

J. Jake Nichol, M.B.A.

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 jjakenichol

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Employment History

- 2019 –  **R&D Graduate Intern**, Sandia National Laboratories.
- 2018 – 2019  **Graduate Research Assistant**, Tapia Lab, Department of Computer Science, School of Engineering, University of New Mexico.
- 2017 – 2019  **Owner**, Swarming Technologies LLC.
- 2015 – 2017  **Robot Engineer/Designer**, NASA Swarmathon & Moses Biological Computation Lab, Department of Computer Science, School of Engineering, University of New Mexico.
- 2014 – 2014  **Software Engineering Intern**, Intel Corporation.

Education

- 2018 – 2024  **Ph.D. Computer Science, University of New Mexico**, Moses Biological Computation Lab.
Thesis title: *Structure Identification of Complex Spatiotemporal Systems via Machine Learning and Causal Learning in Climate Science*.
- 2015 – 2017  **M.B.A., University of New Mexico**, Anderson School of Management.
- 2011 – 2016  **B.S. Computer Science, University of New Mexico**, School of Engineering.

Research Publications

In Preparation

- 1 **J. J. Nichol**, M. Weylandt, G. M. Fricke, E. M. Moses, and P. L. Swiler, “Causal Space-Time Stencil Learning: Local Causal Dynamics in Complex Systems.”
- 2 **J. J. Nichol**, M. Weylandt, G. M. Fricke, E. M. Moses, and P. L. Swiler, “On the Identification of Local Causal Space-Time Structures in the Atmosphere.”

Journal and Conference Articles

- 1 **J. J. Nichol**, M. Peterson, G. M. Fricke, and K. Peterson, “Learning Why: Data-Driven Causal Evaluations of Climate Models.,” *ICML 2021 Workshop Tackling Climate Change with Machine Learning*, 2021.  DOI: 10.2172/1884401.
- 2 **J. J. Nichol**, M. G. Peterson, K. J. Peterson, G. M. Fricke, and M. E. Moses, “Machine learning feature analysis illuminates disparity between E3SM climate models and observed climate change,” *Journal of Computational and Applied Mathematics*, vol. 395, p. 113 451, Oct. 2021, ISSN: 0377-0427.  DOI: 10.1016/j.cam.2021.113451.

Technical Reports

- 1 **J. J. Nichol**, M. Weylandt, M. Smith, and L. Swiler, “Benchmarking the PCMCI Causal Discovery Algorithm for Spatiotemporal Systems,” Tech. Rep., 2023.  URL: <https://www.osti.gov/biblio/1991387>.
- 2 **J. J. Nichol**, M. Peterson, and K. Peterson, “Causal Evaluations for Identifying Differences between Observations and Earth System Models,” Tech. Rep., 2021.  DOI: 10.2172/1820528.

- 3 K. J. Peterson, A. J. Powell, I. K. Tezaur, E. L. Roesler, **J. Nichol**, M. G. Peterson, W. L. Davis, J. D. Jakeman, D. J. Stracuzzi, and D. L. Bull, "Arctic tipping points triggering global change (lrd final report)," Tech. Rep., Sep. 2020.  DOI: 10.2172/1669210.

Other Works

- 1 S. M. Ackerman, G. M. Fricke, J. P. Hecker, K. M. Hamed, S. R. Fowler, A. D. Griego, J. C. Jones, **J. J. Nichol**, K. W. Leucht, and M. E. Moses, *The Swarmathon: An Autonomous Swarm Robotics Competition*, 2018.  DOI: 10.48550/arxiv.1805.08320. eprint: 1805.08320.

Miscellaneous Experience

Public Speaking Engagements

- 2022 ━ European Seminar on Computing (ESCO). *Global Multivariate Causal Discovery for the Analysis of Emergent Properties in Earth System Models*. Pilsen, CZ.
- 2021 ━ Chesapeake Large-Scale Analytics Conference (CLSAC). *Causal Discovery for Climate Science and the Energy Exascale Earth System Model*. Virtual.
- 2020 ━ European Seminar on Computing (ESCO). *Machine Learning to Compare Arctic Simulations with Observed Data*. Pilsen, CZ.

Poster Presentations

- 2024 ━ "Recovering the Spatial Evolution of Volcanic Aerosols." **Nichol, J. J.** (2024, May 7). Sandia National Laboratories and Los Alamos National Laboratories Annual Climate Summit. Los Alamos, NM, United States.
- ━ "Recovering the Spatial Evolution of Volcanic Aerosols." **Nichol, J. J.** (2024, April 22). Sandia National Laboratories Analytics for Climate and Earth Sciences (ACES) Symposium. Albuquerque, NM, United States.
- 2021 ━ "Learning Why: Data-Driven Causal Evaluations of Climate Models." **Nichol, J. J.**, Peterson, M. G., Fricke, G. M., & Peterson, K. J. (2021, July 18-24). International Conference on Machine Learning (ICML). Virtual.
- 2020 ━ "Comparing Simulated and Observed Data with Random Forest Feature Importance." **Nichol, J. J.**, Peterson, M., Peterson, K., & Stracuzzi, D. (2020, February 25-27). Conference on Data Analysis (CoDA). Santa Fe, NM, United States.
- 2019 ━ "Feature Comparison of Arctic Observations and Climate Models." **Nichol, J. J.**, Peterson, M., Peterson, K., Stracuzzi, D., Fricke, M., & Moses, M. (2019, December 9-13). American Geophysical Union (AGU) Fall Meeting. San Francisco, CA, United States.

Honors and Awards

- 2020 ━ **Best Talk Prize**, European Seminar on Computing (ESCO)
- ━ **3rd Place Poster Prize**, Department of Energy Conference on Data Analysis (CoDA)
- 2011 ━ **Eagle Scout**, Boy Scouts of America

Professional Service

Reviewer for ACM SIGKDD International Conference on Knowledge Discovery and Data Mining.

Software Packages

Published

clif: CLImate Fingerprinting. *A library that calculates empirical orthogonal functions for mainly climate data.* Developed with Kenny Chowdhary. Available on  <https://github.com/sandialabs/clif>

Under Development

CaStLe: Causal Space-Time Stencil Learning. *Local causal space-time structures from observational data.* To be available soon.

Research Interests and Related Skills

Causal Inference	Algorithmic causal inference, i.e., causal structure learning, causal discovery, or causal network learning; causal inference techniques for advancing scientific machine learning.
Machine Learning	Scientific ML; domain/physics-informed ML; ML feature importance, such as random forests Gini importance, permutation importance, drop-column importance, SHAP.
Artificial Intelligence	AI for Earth systems science; trusted AI, explainable AI, and fairness and ethics in AI.
Programming	Python and data science libraries such as NumPy, SciPy, Pandas, Xarray, DASK, and Tigramite.
Misc. Tech. Skills	L <small>A</small> T <small>E</small> X, high performance computing frameworks Slurm and PBS, GNU Parallel, and MATLAB. Minor experience with Docker and Ansible.

References

Available on Request