XUAN CAO

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Department of Mathematical Sciences, University of Cincinnati
5306 French Hall West, University of Cincinnati, Cincinnati, OH 45221, USA

EDUCATION

- **University of Florida** *August 2013 - August 2018*

  Ph.D. in Statistics

  Advisor: Dr. Malay Ghosh and Dr. Kshitij Khare

- **Nanjing University** *August 2009 - May 2013*

  B.S. in Statistics

PROFESSIONAL EXPERIENCE

- **University of Cincinnati** *August 2023 - present*

  Associate Professor Department of Mathematical Sciences

- **University of Cincinnati** *August 2018 - August 2023*

  Assistant Professor, Department of Mathematical Sciences

RESEARCH INTERESTS

Bayesian model selection in high-dimensional settings, graphical models, scalable MCMC computation, statistical applications in genetics and neuroscience

PUBLICATIONS

Statistical Theory, Methods and Applications (*graduate student)

- **Cao, X.**, Khare, K., Ghosh, M. (2019). Posterior graph selection and estimation consistency for high-dimensional Bayesian DAG models. *Annals of Statistics*. 47(1):319-348.
- **Cao, X.**, Khare, K., Ghosh, M. (2020). High-dimensional posterior consistency for hierarchical nonlocal priors in regression. *Bayesian Analysis*, 15(1):241-262.
- **Cao, X.**, Zhang, S. (2020). A permutation-based Bayesian approach for inverse covariance estimation. *Communication in Statistics – Theory and Method*, 49(14):3557-3571.
- **Cao, X.**, Ding, L., Mersha, T. (2020). Joint variable selection and network modeling for detecting eQTLs. *Statistical Applications in Genetics and Molecular Biology*, 19(1).
- **Cao, X.**, Khare, K., Ghosh, M. (2020). Consistent Bayesian sparsity selection for high-dimensional Gaussian DAG models with multiplicative and beta-mixture priors. *Journal of Multivariate Analysis*, 179:104628.
- **Cao, X.**, Lee, K. (2020). Variable selection using nonlocal priors in high-dimensional generalized linear models with application to fMRI data analysis. *Entropy*, 22(8), 807.
- **Cao, X.**, Lee, K. (2021). Joint Bayesian variable and DAG selection consistency for high-dimensional regression models with network-structured covariates. *Statistica Sinica*, 31:1509-1530.

- **Cao, X.**, Lee, K., Huang, Q. (2021). Bayesian variable selection in logistic regression with application to whole-brain functional connectivity analysis for Parkinson's Disease. *Statistical Methods in Medical Research*, 30(3):826-842.
- **Cao, X.**, Yang, F*. (2021). On the non-local priors for sparsity selection in high-dimensional Gaussian DAG models. *Statistical Theory and Related Fields*, 5(4):332-345.
- Lee, K., **Cao, X.** (2021). Bayesian group selection in logistic regression with application to MRI data analysis. *Biometrics*, 77 (2):391-400. (Featured article on the cover page)
- Lee, K., **Cao, X.** (2021). Bayesian inference for high-dimensional decomposable graphs. *Electronic Journal of Statistics*, 15(1):1549-1582.
- Li, Y., Ge, L., Zhou, Y., **Cao, X.**, Zheng, J. (2021). Toward the impact of non-pharmaceutical interventions and vaccination on the COVID-19 pandemic with time-dependent SEIR model. *Frontiers in Artificial Intelligence*, 4:26.
- **Cao, X.**, Yang, F.*, Zheng, J., Wang X., Huang, Q. (2022). Aberrant structure MRI in Parkinson's disease and comorbidity with depression based on multinomial tensor regression analysis. *Journal of Personalized Medicine*, 12(1):89.
- **Cao, X.**, Ding, L., Mersha, T. (2022). Development and validation of an RNA-seq-based transcriptomic risk score for asthma. *Scientific Reports*, 12(1):1-12.
- Lee, K., **Cao, X.** (2022). Bayesian joint inference for multiple directed acyclic graphs. *Journal of Multivariate Analysis*, 191:105003.
- Yang, C., Mai, J., **Cao, X.**, Burberry, A., Cominelli, F., Zhang, L. (2023). ggpicrust2: an R Package for PICRUSt2 predicted functional profile analysis and visualization. *Bioinformatics*, 39(8).
- **Cao, X.**, Lee, K. (2024) Bayesian inference on hierarchical nonlocal priors in generalized linear models. *Bayesian Analysis*,19(1):99-122.
- **Cao, X.**, Lee, K. (2024) Consistent and scalable Bayesian joint variable and graph selection for disease diagnosis leveraging functional brain network. *Bayesian Analysis*, 19(3):895–923.
- **Cao, X.**, Zhang, L., Lee, K. (2024). Development of network-guided transcriptomic risk score for disease prediction. *Stat*, 13(1):e648.
- Yang, F.*, Zhang, L., Zheng, J., **Cao, X.** (2024) Consistent group selection using nonlocal priors in regression. *Statistical Papers*, 65(2):989-1019.
- Ouyang, J.*, **Cao, X.** (2024). Consistent skinny Gibbs in probit regression. *Computational Statistics and Data Analysis*, 198:107993.
- Fagbohungbe, T.*, Zhang, L., **Cao, X.** (2025). Sparse inverse covariance selection with mass-nonlocal priors. *Statistics & Probability Letters*, 219:110348.
- Lee, K., Chang, W., **Cao, X.** (2025). The joint local dependence Cholesky prior for bandwidth selection across multiple groups. *Bayesian Analysis*, 20(4), 1539–1558.
- Odoom, E.*, Ouyang, J.*, **Cao, X.**, Wang, X. (2026). Hierarchical skinny Gibbs sampler in logistic regression using Pólya–Gamma latent variables. *Statistics and Its Interface*, 19(2), 179–196.
- **Cao, X.**, Lee, K. (2026+) Scalable Bayesian inference on high-dimensional multivariate linear regression. *Bayesian Analysis*, to appear.

