Xiaofeng Liu, Ph.D. Curriculum Vitae

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Research Interests

My research focus is primarily on advancing the understanding of watershed processes and their interactions with climate, human activities, and ecosystems through the integration of AI-based algorithms, process-based models, and statistical approaches. I develop scalable tools to address complex water-related challenges across local to continental scales. My research generates actionable insights to support evidence-based water resource management and drive measurable improvements in freshwater quality and ecosystem health.

Academic Positions

08/2024 – 07/2026 **Schmidt AI in Science Postdoctoral Fellow**, Michigan Institute for Data and AI in Society (MIDAS), University of Michigan
Science Mentor: William S. Currie; AI Mentor: Samet Oymak

06/2023 – 07/2024 **Postdoctoral Fellow**, School for Environment and Sustainability, University of Michigan
PI: Runzi Wang

01/2016 – 06/2023 **Graduate Research Assistant**, Georgia Water Resources Institute, School of Civil and Environmental Engineering, Georgia Institute of Technology
Advisor: Aris P. Georgakakos

Education

08/2015 – 06/2023 **Georgia Institute of Technology**
Ph.D. in Water Resources Engineering
Thesis: Improved Methods for Lake Water Quality Assessment and Management with Application to Lake Lanier
Advisor: Aris P. Georgakakos; Committee: Jingfeng Wang, Jian Luo, Husayn El Sharif, and Anna Truszczynski (Deputy Director, Georgia EPD)
M.S. in Operations Research
M.S. in Water Resources Engineering

08/2014 – 07/2015 **Chinese Academy of Sciences**
Research Assistant at Research Center for Eco-Environmental Sciences
Advisor: Qiuwen Chen

08/2010 – 07/2014 **Hohai University**
B.S. in Hydrology and Water Resources Engineering (3/152)
Thesis: Hydrodynamic Simulations of Sharp Open-Channel Bends
Advisors: Yuebo Xie and Qiuwen Chen

Grants, Awards, and Honors

06/2025 **PINN Carpentry Hackathon Fund**, MIDAS, $560

04/2025 **Schmidt Sciences Community Initiative Fund**, Schmidt Sciences, $100,000 (News)

08/2024 – 07/2026 **Eric and Wendy Schmidt AI in Science Postdoctoral Fellowship**, Schmidt Sciences, $159,600
One of the 10 recipients

2024 **UMPDA Postdoc Conference Award**, University of Michigan, $500

2021 **Future Faculty Fellow**, Georgia Institute of Technology, $1,000 (News)

2014 **Best Bachelor Thesis**, Hohai University

2011 – 2014 **Academic Excellence Award**, Hohai University

2011, 2013 **Outstanding Student Award**, Hohai University

Skills

Programming	Python, MATLAB, R
Spatial Analysis	ArcGIS, QGIS
Modeling	SWAT/SWAT+, Delft3D/Delft3D FM, HEC-RAS, HEC 5Q

Research Publications

Peer-Reviewed ([†] mentee, [*] corresponding author)

[J.1] Xia[†], Xiaobo, **Xiaofeng Liu**, Jiale Liu, Kuai Fang, Lu Lu, Samet Oymak, William S Currie, and Tongliang Liu (2025). "Identifying trustworthiness challenges in deep learning models for continental-scale water quality prediction". ***arXiv preprint arXiv:2503.09947*** (Under revision for Nexus).

[J.2] Ma[†], Yueying, Runzi Wang, Yefu Chen, **Xiaofeng Liu**, Katherine Lieberknecht, and Khalid Osman (2025). "Diverging point-source pathogens pollution patterns across urban–rural gradient and pollutant sources in Texas, U.S." ***Environmental Science & Technology Letters*** (Under revision).

[J.3] Park[†], Yunsu, **Xiaofeng Liu**, Yuyue Zhu, Lauren Fry, and Yi Hong (2025). "Enhancing streamflow prediction for transboundary water resource management in large freshwater systems." ***Hydrology*** (Under revision).

