Zachary D. Calhoun
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EDUCATION

Duke University Expected May 2026
Ph.D., Civil & Environmental Engineering

Duke University 2023
M.S., Civil & Environmental Engineering

University of Virginia 2017
B.S., Systems & Information Engineering, 2nd Major Spanish Language

PUBLICATIONS

Refereed Journal Articles

Li, K., Wood, C., Nichols, L., Calhoun, Z. D., Bhavsar, N. A., Carlson, D. (2025) Neighborhood Temperature and Contextual Factors Improve Prediction of Childhood Body Mass Index: An Application of Novel Graph Neural Networks. *AJE Advances: Research in Epidemiology.* uuaf011, https://doi.org/10.1093/ajeadv/uuaf011

Calhoun, Z. D., Black, M. S., Bergin, M. & Carlson, D. (2024) Refining citizen climate science: Addressing preferential sampling for improved estimates of urban heat. *Environ. Sci. Technol. Lett.* 11, 8. https://doi.org/10.1021/acs.estlett.4c00296

Calhoun, Z. D., Willard, F., Ge, C., Rodriguez, C., Bergin, M. & Carlson, D. (2024) Estimating the effects of vegetation and increased albedo on the urban heat island effect with spatial causal inference. *Sci Rep* 14, 540. https://doi.org/10.1038/s41598-023-50981-w

Calhoun, Z. D., Lahrichi, S., Ren, S., Malof, J. M. & Bradbury, K. (2022) Self-supervised encoders are better transfer learners in remote sensing applications. *Remote Sens.* 14, 21. https://doi.org/10.3390/rs14215500

Manuscripts Under Review

Calhoun, Z. D., Bergin, M., & Carlson, D. Scalable and robust Gaussian processes for reanalysis of crowdsourced urban air temperature. *Urban Climate.*

Manuscripts in Preparation

Bajgain, T. R., Calhoun, Z. D., Wagner, D., Carlson, D., & Bergin, M. How many sensors do you need? Fewer than you think.

Kim, E., Calhoun, Z. D., Bergin, M., & Carlson, D. A scalable preferential sampling adjustment for citizen-collected climate data.

Other Publications

Calhoun, Z. D. How can cities adapt to a warmer climate? (2024) Blog post, available online at https://communities.springernature.com/posts/how-can-cities-adapt-to-a-warmer-climate.

Calhoun, Z. D., Jiang, Z., Bergin, M. & Carlson, D. (2022) Urban heat island detection and causal inference using convolutional neural networks. *Proceedings of the 2022 NeurIPS Workshop on Climate Change.*

Calhoun, Z., Maribojoc, P., Selzer, N., Procopi, L., Bezzo, N. & Fleming, C. (2017) Analysis of identity and access management alternatives for a multinational information-sharing environment. *Proceedings of the 2017 Systems and Information Engineering Design Symposium.*

Huzaifa, U., Bernier, C., Calhoun, Z., Heddy, G., Kohout, C., Libowitz, B., Moenning, A., Ye, J., Maguire, C. & LaViers, A. (2016) Embodied movement strategies for development of a core-located actuation walker. *Proceedings of the 6th IEEE International Conference on Biomedical Robotics and Biomechatronics*.

PRESENTATIONS

Invited Talks

Calhoun, Z. Measuring and Mitigating Urban Heat: Statistical Tools for Climate Adaptation. Presented to the Earth and Atmospheric Sciences Department at Georgia Tech. October 2025

Calhoun, Z. Matching Heat Maps to Health Outcomes: Urban Heat Stress and Opportunities to Intervene. *Underwriters Laboratories Research Symposium*. Atlanta, GA. August 2024.

Black, M., Azan, A., Chepaitis, P., Calhoun, Z. Building Resilience for Health: Exploring the Impact of Extreme Heat on Human Health. Webinar hosted by Underwriters Laboratories: Chemical Insights Research Institute. October 2024.

Calhoun, Z., & Bergin, M. The Changing Climate and Impact on Air Pollution. *Underwriters Laboratories Research Symposium.* Evanston, IL. August 2023.

Conference Presentations (Oral)

Calhoun, Z., Kim, E., Bergin, M., Carlson, D. Modeling urban heat stress with preferentially sampled citizen science data. *Joint Statistical Meetings*, Nashville, TN. August 2025.

Calhoun, Z. Big, noisy data: how scalable Gaussian processes can leverage personal weather stations to improve spatiotemporal coverage of urban climate networks. *Duke CEE SympoCEEum*, Durham, NC. April 2025. **(Best Oral Presentation Award)**

Calhoun, Z. Black, M.S., Bergin, M., Carlson, D. Spatiotemporal estimates of urban heat stress using citizen science: how adjusting for preferentially sampled observations can fill in the gaps. *American Geophysical Union (AGU) Fall Meeting*. Washington, DC. December 2024.

