

CURRICULUM VITAE

Jiazhang Cai

310 Herty Drive, Department of Statistics, Athens, GA 30602

Email: jc27544@uga.edu

Phone Number: (737)-781-5686

Education

- Ph.D. in Statistics, University of Georgia, Athens, GA 08/2021 – 08/2026 (Expected)
- M.S. in Data Science, Rutgers University, NJ 09/2019 – 05/2021
- B.S. in Applied Mathematics, Beijing Normal University, Beijing, China 09/2015 – 06/2019

Research Areas

- Statistical Methods for Spatial and Multi-Omics Data
- Interpretable and Uncertainty-Aware Machine Learning
- AI for Scientific Discovery and Bioinformatics

Research Experience

- **Research Assistant** College of Veterinary Medicine 01/2023 – Present
University of Georgia, Athens, GA
- **Research Assistant** Department of Plant Biology 12/2023 – Present
University of Georgia, Athens, GA
- **Intern bioinformatician** 3D Health Solutions 08/2024 – 10/2024
Athens, GA
- **Research Assistant** Georgia Genomics and Bioinformatics Core (GGBC) 08/2022 – 05/2024
University of Georgia, Athens, GA

Publications

- Published
- [1] **Cai, J.**, Cheng, H., Wu, S., Zhong, W., Yuan, G. C., & Ma, P. (2024). WEST is an ensemble method for spatial transcriptomics analysis. *Cell Reports Methods*, 4(11).
 - [2] **Cai, J.**, Wu, S., Cheng, H., Zhong, W., Yuan, G. C., & Ma, P. (2025). Protocol to boost the robustness and accuracy of spatial transcriptomics algorithms using ensemble techniques. *STAR protocols*, 6(1).
 - [3] **Cai, J.**, Mohsin, I., Rogers, W., Zhang, M., Jiang, L., Malmberg, R., & Alabady, M. (2024). The microbiome and metatranscriptome of a panel from the *Sarracenia* mapping population reveal complex assembly and function involving host influence. *Frontiers in Plant Science*, 15, 1445713.

- [4] Wu, S., Cheng, H., **Cai, J.**, Ma, P., Zhong, W. (2023, February). Subsampling in large graphs using Ricci curvature. In *The Eleventh International Conference on Learning Representations*.
- [5] Wang, Z., Fang, L., **Cai, J.**, Ma, P., & Zhong, W. (2024). MultiCOP: An Association Analysis of Microbiome-Metabolome Relationships. *Statistics in Biosciences*, 1-21.
- [6] Ruan, W., Lyu, Y., Zhang, J., **Cai, J.**, Shu, P., Ge, Y., ... & Liu, T. (2026). Large language models for bioinformatics. *Quantitative Biology*, 14(1), e70014.
- [7] Fang, L., Yu, X., **Cai, J.**, Chen, Y., Wu, S., Liu, Z., ... & Ma, P. (2026). Knowledge distillation and dataset distillation of large language models: Emerging trends, challenges, and future directions. *Artificial Intelligence Review*, 59(1), 17.
- [8] Young, T., Walton, R. A., Cheng, P., **Cai, J.**, Mochel, J. P., & Peterson, K. (2025). Incidence of hypernatremia in dogs treated with single dose activated charcoal for acute toxicant ingestion: multi-center retrospective study (2018–2023). *Frontiers in Veterinary Science*, 12, 1547076.
- [9] Yee, M., Guillaumin, J., 't Hoen, M., **Cai, J.**, Mochel, J., & Walton, R. (2024). Utilization of peripheral glucose and lactate differences in the diagnosis of feline arterial thromboembolism: a multi-center study. *Frontiers in Veterinary Science*, 11, 1505479.
- [10] Neufeld, M. R., Hanson, K. R., Mochel, J. P., **Cai, J.**, Raffe, M. R., Handel, A., & Julius, T. (2026). Transmucosal detomidine gel induces emesis in approximately half of cats presenting for dietary indiscretion. *Journal of the American Veterinary Medical Association*, 1(aop), 1-6.
- [11] Wheeler, E., Kraus, B. H., Mochel, J., **Cai, J.**, Ciou, M., Lu, M., & Ward, J. (2025). A preliminary investigation in dogs to evaluate for post-anesthetic lung ultrasound findings suggestive of atelectasis. *Veterinary Anaesthesia and Analgesia*, 52(1), 124-e13.
- [12] Wang, B., **Cai, J.**, Fang, L., Tsujikawa, M., Ma, P., & Leung, Y. F. (2025). Tensor analysis of animal behavior by matricization and feature selection. *Computers in Biology and Medicine*, 197, 110959.
- [13] Nugen, S., Walton, R. A., Smith, R., **Cai, J.**, Mochel, J. P., & Mays, E. L. (2026). Multicenter Retrospective Evaluation of the Use of Lyophilized Platelets in Dogs. *Journal of Veterinary Emergency and Critical Care*.
- [14] Gabriel, L., Walton, R. A., Young, T., **Cai, J.**, Mochel, J. P., & Peterson, K. (2025). Incidence of hypernatremia in dogs treated with multi-dose activated charcoal for acute toxicant ingestion: multi-center retrospective study (2018–2023). *Frontiers in Veterinary Science*, 12, 1584162.
- [15] Ngo, L., Walton, R., Wolf, J., Levy, N., Ludwik, T., Thevelein, B., Blong, A., **Cai, J.**, & Mochel, J. (2025). The association between non-depolarizing neuromuscular blockade agents and survival to discharge in dogs undergoing mechanical ventilation: a multi-center retrospective study of 227 dogs (2010–2020). *Frontiers in Veterinary Science*, 12, 1539138.