[J.4] Li, Yingcong, Xiangyu Chang, Muti Kara, **Xiaofeng Liu**, Amit Roy-Chowdhury, and Samet Oymak (2025). "When and how unlabeled data provably improve In-Context Learning". ***arXiv preprint arXiv:2506.15329*** (NeurIPS (acceptance rate: 24.52%)).

[J.5] **Liu**, **Xiaofeng**, Xiaobo Xia, Xuechen Zhang, Mohna Chakraborty, Xiyuan Chang, Kuai Fang, William S. Currie, and Samet Oymak (2025). "Self-imputation and cross-variable learning improve water quality prediction with sparse data". ***ICML 2025 on Foundation Models for Structured Data***.

[J.6] Liu, Shuying, Jing Xu, Runzi Wang, Xiang Fu, **Xiaofeng Liu**, Ye Zhao, and Xiang Zhang (2025). "Investigating the causal effects of anthropogenic factors on urban streams and lakes water quality by integrating causal inference with interpretable machine learning". ***Journal of Cleaner Production*** 488, p. 144626.

[J.7] **Liu**, **Xiaofeng**, Chen Zuo, Jianxing Guan, Yueying Ma, Yiyi Liu, Gang Zhao, and Runzi Wang (2025). "Extreme rainfall disproportionately impacts *E. coli* concentrations in Texas recreational waterbodies". ***Science of The Total Environment*** 958, p. 178062. (Michigan News, The Microbiologist, Science Daily, News Medical, Phys.org, EurekAlert, Yahoo).

[J.8] Wang, Runzi, Yiyi Liu, Jianxing Guan, Chen Zuo, Congyi Dai, **Xiaofeng Liu**[*], Zhongyao Liang, and Gang Zhao (2024). "Environmental justice of Texas recreational water quality–The disproportionate *E. coli* levels and trends". ***Journal of Environmental Management*** 370, p. 122969.

[J.9] Zhou[†], Yuhan, **Xiaofeng Liu**[*], Gang Zhao, Chen Zuo, Karen Alofs, and Runzi Wang (2024). "Pathways linking watershed development and riparian quality to stream water quality and fish communities: Insights from 233 subbasins of the Great Lakes region". ***Water Research*** 261, p. 121964.

[J.10] Liu, Xiang, Yue Liu, **Xiaofeng Liu**, Gongjin Zhang, Jin Zhang, Yaoqiang Li, Xiang Xu, and Min Wang (2024). "Enhanced hydrolysis and acidification of corn straw via liquid fraction of digestate: Environmental adaptability and microbial mechanisms". ***Process Safety and Environmental Protection*** 185, pp. 1160–1170.

[J.11] Liu, Xiang, Quan Yuan, Jihui Ding, Yaoqiang Li, **Xiaofeng Liu**, Chen Fang, and Min Wang (2024). "A perspective on the algae-derived dissolved organic matter and its dynamic influence on the aggregation of nanoplastics in eutrophic waters". ***Chemosphere*** 369, p. 143907.

[J.12] Nguyen, Vinh, **Xiaofeng Liu**, and Jeremy Marvel (2024). "Augmented reality interface for robot-sensor coordinate registration". ***Journal of Computing and Information Science in Engineering*** 24.3.

[J.13] **Liu**, **Xiaofeng** and Aris P Georgakakos (2021). "Chlorophyll a estimation in lakes using multi-parameter sonde data". ***Water Research*** 205, p. 117661.

[J.14] Yang, Guang, Shenglian Guo, Pan Liu, **Xiaofeng Liu**, and Jiabo Yin (2020). "Heuristic input variable selection in multi-objective reservoir operation". ***Water Resources Management*** 34, pp. 617–636.

In Preparation

[P.1] **Liu**, **Xiaofeng**, Haw Yen, Michael J. White, Joon-Hee Lee, Jeffrey Arnold, Samet Oymak, and William S. Currie (2025). "HydroFM: A scientific foundation model for hydrological and biogeochemical prediction."

