BEICHEN ZHANG, PH.D.

Climate Data Scientist ◇ BlackRock
GitHub ◇ Google Scholar ◇ LinkedIn ◇ Website

PERSONAL PROFILE

Climate scientist studying how **climate extremes** and **energy transitions** affect people, communities, and institutions, and how quantitative risk information shapes decisions. My research work combines **causal inference**, **explainable machine learning**, **deep learning**, and **remote sensing** to examine drought impacts, social unrest, public health, and energy-transition trade-offs. At BlackRock, I model how physical and transitional climate risk impacts financial risk. I am interested in learning and combining behavioral science into climate-risk research to understand why risk information does, or does not, lead to action.

PROFESSIONAL EXPERIENCE

Climate Data Scientist, **BlackRock** November 2025 – Present

Develop models that translate physical climate hazards into investment-relevant information. Build interpretable and scalable analytics that make climate science usable in financial decision-making.

Postdoctoral Researcher, **Lawrence Berkeley National Laboratory** June 2024 – September 2025

Led development of a coupled agent-based modeling and life cycle assessment framework to evaluate environmental and societal trade-offs of energy-transition pathways.

Project Researcher, **Frontier Development Lab** (NASA & DOE funded) June 2022 – August 2022

Developed FireCLR, a self-supervised deep learning model for rapid wildfire burn-area and severity detection from high-resolution satellite imagery.

EDUCATION

Ph.D., Natural Resource Sciences (minor in Statistics), **University of Nebraska-Lincoln** 2019 – 2024
Dissertation: *Applications of Artificial Intelligence on Drought Impact Monitoring and Assessment*

M.S., Natural Resource Sciences, **University of Nebraska-Lincoln** 2017 – 2019
Thesis: *Investigation of GRACE-derived Information on Forest Drought Stress Across the Contiguous US*

B.S., Geographic Information Science, **Northwest A&F University** 2013 – 2017

RESEARCH THEMES

Climate risk in financial decision-making

- Develop data-driven models that connect physical climate hazards to financial risk.
- Interested in how investors and financial institutions interpret and act on climate-risk information.

Decisions and trade-offs in energy transitions

- Coupled agent-based modeling with life cycle assessment to represent actors in energy-transition systems and reveal the environmental and societal trade-offs of alternative pathways.
- Co-developed a framework for interdependencies among emerging energy-transition pathways.
- Co-developed the assessment of water constraints on hydrogen siting in California.

Societal and health impacts of climate extremes

- Applied causal inference to test whether droughts and floods increase protest activity in India, Pakistan, and Bangladesh, linking physical hazards to collective human responses.
- Linked climate conditions to health outcomes: soil moisture and soil temperature as drivers of coccidioidomycosis (Valley fever) incidence.

How people and institutions report climate impacts

- Built NLP pipelines that extract drought impacts from social media, news, and crowd-sourced reports.
- Contributed to the WMO/IDMP baseline assessment of drought impact monitoring practices worldwide.

Methodological foundations

- Self-supervised deep learning (contrastive learning) for label-free mapping of wildfire burn areas and severity from high-resolution satellite imagery (FireCLR).
- Explainable ML (XGBoost + SHAP) for multi-sector drought impacts; operational Forest Drought Response Index (ForDRI) from remote sensing.

SELECTED PUBLICATIONS

Zaki, M. T., **Zhang, B.**, & Ajami, N. K. (2026). Beyond silos: A conceptual framework for assessing interdependencies in emerging energy transition pathways. *Environmental Research Letters*. doi:10.1088/1748-9326/ae7617

Zhang, B., Zaki, M. T., Breunig, H., & Ajami, N. K. (2025). Coupling agent-based modeling and life cycle assessment to analyze trade-offs in resilient energy transitions. *NeurIPS Workshop on Tackling Climate Change with Machine Learning*. arXiv:2511.06791

Li, Q., **Zhang, B.**, Wang, R., Li, H., Zhan, Y., Tong, D., & Bell, J. E. (2025). Effects of soil moisture and soil temperature on coccidioidomycosis. *GeoHealth*. doi:10.1029/2025GH001574

Werum, R., Hayes, M., Schaefer, D., & **Zhang, B.** (2025). Climate extremes and protests in India, Pakistan, and Bangladesh, 1995–2013. *Weather, Climate, and Society*, 17(2), 161–175.

Smith, K., Walker, D., **Zhang, B.**, Veness, W., Lam, M., Knutson, C., Stefanski, R., Aich, V., & Svoboda, M. (2025). *Baseline Assessment of Drought Impact Monitoring*. Integrated Drought Management Tools and Guidelines Series 3. WMO and IDMP.

Zhang, B., Abu Salem, F. K., Hayes, M. J., Smith, K. H., Tadesse, T., & Wardlow, B. D. (2023). Explainable machine learning for the prediction and assessment of complex drought impacts. *Science of the Total Environment*, 165509.

Zhang, B., Wang, H., Alabri, A., Bot, K., McCall, C., Hamilton, D., & Růžička, V. (2022). Unsupervised wildfire change detection based on contrastive learning. *NeurIPS Workshop on Artificial Intelligence for Humanitarian Assistance and Disaster Response*. arXiv:2211.14654

Zhang, B., Schilder, F., Smith, K., Hayes, M., Harms, S., & Tadesse, T. (2021). TweetDrought: A deep-learning drought impacts recognizer based on Twitter data. *ICML Workshop on Tackling Climate Change with Machine Learning*.

SELECTED PRESENTATIONS

"Coupling Agent-based Modeling and Life Cycle Assessment to Analyze Trade-offs in Resilient Energy Transitions." *NeurIPS Workshop on Tackling Climate Change with Machine Learning*, Dec. 2025.

"An Integrated Framework for Environmental and Social Impact Assessment of Emerging Decarbonization Pathways." *AGU Fall Meeting*, Dec. 2024.

"Application of Reinforcement Learning to Represent Human–Flood Interactions." *AGU Fall Meeting*, Dec. 2023.

"Investigation of the Relationships between Drought Characteristics and Respiratory- and Cardiovascular-Related Mortality." *AGU Fall Meeting*, Dec. 2023.

"Explainable Machine Learning Applications to Predict and Assess Complex Drought Impacts based on a Multi-sourced Dataset." *AMS Annual Meeting*, Jan. 2023.

"Can Causal Inference Help Investigate Drought Impacts on Social Unrest in India?" *AGU Fall Meeting*, Dec. 2022.

"Unsupervised Wildfire Change Detection based on Contrastive Learning (FireCLR)." *NeurIPS Workshop on Artificial Intelligence for Humanitarian Assistance and Disaster Response*, Dec. 2022.

SERVICE AND FELLOWSHIP

Session Chair, AGU 2023 GeoHealth session "Surviving the Dry Spell: Understanding the Connection Between Drought and Health"

Core Team Member, Hydro90, public hydrology-outreach nonprofit, 20,000+ subscribers (2021 – present)

Claire M. Hubbard Water, Climate, and Health Fellowship, UNL, $17,500/year (2022 – 2024)

This CV was edited with the assistance of Claude (Anthropic).