

Jian Cao

Assistant Professor

Department of Mathematics

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Education

- 2020 *Ph.D.* in Statistics, King Abdullah University of Science and Technology
- 2016 *M.Sc.* in Finance, Shanghai Jiaotong University
- 2014 *B.Sc.* in Applied Mathematics, University of Science and Technology of China

Areas of Specialization

Computational Statistics, Gaussian Processes, Multivariate Normal Probabilities, Scientific Computing, Truncated Multivariate Normal Distribution

Journal Articles

- 2023 Cao, J., & Katzfuss, M. “Linear-Cost Vecchia Approximation of Multivariate Normal Probabilities,” *Submitted*
- 2023 Cao, J., Zhang, J., Sun, Z., & Katzfuss, M. (2023). “Locally Anisotropic Covariance Functions on the Sphere,” accepted by *Journal of Agricultural, Biological and Environmental Statistics*
- 2023 Cao*, J., Kang, M.*, Jimenez, F., Sang, H., Schäfer, F., & Katzfuss, M. (2023). “Variational Sparse Inverse Cholesky Approximation for Latent Gaussian Processes via Double Kullback-Leibler Minimization,” accepted by the 40th International Conference on Machine Learning
- 2022 Cao, J., Guinness, J., Genton, M. G., & Katzfuss, M. (2022). “Scalable Gaussian-process Regression and Variable Selection using Vecchia Approximations,” *Journal of Machine Learning Research*, 2022, **23**(348), pp.1-30
- 2022 Cao, J., Durante, D., Genton, M. G. (2022). “Scalable Computation of Predictive Probabilities in Probit Models with Gaussian Process Priors,” accepted by *Journal of Computational and Graphical Statistics* 2022, **31**(3), pp.709-720
- 2022 Cao, J., Genton, M. G., Keyes, D. E., & Turkiyyah, G. M. (2022). “tlrmvnmvt: Computing High-Dimensional Multivariate Normal and Student-*t* Probabilities with Low-rank Methods in R,” *Journal of Statistical Software*, **101**, pp.1-25
- 2022

Abdulah, S., Li, Y., Cao, J., Ltaief, H., Keyes, D. E., Genton, M. G., & Sun, Y. (2022). “Large-scale Environmental Data Science with ExaGeoStatR,” accepted by *Environmetrics*

- 2021 Cao, J., Genton, M. G., Keyes, D. E., & Turkiyyah, G. M. (2021). “Exploiting Low Rank Covariance Structures for Computing High-Dimensional Normal and Student-*t* Probabilities,” *Statistics and Computing*, **31**(1), pp.1-16
- 2021 Cao, J., Genton, M. G., Keyes, D. E., & Turkiyyah, G. M. (2021). “Sum of Kronecker Products Representation and Its Cholesky Factorization for Spatial Covariance Matrices from Large Grids,” *Computational Statistics & Data Analysis*, **157**, pp.107165
- 2021 Huang, J., Fang, F., Turkiyyah, G., Cao, J., Genton, M. G., & Keyes, D. E. (2021). “An $O(N)$ Algorithm for Computing Expectation of N -dimensional Truncated Multi-variate Normal Distribution I: Fundamentals,” *Advances in Computational Mathematics*, **47**(5), pp.1-34
- 2019 Cao, J., Genton, M. G., Keyes, D. E., & Turkiyyah, G. M. (2019). “Hierarchical-block Conditioning Approximations for High-dimensional Multivariate Normal Probabilities,” *Statistics and Computing*, **29**, pp.585-598

Invited Seminars

- 2023 **Department of Statistics, University of Nebraska, Lincoln**
Linear-Cost Vecchia Approximation of Multivariate Normal Probabilities
- 2023 **Department of Management Science and Statistics, The University of Texas at San Antonio**
Linear-Cost Vecchia Approximation of Multivariate Normal Probabilities

