Trevor Harris, PhD

Contact

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Scientific machine learning for Climatology, Epidemiology, and their intersection. My ongoing work is developing methods for integrating and comparing climate model output, developing multi-scale learning algorithms for climate forecasting, using graph neural networks for spatiotemporal analysis, and developing causal inference and granger causal inference tools with deep neural networks. Past work includes functional data analysis methods for anomaly detection, changepoint detection, and spatiotemporal sequence comparisons.

Education

PhD Statistics 2016 – 2021
University of Illinois at Urbana-Champaign, Champaign, IL
Advisor: Dr. Bo Li
Thesis: *Functional Data Methods for Climatological Processes*

MS Statistics 2016 – 2018
University of Illinois at Urbana-Champaign, Champaign, IL

BS Mathematics 2010 – 2014
University of Florida, Gainesville, FL
Advisors: Dr. Murali Rao and Dr. Farid AitSahlia
Thesis: *Estimating an optimal stopping time policy for American options*

Experience

Assistant Professor, Department of Statistics 2024 – Present
University of Connecticut, Storrs, CT

Assistant Professor, Department of Statistics 2021 – 2024
Texas A&M University, College Station, TX

Research Assistant, Department of Statistics 2017 – 2021
University of Illinois, Champaign, IL
Advisor: Dr. Bo Li

Graduate Intern, Mission Algorithms R&S Summer 2018, 2019–2020
Sandia National Laboratories, Albuquerque, NM
Advisor: Dr. J. Derek Tucker

Product Modeling Analyst, Underwriting Research 2014 – 2016
GEICO, Washington D.C.

Teaching Experience

Instructor, Department of Statistics 2021 – Present
Texas A&M University, College Station, TX

–STAT 211: Principles of Statistics I
–STAT 438: Bayesian Statistics
–STAT 335: Principles of Data Science
–STAT 421: Machine Learning
–STAT 600: Reproducible computational statistics

Teaching Assistant, Department of Accounting 2017
University of Illinois, Champaign, IL

–ACCY 570: Data Analytics Foundations for Accountancy
–ACCY 571: Statistical Analyses for Accountancy

Teaching Assistant, Department of Statistics 2016 – 2017
University of Illinois, Champaign, IL

–STAT 400: Statistics and Probability I

Awards and Honors

1. Top 10 most-cited papers in Environmetrics (2022-2023) 2024
2. Best paper award for The Journal of Agricultural, Biological, and Environmental Statistics (JABES) 2024
3. Horace W. Norton Prize for outstanding thesis research in Statistics 2021
4. Selected as one of nine students to represent the University of Illinois in the national competition for the Schmidt Science Fellows Program 2020
5. Selected to attend the NextProf Science Workshop (canceled due to Coronavirus) 2020
6. Honorable mention in the ICSA Midwest student poster competition 2019
7. UIUC Statistics Department's Leadership and Service award 2019
8. Awarded travel funding for the 2019 STATMOS Spatial Statistics Workshop 2019
9. UIUC List of Teachers Ranked as Excellent by Their Students 2016
10. Graduated *magna cum laude* at University of Florida 2014

Publications

1. **Harris, T.**, Sriver, R. (2024). *Quantifying uncertainty in climate projections with conformal ensembles.* Annals of Applied Statistics, *In review.*

2. Garrett, R., **Harris, T.**, & Li, B. (2024). *Validating Climate Models with Spherical Convolutional Wasserstein Distance.* Advances in Neural Information Processing Systems 37 (**spotlight**).

3. **Harris, T.**, Li, B., & Sriver, R. (2023). *Multimodel ensemble analysis with neural network Gaussian processes.* Annals of Applied Statistics, 17(4), 3403-3425.

4. Fimbres-Macias, J., **Harris, T. A.**, Hamer, S., & Hamer, G. (2023). *Phenology and environmental predictors of Triatoma sanguisuga dispersal in east-central Texas*, United States. Acta Tropica, 240, 106862.

5. Wang, M., **Harris, T.**, & Li, B. (2023). *Asynchronous Changepoint Estimation for Spatially Correlated Functional Time Series.* Journal of Agricultural, Biological and Environmental Statistics, 28(1), 157-176.

6. Tonks, A., **Harris, T.**, Li, B., Brown, W., & Smith, R. (2022). *Forecasting West Nile Virus with Graph Neural Networks: Harnessing Spatial Dependence in Irregularly Sampled Geospatial Data.* arXiv preprint arXiv:2212.11367. In revision. GeoHealth

7. Ringer, R. J., Yoon, H., Kadeethum, T., & **Harris, T.**. (2022). *Machine learning applications for estimation of greenhouse gas emissions using multiple satellite images* (No. SAND2022-16609C). Sandia National Lab.(SNL-NM), Albuquerque, NM (United States).