• Preprints

- [16] Lu, H., Fang, L., Zhang, R., Li, X., **Cai, J.**, Cheng, H., ... & Ma, P. (2025). Alignment and safety in large language models: Safety mechanisms, training paradigms, and emerging challenges. arXiv preprint arXiv:2507.19672.
- [17] Bargues-Carot, A., Prado-Rico, J., Kawasawa, Y. I., **Cai, J.**, Yanosky, J. D., Zenitsky, G., ... & Huang, X. (2025). MicroRNA Expression in Asymptomatic Welders: Implications for Biomarker Discovery for Environmentally-Linked Neurodegenerative Disorders. medRxiv.

- Under Review

- [18] **Cai, J.**, Chen, Y., Fang, L., Zhong, W., Yuan, G. C., & Ma, P. (2025). SpaDiff: Denoising for Sequence-based Spatial Transcriptomics via Diffusion Process. *Cell Reports Methods*.
- [19] **Cai, J.**, Feng, Y., Cheng, H., Ge, Y., Guo, Z., Huang, H., ... & Shen, Y. (2025). Pseudo-Time Reconstruction for Analyzing Transmission Direction in COVID-19 Contact-Tracing Data. *Epidemics*.
- [20] Fang, L., Chen, Y., **Cai, J.**, Zhong, W., & Ma, P. (2026). Multi-Teacher Bayesian Knowledge Distillation for Protein Localization Prediction with Uncertainty Quantification. *Journal of the American Statistical Association Case Studies*.
- [21] Lu, H., Cheng, H., Fang, L., **Cai, J.**, Zeng, P., Ma, P., Zhong, W. (2026). Double Generative Learning for Tackling the Curse of Dimensionality in Causal Inference. Under review, *Journal of the American Statistical Association*.

