BEICHEN ZHANG, PH.D.

Earth and Environmental Sciences Area ◇ Lawrence Berkeley National Laboratory
Email ◇ GitHub ◇ LinkedIn ◇ Website

PERSONAL PROFILE

Postdoctoral Researcher at Berkeley Lab, specializing in studying **climate extremes**, particularly **drought**, and their impacts on the natural environment and socioeconomic sectors, with over 7 years of experience in **geoinformatics** (including advanced remote sensing, GIS, and geospatial analysis) and **applied climatology**. Skilled in **data science**, with 5+ years of expertise in **machine learning** and **deep learning** techniques, using Python and R, evidenced by published research in top-tier journals/conferences. Demonstrated proficiency in developing innovative tools and models to address complex climatic challenges and impacts.

PROFESSIONAL EXPERIENCE

Postdoctoral Researcher, **Lawrence Berkeley National Laboratory** June 2024 - Current
Advisor: Dr. Newsha Ajami
Developing a holistic framework and an evaluation tool using data mining and machine learning for emerging energy solutions ensures comprehensive assessments of natural resources, climate risk, community impacts, and market dynamics, informing strategies for adoption.

EDUCATION

Ph.D., Natural Resource Sciences, **University of Nebraska-Lincoln** August 2019 - August 2024
Specialized in Climate Assessment and Impacts, with a minor in Statistics
Advisors: Dr. Michael Hayes, Dr. Tsegaye Tadesse
Dissertation: Applications of Artificial Intelligence on Drought Impact Monitoring and Assessment

M.S., Natural Resource Sciences, **University of Nebraska-Lincoln** August 2017 - August 2019
Specialized in Climate Assessment and Impacts
Advisor: Dr. Tsegaye Tadesse
Thesis: Investigation of GRACE-derived Information on Forest Drought Stress Across the Contiguous U.S.

B.S., Geographic Information Science, **Northwest A&F University** August 2013 - July 2017

RESEARCH EXPERIENCE AND INTERESTS

AI, Life Cycle Assessment, and Sustainable Energy Transitions

- Developing an integrated agent-based and life cycle assessment modeling framework to evaluate the environmental and societal impacts of decarbonization portfolios.
- Co-developing a conceptual framework to assess interdependencies among energy transition pathways; preliminary results presented at AGU 2024.
- Investigating water sustainability challenges of hydrogen production across spatial and temporal scales in California.

AI, Drought, and Climate Impact Assessment

- Built explainable machine learning models (XGBoost and SHAP) to assess drought impacts on multi-sectors, published in *Science of The Total Environment* and presented at NeurIPS 2020 workshop.
- Developed an NLP pipeline to extract drought-related impacts from social media, news, and crowd-sourced platforms, presented at ICML 2021 workshop and currently under revision for a journal publication.

Causal Inference, Climate Extremes, and Health and Societal Impacts

- Investigated the relationship between drought indices and cardiovascular and respiratory mortality in California using structural equation modeling, with preliminary work presented at AGU 2023.
- Explored causal links between climate extremes and protests in South Asia using remote sensing and demographic datasets. Preliminary results were presented at AGU 2022 and are currently under preparation for publication.

AI and Remote Sensing for Wildfire

- Developed **FireCLR**, a self-supervised deep learning model for post-wildfire burn severity detection during a NASA Frontier Development Lab fellowship; presented at NeurIPS 2022 workshop and showcased by FDL.
- Co-developed the operational project of an unsupervised forest drought response index (ForDRI) using remote sensing and hydrometeorological data, results published in *Remote Sensing*.

TEACHING AND MENTORING EXPERIENCE

Project Advisor, Analyzing the Impacts of Drought on Washington State's Agricultural Sector

Mentored a University of Washington MS student team on a 10-week capstone project investigating drought-related risks in agriculture under climate change.

Lab Instructor, Applications of Remote Sensing in Agriculture and Natural Resources

Taught practical applications of remote sensing for vegetation and ecosystem monitoring, including multispectral and hyperspectral analysis with ENVI and ERDAS Imagine.