Applications in Interdisciplinary Research

- Huang, Q., Zhang, R., Hu, X., Ding, S., **Cao, X.**, Tao, L., Qian, Z., Liu, H. (2014). Disturbed small-world networks and neurocognitive function in frontal lobe low-grade glioma patients. *PLoS ONE* 9(4): e94095.

- Huang, Q., **Cao, X.**, Chai, X., Wang, X., Xiao, C. (2019). In reply to the letter to the editor regarding "the radiological imaging features of easily misdiagnosed epithelioid glioblastoma in seven patients". *World Neurosurgery*, 30 Apr 2019, 125:546.

- Huang, Q., **Cao, X.**, Chai, X., Wang, X., Xiao, C. (2019). The radiological imaging features of easily misdiagnosed epithelioid glioblastoma in seven patients. *World Neurosurgery*, Volume 124, April 2019, Pages e527-e532.

- Huang, Q., **Cao, X.**, Chai, X., Wang, X., Xu, L., Xiao, C. (2019). 3 dimensional pseudocontinuous arterial spin labeling and susceptibility-weighted magnetic resonance imaging associated with clinical progression in mild cognitive impairment and Alzheimer's disease. *Medicine*, 2019 Jun; 98(23): e15972.

- Huang, Q., Chai, X., Xiao, C., **Cao, X.** (2019). A case report of oral contraceptive misuse induced cerebral venous sinus thrombosis and dural arteriovenous fistula. *Medicine*, 2019 Aug; 98(33): e16440.

- **Cao, X.**, Wang, X., Xue, C., Zhang, S., Huang, Q., Liu, W. (2020). A radiomics approach to predicting Parkinson's disease by incorporating whole-brain functional activity and grey matter structure. *Frontiers in Neuroscience*, 14:751.

- Zhang, X., Xue, C., **Cao, X.**, Yuan, Q., Qi, W., Xu, W., Zhang, S., Huang, Q. (2021). Altered patterns of amplitude of low-frequency fluctuations and fractional amplitude of low-frequency fluctuations between amnestic and vascular mild cognitive impairment: an ALE-based comparative meta-analysis. *Frontiers in Aging Neuroscience*, 13:539.

- Zhang, X, **Cao, X.**, Xue, C., Zheng, J., Zhang, S., Huang, Q., Liu, W. (2021). Aberrant functional connectivity and activity in Parkinson's disease and comorbidity with depression based on radiomic analysis. *Brain and Behavior*, 11(5):e02103.

- Zhang, X., Wang, Z., **Cao, X.**, Ruan, Y., Zhang, S., Huang, Q., Xue, C. (2023). Aberrant spontaneous static and dynamic amplitude of low-frequency fluctuations in cerebral small vessel disease with or without mild cognitive impairment. *Brain and Behavior*, 13(12):e3279.

