Zhihao Wang

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EDUCATION

- Ph.D., Geographical Sciences, University of Maryland, College Park, 2020 - 2026
- M.A., Geography, The Ohio State University, Sept. 2018 - Jun. 2020
- B.E.S., Honours Geomatics with Computer Science Minor, University of Waterloo, Canada, 2016 - 2018
- B.E., Remote Sensing Science and Technology, Wuhan University, China, 2014 - 2018

RESEARCH INTERESTS

- Physical-informed emulation for process-based ecosystem modeling.
- Geo-foundation models for semantic segmentation in satellite imagery.
- AI-driven approaches for uncovering tipping points under climate projections.

HONORS AND AWARDS

- Outstanding Graduate Assistant Award (80/4000+), University of Maryland 2026
- NeurIPS Scholar (Travel) Award 2025
- AAAI Student Scholarship (Travel) 2024
- Excellence in Graduate Research Award, 2nd place, GEOG, University of Maryland 2024
- Winner (Top-3) & Travel Grant, ACM SIGSPATIAL Cup Competition 2022, 2023
- Dean's Fellowship, University of Maryland 2020
- Dean's Honor List & Entrance Scholarship, University of Waterloo 2016, 2017, 2018
- Wuhan University Scholarship, 5050 Scholarship, Wuhan University 2016

PUBLICATIONS

1. **Wang, Z.**, Ma, L., Hurtt, G., Jia, X., Li, Y., Li, Z., Xu, S., & Xie, Y. (2025) CarbonGlobe: A Global-Scale, Multi-Decade Dataset and Benchmark for Carbon Forecasting in Forest Ecosystems. In The Thirty-nine Conference on Neural Information Processing Systems Dataset and Benchmark Track (NeurIPS'25).
2. **Wang, Z.**, Li, C., Wang, R., Ma, L., Hurtt, G., Jia, X., Ma, G., Li, Z., & Xie, Y. (2025) TreeFinder: A US-Scale Benchmark Dataset for Individual Tree Mortality Monitoring Using High-Resolution Aerial Imagery. In The Thirty-nine Conference on Neural Information Processing Systems Dataset and Benchmark Track (NeurIPS'25).
3. **Wang, Z.**, Xie, Y., Li, Z., Jia, X., Jiang, Z., Jia, A., & Xu, S. (2024) SimFair: Physics-Guided Fairness-Aware Learning with Simulation Models. In Proceedings of the AAAI Conference on Artificial Intelligence (AAAI'24) (Vol. 38, No. 20, pp. 22420-22428).
4. **Wang, Z.**, Xie, Y., Jia, X., Ma, L., & Hurtt, G. (2023). High-Fidelity Deep Approximation of Ecosystem Simulation over Long-Term at Large Scale. In Proceedings of the 31st ACM International Conference on Advances in Geographic Information Systems (SIGSPATIAL'23) (pp. 1-10). **Oral**.

5. **Wang, Z.**, Li, Z., Xie, Y., Souza Jr, C., Souza Filho, J. S., & Pinheiro, S. (2024). AI-based Validation of Deforestation Using High-Resolution Satellite Imagery in the Brazilian Amazon. The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, 48, 583-588.

6. Chen, W.*, **Wang, Z.***, Li, Z.*, Xie, Y., Jia, X., & Li, A. (2022). Deep semantic segmentation for building detection using knowledge-informed features from LiDAR point clouds. In Proceedings of the 30th International Conference on Advances in Geographic Information Systems (SIGSPATIAL'22) (pp. 1-4). **Winner**.

7. Li, R., **Wang, Z.**, Jia, X., Mai, G., Ma, L., Hurtt, G., Quan, S., Li, Z., & Xie, Y. (2025) EcoDiffusion: Uncertainty-Aware Emulation of Ecosystem Processes with Conditional Diffusion for Long Sequences with Single-Step Initialization. In Proceedings of the AAAI Conference on Artificial Intelligence (AAAI'25).

8. Li, C., **Wang, Z.**, & Xie, Y. (2025) Multimodal Foundation Models as Router Models for High-Resolution Aerial Image Segmentation. The IEEE International Conference on Data Mining (ICDM'25).

9. Li, R., Wang, D., **Wang, Z.**, Liang, S., Li, Z., Xie, Y., & He, J. (2025) Transformer approach to nowcasting solar energy using geostationary satellite data. Applied Energy, 377, 124387.

10. Li, Z., Xie, Y., Jia, X., Mai, G., **Wang, Z.**, & Chen, W. (2025). Machine-learning-enabled spatial pattern mining: evaluating the impact of imperfect inputs. International Journal of Geographical Information Science, 1-39.

11. Li, Z., Xie, Y., Skakun, S., Jia, X., Mai, G., Lu, W., Tong, M., & **Wang, Z.** (2026). Annotation-free cloud masking for PlanetScope images in the Arctic via cross-platform ability transfer using deep learning and foundation models. Remote Sensing of Environment, 334, 115138.

12. Xie, Y., Nhu, A. N., Song, X. P., Jia, X., Skakun, S., Li, H., & **Wang, Z.** (2025). Accounting for spatial variability with geo-aware random forest: A case study for US major crop mapping. Remote Sensing of Environment, 319, 114585.

