Trevor Harris

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Professional Experience

- **Assistant Professor**, Department of Statistics 2021 – Present
  Texas A&M University, College Station, TX
  - Developed a Neural Network Gaussian Process model to integrate climate model output, achieving substantial accuracy and image fidelity gains over model averaging approaches.
  - Implemented a Graph Neural Network model (GraphSAGE) for West Nile virus forecasting, improving short-term forecasting accuracy with spatially indexed data.
  - Demonstrated how idea and opportunity diffusion are still reliant on physical proximity using regression discontinuity and Bayesian structural time series modeling.
  - Designed and taught courses in machine learning, data science, Bayesian statistics, and computational statistics. Supervising four PhD students and two masters students.
  - Secured research funding for multiple projects: Causal impact of extreme weather on vector borne disease ($10k), Uncertainty quantification in deep learning ($15k), Crop classification and yield forecasting from UAVs ($10k), and Climate model emulation ($100k).

- **Graduate Intern**, Mission Algorithms R&S Summer 2018, 2019–2020
  Sandia National Laboratories, Albuquerque, NM
  - Developed a fast algorithm for detecting multiple change points in functional time series data. Successfully applied this method to monitor 234k atmospheric moisture profiles.
  - Derived a robust statistical method for quantifying shape irregularity and detecting anomalously shaped trajectories on smooth manifolds.
  - Used a spatial Kriging model to characterize anomalously textured particles in microscopic imagery.

- **Product Modeling Analyst**, Underwriting Research 2014 – 2016
  GEICO, Washington D.C.
  - Modeled customer risk with Poisson regression to inform actuarial pricing models.
  - Developed and maintained internal tools for updating production models automatically.

Education

- **PhD Statistics**, University of Illinois at Urbana-Champaign 2016 – 2021
  Dissertation: *Functional Data Methods for Climatological Processes*
- **MS Statistics**, University of Illinois at Urbana-Champaign 2016 – 2018
- **BS Mathematics**, University of Florida 2010 – 2014

Technical skills

- **Programming:** Python, JAX, PyTorch, Scikit-Learn, NumPy, R, Stan, SQL, Git.
- **Statistical methods:** Linear and Logistic Regression, Ridge and Lasso Regression, Random Forests, Gaussian Processes, Hypothesis Testing, Nonparametric Testing, Principal Component Analysis (PCA), Functional Data Analysis, Conformal Inference, Bayesian Analysis.
- **Machine Learning:** Multilayer Perceptrons (MLP), Convolutional Neural Networks (CNN), Graph Neural Networks (GNN), Autoencoders and Variational Autoencoders (VAEs).

Selected Publications

- **Harris, T.**, Li, B., Ryan Sriver (2023) *Multi-model Ensemble Analysis with Neural Network Gaussian Processes*. Annals of Applied Statistics. arXiv.
- Carmody, D., Mazzarello, M., Santi, P., **Harris, T.**, Lehmann, S., Abbiasov, T., Dunbar, R., Ratti, C. (2022) *The effect of co-location on human communication networks*. Nature Computational Science. arXiv.
- **Harris, T.**, Li, B., Tucker, J. D. (2022) *Scalable Multiple Change Point Detection for Functional Data Sequences*. Environmetrics. arXiv.
- **Harris, T.**, Li, B., Steiger, N., Smerdon, J., Tucker, J. D., Narisetty, N. (2021). *Evaluating Proxy Influence in Assimilated Paleoclimate Reconstructions – Testing the Exchangeability of Two Ensembles of Spatial Processes*. Journal of the American Statistical Association. Article.
- **Harris, T.**, Tucker, J. D., Li, B., Shand, L. (2021). *Elastic Depths for Detecting Shape Anomalies in Functional Data*. Technometrics. Article.

Additional publications in Journal of Agricultural, Biological, and Environmental sciences, GeoHealth, and Acta Tropica.

Selected Talks

- *Multi-model Ensemble Analysis with Neural Network Gaussian Processes*, ICDS, Santiago, Chile, Nov 2023 (Keynote).
- *Distributionally Robust Multi-model Ensemble Analysis*, JSM, Toronto, Canada, Aug 2023.
- *Sliced Elastic Distance for Climate Model Validation*, ICSA, Gainesville, June 2022.
- *Variational Target Encoding for Climate Model Integration*, CISL Climate Informatics, Oxford, Sept 2020 (Spotlight).
- *Evaluating Proxy Influence in Assimilated Paleoclimate Reconstructions*, AGU Fall Meeting, San Francisco, Dec 2019.

Other conference presentations at ICSA, IISA, JSM, SIAM GS23, EccoStat, ENAR, AGU fall meeting, and ISBA.

Selected Awards and Honors

- Horace W. Norton Prize for outstanding thesis research in Statistics. 2021
- Selected as one of nine students to represent the University of Illinois in the national competition for the Schmidt Science Fellows Program. 2020
- UIUC Statistics Department's Leadership and Service award. 2019

Professional Activities

- **Member:** Design & Analytics Lab for Urban Artificial Intelligence (DAL) and the National Labs/Arts & Sciences Working Group.
- **Judge:** TAMU Datathon 2021, TAMU Student Research Week 2022.
- **Reviewer:** Journal of the American Statistical Association, Journal of Multivariate Analysis, Technometrics, Environmetrics, Biometrics, Climate Informatics, Statistical Methods & Applications, Stat, Journal of Climate, Climate of the Past, Journal of Machine Learning Research, Annals of Applied Statistics, Annals of Statistics.