Conference Presentations (Poster)

Calhoun, Z., Bergin, M., Carlson, D. Assimilating crowdsourced weather data into urban climate models: a fast geostatistical framework using scalable Gaussian processes. *12th International Conference on Urban Climate.* Rotterdam, Netherlands. July 2025.

Calhoun, Z., Jiang, G., Willard, F., Ge, C., Rodriguez, C., Bergin, M., & Carlson, D. Towards precision urban climate: estimating the effects of interventions on the urban heat island effect with spatial causal inference. *Association of Environmental Engineering and Science Professors 2025 Conference*. May 2025. **(Best Poster Award)**

Liao, E., Calhoun, Z., Bergin, M., & Carlson, D. Urban heat mitigation: Predicting the efficacy of heat-reducing interventions using spatial causal inference. *9th Annual Clean AIRE NC Breathe Conference.* October 2024. **(Best Poster Award)**

Calhoun, Z., Bergin, M., & Carlson, D. Measuring the health effects of severe air pollution incidents using spatiotemporally tagged tweets. *Workshop on AI and Open Data Practices in Chemical Hazard Assessment. National Academies of Sciences, Engineering, and Medicine.* Online. May 2022.

TEACHING & MENTORSHIP

Teaching Assistantships

Air Pollution Engineering, Duke University Spring 2024

- Developed and graded homework related to material.
- Supported students with weekly office-hours, both in-person and online.
- Taught lectures on the impact of meteorology on air-pollutant transport

Data Science and Machine Learning for Engineers, Duke University Fall 2023

- Co-developed homework and exams from course material.
- Taught lecture on specific data science techniques related to my research.
- Maintained weekly office-hours and provided guidance on final project.

Guest Lectures

Air Pollution Engineering, Duke University Spring 2025

- Taught 4 lectures to gain experience for the College Teaching Certificate.
- Developed concept for final project and facilitated student progress.
- Presented students with ethical strategies for using artificial intelligence.

Undergraduate Independent Study Mentorship

Ella Tallett, Duke University 2025 – Present

- Helping to develop a final thesis on the statistical attribution of urban warming to climate change versus urban heat.

Oumaima Berrada, Duke Kunshan University 2025 – Present

- Co-advising remotely with Professor Tongshu Zheng at Duke's partner university in China.
- Developing project on the use of mixed-effects models to analyze differences in urban heat by city.

Edrian Liao, undergraduate, Duke University 2024 – 2025

- Supported final thesis and advised student on graduate career.
- Won "Best Poster Award" presenting our work.
- Now PhD student at MIT.

Daniel Oren, undergraduate, Duke University 2024

- Tested and deployed low-cost sensors around Durham, North Carolina.

Frank Willard, undergraduate, Duke University 2023

- Explored methods to quantify effects of interventions on urban temperatures.
- Won an Honorable Mention for the Computing Research Association's Outstanding Undergraduate Researcher Award.
- Included as co-author.

Duke Climate+ Summer Research Projects for Undergraduates

Adapting to warmer temperatures at the city-scale 2025

- Students: Oumaima Berrada, Ella Tallett, Rittik Barua, Yazlin Moujalled
- Instructed students on data analysis and basics of GIS.
- Provided students with feedback on presentations.

Measuring urban heat islands and their causes in Durham 2023

- Students: Chenhao Ge, Claudia Rodriguez
- Taught fundamentals of causal inference.
- Resulted in publication, with students as co-authors.

Tracking climate change causes & impacts with satellites and AI 2022

- Students: Saad Lahrichi, Rebecca Lan, Edrian Liao
- Taught students about Google Earth Engine and computer vision.

AWARDS & FELLOWSHIPS

Utku Best Pre-PhD Paper Award 2024
Duke Pratt-Gardner Graduate Fellowship 2021

SERVICE

University Service

PhD+ Executive Board Member, Duke University 2023 – Present

- Invited speakers to discuss career options for PhD students in academia, government, and industry.
- Hosted workshops to discuss relevant topics, and distributed marketing material.

Carlson Lab Reading Group Coordinator 2023 – Present

- Scheduled weekly lab meetings to discuss relevant research topics.

Refereed journals

- *ARC Geophysical Research*
- *Geohealth*
- *Earth Science Informatics*
- *Nature Scientific Reports*
- *Remote Sensing Applications: Society and Environment*

Professional Affiliations

Association of Environmental Engineering and Science Professors 2025 – Present
American Statistical Association 2025 – Present
International Association for Urban Climate 2024 – Present
American Geophysical Union 2024

Training & Certificates

College Teaching Certificate, Duke University 2024 – Present

Technical Skills

Programming Languages: Python, R, JavaScript
Libraries: GPyTorch, PyTorch, Geopandas, Rasterio
Software: Google Earth Engine, Microsoft Office
Second Languages: Spanish (intermediate)

Industry Experience

Peloton Interactive 2019 – 2021
Supply Chain IT Analyst New York, NY

Myers-Holum, Inc 2017 – 2019
Technical Consultant & Developer New York, NY