Beichen Zhang

(He/Him/His)

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EDUCATION

University of Nebraska-Lincoln, School of Natural Resources — Lincoln, NE, USA
Ph.D. Candidate in Natural Resource Sciences/Climate Assessment and Impacts — 08/2019-Present
Minor in Statistics
Advisor: Dr. Michael Hayes and Dr. Tsegaye Tadesse

University of Nebraska-Lincoln, School of Natural Resources — Lincoln, NE, USA
M.S. in Natural Resource Sciences/Climate Assessment and Impacts — 08/2017-08/2019
Thesis: *Investigation of GRACE-derived Information on Forest Drought Stress Across the Contiguous U.S*
Advisor: Dr. Tsegaye Tadesse

Northwest A&F University, College of Natural Resources and Environment — Yangling, China
B.S. in Geographic Information Science — 09/2013-07/2017
Thesis: *Impact Crater Extraction based on the Mars Digital Elevation Model*
Advisor: Dr. Cheng Wang

RESEARCH EXPERIENCE

Graduate Research Assistant — 09/2019-Present
School of Natural Resources, University of Nebraska-Lincoln
National Drought Mitigation Center, University of Nebraska-Lincoln

- Investigating ecological drought impacts using phenological data sets in the U.S.
  - Building a typical data-mining pipeline to investigate and analyzing ecological drought impacts using the crowd-sourced phonological data sets from the National Phenology Network (NPN).
  - Collaborating with interdisciplinary researchers in ecology, remote sensing, and citizen science to prepare for a grant proposal.
- Recognizing and analyzing drought impacts based on Twitter data in the U.S.
  - Developed and fine-tuned deep-learning-based NLP models (BERT). And applied the transfer learning to recognize drought impacts from drought-related tweets.
  - Analyzing the spatial and temporal patterns of various drought impacts based on the predicted classifications.
  - Testing and refining models based on the drought impacts data from additional media sources.
- Investigating and analyzing relationships between drought indicators and impacts in the U.S.
  - Developed and fine-tuned machine learning models (XGBoost, RF, SVM, etc.) to predict drought impacts based on the drought indicators and remotely sensed geographic data.
  - Applied an explainable interpreter (SHAP) to quantitatively identify the machine-learned relationships between drought indicators and impacts.
  - Developing case studies based on drought events to evaluate the quality of model inference.
- Investigating and analyzing impacts of climate extremes on social unrest in India
  - Developing causal inference models to investigate and interpret the causal relationships between the climate extremes (precipitation and temperature) and the frequency of protests.
  - Developed time-series analyses of the relationship between precipitation extremes and the frequency of protests at the state and sub-state levels.
  - Developed spatial regression models to predict the frequency of protests using drought indicators and socio-economic variables.
  - Collaborating with interdisciplinary research groups in computer science and sociology to build predictive models for social unrest using the multi-agent system.

- Developed and evaluated a forest drought response indicator (ForDRI) in the western U.S.
  - Selected and built informative input data sets for the model, including but not limited to hydro-meteorological, biophysical, and satellite remotely sensed variables.
  - Built and analyzed a PCA-based unsupervised model to identify forest drought stress.
  - Evaluated the drought indicator with the tree-ring data and Bowen ratio.

Graduate Research Assistant 05/2018-08/2019
National Drought Mitigation Center, University of Nebraska-Lincoln

- Investigated relationships between forest water stress and groundwater storage (M.S. thesis)
  - Developed spatial and temporal analyses of GRACE assimilation data, tree-ring chronological data, and meteorological drought indicators.
  - Built and analyzed multiple regression models using the tree-ring data as the dependent variable, and GRACE-based variables and meteorological drought indicators as predictors.

- Developed drought monitoring models and indices
  - Built a PCA-based Combined Drought Index (CDI) in the Hindu-Kush-Himalaya (HKH) region.
  - Built data sets for the vegetation Outlook (VegOut) in the U.S.

- Acquired and processed large geospatial data sets.
  - Projected, resampled, and managed satellite remote sensing data (MODIS, Landsat, GRACE, etc.) in HDF, NetCDF, GeoTiFF, and binary formats.
  - Extracted and managed outputs from land assimilation models (NLDAS, GLDAS, etc.) and climate models.
  - Acquired station observations, and performed quality control and interpolation.
  - Automated map prints.

TEACHING EXPERIENCE

Graduate Teaching Assistant 08/2021-12/2021
Lab Instructor for *Introduction to Remote Sensing (Graduate-level course)*
School of Natural Resources, University of Nebraska-Lincoln

- Prepared lab materials and assignments focusing on proximal sensing, aerial photo interpretation, and remote sensing data processing and analysis.
- Lab instructor for two classes with ~45 senior-level and graduate students.
- Guided graduate students to develop course research projects, including collecting, processing, and analyzing spectroscopic data of tree leaves.

Graduate Teaching Assistant 08/2019-05/2021
Lab Instructor for *Introduction to Geospatial Information Sciences* 08/2017-05/2018
School of Natural Resources, University of Nebraska-Lincoln

- Developed and prepared lab materials and assignments focusing on applications of geospatial information technology: GIS, RS, GPS, and spatial data analysis.
- Lab instructor for two classes each semester with 20-30 junior- and senior-level undergraduates.

PUBLICATIONS

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.

CONFERENCE PRESENTATIONS

"TweetDrought: A Deep-Learning Drought Impacts Recognizer based on Twitter Data" ICML Workshop. July, 2021

"Quantitative Assessment of Drought Impacts Using XGBoost based on the Drought Impact Reporter" NeurIPS Workshop. December, 2020

"Anticipating the Number of Social Unrest Event Using Spatial Models" SNR Summer Seminar Series. Lincoln, NE, July, 2020

"Evaluation of GRACE Data Assimilation Based on the Tree Ring Growth Index Across the Contiguous US" National Soil Moisture Workshop. Kansas State University, Manhattan, KS, May 2019.

"A Comparison of Drought Indicators to Crop Yields for Nebraska from 1981 to 2012" Association of American Geographers Annual Meeting. New Orleans, LA, April 2018.

HONORS AND AWARDS

Travel Funds
School of Natural Resources and Graduate Committee funds, $750.

First Class Professional Scholarship
Top 10% students of Dept. of Natural Resources and Environment.

ADDITIONAL EXPERIENCE

Editorial board member for the Hydro90 2021-Present
(NGO to promote professional hydrology knowledge for the public in China)

Outreach coordinator of the School of Natural Resources Graduate Student Association (SNR GSA) at the University of Nebraska-Lincoln 2021-Present

TECHNICAL SKILLS

Statistics: regression, multivariate analysis, time-series analysis, spatial statistics, causal inference

Artificial Intelligence: machine learning, deep learning, natural language processing.

Programming languages: Python, R, Matlab, JavaScript, SQL.

Professional Software: ArcGIS, QGIS, ENVI, ERDAS, Google Earth Engine.

PROFESSIONAL MEMBERSHIP

American Geophysical Union (AGU) 2020-Present

American Association of Geographers (AAG) 2018-2019

LANGUAGE

Chinese: Fluent

English: Proficient