8. 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, 2(8), 494-503.

9. **Harris, T.**, Li, B., & Tucker, J. D. (2022). *Scalable multiple changepoint detection for functional data sequences.* Environmetrics, 33(2), e2710.

10. **Harris, T.**, Li, B., Steiger, N. J., Smerdon, J. E., Narisetty, N., & Tucker, J. D. (2021). *Evaluating proxy influence in assimilated paleoclimate reconstructions—Testing the exchangeability of two ensembles of spatial processes.* Journal of the American Statistical Association, 116(535), 1100-1113.

11. **Harris, T.**., Tucker, J. D., Li, B., & Shand, L. (2021). *Elastic depths for detecting shape anomalies in functional data.* Technometrics, 63(4), 466-476.

12. **Harris, T.**, & Li, B. (2014). *Kriging.* Wiley StatsRef: Statistics Reference Online, 1-11.

Funding

1. Sandia, Uncertainty Quantification with Conformal Inference. Amount: $234,000, 10/01/2024 - 09/30/2027 Role: PI.

2. Sandia, Assessing Climate Intervention Outcomes via Bayesian Transport Maps. Amount: $300,000, 04/19/2022 - 09/19/2024 Role: PI.

3. Burroughs Wellcome Trust Fund, Modeling West Nile virus under extreme climate. Amount: $10,000, 03/01/2023 - 02/29/2024. Role: PI.

4. Texas A&M Seed Grant Program for Promoting Research Collaborations, Machine-Learning Phenotyping for Unmanned Aircraft System-based Dryland and Irrigated Corn Classification and Yield Estimation. Amount: $10,000, 05/01/2022 - 09/01/2023. Role: Co-PI, PI: Anthony Filippi

5. Sandia, Probabilistic Machine Learning Methods For Uncertainty Quantification. Amount: $15,000, 05/19/2022 - 09/30/2022. Role: Collaborator, PI: Hongkyu Yoon

Invited Talks

1. *Quantifying uncertainty in climate projections with conformal ensembles*, IMSI, Chicago IL, Mar 2025

2. *GraphMAGE: Graph Neural Networks for West Nile virus forecasting*, TIES 2024, Adelaide, Australia, Oct 2024

3. *Quantifying uncertainty in climate projections with conformal ensembles*, South Dakota State University, Brookings, SD, Oct 2024

4. *A statistical learning approach to multi-model ensemble analysis*, ENVR Workshop, Boulder, CO, Oct 2024

5. *Quantifying uncertainty in climate projections with conformal ensembles*, Climate Extremes Roundtable, Boulder, CO, Oct 2024

6. *Quantifying uncertainty in climate projections with conformal ensembles*, JSM, Portland, OR, Aug 2024

7. *Distributionally robust multi-model ensemble analysis with deep kernel learning*, Brigham Young University, Provo, UT, Feb 2024

8. *Distributionally robust multi-model ensemble analysis with deep kernel learning*, Hunter College, NY, NY, Nov 2023

9. *Multi-model Ensemble Analysis with Neural Network Gaussian Processes*, ICDS, Santiago, Chile, Nov 2023 (**Keynote**)

10. *Distributionally robust Multi-model Ensemble Analysis*, JSM, Toronto, Canada, Aug 2023

11. *Multi-model Ensemble Analysis with Neural Network Gaussian Processes*, EccoStat, Kyoto, Japan, July 2023

12. *Multi-model Ensemble Analysis with Neural Network Gaussian Processes*, SIAM GS23, Bergen, Norway June 2023

13. *Multi-model Ensemble Analysis with Neural Network Gaussian Processes*, ICSA, Ann Arbor, MI June 2023

14. *Multi-model Ensemble Analysis with Neural Network Gaussian Processes*, IISA, Golden, CO May 2023

15. *Multi-model Ensemble Analysis with Neural Network Gaussian Processes*, Notre Dame, South Bend, ID, Apr 2023

16. *Multi-model Ensemble Analysis with Neural Network Gaussian Processes*, IMSI, Chicago IL, Sept 2022

17. *Multi-model Ensemble Analysis with Neural Network Gaussian Processes*, JSM, Washington DC, Aug 2022

18. *Multi-model Ensemble Analysis with Neural Network Gaussian Processes*, NRC, Fairfax, Aug 2022

19. *Multi-model Ensemble Analysis with Neural Network Gaussian Processes*, ISBA, Montreal, June 2022

20. *Sliced Elastic Distance for Climate Model Validation*, ICSA, Gainesville, June 2022

21. *Multi-model Ensemble Analysis with Neural Network Gaussian Processes*, ATD, Fairfax, May 2022

22. *Variational target encoding for climate model integration*, JSM, Seattle, July 2021

23. *Elastic depths for identifying shape anomalies in functional data*, ISI WSC Virtual, July 2021

