BRANDON WEART

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EDUCATION

William Rainey Harper College, Palatine, IL, A.S. General Science, December 2022

Northern Illinois University, Dekalb, IL, B.S. Meteorology, Minor in Geography, Geographic Information Systems Certificate, May 2025, GPA: 3.72

Northern Illinois University, Dekalb, IL, M.S. Meteorology, May 2027

RESEARCH INTERESTS

My research focuses on the applications of machine learning to various issues in the field of atmospheric science, particularly those related to climate emulation.

RESEARCH EXPERIENCE

Department of Earth, Atmosphere, and Environment, NIU, Dekalb, IL
February 2024-May 2025 Undergraduate Researcher, Advisors: Dr. Victor Gensini

- Investigated the potential for long-range (8+ days) severe weather forecasting using Climate Prediction Center Analogs
- Analyzed Practically Perfect Hindcasts (PPH) to observe severe weather trends for CPC analog dates and created long-range forecasts based on the trends.
- Applied statistical calculations to determine the effectiveness of extended-range forecasts.

Undergraduate Research, NIU, Dekalb, IL
February 2024- May 2024
Advisor: Kyle Pittman, Sylvia Stinnet, Dr. Walker Ashley, Dr. Alex Haberlie

- Analyzed the effects of climate change on the severe convective storm (SCS) and flash flood event in Texas on March 21-23rd, 2022.
- Ran the Weather Research and Forecasting (WRF) model with a pseudo-global-warming configuration to simulate the effects of human-induced climate change and analyzed the results.

Student Engagement Fund (SEF) Research, NIU, Dekalb, IL
August 2024-December 2024, Advisor: Dr. Alex Haberlie

- Trained a convolutional neural network to identify linear, cellular, and mixed convective modes using the SVRIMG database
- Did rigorous quality checking of the data to ensure our model was ingesting usable and valid data.
- Created 10,000+ examples to train the neural network to achieve an accuracy of 80%+
- Won a $200 award for the best poster presentation.

Department of Energy Student Undergraduate Laboratory Internship, Argonne National Laboratory, Lemont, IL, *May-Aug 2024 Intern, Advisor: Dr. Joseph O'Brien*

- Proved the necessity of a Micronet of rain gauges in the Chicago area to fill in observational gaps and increase the accuracy and spatial resolution of precipitation observations

- Compared NEXRAD and rain gauge data with Python to analyze discrepancies between radar-derived and gauge-measured precipitation accumulation.
- Worked to deploy various meteorological instrumentation at the Argonne Testbed for Multiscale Observational Science (ATMOS) to determine the necessary spacing for the network.
- Participated in DOE workshops focused on career development, data stewardship, and emerging data formats (e.g., Zarr)

Department of Energy Student Undergraduate Laboratory Internship, Argonne National Laboratory, Lemont, IL, *May-Aug 2025 Intern, Advisor: Dr. Robert Jackson*

- Worked on a project to utilize radar reflectivity data and linear regression-derived Z-R relationships to predict rainfall data compared to a ground truth WXT sensor
- Trained a shallow neural network for regression prediction of rainfall accumulation (R) given linear radar reflectivity (Z) which outperformed basic linear regression.
- Performed rigorous data quality checking, filtering, and cross-validation on my ML models as well as statistical analysis of the outputs.
- Utilized T-matrix and PyDSD to convert disdrometer data into synthetic radar moments for analysis with machine learning

Visiting Researcher, Argonne National Laboratory
Lemont, IL, *Oct 2025-Present, Advisor: Dr. Robert Jackson*

- Assisted in the development of a lake breeze tracking algorithm for HRRR model output using computer vision techniques, finding that calculated 10-m convergence works well as a parameter and easily resolves lake breezes.
- Created figures for two Bulletin of the American Meteorological Society papers currently in review, *CROCUS Micronet: A Distributed, AI-Enabled Urban Observation System in Chicago (Muradyan et al. 2026),* and *CROCUS Urban Canyons (Collis et al. 2026)*

Department of Earth, Atmosphere, and Environment, NIU, Dekalb, IL
August 2025-May 2027 Graduate Research Assistant, Advisor: Dr. Alex Haberlie

- Investigating climate emulation as a solution to computationally inefficient numerical and statistical downscaling methods
- Downscaling global climate model data to convection-permitting resolutions to recreate precipitation climatologies and extreme
- Using a score-based diffusion model to test transfer learning capabilities of pretrained deep learning models on unfamiliar datasets.
- Applying rigorous statistical analysis and hyperparameter tuning to ensure model is running at maximum effectiveness.