Talks & Posters

- 2023 **2023 International Conference on Machine Learning** Honolulu, HI, USA
Poster: Variational sparse inverse Cholesky approximation for latent Gaussian processes via double Kullback-Leibler minimization
- 2023 **2023 Spatial Statistics** Boulder, CO, USA
Contributed Session: Variational sparse inverse Cholesky approximation for latent Gaussian processes via double Kullback-Leibler minimization
- 2023 **2023 International Indian Statistical Association Conference** Golden, CO, USA
Invited Session: Variational sparse inverse Cholesky approximation for latent Gaussian processes via double Kullback-Leibler minimization

- 2023 ***ASA/IMS SPRING RESEARCH CONFERENCE 2023*** Banff, Canada
 Contributed Session: Variational sparse inverse Cholesky approximation for latent Gaussian processes via double Kullback-Leibler minimization
- 2022 ***ENVR 2022 Workshop*** Provo, UT, USA
 Poster: Scalable Gaussian Process Regression and Variable Selection under Automatic Relevance Determination Kernels
- 2022 ***IMSI Gaussian Processes Workshop*** Chicago, IL, USA
 Poster: Scalable Gaussian Process Regression and Variable Selection under Automatic Relevance Determination Kernels
- 2022 ***Joint Statistical Meetings*** Washington D.C., USA
 Contributed Session: Scalable Gaussian Process Regression and Variable Selection under Automatic Relevance Determination Kernels
- 2022 ***ISBA World Meeting*** Montreal, Quebec, Canada
 Contributed Talk: Scalable Gaussian Process Regression and Variable Selection under Automatic Relevance Determination Kernels
- 2022 ***SETCASA Poster Competition*** College Station, TX, USA
 Poster: Scalable Gaussian Process Regression and Variable Selection under Automatic Relevance Determination Kernels
- 2022 ***Texas A&M Statistics Cafe*** College Station, TX, USA
 Presentation: Scalable Gaussian Process Regression and Variable Selection under Automatic Relevance Determination Kernels
- 2021 ***TAMIDS Research Conference*** College Station, TX, USA
 Presentation: Scalable Gaussian Process Regression and Variable Selection under Automatic Relevance Determination Kernels
- 2020 ***Joint Statistical Meetings*** Virtual Conference
 Contributed Session: Sum of Kronecker Products Representation for Spatial Covariance Matrices and Its Factorization
- 2019 ***Joint Statistical Meetings*** Denver, CO, USA
 Topic-Contributed Session: Exploiting Low Rank Covariance Structures for Computing High-Dimensional Normal and Student- t Probabilities
- 2018 ***Big Data Meets Large-Scale Computing*** IPAM, Los Angeles, CA, USA
 Poster: Exploiting Low Rank Covariance Structures for Computing High-Dimensional Normal and Student- t Probabilities
- 2018 ***Joint Statistical Meetings*** Vancouver, BC, Canada
 Poster: Hierarchical-block Conditioning Approximations for High-dimensional Multivariate Normal Probabilities

2017 ***Joint Statistical Meetings*** Baltimore, MD, USA
Contributed Session: Hierarchical-block Conditioning Approximations for High-dimensional Multivariate Normal Probabilities

Awards

2020 ***Al-Kindi Statistics Student Research Award***
King Abdullah University of Science and Technology

2019 ***Winner of the Student Paper Competition***, Section on Statistical Computing and the Section on Statistical Graphics of ASA
Title: “Exploiting Low Rank Covariance Structures for Computing High-Dimensional Normal and Student- t Probabilities”

Short Courses

2019 ***A Short Course on Deep Learning***, KAUST Saudi Arabia

2017 ***Winter School on Hierarchical Matrices***, Kiel Germany

Teaching

2024 Spring Lecturer for Math 3339 “Statistics for the Sciences”, University of Houston

2023 Fall Lecturer for Math 3339 “Statistics for the Sciences”, University of Houston

2022 April TAMIDS Webinar “Scalable Gaussian Process Approximation and Optimization

2018 Fall Teaching Assistant for MS level *Probability and Statistics*

2017 Fall Teaching Assistant for MS level *Probability and Statistics*

Programming Languages

R, C++, and Python

R Package

tlrmvnmvt, published on CRAN

Compute high-dimensional multivariate normal (MVN) and multivariate Student- t (MVT) probabilities with tile-low-rank and block reordering ([LINK](#))