

Kailong Li

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🔗 <https://github.com/loong2020/Stepwise-Clustered-Ensemble>

Summary

- Professional expertise in process- and statistical-based hydrological modeling
- Demonstrated success in initiating, conducting, and managing complex projects
- Strong commitment to interdisciplinary research and problem-solving
- Published over 10 peer-reviewed papers in prestigious journals
- Delivered over 20 presentations at academic seminars, government forums, and international conferences

Research Interests

- Hydrological modeling with advanced parallelization on high-performance computing resources
- Interpretable machine learning model for large-scale hydrological modeling and inference
- Physics-informed machine learning for exploring eco-hydrological processes
- Hydrologic extremes simulation and associated decision-making
- Integrated water resources management
- Mathematical programming for agricultural water management

Work Experience

- 05/2024 – present **Postdoctoral Researcher**, *Desert Research Institute*
Analyze post-wildfire hydrological processes
Submit proposals to funding agencies
- 03/2022 – 03/2024 **Postdoctoral Fellow**, *University of Saskatchewan, Global Institute for Water Security*
- Led hydrological research for bridging physical understanding and machine learning models
 - Mentored Master students with their research projects
 - Presented research findings at a variety of academic seminars and international conferences
- 09/2015 – 03/2022 **Research Assistant**, *Institute for Energy, Environment and Sustainable Communities*
- Led hydrological research encompassing prediction, inference, and impact analysis, contributing to advancements in the field
 - Developed project proposals, tracked project deliverables, and compiled various documents/reports
 - Prepared speaking notes, briefing notes, reports, communication materials, etc.
 - Interacted with diverse interest groups, stakeholders, the public, and other institutes

Education

- 09/2015 – 12/2021 **University of Regina, Canada**
Ph.D., Environmental Systems Engineering
Dissertation: Statistical-Based Hydrological Simulation and Inference
- 09/2012 – 08/2015 **University of Regina, Canada**
M.A.Sc., Environmental Systems Engineering
Dissertation: A Market-Based Arid-Region Water Resources Planning Model
- 09/2008 – 07/2012 **Xi'an University of Technology, China**
B.Eng., Hydrologic and Water Resources Engineering

Project Experience

2024 – 2026

Integrating Physics-Informed Deep Learning for improved Understanding and Prediction of Post-Wildfire Hydrological Processes in Nevada Watersheds

Funded by Desert Research Institute. PI (no other investigators). Award Term: 2024-2026. Total Award: \$253,380.

Teaching Experience

02/2023 – present

Guest Lecturer, School of Environment and Sustainability, University of Saskatchewan
Teach ENVS 815 (Hydrological Modelling for Water Security) with Dr. Saman Razavi

- Delivered a series of lectures on hydrologic modeling, sensitivity analysis, and coding practices
- Conducted discussion sessions and provided weekly office hours for students
- Supervised laboratory sessions that enabled students to explore and understand hydrologic processes
- Graded student assignments and provided feedback to enhance learning outcomes

07/2019 – 06/2022

Guest Lecturer, Faculty of Engineering and Applied Science, University of Regina
Teach ENEV 803 (Water Resources Management) under the supervision of Dr. Gordon Huang

- Delivered a series of lectures on real-world water resources management applications
- Created and evaluated assignments and exams to assess student progress
- Held regular office hours and provided weekly support to students to enhance their learning experience

Publications

Li, K., Huang, G., Wang, S., Razavi, S., & Zhang, X. (2022). Development of a joint probabilistic rainfall-runoff model for high-to-extreme flow projections under changing climatic conditions. *Water Resources Research*, 58, e2021WR031557. <https://doi.org/10.1029/2021WR031557>

Li, K., Huang, G., Wang, S., Baetz, B., & Xu, W. (2022). A stepwise clustered hydrological model for addressing the temporal autocorrelation of daily streamflows in irrigated watersheds. *Water Resources Research*, 58, e2021WR031065. <https://doi.org/10.1029/2021WR031065>

Li, K., G. Huang, S. Wang, and S. Razavi (2022), Development of a physics-informed data-driven model for gaining insights into hydrological processes in irrigated watersheds, *Journal of Hydrology*, 613, 128323. <https://doi.org/10.1016/j.jhydrol.2022.128323>

Li, K., Huang, G., & Baetz, B. (2021). Development of a Wilks feature importance method with improved variable rankings for supporting hydrological inference and modelling. *Hydrology and Earth System Sciences*, 25(9), 4947-4966. <https://doi.org/10.5194/hess-25-4947-2021>

Li, K., Huang, G., Zhang, X., Lu, C., & Wang, S. (2021). Temporal-Spatial changes of monthly vegetation growth and their driving forces in the ancient Yellow River irrigation system, China. *Journal of Contaminant Hydrology*, 243, 103911. <https://doi.org/10.1016/j.jconhyd.2021.103911>

