SHANYUN GAO

Department of Statistics, Purdue University, West Lafayette, IN 47907
gao565@purdue.edu ◇ shanyun-gao-l.github.io
Google Scholar ◇ github.com/Shanyun-Gao-L

RESEARCH INTERESTS

Causal discovery in time series; causal in-context learning in transformers; causal change point detection; constraint-based methods and conditional independence testing.

EDUCATION

Ph.D. in Statistics Aug. 2021 – Present
Purdue University, West Lafayette, IN
Co-advisors: Dr. Qifan Song (Purdue University) and Dr. Murat Kocaoglu (Johns Hopkins University)
Ph.D. Qualifying Exam: ranked 1st GPA: 3.93/4.00

M.S. in Applied Statistics Aug. 2019 – May 2021
Purdue University, West Lafayette, IN GPA: 4.00/4.00

B.S. in Applied Statistics Sep. 2015 – Jun. 2019
Shanghai University of Finance and Economics, Shanghai, China
School of Statistics and Management

PUBLICATIONS

Conference Papers

[1] **S. Gao**, R. Addanki, T. Yu, R. A. Rossi, Q. Song, M. Kocaoglu. *Stationarity-Aware Causal Discovery in Time Series via Minimal Separating Sets.* In Proceedings of the 29th International Conference on Artificial Intelligence and Statistics (AISTATS), 2026.
[Paper]

[2] **S. Gao**, R. Addanki, T. Yu, R. A. Rossi, M. Kocaoglu. *Causal Discovery-Driven Change Point Detection in Time Series.* In Proceedings of the 28th International Conference on Artificial Intelligence and Statistics (AISTATS), PMLR 258, 2025.
[Paper]

[3] **S. Gao**, R. Addanki, T. Yu, R. A. Rossi, M. Kocaoglu. *Causal Discovery in Semi-Stationary Time Series.* In Advances in Neural Information Processing Systems (NeurIPS), 36: 46624–46657, 2023.
[Paper]

Workshop Papers

[4] **S. Gao**, M. Kocaoglu, Q. Song. *Causal In-Context Learning in Transformers: Training Dynamics Across Heterogeneous Interventional Data.* In AISTATS 2026 Workshop on Causality in the Age of AI Scaling, 2026.

Working Papers

[5] **S. Gao**, M. Kocaoglu, Q. Song. *Transformers Implicitly Perform Local Causal Discovery from Diverse Data.* Manuscript in preparation.

PRESENTATIONS

Causal Discovery in Semi-Stationary Time Series (oral). Causal Inference for Time Series Data Workshop, Conference on Uncertainty in Artificial Intelligence (UAI), Pittsburgh, PA. Aug. 2023

RESEARCH EXPERIENCE

Research Collaboration with Adobe Research Aug. 2022 – Jan. 2026
Collaborators: R. Addanki, T. Yu, R. A. Rossi

- Maintained a three-year collaboration on constraint-based causal discovery for time series, resulting in three first-author papers (NeurIPS'23, AISTATS'25, AISTATS'26).
- Developed PCMCI$_\Omega$ for periodically alternating causal mechanisms, Causal-RuLSIF for causal-mechanism change point detection, and MSSD for stationarity-aware discovery via minimal separating sets.
- Released open-source implementations and evaluated methods on synthetic benchmarks and real-world climate and river-flow data.

Graduate Research Assistant, CausalML Lab, Purdue University Aug. 2022 – Aug. 2023
PI: Dr. Murat Kocaoglu

- Formulated the semi-stationary structural causal model, in which a finite set of causal mechanisms recurs periodically over time.
- Implemented and evaluated PCMCI$_\Omega$, a non-parametric, constraint-based algorithm that is provably sound for discrete-valued time series.

Graduate Research Assistant, College of Health & Human Sciences Aug. 2020 – May 2021
Purdue University

- Contributed to a five-year NIH-funded interdisciplinary project on improved power analysis methods.
- Developed simulation-based power analysis procedures for multilevel models.

TEACHING EXPERIENCE

Department of Statistics, Purdue University Aug. 2023 – Present
Teaching Assistant; Administrative TA; Head TA

- STAT 301 (Elementary Statistical Methods): lead lab sessions on statistical concepts and data analysis.
- Guide students through SPSS implementation and interpretation of results.

OTHER EXPERIENCE

Data Analyst (Volunteer), Local Charity Organization Jan. 2020 – Jul. 2020
West Lafayette, IN

- Analyzed donor behavior with exploratory and statistical methods to identify prospective donors.

HONORS & AWARDS

Bilsland Dissertation Fellowship, Purdue University	2026 – 2027
Qualcomm Innovation Fellowship, proposal abstract accepted	2026
Burr Award	2025 – 2026
WISP Fall Travel Grant	2023 – 2024
Applied Statistics Scholarship	2020 – 2021
McAuliffe Graduate Student Scholar Award	2020 – 2021

PROFESSIONAL SERVICE

Reviewer: NeurIPS, ICML, ICLR, UAI, AAAI, AISTATS, TMLR.

SKILLS

Programming: Python, R **Tools:** LaTeX, MATLAB, SPSS
Methods: causal discovery, causal in-context learning, conditional independence testing, change point detection, time series analysis, simulation-based power analysis