- Zheng, D., Ruan, Y., **Cao, X.**, Guo, W., Zhang, X., Qi, W., Yuan, Q., Liang, X., Zhang, D., Huang, Q., Xue, C., Alzheimer's Disease Neuroimaging Initiative (2024). Directed functional connectivity changes of triple networks for stable and progressive mild cognitive impairment. *Neuroscience*, 545(3):47-58.

- Ruan, Y., Zheng, D., Guo, W., **Cao, X.**, Qi, W., Yuan, Q., Zhang, X., Liang, X., Zhang, D., Xue, C., Xiao, C. (2024). Shared and specific changes of cortico-striatal functional connectivity in stable mild cognitive impairment. *Journal of Alzheimer's Disease*, 98(4):1301-1317.

- Leite, J. O., Yang, S. H., Jain, A., Giglia, J. S., Ouyang, J., **Cao, X.** (2026+). Impact of internal iliac interventions on mortality and intestinal ischemia in ruptured abdominal aortic aneurysm endovascular repair. *Vascular*, to appear.

RESEARCH SUPPORT

- Collaboration Grants for Mathematicians, Simons Foundation, PI, $42,000 (2019 - 2024)
  Title: New approaches for covariance estimation and model selection in high dimensions

- Universal Provider Award for Statistical Consulting Center, Provost's office, Co-PI, $119, 054 (2024-2026)

- Internal Grant from Department of Radiology, University of Cincinnati, PI, $10,000 (2021)
  Title: Radiology informatics data analytics – computing the appropriateness of medical imaging
- Taft Summer Research Fellowship, Charles Phelps Taft Research Center, PI, $8000 (2020, 2022, 2024)

PRESENTATIONS

Invited Talks

- Eastern Asia Chapter Meeting of ISBA, The Education University of Hong Kong, June 2024
- Theory and Foundations of Statistics in the Era of Big Data, Florida State University, April 2024
- Department of Statistics, University of Akron, April 2024
- Department of Biostatistics and Bioinformatics, University of Cincinnati, April 2023
- Department of Biostatistics, University at Buffalo, April 2023
- Joint Statistical Meetings e-Poster Session, Washington, DC, 2022
- ICSA Applied Statistics Symposium, University of Florida, June 2022
- International Conference on Computational and Methodological Statistics, December 2021
- Eastern Asia Chapter Meeting of ISBA, November 2021
- Department of Mathematics and Statistics, Auburn University, November 2021
- Department of Statistics, University of South Carolina, November 2020
- International Conference for ICSA, Hangzhou, China, December 2019
- Eastern Asia Chapter Meeting of ISBA, Kobe University, July 2019
- Department of Biostatistics and Bioinformatics, University of Louisville, January 2019
- Division of Biostatistics and Epidemiology, Cincinnati Children's Hospital, November 2018
- Department of Mathematics, Nanjing University, May 2018

Contributed Talks

- Joint Statistical Meetings, Toronto, Canada, August 2023
- Symposium on Data Science and Statistics, June 2021
- Joint Statistical Meetings, August 2020
- 21st Meeting of New Researchers in Statistics and Probability, Colorado State University, 2019
- ENAR Spring Meeting, Philadelphia, PA, March 2019
- ENAR Spring Meeting, Atlanta, GA, March 2018

TEACHING EXPERIENCE

- STAT 2037: Probability & Statistics I, Fall 2018, Fall 2019, Spring 2020, Fall 2020, Spring 2021, Spring 2022, Spring 2023
  STAT 3038: Probability & Statistics II, Spring 2024, Spring 2026
  STAT 3041: Data Science and Statistics, Fall 2025, Spring 2026

STAT 4121: Mathematical Statistics I, Fall 2022, Fall 2023, Fall 2024
STAT 5121: Mathematical Statistics I, Fall 2018, Fall 2019, Fall 2020
STAT 5122/6022: Mathematical Statistics II, Spring 2021, Spring 2022, Spring 2023
STAT 7031: Statistics Theory, Fall 2025
STAT 8022: Advanced Bayesian Analysis, Fall 2022, Fall 2023, Fall 2024
STAT 8024: Advanced Statistical Modeling, Spring 2020
University of Cincinnati

- STA 3024: Introduction to Statistics II, Summer 2016
  STA 2023: Introduction to Statistics I, Fall 2014 – Spring 2016
  University of Florida

STUDENT MENTORING

Ph.D. Dissertation Committee Chairmanship

- Dr. Fang Yang (2022) First Position: Biostatistician at Medpace
  Dissertation: Nonlocal priors in generalized linear models and Gaussian graphical models
- Jiarong Ouyang, in progress
  Dissertation: Scalable and consistent MCMC in high dimensions
- Taiwo Fagbohungbe, in progress
  Dissertation: Bayesian inference on single and multiple graphical models
- Jacob Akubire, in progress
  Dissertation: Integrative covariance estimation for discrete autoregressive switching processes

