Jenna Abrahamson

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Research Interests

Satellite Remote Sensing, Machine Learning, Water/Carbon Cycle Interactions, Data Fusion, Statistics (Bayesian, Spatiotemporal)

Education

North Carolina State University — Raleigh, North Carolina
Ph.D. in Geospatial Analytics — *Aug. 2021 – Present*
Advisor/Committee Chair: Dr. Josh Gray
Committee: Dr. Mirela Tulbure, Dr. Erin Schliep, Dr. John King
Expected Graduation: December 2025

Stanford University — Online
Professional Certificate in Data Science — *Oct. 2020 – Jan. 2021*
Courses: Python Programming, R Programming, Statistics

University of St. Thomas — St. Paul, Minnesota
B.S. in Environmental Science and Geology — *Sept. 2015 – May 2019*
Minor in Sustainability & GIS
Graduated Magna Cum Laude

Research Experience

NSF Graduate Research Fellow
Fellow in Dr. Josh Gray's SEAL Lab at NCSU — *Aug. 2021 – Present*
`[Python/R/bash/HPC]`

- Testing machine learning methods for classifying inundation in coastal wetland ecosystems using both optical and synthetic aperture radar satellite observations (Sentinel-2, Sentinel-1, PlanetScope).
- Developing data fusion methods to integrate satellite machine learning models with a physically-based hydrologic model at high spatial and temporal resolutions.
- Simulating wetland methane fluxes using process-based modeling and a combination of in-situ and remotely sensed data.

Ph.D. Intern
Pacific Northwest National Laboratory — *June 2023 – Aug. 2023*
`[Python/Google Earth Engine]`

- Developed strategies to optimize flood prediction by integrating remote sensing, machine learning, and time series techniques.
- Primary developer of a multi-sensor remote sensing code pipeline for mapping variable inundation across ecosystems.
- Co-authored a review manuscript on variable inundation and its link to biogeochemical processes across Earth's ecosystems.

Graduate Research Assistant
IARPA SMART Project - PI Dr. Josh Gray *Aug. 2021 – June 2023*
`[R/bash/HPC]`

- Implemented *roboBayes*, a Bayesian online change detection algorithm used to flag land disturbances in near-real-time using multi-sensor satellite data cubes for areas across Earth.
- Developed a global machine learning module used in conjunction with roboBayes to characterize the types of land disturbance.
- Worked with ML engineers at Accenture to develop a production-level code pipeline deployed using AWS and scored quarterly.

Undergraduate Research Assistant
EPA Project - PI Dr. Gaston Small *May 2018 – June 2019*
`[Stella Architect/JMP]`

- Developed numerical models of plant growth and nutrient cycling using Stella Architect to predict daily nutrient/water runoff.
- Conducted chemical analysis of phosphate and nitrogen in water samples and tested rates of absorption statistically using JMP.
- Presented at the EPA P3 Sustainable Design Competition in Boston, MA where our team was awarded the P3 grant.

Undergraduate Research Assistant
ACS Petroleum Project - PI Dr. Jeni McDermott *Feb 2016 – May 2018*
`[MatLab]`

- Analyzed stream longitudinal profiles using chi-plot statistical analysis to determine areas of change in fluvial systems.
- Helped develop a novel method to predict areas of river capture in complex drainages based on statistical power-law relationships using 1-m digital elevation models and MatLab.
- Participated and helped lead international fieldwork in Norway.

Publications

Abrahamson, J.N., Gray, J., Tulbure, M., Schliep, E. Monitoring Ephemeral Inundation Dynamics in Coastal Wetlands using Machine Learning and Space-Time Data Fusion. (In Preparation).

Stegen, J., Burgin, A., Busch, M., Fisher, J., Ladau, J., **Abrahamson, J.N.,** ...Variable Inundation Across Earth's Terrestrial Ecosystems. *EGU Biogeosciences, 2024.* (In Review, Accepted for Preprint).