FIELD EXPERIENCE

Community Research on Climate and Urban Science (CROCUS) Urban Canyons Field Campaign,
Argonne National Laboratory, *May-August 2024*

- Studied the effects of an Urban Heat Island on the planetary boundary layer
- Took hand-held meteorological observations at 100+ locations around the city of Chicago.
- Analyzed preliminary data from UIUC radiosonde launches and created figures to present notable findings.

PROFESSIONAL EXPERIENCE

CROCUS Urban Canyons Field Campaign
Forecast Committee Co-lead, July-August 2024

- Co-lead the forecasting division of the field campaign to inform go-no-go decisions.
- Created comprehensive day-to-day forecasts for PIs to ensure weather awareness and safety during the field campaign.
- Created detailed figures and slides to resolve features of interest to the campaign (I.E. Lake breezes, precipitation).

CROCUS Urban Rainfall and Flooding Field Campaign
Forecast Committee Forecaster, Radiosonde Launch Team, April-May 2025

- Co-lead the forecasting division of the field campaign to inform go-no-go decisions.
- Created comprehensive day-to-day forecasts for PIs to ensure weather awareness and safety during the field campaign, as well as create targets for science.
- Created detailed figures and slides to resolve features of interest in the campaign (I.E. Lake breezes, precipitation).
- Setup and launch radiosondes over a 24-hour period to capture local atmospheric conditions in extreme rainfall events.

Forecasting Committee, Northern Illinois University
Inaugural Operational Forecasting leader, August 2024-May 2025

- Organized and started up an operational forecasting division for students at NIU.
- Led 50+ students to create synoptic and mesoscale forecasts to provide data to the NIU Northern Star newspaper.
- Helped NIU students develop and hone their forecasting skills and learn how to communicate science to the general public effectively.
- Visualized data and verification metrics for previous forecasts as well as provide easy-to-interpret figures to the broadcast sector.

Research Initiative Committee, Northern Illinois University
Participant and assistant instructor, Started Feb 2025

- Assisted with instructing 20+ students on how to walk through the scientific method and how to come up with a research question
- Curated 10+ instructional Jupyter notebooks to educate students on how to use Python and it's libraries to manipulate and work with large datasets.
- Assisted with guiding students through the research process and achieving a desired result.

Student Assistant, 105th Annual American Meteorological Society conference, New Orleans, LA
Student Assistant, January 2025

- Assisted fellow presenters and speakers by uploading their presentations or posters to the Confex software in the Speaker Ready Room.
- Teched 10+ sessions with multiple speakers and helped set up the recordings as well as ensured a seamless and hiccup free process for speakers to present their materials.
- Had to solve problems on-the-fly such as technical issues, speaker complaints or last-minute backouts, and dealing with timing issues accrued from problems that arose.

Student Assistant, 106th Annual American Meteorological Society conference, Houston, TX
Student Assistant, January 2026

- Assisted fellow presenters and speakers by uploading their presentations or posters to the Confex software in the Speaker Ready Room.
- Teched 10+ sessions with multiple speakers and helped set up the recordings as well as ensured a seamless and hiccup free process for speakers to present their materials.
- Had to solve problems on-the-fly such as technical issues, speaker complaints or last-minute backouts, and dealing with timing issues accrued from problems that arose.
- Assisted during a major town hall meeting with the incoming and outgoing presidents of AMS, as well as the president of the University Cooperation for Atmospheric Research (UCAR), ensuring a smooth and uninterrupted talk despite uncontrollable technical issues.

