

JASON STOCK

Updated December 23, 2024

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EDUCATION

- 2024 Ph.D. **Colorado State University**, Computer Science
From Neuro-Inspired Attention Methods to Generative Diffusion: Applications to Weather and Climate. 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

- 06.2020 – 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 and flow matching, 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., Hillburn, 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. Summary report: <https://arxiv.org/abs/2407.13926>
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

- Machine Learning: Fundamentals and Architectures*. Disasters, Demography, Disparities and Decisions (D4) Hack Week at the University of Washington, 2024.
- 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 the 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 Tackling Climate Change with Machine Learning, 2024
- Reviewing**: Artificial Intelligence for the Earth Systems (AIES; 2022 & 2023)
- Certificates**: SAFe4 DevOps Practitioner (Scaled Agile Inc.); Leadership Preparation (CSU)

Workshops and Hackathons

- Contributor**, Disasters, Demography, Disparities and Decisions (D4) Hack Week, 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