Ph.D. Dissertation Committee Membership

- Dr. Weiji Su (2020) First Position: Research Scientist-Statistician at Eli Lilly and Company
  Dissertation: Flexible joint hierarchical Gaussian process model for longitudinal and recurrent event data
- Dr. Anushka Palipana (2022) First Position: Postdoc at Cincinnati Children's Hospital Medical Center
  Dissertation: Univariate and multivariate joint models with flexible covariance structure for dynamic prediction of longitudinal and time-to-event data

M.S. Oral Exam Committee Membership

- Mr. Kyei Afari (2023), Ms. Ianta Dos Santos (2024)

Undergraduate Capstone Project Chairmanship

- Ms. Tracey Mulroney (2022), Ms. Meng Yao (2024), Ms. Ningfei Yang (2024)

HONORS AND AWARDS

- Faculty Development Award, College of Arts and Sciences, University of Cincinnati, 2019-2020
- Domestic Travel Award, Taft Research Center, University of Cincinnati, March 2019
- Travel Award, Office of Research, University of Florida, August 2017
- Bagui Award, Florida Chapter of the ASA Annual Meeting, Jacksonville, February 2017
  – Awarded to the best student papers and presentations
- Temasek Foundation International Leadership Enrichment and Regional Networking (LEaRN) Program Scholarship, National University of Singapore, Exchange Program, 2012

PROFESSIONAL SERVICE

Department and University Committee Service

- Co-Director of the Statistics Consulting Center, 2024-2026
- Qualifying Exams Committee] 2020-2024
- Undergraduate Affairs Committee, 2019-2023
- Undergraduate and Graduate Program Committee within STAT Division, 2022-2023
- Chair for Visiting Assistant Professor Hiring Committee, 2023
- Organizer for the Statistics Seminar, 2021-2024
- Course coordinator for STAT 2037 in Spring 2021
- Grader for the 2022 Math Bowl
- Reviewer for the UC Undergraduate Scholarly Showcase, 2022-2024
- Judge at the 2019 UC Expo Poster Forum

Service to the Academic Community

- Referee for:
  - Annals of Statistics (3)
  - Bernoulli (1)
  - Bayesian Analysis (3)
  - Biometrics (1)
  - Brain Imaging and Behavior (1)
  - Electronic Journal of Statistics (3)
  - Environmetrics (1)
  - Frontiers in Genetics (2)
  - Frontiers in Neuroscience (1)
  - IEEE Transactions on Neural Networks and Learning Systems (1)
  - Journal of Computational and Graphical Statistics (2)
  - Journal of Headache and Pain (1)
  - Journal of Machine Learning Research (1)
  - Journal of Statistical Computation and Simulation (5)
  - Journal of Statistical Planning and Inference (2)
  - Journal of the American Statistical Association (5)
  - Mathematical Biosciences and Engineering (1)
  - Mathematical Population Studies (1)
  - Medicine (8)
  - npj Parkinson's Disease (3)
  - Sankhya A (1)
  - Sankhya B (1)
  - Stat (1)
  - Statistical Papers (5)
  - Statistics and Computing (1)
  - Statistics and Its Interface (2)
  - Statistics and Probability Letters (1)
- Associate Editor for Sankhya A
- Topic Editor for Frontiers in Neurology - Dementia and Neurodegenerative Diseases

- Review Editor for Frontiers in Genetics - Applied Genetic Epidemiology and Statistical Genetics and Methodology
- National Science Foundation panel reviewer, 2023
- Simons Foundation panel reviewer for Collaboration Grants for Mathematicians, 2020
- Judge for American Statistical Association Section on Bayesian Statistical Science Student Paper Competition, 2022, 2023
- Member of the Scientific Committee and Invited Session Organizer, The Conference on Theory and Foundations of Statistics in the Era of Big Data, Florida State University, 2024
- Session Chair: Women in Statistics and Data Science, Cincinnati, 2018; Eastern Asia Chapter Meeting of International Society for Bayesian Analysis, Kobe, Japan, July 2019; Eastern Asia Chapter Meeting of International Society for Bayesian Analysis, Kunming, China, November 2021; Joint Statistical Meetings, Toronto, Canada, August 2023
- Member: American Statistical Association; International Chinese Statistical Association; International Society for Bayesian Analysis