Rasmussen, P., **Abrahamson, J.N.**, Tang, X., Smith, O., Gray, J., Woodcock, C., Ruiz, M. Assessment of Performance of Tree-Based Algorithms to Reduce Errors of Omission and Commission in Change Detection. *IGARSS 2023 - IEEE International Geoscience and Remote Sensing Symposium.*

Shrestha, P.; Salzl, M.T.; Jimenez, I.J.; Pradhan, N.; Hay, M.; Wallace, H.R.; **Abrahamson, J.N.**; Small, G.E. Efficacy of Spent Lime as a Soil Amendment for Nutrient Retention in Bioretention Green Stormwater Infrastructure. *Water, 2019.*

Presentations

Abrahamson, J.N., Gray, J., Schliep, E. (April 2024). Multi-Sensor Space-Time Data Fusion of Machine Learning Generated Time Series. *EGU General Assembly*, Vienna, Austria. [Lightning Talk]

Abrahamson, J.N., Gray, J. (Dec. 2023). Monitoring Ephemeral Inundation Dynamics in Coastal Wetlands Using Time Series of Sentinel and PlanetScope Data. *AGU Fall Meeting*, San Francisco, CA. [Poster]

Abrahamson, J.N., Gray, J. (Dec. 2022). Integrating Physical and Remote Sensing Models to Map Inundation at High Spatial and Temporal Resolution. *AGU Fall Meeting*, Chicago, IL. [Poster]

Abrahamson, J.N., Shrestha, P, Small, G.E. (May 2019). Evaluating leachate nutrient flux losses from various compost treatments in urban agriculture. *Urban Food Systems Symposium*, Minneapolis, MN. [Poster]

Abrahamson, J. N., McDermott, J. A., Allen, E. F., Redfield, T. F. (Oct. 2017). Using Drainage Area Power-Law Relationships to Test for Points of River Capture. *GSA Annual Meeting*, Seattle, Washington. [Poster]

Grants and Awards

NCSU CNR Symposium Best Poster Presentation	*2024*
NASA Future Investigator in Earth and Space Technology	*2023*
NSF Graduate Research Fellowship	*2023*
NCSU Geospatial Analytics Collaboration and Innovation Award	*2022*
NCSU University Graduate Fellowship	*2021*
PEPSI Environmental Science Scholarship	*2018*
Brownstein Geology Scholarship	*2017*
UST Collaborative Inquiry Grant	*2017*
UST Young Scholars Grant	*2017*
UST Collaborative Inquiry Grant	*2016*

Industry Experience

GIS Analyst — St. Paul, MN
Pointmap Inc. — *Oct. 2019 – June 2021*

- Maintained spatial databases and applications, and managed the GIS analytics for multiple large-scale environmental consulting projects.

Environmental Field Technician — Minneapolis, MN
Braun Intertec Corporation — *May 2019 – Oct. 2019*

- Collected samples for soil, groundwater, air, and soil vapor analysis and drafted Phase I and II Environmental Site Assessments.

Technical Skills

Proficient in: Python, R, High-Performance Computing, Git, Machine Learning (caret, H2O, sklearn, Dask-ML), Google Earth Engine, Jupyter

Familiar with: C, MatLab, JavaScript, HTML, Docker, SQL, AWS, bash

Hackathon Experience

Participated in the 4-day Princeton Open Hackathon advancing code for seagrass classification using deep learning methods (CNN) and commercial satellite imagery with collaborators at NOAA.

Professional

Invited Talks & Workshops

NCSU Geospatial Forum: *Satellite Change Detection & ML* — *Feb. 2024*
CGA Lunch Series: *Elegant and Effective Data Visualizations* — *Jan. 2024*
Accenture Computer Vision Seminar: *CV in Remote Sensing* — *June 2022*

Guest Lecturer

GIS715: Geovisualization — *Spring 2024*

Diversity, Equity, and Inclusion Chair

Geospatial Graduate Student Organization (GGSO) — *May 2023 – Present*

Panel Member: Applying for External Funding

NCSU Diversity in STEM Symposium — *Spring 2024*