13. Chen, D., Fu, C., Jenkins, L., He, J., **Wang, Z.**, Jandt, R., Frost, G., Bredder, A., Berner, L., & Loboda, T. (2024) Regional fire-greening positive feedback loops in Alaskan Arctic tundra. Nature Plants: 1-6.

14. Li, R., Xie, Y., Jia, X., Wang, D., Li, Y., Zhang, Y., **Wang, Z.**, & Li, Z. SolarCube: An Integrative Benchmark Dataset Harnessing Satellite and In-situ Observations for Large-scale Solar Energy Forecasting. In The Thirty-eight Conference on Neural Information Processing Systems Dataset and Benchmark Track (NeurIPS'24).

15. Xu, S., Wang, D., Liang, S., Jia, A., Li, R., **Wang, Z.**, & Liu, Y. (2024). A novel approach to estimate land surface temperature from landsat top-of-atmosphere reflective and emissive data using transfer-learning neural network. Science of the Total Environment, 955, 176783.

16. Peng, J., Yu, P., Yu, Y., Jia, A., Wang, D., Wang, H., & **Wang, Z.** (2023). An evaluation of the NOAA global daily gap-filled VIIRS surface albedo. Remote Sensing of Environment, 298, 113822.

17. Jia, A., Liang, S., Wang, D., Ma, L., **Wang, Z.**, & Xu, S. (2023). Global hourly, 5 km, all-sky land surface temperature data from 2011 to 2021 based on integrating geostationary and polar-orbiting satellite data. Earth System Science Data, 15(2), 869-895.

18. Liang, X., Liu, D., **Wang, Z.**, & Wang, J. (2022). Characterizing the dynamics of wildland-urban interface and the potential impacts on fire activity in Alaska from 2000 to 2010. Landscape and Urban Planning, 228, 104553.

19. Li, R., Wang, D., Liang, S., Jia, A., & **Wang, Z.** (2022). Estimating global downward shortwave radiation from VIIRS data using a transfer-learning neural network. Remote Sensing of Environment, 274, 112999.

20. Li, Y., Liu, Y., Bohrer, G., Cai, Y., Wilson, A., Hu, T., **Wang, Z.**, & Zhao, K. (2022). Impacts of forest loss on local climate across the conterminous United States: Evidence from satellite time-series observations. Science of the Total Environment, 802, 149651.

PRESENTATIONS

- **Wang, Z.**, Xie, Y., Jia, X., Ma, L., Ott, L., & Hurtt, G. 2025. Deep-ED: A Deep Learning Emulator for Uncovering Ecosystem Tipping Points under Intermediate Climate Scenarios. American Geophysical Union (AGU) annual meeting, New Orlean. **Oral.**
- **Wang, Z.**, Xie, Y., Jia, X., Ma, L., Ott, L., & Hurtt, G. 2024. Deep-ED: An Advanced Deep Learning Approach for Ecosystem Dynamics and Global Carbon Forecasting. American Geophysical Union (AGU) annual meeting, Washington, D.C.
- **Wang, Z.**, and Liu, D. 2019. A Spatial-Temporal Classification Method Based on Convolutional Neural Network and Markov Random Field. American Geophysical Union (AGU) annual meeting, San Francisco.
- **Wang, Z.**, and Liu, D. 2019. A Method to Optimize Temporal Sequence and Spatial Context in Multi-Temporal Land Cover Maps. Association of American Geographers (AAG) annual meeting, Washington, D.C.

TEACHING EXPERIENCE

Instructor:

- GEOG 276 Principles of Python Programming and Geocomputing, UMD 2025

Guest Lecture:

- GEOG 788T Deep Learning for Spatial and Spatio-Temporal Data, UMD 2025
- GEOG 398E Introduction to Spatial Artificial Intelligence, UMD 2025

Teaching Assistant:

- GEOG 140 Natural Disaster, UMD 2020
- GEOG 5210 Fundamentals of GIS, OSU 2020
- GEOG 5201 Geo-visualization, OSU 2019
- GEOG 5225 Geographic Applications of RS, OSU 2019
- GEOG 5226 Spatial Simulation and Modeling in GIS, OSU 2018

SKILLS

- Programming languages: Python, MATLAB, R, JavaScript, C++/C, SQL
- Tools/Libraries: PyTorch, TensorFlow, Google Earth Engine and Cloud Platform, Git, ArcGIS

Professionalization

Reviewer:

- Journals: International Journal of Applied Earth Observation and Geoinformation, Journal of Selected Topics in Applied Earth Observations and Remote Sensing, Scientific Reports, IEEE Transactions on Geoscience & Remote Sensing, Natural Hazards, Environmental Monitoring and Assessment, and Humanities & social sciences communications
- Conferences (Program Committee): KDD'26, AAAI'26, SIGSPATIAL'25, IEEE BigData'25
- Conferences (reviews under the guidance of the advisor): AAAI'23-25, IJCAI'23-25, KDD'25, SIGSPATIAL'23-24, ICDM'25, IEEE BigData'24, SDM'23

Mentoring

High School Student

- Cooper Li, Montgomery Blair High School 2024-2025
- Krish Pruthi, Poolesville High School 2025
- Peter Jin, James M. Bennett High School 2025