- In Preparation

- [22] **Cai, J.**, Fang, L., Lu, H., Zhang, R., Wang, T., Zhang, Y., ... & Ma, P. (2026). Complex Problem Solving in Large Language Models.
- [23] **Cai, J.**, Liu, X., Ma, Y., Ma, P., & Hong Y. (2026). Learning Protein–DNA Co-evolution of Geminiviral Replication Protein and Origin with Language Models.
- [24] **Cai, J.**, Rogers, W., Webb, W., James, C., Collier, Z., & Alabady, M. (2026). Inferring Functional Potential and Causal Drivers in the *Sarracenia* Pitcher Microbiome from 16S Data.
- [25] Bayraktar, F., Webb, W., **Cai, J.**, & Alabady, M. (2026). Molecular Inverted Probes (MIPs)-based whole genome sequencing of human respiratory viruses.
- [26] Wheeler, E., Kraus, B., Mochel, J., **Cai, J.**, Handel, A., Ciou, M., Lu, M., & Ward, J. (2026). Use of Transthoracic Lung Ultrasound for Assessment of Perioperative Atelectasis in Dogs Undergoing Non-emergent Anesthesia.
- [27] Fuller, B., Tan, D., Petrovsky, Mochel, J., **Cai, J.**, Handel, A., & Oxley, B. (2026). The Complex Interdependence of Torsion, Procurvatum, and Frontal Plane Angulation in Canine Distal Femoral Osteotomy: Limitations in Predicting Post-Correction Alignment.
- [28] Mochel, J., **Cai, J.**, Handel, A., & Walton, R. (2026). The association between drug protocols with or without benzodiazepines for sedation in dogs undergoing mechanical ventilation: a multi-center retrospective study of 137 dogs.
- [29] Deom, K., Willette, C., **Cai, J.**, Wheeler, E., & Kraus, B. (2026). The Effects of Canine ABCB1-1Δ Mutation on Common Pre-anesthetic Medication Combinations.
- [30] Mochel, J., **Cai, J.**, Handel, A., & Walton, R. (2026). Clinical features, Medical Management, and Patient Outcomes Following Sand Ingestion in 55 dogs.
- [31] Mochel, J., **Cai, J.**, Handel, A., & Walton, R. (2026). Multi-center retrospective evaluation of contrast tomography findings in non-coagulopathic spontaneous hemothorax in dogs secondary to neoplasia.

Research Collaborations

- Guo-Cheng Yuan Lab, Icahn School of Medicine at Mount Sinai 2022 – Present
Spatial transcriptomics and multi-omics data analysis

- Alabady Lab, Department of Plant Biology, University of Georgia 2022-Present
Genetic basis of carnivory in plants and genetic drivers of plant-microbiome interactions
- SMART Lab, College of Veterinary Medicine, University of Georgia 2023-Present
Clinical trial data analysis and statistical modeling
- IBM Thomas J. Watson Research Center 2025 – Present
Quantum computing for spatial transcriptomics
- Ye Shen Lab, College of Public Health, University of Georgia 2021-Present
Statistical Method development for epidemic

Outreach/Supervision Activities

- Supervising high school research of Nanthan Yuan 2023
Statistical modeling for HIV classification
- Supervising undergraduate research of Vincent Nguyen from University of Georgia 2024-2025
Statistical analysis for multiple veterinary clinical trial studies

Awards and Grants

- Poster Presentation Award (First Place) 2025
Georgia Statistics Day Conference, University of Georgia, Athens, GA
- Graduate School Summer Research Grant, \$1,000 2025
University of Georgia, Athens, GA
- Graduate School Conference Travel Grant 2025
University of Georgia, Athens, GA
- Graduate School Conference Travel Grant 2024
University of Georgia, Athens, GA
- Graduate School Summer Research Grant, \$1,500 2024
University of Georgia, Athens, GA
- ICSA Travel Fund 2023
International Chinese Statistical Association

Presentations

• Invited Conference/Workshop Presentations

- Eastern North American Region, New Orleans, LA 2025
- International Chinese Statistical Association, Wuhan, China 2024
- Joint Statistical Meetings, Toronto, Canada 2023

• Poster Presentations

- Georgia Statistics Day Conference, University of Georgia, Athens, GA 2025

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- Joint Statistical Meetings, Nashville, TN 2025
 - Conference on Statistics in Genomics and Genetics, Minneapolis, MN 2025
 - Joint Statistical Meetings, Portland, OR 2024
 - Georgia Statistics Day Conference, Emory University, Atlanta, GA 2024
 - International Chinese Statistical Association China Conference, Chengdu, China 2023
 - Georgia Statistics Day Conference, Emory University, Atlanta, GA 2021

Teaching

• Teaching Assistant

- STAT 8070: Statistical Computing II Spring 2026
University of Georgia, Athens, GA
- STAT 8210: Multivariate: Theory and Methods Spring 2022
University of Georgia, Athens, GA
- STAT 2000: Introductory Statistics Spring 2022
University of Georgia, Athens, GA
- STAT 2000: Introductory Statistics Fall 2021
University of Georgia, Athens, GA

Computing Skills

- Programming: Python, R, C++, MATLAB
- Scientific Computing: GPU computing, HPC cluster environments (SLURM)
- Statistical Software: R (tidyverse, Bioconductor), PyTorch, TensorFlow