

JASON STOCK

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EDUCATION

- 2024 Ph.D. **Colorado State University**, Computer Science (Expected Dec, 2024)
Advancing Machine Learning for Weather and Climate Modeling: From Neuro-Inspired Attention to Generative Diffusion Methods. Advisor: Charles Anderson
- 2021 M.S. **Colorado State University**, Computer Science
Using Machine Learning to Improve Vertical Profiles of Temperature and Moisture for Severe Weather Nowcasting. Advisor: Charles Anderson & Co-Advisor: Imme Ebert-Uphoff
- 2019 B.S. **Colorado State University**, Computer Science & Mathematics (minor)

EMPLOYMENT

- 01.2020 – present **Graduate Research Assistant**, Colorado State University – Computer Science
NSF AI Institute for Research on Trustworthy AI in Weather, Climate, and Coastal Oceanography (AI2ES)
- 11.2023 – 02.2024 **Research Intern**, NVIDIA Research – Climate Simulation Group
- 05.2023 – 08.2023 **Research Intern**, Maxar Technologies – Research and Development
- 01.2020 – 05.2020 **Graduate Teaching Assistant**, Colorado State University – Distributed Systems
- 06.2018 – 11.2019 **Software Engineer Intern**, The Boeing Company – NOTAMs Group
- 01.2017 – 05.2018 **Undergraduate Teaching Assistant**, Colorado State University – Computer Architecture

RESEARCH INTERESTS

Neuro-inspired attention in neural networks, generative diffusion models, deep reinforcement learning for control, creating interpretable-by-design machine learning methods, and modeling weather and climate change.

Languages: Python, Java, C++, Bash, ReactJS, Rust, C, Scala

Tools: PyTorch, TensorFlow, MLX, NumPy, Linux, Git, Apache Hadoop & Spark, Azure, AWS, Slurm, Docker

CONFERENCE AND JOURNAL PUBLICATIONS

1. **Stock, J.**, Hilburn, K., Ebert-Uphoff, I., & Anderson, C. (2024). *SRViT: Vision Transformers for Estimating Radar Reflectivity from Satellite Observations at Scale*. In ICML 2024 Workshop on Machine Learning for Earth System Modeling, July, 2024.
2. **Stock, J.**, Pathak, J., Cohen, Y., Pritchard, M., Garg, P., Durran, D., Mardani, M., & Brenowitz, N. (2024). *DiffObs: Generative Diffusion for Global Forecasting of Satellite Observations*. In ICLR 2024 Workshop on Tackling Climate Change with Machine Learning, May, 2024.
3. **Stock, J.**, & Anderson, C. (2023). *Memory-Based Sequential Attention*. In NeurIPS 2023 Workshop on Gaze Meets Machine Learning (PMLR), Dec, 2023. **(Oral Spotlight)**
4. Haynes, K., **Stock, J.**, Dostalek, J., Anderson, C., & Ebert-Uphoff, I. (2023). *Exploring the Use of Machine Learning to Improve Vertical Profiles of Temperature and Moisture*. Artificial Intelligence for the Earth Systems (AIES), Aug, 2023.
5. **Stock, J.**, & Anderson, C. (2022). *Attention-Based Scattering Network for Satellite Imagery*. In NeurIPS 2022 Workshop on Tackling Climate Change with Machine Learning, Dec, 2022.
6. Anderson, C., & **Stock, J.** (2022). *An Interpretable Model of Climate Change Using Correlative Learning*. In NeurIPS 2022 Workshop on Tackling Climate Change with Machine Learning, Dec, 2022.
7. **Stock, J.**, & Anderson, C. (2022). *Trainable Wavelet Neural Network for Non-Stationary Signals*. In ICLR 2022 Workshop on AI for Earth and Space Science, Apr, 2022.
8. Anderson, C., **Stock, J.**, & Anderson, D. (2022). *Interpretable Climate Change Modeling with Progressive Cascade Networks*. In ICLR 2022 Workshop on AI for Earth and Space Science, Apr, 2022.