[P.2] **Liu**, **Xiaofeng**, Runzi Wang, Haw Yen, Yu-Chen Wang, Margaret Kalcic, Daniel R Obenour, and Donald Scavia (2025). "Attributing historical variations in Lake Erie harmful algal blooms to climate, agricultural practices, and land use changes in the Maumee River Watershed."

[P.3] **Liu**, **Xiaofeng** and Aris P. Georgakakos (2025a). "Hydrodynamic and water quality modeling for Lake Lanier."

[P.4] **Liu**, **Xiaofeng** and Aris P. Georgakakos (2025b). "Integrated in situ monitoring for lake water quality assessment."

[P.5] Sharif, Husayn El, **Xiaofeng Liu**, and Aris P. Georgakakos (2025). "Satellite-based lake Chlorophyll a assessment."

[P.6] Guan, Jianxing, Qifan Wu, Congyi Dai, Hongpeng Fu, **Xiaofeng Liu**, Yang Song, and Runzi Wang (2025). "A National assessment of the influence of lake water quality on visitor sentiment: Insights from 82 U.S. lakes."

[P.7] **Liu**, **Xiaofeng**, Yi Hong, Samet Oymak, and William S. Currie (2025). "A comprehensive large-scale dataset for advancing deep learning in hydrology and water quality."

Selected Conference Proceedings

[C.1] **Liu**, **Xiaofeng** (2025). "Improved water quality prediction with a Tabular Foundation Model". *The 5th International Forum on Big Data for Sustainable Developement Goals*. Sep 6 – 8, Beijing, China. (Oral).

[C.2] Ma, Yueying, Runzi Wang, Yefu Chen, **Xiaofeng Liu**, Katherine Lieberknecht, and Khalid Osman (2025). "Diverging point-source pathogen patterns in Texas: Links to socioeconomic and urbanization gradient". *Association of Collegiate Schools of Planning (ACSP) 2025*. Oct 23 – 25, Minneapolis, Minnesota. (Oral).

[C.3] **Liu**, **Xiaofeng**, Xiaobo Xia, Jiale Liu, Kuai Fang, Lu Lu, Samet Oymak, William S. Currie, and Tongliang Liu (2025). "Identifying trustworthiness challenges in deep learning models for continental-scale water quality prediction". *HydroML 2025: Machine Learning in Water, Earth, and Climate Sciences*. May 27 – 29, Lake Arrowhead, CA. (Oral).

[C.4] **Liu**, **Xiaofeng**, Gang Zhao, Qifan Wu, Yu-Chen Wang, Anna Apostel, Yilun Zhao, Dongyang Ren, Haw Yen, Margaret Kalcic, Daniel R Obenour, et al. (2024). "Attributing historical variations in Lake Erie harmful algal blooms to climate and agricultural practices changes in the Maumee River watershed". *AGU Fall Meeting Abstracts*. Dec 9 – 13, Washington, D.C. (Oral).

[C.5] **Liu**, **Xiaofeng**, Chen Zuo, Jianxing Guan, Yueying Ma, Yiyi Liu, Gang Zhao, and Runzi Wang (2024). "Environmental justice in Texas recreational water quality: disproportionate impacts of extreme rainfall on E. coli concentrations". *AGU Fall Meeting Abstracts*. Dec 9 – 13, Washington, D.C.

[C.6] **Liu**, **Xiaofeng**, Husayn El Sharif, and Aris P Georgakakos (2023). "Integrated management of lake water quality using in situ data, satellite remote sensing observations, and hydrodynamic-biogeochemical modeling". *AGU Fall Meeting Abstracts*. Dec 11 – 15, San Francisco, CA.

[C.7] **Liu**, **Xiaofeng** and Aris P Georgakakos (2023). "Lake Lanier water quality and ecological modeling". *Proceedings of the 2023 Georgia Water Resources Conference*. Mar 30 – 31, Athens, GA. (Oral).

[C.8] **Liu**, **Xiaofeng** and Aris P Georgakakos (2022a). "Chlorophyll a estimation in lakes using multi-parameter sonde data". *AGU Fall Meeting Abstracts*. Dec 12 – 16, Chicago, IL.

