictions*. ACEC 2021 Tennessee Engineer's Conference, Franklin, TN.

Alderisio, K., Pace, C., Maestri, A., & Bartlett, M. S. (2021). *A comparison of protozoan matrix recovery using acid and heat dissociation during immunomagnetic separation*. NYC Watershed Science and Technical Conference, New York City.

Bartlett, M. S. (2021). *Digital transformation of stormwater infrastructure presented by Stantec*. WEF Stormwater Summit.

Bartlett, M. S. (2020). *Extreme flood mitigation by dams under present and future climate*. Association of State Floodplain Managers Annual Conference, Texas.

Bartlett, M. S. (2020). *Deciphering the increase of Giardia spp. Cysts in in the Rondout watershed: The role of stochastic rainfall and rain on snow*. NYC Watershed Science and Technical Conference, New York City.

Bartlett, M. S. (2020). *Extreme flood mitigation by dams under present and future climate*. 2020 NYWEA Annual Meeting & Exhibition.

Bartlett, M. S. (2020). *Navigating risk, climate, and design: Stormwater basins*. 2020 NYWEA Annual Meeting & Exhibition.

Bartlett, M. S. (2019). *Extreme flood risk from rain events and rain on snowpack*. NYC Watershed Science and Technical Conference, New York City.

Bartlett, M. S., & Porporato, A. (2018). *Crop failure risk under deterministic and stochastic irrigation controls* [Abstract H13O-1972]. American Geophysical Union Fall Meeting, Washington, D.C.

Hartzell, S. R., Bartlett, M. S., & Porporato, A. (2018). *Agricultural risk management under climate variability: The role of crop diversification* [Abstract H13O-1973]. American Geophysical Union Fall Meeting, Washington, D.C.

Bartlett, M. S., Parolari, A., & Porporato, A. (2018). *A probabilistic CN modeling approach for soil moisture and runoff prediction under different climate, crop type, and irrigation scenarios*. American Society of Agricultural and Biological Engineers, Detroit, MI.

Hartzell, S. R., Bartlett, M. S., & Porporato, A. (2018). *Physiological modeling of CAM for agroecosystems*. The Biology of CAM Plants, Phoenix, AZ.

Bartlett, M. S., & Porporato, A. (2017). *Rainfall-runoff response informed by exact solutions of the Boussinesq equation on hillslopes* [Abstract H43K-1793]. American Geophysical Union Fall Meeting, New Orleans, LA.

Hartzell, S. R., Bartlett, M. S., & Porporato, A. (2017). *The Photo-3 model: A Python-based model for C3, C4, and CAM photosynthesis coupled with environmental conditions* [Abstract H14A-02]. American Geophysical Union Fall Meeting, New Orleans, LA.

Bartlett, M. S. (2017). *Forest ecohydrology and runoff across spatial scales*. Invited talk at University of Washington, Seattle, WA.

Bartlett, M. S. (2017). *Ecohydrology and water resources across biomes and spatial scales*. Invited talk at University of Texas, Austin, TX.

Bartlett, M. S., Rodriguez-Iturbe, I., & Porporato, A. (2016). *A mean field approach to the watershed response under stochastic seasonal forcing* [Abstract H52A-06]. American Geophysical Union Fall Meeting, San Francisco, CA.

Porporato, A., Bartlett, M. S., & Hartzell, S. R. (2016). *Optimal and robust control solutions for real-time control of stormwater basins* [Abstract H23J-1714]. American Geophysical Union Fall Meeting, San Francisco, CA.

Porporato, A., Bartlett, M. S., & Hartzell, S. R. (2016). *Ecohydrology of the different photosynthetic pathways and implication for sustainable agriculture* [Abstract H51J-06]. American Geophysical Union Fall Meeting, San Francisco, CA.

Hartzell, S. R., Bartlett, M. S., & Porporato, A. (2016). *Optimal traits of plant hydraulic capacitance as an adaptation to hydroclimatic variability* [Abstract B11B-0435]. American Geophysical Union Fall Meeting, San Francisco, CA.

Bartlett, M. S., & Porporato, A. (2016). *Mean field approach to watershed hydrology* [Abstract 17497-5]. CUAHSI 2016 Biennial Colloquium, Shepherdstown, WV.

Bartlett, M. S. (2016). *Crop water use and runoff in agricultural watersheds under hydro-climatic variability*. Invited talk at North Carolina State University, Raleigh, NC.

Bartlett, M. S., & Porporato, A. (2016). *Mean field approach to watershed hydrology* [Abstract 17497-5]. European Geophysical Union General Assembly, Vienna, Austria.

Bartlett, M. S., Parolari, A. J., McDonnell, J., & Porporato, A. (2015). *Beyond the SCS curve number: A new stochastic spatial runoff approach* [Abstract H13C-1551]. American Geophysical Union Fall Meeting, San Francisco, CA.

Bartlett, M. S., Parolari, A. J., McDonnell, J. J., & Porporato, A. (2015). *Theory of event based rainfall-runoff models: Spatially variable runoff generated by thresholds or progressive partitioning over stochastic source areas*. Gordon Research Conference for Catchment Science: Interactions of Hydrology, Biology & Geochemistry, Andover, NH.

Bartlett, M. S., Parolari, A. J., McDonnell, J. J., Daly, E., & Porporato, A. (2015). *Runoff production in stochastic soil moisture models: Saturation-excess threshold and soil moisture-dependent progressive partitioning*. Gordon Research Conference for Catchment Science: Interactions of Hydrology, Biology & Geochemistry, Andover, NH.

Bartlett, M. S., & Porporato, A. (2014). *A statistically consistent determination of the antecedent soil moisture condition (retention parameter) of the SCS-CN method*. Soil & Water Assessment Tool (SWAT) Conference, Pernambuco, Brazil.

Pelak, N. F., Bartlett, M. S., Albertson, J., Barbano, P., & Porporato, A. (2014). *Theoretical considerations on stochastic soil moisture dynamics and the optimal design of soil moisture sensor networks* [Poster presentation]. CUAHSI 2014 Biennial Colloquium, Shepherdstown, WV.

Bartlett, M. S., McDonnell, J., & Porporato, A. (2013). *Deciphering and modeling interconnections in ecohydrology: The role of scale, thresholds, and stochastic storage processes* [Abstract H12D-01]. American Geophysical Union Fall Meeting, San Francisco, CA.

Moura, A. E., Montenegro, S. M., Silva, B. B., Bartlett, M. S., Porporato, A. M., & Antonino, A. C. (2013). *Impact of rainfall interception on hydrologic partitioning and soil erosion in natural and managed seasonally dry ecosystems* [Abstract H21F-1114]. American Geophysical Union Fall Meeting, San Francisco, CA.

Bartlett, M. S., Vico, G., & Porporato, A. (2012). *Modeling analysis of the benefits of Crassulacean acid metabolism (CAM) for sustainable agriculture in arid regions* [Abstract H53H-1663]. American Geophysical Union Fall Meeting, San Francisco, CA.

Bartlett, M. S., Vico, G., & Porporato, A. (2011). *Statistical Characteristics of topographic surfaces and dynamic smoothing of landscapes* [Abstract EP43A-0661]. American Geophysical Union 2011 Fall Meeting, San Francisco, CA.