Lab Instructor, Introduction to Remote Sensing

Taught fundamental remote sensing data collection and hands-on data processing with ENVI and ERDAS Imagine, emphasizing multispectral remote sensing experiments.

Lab Instructor, Introduction to Geospatial Technologies

Taught GIS principles and applications using ArcGIS and QGIS for spatial analysis and data visualization.

PUBLICATIONS

Peer-reviewed

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 Programme, Integrated Drought Management Tools and Guidelines Series 3. World Meteorological Organization and Integrated Drought Management Programme.

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.

Zhang, B., Salem, F. K. A., 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.*

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.*

Zhang, B., Abu Salem, K. F., Hayes, M., & Tadesse, T. (2020). Quantitative assessment of drought impacts using XGBoost based on the Drought Impact Reporter. *NeurIPS Workshop on Tackling Climate Change with Machine Learning.*

Tadesse, T., Hollinger, D. Y., Bayissa, Y. A., Svoboda, M., Fuchs, B., **Zhang, B.**, ... & Richardson, A. D. (2020). Forest drought response index (ForDRI): A new combined model to monitor forest drought in the eastern United States. *Remote Sensing*, 12(21), 3605.

Under Review

Zhang, B., Smith, K., Schilder, F., Abu Salem, K. F., Samal, A., Tadesse, T. & Hayes, M. Tracking drought impacts: AI assisted drought impact reporter.

Qianqian Li, **Zhang, B.**, Wang, R., Li, H., Zhan, Y, Tong, D. & Bell, J. E. Effects of soil moisture and soil temperature on coccidioidomycosis.

Werum, R., Schaefer, D. **Zhang, B.**, & Hayes, M. Most politics are local: women's protests in South Asia, 2016-2022

Tadesse, T., Connolly, S., Wardlow, B., Svoboda, M., **Zhang, B.**, ... & Riganti, C. Development and evaluation of the Forest Drought Response Index (ForDRI): an integrated tool for monitoring drought stress across forest ecosystems in the Contiguous United States.

In Progress

Zaki, M.T., **Zhang, B.** & Ajami, N. Beyond silos: a framework for assessing interdependencies in emerging environmental and social resilience of energy transition pathways.

Zhang, B., Zaki, M.T. & Ajami, N. Modeling trade-offs in sustainable energy transitions: An integrated agent-based and life cycle assessment modeling framework.

Hersbach, T. J. P., **Zhang, B.**, Makhijani, A., Ajami, N. & Sokaras, D., Time- and Location-Dependent Water Availability Affects the Siting and Scaling of Hydrogen Production.

SELECTED CONFERENCE PRESENTATIONS

"Novel AI Applications for Drought Impact Monitoring and Assessment" *AGU Fall Meeting.* December, 2024.

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

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

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

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

"Unsupervised Wildfire Change Detection based on Contrastive Learning" *AGU Fall Meeting.* December, 2022.

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

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

"TweetDrought: A Deep-Learning Drought Impacts Recognizer based on Twitter Data" *ICML Workshop Tackling Climate Change with Machine Learning.* July, 2021.

"Quantitative Assessment of Drought Impacts Using XGBoost based on the Drought Impact Reporter" *NeurIPS Workshop Tackling Climate Change with Machine Learning.* December, 2020.

HONORS AND AWARDS

Claire M. Hubbard Water Climate and Health Fellowship, University of Nebraska 2022-2024

TECHNICAL SKILLS

Statistical modeling: regression analysis, multivariate analysis, spatiotemporal analysis, causal inference.
AI-related: machine learning, deep learning, computer vision, natural language processing.
Geoinformatics: remote sensing, geographic information system, geospatial data analysis.
Programming Languages: Python, R, MATLAB, JavaScript, SQL.
Professional Software: ArcGIS, QGIS, ENVI, ERDAS, Google Earth Engine.

PROFESSIONAL MEMBERSHIP

American Meteorological Society (AMS), American Geophysical Union (AGU)

LANGUAGE

English: Proficient; Chinese: Native