9. **Stock, Jason** (2021). *Using Machine Learning to Improve Vertical Profiles of Temperature and Moisture for Severe Weather Nowcasting*. M.S. Thesis, Dept. of Computer Science, Colorado State University, Jun, 2021. **(CSU CS Department Best Poster Award)**

TECHNICAL REPORTS AND PREPRINTS

1. Ebert-Uphoff, I., Ver Hoef, L., Schreck, J.S., **Stock, J.**, Molina, M.J., McGovern, A., Yu, M., Petzke, B., Hilburn, K., Hall, D.M., Gagne, D.J., & Scheuerman, S. (Draft). *An Investigation of Metrics to Evaluate the Sharpness in AI-Generated Meteorological Imagery*. AI Institute for Research on Trustworthy AI in Weather, Climate, and Coastal Oceanography (AI2ES), Jan, 2024.
2. Ebert-Uphoff, I., Lagerquist, R., Hilburn, K. A., Lee, Y., Haynes, K., **Stock, J.**, Kumler, C., & Stewart, J. Q. (2021). *CIRA Guide to Custom Loss Functions for Neural Networks in Environmental Sciences – Version 1*. arXiv preprint arXiv:2106.09757, Jun, 2021.
3. **Stock, J.**, & Cavey, T. (2021). *Who’s a Good Boy? Reinforcing Canine Behavior in Real-Time using Machine Learning*. arXiv preprint arXiv:2101.02380, Jan, 2021. **(NVIDIA Interview)**

NON-REFEREED CONFERENCE PRESENTATIONS

1. Bostrom, A., Davis, P., Ebert-Uphoff, I., Kumler, C., **Stock, J.**, & White, M. (2023). *On the Ethical and Responsible Design of AI Systems for Environmental Science*. Conference on Ethical and Responsible Design in the National AI Institutes, May, 2023.
2. **Stock, J.**, & Anderson, C. (2023). *Attention-Based Scattering Network for Satellite Imagery*. AMS 103rd Annual Meeting, 22nd Conference on Artificial Intelligence for Environmental Science, Jan, 2023.
3. Haynes, K., **Stock, J.**, Dostalek, J., Grasso, L., Anderson, C., & Ebert-Uphoff, I. (2023). *Exploring the Use of Machine Learning to Improve Vertical Profiles of Temperature and Moisture*. AMS 103rd Annual Meeting, 22nd Conference on Artificial Intelligence for Environmental Science, Jan, 2023.
4. Ebert-Uphoff, I., Lagerquist, R., Hilburn, K. A., Lee, Y., Haynes, K., **Stock, J.**, Kumler, C., & Stewart, J. Q. (2022). *How to Develop Custom Loss Functions for Neural Networks in Meteorology*. AMS 102nd Annual Meeting, 21st Conference on Artificial Intelligence for Environmental Science, Jan, 2022.
5. Ebert-Uphoff, I., Lagerquist, R., Hilburn, K., Lee, Y., Haynes, K., **Stock, J.**, Kumler, C., & Stewart, J. Q. (2021). *Guide to Custom Loss Functions for Neural Networks in Environmental Sciences*. 3rd NOAA Workshop on Leveraging AI in Environmental Sciences, Sept, 2021.
6. **Stock, J.**, Dandy, J., Ebert-Uphoff, I., Dostalek, J., & Grasso, L. (2021). *Using Machine Learning to Improve Vertical Profiles of Temperature and Moisture for Severe Weather Forecasting*. 3rd NOAA Workshop on Leveraging AI in Environmental Sciences, Sept, 2021.
7. **Stock, J.**, Dandy, J., Ebert-Uphoff, I., Anderson, C., Dostalek, J., Grasso, L., Zeitler, J., & Weinman, H. (2021). *Using Machine Learning to Improve Vertical Profiles of Temperature and Moisture for Severe Weather Nowcasting*. AMS 101st Annual Meeting, 20th Conference on Artificial Intelligence for Environmental Science, Jan, 2021.