Li, K., Huang, G., & Wang, S. (2019). Market-based stochastic optimization of water resources systems for improving drought resilience and economic efficiency in arid regions. *Journal of cleaner production*, 233, 522-537. <https://doi.org/10.1016/j.jclepro.2019.05.379>

Zhang, X., Huang, G., Liu, L., & **Li, K.** (2022). Development of a stochastic multistage lifecycle programming model for electric power system planning—A case study for the Province of Saskatchewan, Canada. *Renewable and Sustainable Energy Reviews*, 158, 112044. <https://doi.org/10.1016/j.rser.2021.112044>

Shi, X., Huang, Q., & **Li, K.** (2021). Decomposition-based teleconnection between monthly streamflow and global climatic oscillation. *Journal of Hydrology*, 602, 126651. <https://doi.org/10.1016/j.jhydrol.2021.126651>

Fang, W., Huang, S., Ren, K., Huang, Q., Huang, G., Cheng, G., & **Li, K.** (2019). Examining the applicability of different sampling techniques in the development of decomposition-based streamflow forecasting models. *Journal of Hydrology*, 568, 534-550. <https://doi.org/10.1016/j.jhydrol.2018.11.020>

Zeng, X., Zhang, S., Feng, J., Huang, G., Li, Y., Zhang, P., ... & **Li, K.** (2017). A multi-reservoir-based water-hydro-energy management model for identifying the risk horizon of regional resources-energy policy under uncertainties. *Energy Conversion and Management*, 143, 66-84. <https://doi.org/10.1016/j.enconman.2017.02.020>

Cheng, G., Huang, G., Dong, C., Xu, Y., Chen, J., Chen, X., & **Li, K.** (2017). Distributed mixed-integer fuzzy hierarchical programming for municipal solid waste management. Part II: scheme analysis and mechanism revelation. *Environmental Science and Pollution Research*, 24(9), 8711-8721. <https://doi.org/10.1007/s11356-017-8574-8>

Publications under Review and in Preparation

Li, K. and S. Razavi. What controls hydrology? An assessment across the Contiguous United States through an interpretable machine learning approach (Under revision in Journal of Hydrology)

Li, K. and S. Razavi. Searching for Hydrological Laws: Exploring Runoff Generation Mechanisms through Differential Equations Identified from Big Data (Under review by the Proceedings of National Academy of Sciences)

Selected Conferences

Li, K. (2023, September) Understanding the dominant controls of hydrological processes through an interpretable machine learning approach. Modeling Community of Practice (MCoP) webinar by the Government of Alberta. (Invited speaker)

Li, K. (2023, August). Learning hydrology from data: Exploring hydrology through data-driven inference approaches. PEOPLE 2023 International Conference on Persistent, Emerging, and Organic Pollution in the Environment. (Oral presentation)

Li, K. (2022, August). Hydrological Extreme Projections under Changing Climatic Conditions — from the Perspective of the Machine Learning Approach. PEOPLE 2022 International Conference on Persistent, Emerging, and Organic Pollution in the Environment. (Oral presentation)

Li, K., & Razavi, S. (2022, May). Posterior-informed feature importance method for examining the contribution of large-scale climatic indices in hydrological processes. Global Water Futures (GWF) Annual Science Meeting. (Oral presentation)

Li, K. (2022, May). A Stepwise Clustered Hydrological Model for Addressing the Temporal Autocorrelation of Daily Streamflows in Irrigated Watersheds. The 12th Academic Symposium on Resources and Environment. (Invited speaker)

Li, K., Cheng, G., & Huang, G. (2019, December). Long-Term Impacts of Glacier Melts on Macro-Scale Unregulated Streamflow under Climatic Changes. AGU Fall Meeting (Vol. 2019, pp. H34D-09) (Oral presentation)

Memberships and Services

- Membership: Registered Engineer-in-Training (EIT) of the Association of Professional Engineers and Geoscientists of Saskatchewan (APEGS), American Geological Union
- Judge: PEOPLE 2023 International Conferences on Persistent, Emerging, and Organic Pollution in the Environment
- Reviewer: Water Resources Research, Journal of Hydrology, Environmental Modelling and Software, Advances in Water Resources, Agricultural Water Management, and Journal of Environmental Informatics

Awards

- 2021 & 2022 **Saskatchewan Innovation and Excellence Graduate Scholarship**
2020 & 2021 **IEESC PhD Award** (Research Centre, Institute for Energy, Environment and Sustainable Communities)
2019 **PhD Award** (University of Regina)
2018 **UR Graduate Scholarship** (University of Regina, the Faculty of Graduate Studies and Research)

Skills

Statistical Models

- Deep Learning (Pytorch)
- Regression Trees
- Copula



Modelling Software

- SWMM
- HEC-RAS
- SLURP
- SWAT
- ArcGIS



Programming

- Python
- R
- Matlab
- High Performance Computing
- Lingo