Other Presentations

1. *Variational target encoding for climate model integration*, AGU Fall Meeting, San Francisco, Dec 2020

2. *Variational target encoding for climate model integration*, CISL Climate Informatics, Oxford, Sept 2020 (**Spotlight**)

3. *Fast functional change point detection with total variation denoising*, JSM, Philadelphia, July 2020

4. *Evaluating proxy influence in assimilated paleoclimate reconstructions*, ENAR 2020 Spring Meeting, Nashville, Mar 2020

5. *Evaluating proxy influence in assimilated paleoclimate reconstructions*, AGU Fall Meeting, San Francisco, Dec 2019

6. *Evaluating proxy influence in paleoclimate reconstructions*, ICSA Midwest Chapter Meeting, Chicago, Oct 2019

7. *Elastic depths for identifying shape anomalies in functional data*, 62nd World Statistical Congress, Kuala Lumpur, Aug 2019

8. *Evaluating proxy influence in paleoclimate reconstructions*, JSM, Denver, Aug 2019

9. *Evaluating proxy influence in data assimilation algorithms*, Bohrer Workshop (UIUC), Champaign, Nov 2018

10. *Evaluating proxy influence in data assimilation based climate field*, CISL Climate Informatics (NCAR), Boulder, Sept 2018 (**Spotlight**)

11. *Evaluating proxy Influence and reconstruction skill in data assimilation based climate field reconstructions using extremal depth*, Joint Statistical Meeting, Vancouver, July 2018

12. *Functional change point detection with non-negative matrix factorization*, MARTIAN's Symposium, Sandia National Labs, July 2019

13. *An introduction to non-negative matrix factorization*, Intern Symposium, Sandia National Labs, June 2019

14. *Identifying phase and amplitude extremes in functional data with elastic depth*, Statistics Graduate Student Seminar (UIUC), Champaign, Mar 2019

15. *Testing the exchangeability of two spatiotemporal processes with applications to data assimilation*, Illinois Climate Seminar (UIUC), Champaign, Mar 2019

16. *Identifying phase and amplitude extremes in functional Data with elastic depth*, Sandia/UIUC Tech Talks (UIUC), Champaign, Sept 2018

17. *Elastic depth for amplitude and phase in functional data*, MARTIAN's Symposium, Sandia National Lab, July 2018

18. *Elastic functional principal component regression*, Intern Symposium, Sandia National Lab, July 2018

Professional Activities

Proposal/Technical Report Review

- Refereed papers for 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

Other Activities:

- Member of the Humanistic AI Working Group
- Member of the Design & Analytics Lab for Urban Artificial Intelligence (DAL)
- Chaired session for ICDS 2023
- I-GUIDE Forum program committee 2023, 2024
- Organized a topic contributed session for JSM 2023
- Chaired session for JSM 2022, 2023
- Chaired session for IISA 2023
- Judge for Student Research Week 2022
- Judge for TAMU Datathon 2021

Society Memberships:

- American Statistical Association (2016–Present)
- Institute of Mathematical Statistics (2019–Present)
- American Geophysical Union (2019–Present)
- International Chinese Statistical Association (2019–Present)

Service

University of Connecticut
Departmental level:

- Artificial Intelligence and Machine Learning Cluster 2024 – Present
- Gratis Faculty Appointments committee 2024 – Present
- Graduate Examinations committee 2024 – Present

Texas A&M University
Departmental level:

- Grant Opportunities, Library & Web Site/Social Media committee 2021 – 2024

- Communications and University relations committee 2021 – 2024
- Colloquia and Special Events Chair 2023 – 2024
- PhD Qualifying Exam committee 2023 – 2024
- Supervising research for undergraduate students: Grant Schweikhardt and Nicholas Battin
- Supervising research for masters student: Ethan Greiffenstein and Sophia Lazcano
- PhD dissertation committee: Eric Gao (STAT), Xiaodi Hou (ARCH), Abdisalam Abdi (ENTO), Danial Drennan (STAT), Alexander Coulter (STAT), Samuel Gailliot (STAT), Donald Turner (STAT), Renat Sergazinov (STAT)

University of Illinois at Urbana Champaign
Departmental level:

- Founder and president of the PhD Student Seminar 2018 – 2021
- Founder and president of the Statistics Graduate Student Organization at UIUC 2017 – 2021
- President Statistics in the Community at UIUC 2017 – 2018

Software

1. **fmci:** R package for functional change point detection with the multiple changepoint isolation method Github.
2. **elasticdepth:** R package for computing elastic depths and identifying shape outliers. Github.
3. **kstat:** R package for the Kolmogorov-Depth statistic for testing if two functional distribution are different. Github.
4. **extdepth:** R package for computing the extremal depths for functional data. Github.

Tech

Programming: Python, R