OPEN-SOURCE SOFTWARE AND PROJECTS

- Chat with MLX** [code|demo] (2024). A high-performance macOS app connecting local documents to personalized LLMs using RAG on Apple silicon with MLX. Features include document-specific prompts, real-time conversation, personalization, and secure local data processing.
- Emulating Atmospheric Compensation with Machine Learning** (2023). Corrected lightwave scattering as seen in high-resolution satellite imagery with large-scale deep learning. Collaborated with research scientists in designing a performant model that significantly reduced compute time.
- Clustering Cloud Types from the Geostationary Operational Environmental Satellite** [code] (2020). Studied emerging cloud types from untreated GOES-16 imagery using a convolutional autoencoder with k -means. Found inferred and visible channels best for separating clear/cloudy conditions and detecting icing.
- Area Mapping in Voluminous Virtual Environments** [code|paper] (2019). A distributed system for managing several thousand clients to interact in a multi-terabyte virtual environment. Backend services scale horizontally and use HDFS to provide partition tolerance and high data availability.

***Note:** Additional works in machine learning, distributed systems, and big data analytics on my [GitHub](#).*

PROFESSIONAL ACTIVITIES

Invited Talks and Tutorials

Generative Diffusion for Global Forecasting of Satellite Observations. NSF AI Institute for Research on Trustworthy AI in Weather, Climate, and Coastal Oceanography (AI2ES), 2024.

Demystifying Diffusion Models: Insights for Meteorological Applications. Generative AI Working Group, Cooperative Institute for Research in the Atmosphere (CIRA), 2024.

Neural Attention Beyond Saliency. Information and Language Processing (ILP) Lab, Computer Science Department at University of Virginia, 2023.

Estimating Radar from Satellite Observations at Scale with Vision Transformers. Machine Learning Core, Cooperative Institute for Research in the Atmosphere (CIRA), 2023.

Toward Biological Models of Sequential Attention. Guest Lecture for CS510: Image Computation, Computer Science Department at Colorado State University, 2023.

Memory-Based Sequential Attention for Climate Science. Barnes Research Group, Atmospheric Science Department at Colorado State University, 2023.

Neural Models of Attention for Tropical Cyclones. Machine Learning for Tropical Cyclones, Cooperative Institute for Research in the Atmosphere (CIRA), 2023.

Wavelet Neural Networks for Non-Stationary Signals and Satellite Imagery. NSF AI Institute for Research on Trustworthy AI in Weather, Climate, and Coastal Oceanography (AI2ES), 2022.

Trainable Wavelet Neural Network for Non-Stationary Signals. Data Science Seminar, Mathematics Department at Colorado State University, 2022.

An Introduction to Recurrent Neural Networks and Sequence Learning. Machine Learning Core, Cooperative Institute for Research in the Atmosphere (CIRA), 2022.

Reinforcement Learning: an Introduction and Application to Climate Science. Barnes Climate & Data Science Group, Atmospheric Science Department at Colorado State University, 2022.

Mentorship

Zach Hird & Stanley Howard, NeurIPS 2024 High School Paper Track, 2024

Parker Smith, B.S., Colorado State University (Undergraduate Research Assistant), 2022

Alanood Alqobaisi, M.S., Colorado State University (CS Outreach Program), 2022

Service

Program Committee: NeurIPS 2024 Workshop on Gaze Meets Machine Learning, 2024 (In Review)

Reviewing: Artificial Intelligence for the Earth Systems (AIES; 2022 & 2023)

Certificates: SAE4 DevOps Practitioner (Scaled Agile Inc.); Leadership Preparation (CSU)

Workshops and Hackathons

Contributor, D4 Hack Week: Disasters, Demography, Disparities, and Decisions, University of Washington, 2024

Resident, Jessy's Hacker House, EthDenver, 2023

Contributor, Trustworthy Artificial Intelligence for Environmental Science Summer School, NCAR, 2022

Participant, Artificial Intelligence for Earth System Science Summer School, NCAR, 2020

Leadership and Affiliations

Team Captain, Competitive eSports COD Team (CSU), 2021–2024

Member, CSU Association for Computer Machinery (ACM), 2016–2021

Member, CSU CS Hashdump Security Club, 2016–2021

Founder and President, Photography at Colorado State, 2015–2018

Volunteer, Ronald McDonald House, Tri Elks Lodge, and others, 2013–2022