[C.9] **Liu**, **Xiaofeng** and Aris P Georgakakos (2022b). "A new bias correction method for estimating Chlorophyll a in lakes". *UCOWR/NIWR Annual Water Resources Conference*. Jun 14 – 16, Greenville, SC. (Oral).

[C.10] **Liu**, **Xiaofeng**, Aris P Georgakakos, and Brigette Haram (2021). "Chlorophyll a estimation in lakes using multi-parameter sonde data". *Georgia Water Resources Conference*. (Recording).

[C.11] **Liu**, **Xiaofeng**, Koen Blanckaert, and Qiuwen Chen (2014). "Hydrodynamic simulations of sharp open-channel bends". *The 9th International Conference on Ecological Informatics*. Oct 20 – 23, Nanjing, China. (Oral).

Technical Reports

[R.1] **Liu**, **Xiaofeng** and Aris P Georgakakos (2022c). *Lake Lanier Septic System Impact Study: Water Quality Monitoring and Sampling. Technical Report 3*. Georgia Water Resources Institute, Georgia Tech, 119pp.

[R.2] El Sharif, Husayn, **Xiaofeng Liu**, and Aris P Georgakakos (2022). *Lake Lanier Septic System Impact Study: Satellite-based Lake Chlorophyll Assessment. Technical Report 4*. Georgia Water Resources Institute, Georgia Tech, 36pp.

[R.3] **Liu**, **Xiaofeng** and Aris P Georgakakos (2022d). *Lake Lanier Septic System Impact Study: Water Quality Modeling and Assessments. Technical Report 5*. Georgia Water Resources Institute, Georgia Tech, 102pp.

Research Projects

07/2025 – **Developing a Scientific Foundation Model for Stream Hydrological and Biogeochemical Prediction**
Mentors: William S. Currie, Samet Oymak
Collaborators: Jeffrey Arnold, Michael J. White, Haw Yen, and Joon-Hee Lee (USDA)
Role: Postdoctoral Researcher

12/2024 – 06/2025 **Improve Stream Water Quality Prediction with a Tabular Foundation Model**
Mentors: William S. Currie, Samet Oymak
Role: Postdoctoral Researcher
- Developed a novel method SIXL (Self-Imputation and Cross-Variable Learning) that leverages a tabular foundation model to improve water quality prediction under extreme data sparsity. [J.4]
- Advanced understanding of the interactions among climate, land use, and human activities in shaping the physical, chemical, and biological dynamics of streams.

06/2023 – 07/2024 **Attribution of Harmful Algal Bloom Variability in Western Lake Erie to Climate and Agricultural Practice Changes**
Funding Source: USDA NIFA McIntire-Stennis Federal Forestry Research Program
PI: Runzi Wang; Co-PI: Karen Alofs
Role: Postdoctoral Researcher
- Developed a state-of-the-art watershed model of the Maumee River to estimate nutrient loadings supporting harmful algal bloom prediction in western Lake Erie. [P.1]
- Quantified contributions of climate change and agricultural practices to the historically observed changes in algae biomass of western Lake Erie. [P.1]

06/2019 – 06/2022 **Evaluating Septic System Impacts on Lake Lanier Water Quality**
Funding Source: Gwinnett County DWR and Georgia Water Resources Institute
PI: Aris P. Georgakakos; Co-PIs: David E. Radcliffe and Todd Walter
Role: Lead Graduate Researcher
- Led a 2.5-year in situ monitoring campaign to build high-resolution datasets supporting data-driven and process-based analyses of septic system impacts. [P.4]
- Developed a novel in situ method for Chlorophyll *a* estimation using multi-parameter sondes to support real-time algal bloom detection and regulatory compliance. [J.13]
- Built integrated models, including statistical, hydrologic, and hydrodynamic-biogeochemical frameworks, to assess pollution sources, evaluate interventions, and support management decisions. [P.2, P.3]

Research Projects (continued)

06/2016 – 06/2018 **Reservoir and River Temperature Modeling for Fisheries Management in Northern California**
Funding Source: Georgia Water Resources Institute
PI: Aris P. Georgakakos
Role: Lead Graduate Researcher
• Built AI-based and statistical models to forecast Shasta Reservoir outflows and Sacramento River temperature.
• Developed a hybrid optimization-simulation model that integrates downstream temperature thresholds for fishery protection into reservoir operations.