PUBLICATIONS

1. Manuscript in Preparation

- Scott M Collis, M. Cristina Negri, Paytsar Muradyan, Joseph Robert O'Brien, Matthew Tuftedal, Maxwell Grover, Dimitrios K. Fytanidis, Stephen W Nesbitt, Jian Wang, Timothy J. Wagner, Zachary Sherman, Robert Clyde Jackson, Dr. Deanna A Hence, **Brandon Weart**, and others 2024: (CROCUS) Urban Canyons. *In review for Bull. Amer. Met. Soc (BAMS)*

PRESENTATIONS

1. Poster Presentations

- **Weart, B.**, O'Brien, J, 2024: Influence of Micronet Locations on Hyperlocal precipitation measurements in Chicagoland, *Argonne National Laboratory Learning on the Lawn, Lemont, IL*
- **Weart, B.**, O'Brien, J, 2025: Influence of Micronet Locations on Hyperlocal precipitation measurements in Chicagoland, *105th Annual American Meteorological Society conference 2025, New Orleans, LA*
- Grover, M., Fytanidis, D.K., Nesbitt, S.W., Wang, J., Wagner, T.J., Sherman, Z., Jackson, R.C., Hence, D.A., **Weart, B.**: Adopting a Modeling-Observation-Experimentation (MODEX) Research Approach for the Model-Informed Urban Canyon Observation Campaign in the Community Research on Climate and Urban Science (CROCUS) Project, *American Geophysical Union Annual Meeting 2024, Washington, D.C.*
- **Weart, B.,** Phipps, S., Detecting Storm Mode with Machine Learning, *NIU Conference of Undergraduate Research and engagement*
- **Weart, B., Jackson, R.,** Prediction of Radar-Derived Quantitative Precipitation Estimation Using Basic Machine Learning Techniques, *Argonne National Laboratory Learning on the Lawn, Lemont, IL*
- **Weart, B.,** Phipps, S., Detecting Storm Mode with Machine Learning, *American Meteorological Society 106th Annual Meeting, Student Conferencce*

TECHNICAL SKILLS AND TRAINING

- Programming Languages: Python (advanced, intermediate machine learning), R (beginner), Bash, Conda, Git, PyTorch, TensorFlow/Keras, Xarray, NumPy
- Model Experience: Model for Prediction Across Scales (MPAS)
- Radar/Remote Sensing Software Experience: GR2Analyst, PyART, ERDAS
- Geographic Information Systems: ArcGIS (intermediate), QGIS
- Instrumentation Experience: SAGE WAGGLE Nodes, Vaisala multi-parameter weather sensors

PROFESSIONAL MEMBERSHIPS

• American Meteorological Society *Aug 2024-Present*

HONORS AND AWARDS

• Allen Staver Meteorology Scholarship *2024.*

• Northern Illinois University Merit Scholarship *2023 & 2024*

• Dr. Arnold Hampel and Dr. Denise Kennedy CURE Award fund for best poster presentation.

COMMUNITY SERVICE

• Clean the Kish: Participate in a river walk once a year to remove pollutants and keep the river clean. *Aug 2023-Present*

IN THE NEWS

• Local scientists studying how the Chicago skyline contributes to city heat islands**,** https://abc7.com/post/new-crocus-project-argonne-national-lab-studies-how-chicago-skyline-contributes-city-heat-islands/15138061/

• Chicago research project seeks to determine how skyscrapers impact heat, https://www.nbcchicago.com/news/local/chicago-research-project-seeks-to-determine-how-skyscrapers-impact-heat/3513220/?os=ios&ref=app

REFERENCES

Dr. Joseph R. O'Brien, Atmospheric Science Software Specialist
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Environmental Science Division, Argonne National Laboratory
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Dr. Vittorio A. Gensini, Ph. D, CCM, Professor of Meteorology
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Dr. Scott M. Collis, Ph. D, Department Head (GCIS) and Director, ATMOS
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