Peter Van Katwyk

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Summary

PhD candidate in Scientific Machine Learning at Brown University with 5+ years of experience applying deep learning, uncertainty quantification, and geospatial data analysis to climate and environmental modeling. Proven record of deploying scalable ML systems and emulators for Earth systems across academia, NASA, and industry. Passionate about driving real-world impact in climate tech through data science and AI.

Education

Brown University, PhD in Scientific Machine Learning   Sep 2021 – May 2026
- **Advisor**: Karianne Bergen
- **Dissertation**: AI for Climate, Bayesian NNs for Projecting Future Sea Level
- National Science Foundation GRFP Fellow

Brigham Young University, BS in Geological Sciences, Minor in Applied Statistics   Sep 2017 – May 2021

Publications

Selected Publications

- **Van Katwyk** & Bergen (2025). HybridFlow: Quantification of Aleatoric and Epistemic Uncertainty with a Single Hybrid Model. *TMLR*. (to be submitted)
- **Van Katwyk** et al. (2025). ISEFlow v1.0: A Flow-Based Neural Network Emulator for Improved Sea Level Projections and Uncertainty Quantification. *Geoscientific Model Development*. https://doi.org/10.5194/egusphere-2025-870.
- **Van Katwyk** et al. (2023). A Variational LSTM Emulator of Sea Level Contribution from the Antarctic Ice Sheet. *JAMES*. https://doi.org/10.1029/2023MS003899.

Additional Publications

- H. Wang, T. Fu, Y. Du, W. Gao, K. Huang, Z. Liu, P. Chandak, S. Liu, **P. Van Katwyk**, A. Deac, A. Anandkumar, K. Bergen, C. Gomes, S. Ho, P. Kohli, J. Lasenby, J. Leskovec, T. Liu, A. Manrai, D. Marks, B. Ramsundar, L. Song, J. Sun, J. Tang, P. Veličković, M. Welling, L. Zhang, C. Coley, Y. Bengio, M. Zitnik (2023). Scientific discovery in the age of artificial intelligence. *Nature*. https://doi.org/10.1038/s41586-023-06221-2.
- Seroussi, H., et al. (including Peter Van Katwyk) (2023). Insights into the vulnerability of Antarctic glaciers from the ISMIP6 ice sheet model ensemble and associated uncertainty. *The Cryosphere*. https://doi.org/10.5194/tc-17-5197-2023.
- B. C Barton, S. Nelson, J. McBride, B. Bickmore, I. Spring, L. Wells, **P. Van Katwyk**, E. Wolfe (2023). The development of laterite weathering profiles as a function of rainfall and time: A geophysical approach. *Earth Surface Processes and Landforms*. https://doi.org/10.1002/esp.5688.

Presentations

1. ML for Climate: Challenges and Opportunities, Brigham Young University Seminar Series, Feb 2025. Invited Talk.
2. Emulation of sea level rise from the Antarctic and Greenland Ice Sheets using ISEFlow, World Climate Research Programme Emulator Task Team, Feb 2025. Invited Talk.
3. Machine Learning emulators of sea level contribution from the Antarctic and Greenland Ice Sheets. Machine Learning for Physical Oceanography Seminar, Jan 2025. Invited Talk.
4. ISEFlow: Emulating Sea Level Rise using a Hybrid Flow-Based Neural Network Architecture. AGU 2024. Poster.
5. AI-ATC: Reinforcement learning for optimal ARTCC sector traffic management. NASA Internal Conference 2024. Talk.
6. Improving Sea Level Projections with AI. Brown University, Research Matters 2024. Talk.
7. Variational LSTM emulators of sea level contribution from the Antarctic and Greenland ice sheets. AGU 2023. Poster.
8. Emulation of ISMIP6 Antarctic sea level contribution and ensemble distributions using time series neural networks. Liege Colloquium on ML and Data Analysis in Oceanography, May 2023. Talk.
9. Normalizing Flows: Uncertainty Quantification in Earth Machine Learning. SAGE GAGE 2021. Poster.

10. Redox and Detrital Geochemical Variation as an Indicator of Organofacies Variability – Heterogeneity, Provenance, and Process in the Mowry Shale, Wind River Basin, Wyoming. AAPG ACE 2020. Poster.
11. Gradational Weathering of Molokai, Hawaii: Geophysical Study of Hawaiian Lateritic Weathering Profiles. GSA 2020. Poster.

Teaching Experience

- **Graduate Teaching Assistant**: EEPS 1340 Machine Learning for the Earth and Environment. Karianne Bergen.

Fellowships and Awards

- NASA Outstanding Intern Presentation Award. 2024.
- National Science Foundation Graduate Research Fellowship. 2022-2026.
- US Department of Defense Science, Mathematics, and Research for Transformation (SMART) scholarship. Awarded, not accepted. 2021.
- Brigham Young University College of Physical and Mathematical Sciences Dean's List. 2018-2021.
- James & Sally Ellison Geology Scholarhip. 2020-2021.
- Alan Hansen Geological Sciences Scholarhip. 2019-2020.

Service and Outreach

- **Reviewer**: Journal of Geophysical Research: Machine Learning and Computation
- **Earth Science Teacher & Translator**: Translated Earth Science curriculum to Spanish-speaking students with Brown University DEEPS CORES.

Professional Experience

PhD Researcher, NSF GRFP Fellow, Brown University – Providence, RI   Sep 2021 - Present
- Designed deep learning emulators for Antarctic and Greenland ice sheets, cutting future sea level projection error by over **80%** and reducing inference time by **10x** over widely-used IPCC models
- Created a Python package, **ise**, for end-to-end data processing, modeling, and evaluation of ML emulators
- Developed novel ML-specific uncertainty quantification approach to quantify epistemic vs aleatoric uncertainty
- Published **3 first-author papers (to date)** in JAMES, TMLR, and GMD and **coauthored 2 papers** published in Nature and Crysophere, as well as oral and poster presentations at **5 conferences** in the US and Europe

Research Scientist III (Contract), Meta – Remote   Aug 2020 – May 2025
- Built and deployed full-stack AWS infrastructure powering a geospatial ML app for fiber network planning
- Developed and deployed image recognition models and AI-based GIS plugins for automated soil classification, reporting, and horizontal drill permitting used by over **150** teams at Meta and Vermeer
- Created data visualization tools and ML pipelines that improved subsurface planning workflows; trained engineers at Meta, Vermeer, and Zayo on deployment and modeling best practices

Research Data Scientist Intern, NASA – Mountain View, CA   Summer 2024
- Conceived and independently developed a RL framework, **aiatc**, in PyTorch for AI-based air traffic control, including collision avoidance, dynamic weather rerouting, and sector-aware path planning
- Achieved a **6%** reduction in time-to-destination during weather disruptions and generated valid routing solutions in over **99.7%** of simulated test cases
- Delivered oral presentation at NASA-wide conference and received "Outstanding Intern Presentation" award

Technical Skills

Programming: Python, Bash, MATLAB, R, Julia, SQL, C++

ML/AI: PyTorch, TensorFlow, Uncertainty Quantification, Spatial/Temporal Modeling, LLMs, interpretability

Data & Tools: AWS (SageMaker, Lambda, API Gateway, DynamoDB, etc.), HPC, Docker, PostgreSQL, Git, Github

Geospatial & Climate: QGIS, ArcGIS, NetCDF, xarray, Dask, ESGF, Zarr, ESMF, CDO