Invited Talks

10/27/2025 **"Trustworthy AI"**
Center for Naval Research Education, University of Michigan

Teaching

08/2024 **Tutor – High School Data Science and AI Summer Camp**
MIDAS, University of Michigan

Winter 2024 **Guest Lecturer – EAS 579: The Hydrologic Cycle and Water Resources Management**
School for Environment and Sustainability, University of Michigan

Spring 2019 **Tech to Teaching Certificate**
Center for Teching and Learning, Georgia Institute of Technology

Spring 2019 **Teaching Assistant – CEE 6241: Water Resources Management I**
School of Civil and Environmental Engineering, Georgia Institute of Technology

Fall 2013 **Co-Instructor – Hydrometry (virtual)**
Colledge of Hydrology and Water Resources, Hohai University

Mentoring

Ph.D. Students

2025 **Muhammad Talha (Department of Computer Science and Engineering, Department of Biosystems and Agricultural Engineering, Michigan State University)**
Faculty Collaborator: Dr. A.Pouyan Nejadhashemi

2025 **Yuying Ma (School of Architecture, University of Texas at Austin)**
Paper: [J.2]

2024 **Xiaobo Xia (Computer Science, University of Sydney)**
Paper: [J.1]
First position: postdoc at National University of Singapore

Master's Students

Summer 2025 **Matthew Parent (Applied Data Science, University of Michigan)**
CIGLR 2025 Summer Fellow: Great Lakes Hydrologic Model

2025 **Xiyuan Chang (Data Science, University of Michigan)**
Capstone: Improving robustness of foundation models on sparse datasets
First Position: Ph.D. student at New Jersey Institute of Technology

2024 **Yilun Zhao (Landscape Architecture, University of Michigan)**
First Position: Ph.D. student at University of Wisconsin-Madison

2023 **Yuhan Zhou (Landscape Architecture, University of Michigan)**
Paper: [J.9]
First Position: Ph.D. student at the Pennsylvania State University

Mentoring (continued)

Undergraduate Students

2024 – 2025 **Yunsu Park (University of Michigan)**
UROP Best Presentation Award
Paper: [J.3]

2024 – 2025 **Yuyue Zhu (University of Michigan)**
First Position: Master's student at New York University
Paper: [J.3]

2024 – 2025 **Mehak Chohan (University of Michigan)**

Professional Leadership and Service

08/2025 **Lead Organizer**, U-M Knowledge-Guided Machine Learning (KGML) Workshop (Link)

08/2025 **Participant**, NSF Research and Development Strategic Visioning (RDSV) Hackathon on Flood and Erosion Risk Policy Analysis Tool, MIDAS, University of Michigan

07/2025 **Organizer**, Two-Day PINN Carpentry Hackathon, MIDAS, University of Michigan

06/2025 **Notetaker**, NSF Research and Development Strategic Visioning (RDSV) Workshop, MIDAS, University of Michigan (Link)

12/2024 – 12/2025 **Guest Editor**, Special Issue: "Advancing Hydrological Science Through Artificial Intelligence: Innovations and Applications" in *Hydrology* (Link)

2024, 2025 **Session Chair**, American Geophysical Union Fall Meetings (2024, 2025)

08/2023 **Facilitator**, Green Stormwater Infrastructure Educational Workshop, School for Environment and Sustainability at University of Michigan and Friends of Rouge (nonprofit organization)

2020 – 2023 **Graduate Student Advisory Committee**, School of Civil and Environmental Engineering, Georgia Institute of Technology

Peer Review: Water Research, Journal of Hydrology, Environmental Modelling and Software, Earth System Science Data, Journal of Environmental Management, Journal of Hydrologic Engineering