Pulong Ma

Address

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Education & Training

Postdoctoral Fellow — Aug 2018 - July 2021

- Department of Statistical Science, Duke University, Durham, NC
- Statistical and Applied Mathematical Sciences Institute (SAMSI), Research Triangle Park, NC
- Program: Model Uncertainty: Mathematical and Statistical (MUMS)
- Mentors: Prof. Jim Berger and Prof. Li Ma.

Ph.D., Statistics, University of Cincinnati, Cincinnati, OH — 2018

- Dissertation title: Hierarchical Additive Spatial and Spatio-Temporal Process Models for Massive Datasets.
- Advisor: Emily L. Kang, Ph.D. and Co-advisor: Bledar A. Konomi, Ph.D.

B.S., Computational Mathematics, Northeast Forestry University, China — 2013

Professional Experience

Assistant Professor — June 2023 - Present
Department of Statistics, *Iowa State University*, Ames, IA

Assistant Professor — Aug 2021 - June 2023
School of Mathematical and Statistical Sciences, *Clemson University*, Clemson, SC

Graduate Research Fellow — Aug - Dec 2017
Statistical and Applied Mathematical Sciences Institute (SAMSI), Research Triangle Park, NC

SIParCS Graduate Student Intern — May - July 2016
National Center for Atmospheric Research (NCAR), Boulder, CO

Research Interests

Uncertainty Quantification; Spatial and Spatio-Temporal Statistics; Objective Bayes; Nonparametric Bayes; Machine Learning; Big Data Analytics; Interdisciplinary Research in Natural Hazards, Remote Sensing Science, Engineering, Climate Science, Medical Science, Public Health.

Grants

Current

1. **NSF DMS-2348154**. Role: Sole PI.
   Start/End: 10/2023-9/2026. Total Amount: $195,956.
   Title: Modeling Multivariate and Space-Time Processes: Foundations and Innovations.
2. **NSF DMS-2348163** (transferred from DMS-2152998). Role: PI.
   Start/End: 6/2023-7/2025. Total Amount: $154,776.
   Title: Collaborative Research: Bayesian Residual Learning and Random Recursive Partitioning Methods for Gaussian Process Modeling.
3. **NSF DMS-2152998**. Role: PI.
   Start/End: 8/2022-10/2023. Total Amount: $25,226.
   Title: Collaborative Research: Bayesian Residual Learning and Random Recursive Partitioning Methods for Gaussian Process Modeling.

Completed

4. **USCRP**. Role: Co-Investigator. (PI: R. Luettich at UNC at Chapel Hill).
   Start/End: 12/2019–7/2021. Total Amount: $172,506 (my share: $67,676).
   Title: Quantifying and Communicating Numerical Model Uncertainty.

Publications

Peer-reviewed and published papers

1. **Ma, P.** and Bhadra, A. (2022) "Beyond Matérn: On A Class of Interpretable Confluent Hypergeometric Covariance Functions." *Journal of the American Statistical Association, T&M*. Accepted. DOI:10.1080/01621459.2022.2027775.
2. **Ma, P.**, Karagiannis, G., Konomi, B. A., Asher, T. G., Toro, G. R., and Cox, A. T. (2022) "Multifidelity Computer Model Emulation with High-Dimensional Output: An Application to Storm Surge." *Journal of the Royal Statistical Society: Series C*. **71**(4), 861-883. DOI:10.1111/rssc.12558.
3. Baker, E., Barbillon, P., Fadikar, A., Gramacy, R. B., Herbei, R., Higdon, D., Huang, J., Johnson, L. R., **Ma, P.**, Mondal, A., Pires, B., Sacks, J., and Sokolov, V. (2022) "Analyzing Stochastic Computer Models: A Review with Opportunities." *Statistical Science*. **37**(1), 64-89. DOI:10.1214/21-STS822.
4. **Ma, P.**, Mondal, A., Konomi, B. A., Hobbs, J., Song, J. J., and Kang, E. L. (2022) "Computer Model Emulation with High-Dimensional Functional Output in Large-Scale Observing System Uncertainty Experiments." *Technometrics*. **64**(1), 65-79. DOI:10.1080/00401706.2021.1895890.
5. **Ma, P.** (2020) "Objective Bayesian Analysis of a Cokriging Model for Hierarchical Multifidelity Codes." *SIAM/ASA Journal on Uncertainty Quantification*, **8**(4), 1358-1382. DOI:10.1137/19M1289893.
6. **Ma, P.** and Kang, E. L. (2020) "A Fused Gaussian Process Model for Very Large Spatial Data." *Journal of Computational and Graphical Statistics*, **29**(3), 479-489. DOI:10.1080/10618600.2019.1704293.
7. **Ma, P.** and Kang, E. L. (2019) "Spatio-Temporal Data Fusion for Massive Sea Surface Temperature Data from MODIS and AMSR-E Instruments." *Environmetrics*, **31**(2), e2594. DOI:10.1002/env.2594.
8. Konomi, B. A., Hanandeh, A. A., **Ma, P.**, and Kang, E. L. (2019) "Computationally Efficient Nonstationary Nearest Neighbor Gaussian Process Models Using Data-Driven Techniques." *Environmetrics*, **30**(8), e2571. DOI:10.1002/env.2571.
9. **Ma, P.**, Konomi, B. A., and Kang, E. L. (2019) "An Additive Approximate Gaussian Process Model for Large Spatio-Temporal Data." *Environmetrics*, **30**(8), e2569. DOI:10.1002/env.2569.

10. **Ma, P.**, Kang, E. L., Braverman, A., and Nguyen, H. (2019) "Spatial Statistical Downscaling for Constructing High-Resolution Nature Runs in Global Observing System Simulation Experiments." *Technometrics*, **61**(3), 322-340. DOI:10.1080/00401706.2018.1524791.
11. Cawse-Nicholson, K., Fisher, J. B., Famiglietti, C. A., Braverman, A., Schwandner, F. M., Lewicki, J. L., Townsend, P. A., Schimel, D. S., Pavlick, R., Bormann, K. J., Ferraz, A., Kang, E. L., **Ma, P.**, Bogue, R. R., Youmans, T., and Pieri, D. C. (2018) "Ecosystem Responses to Elevated CO2 Using Airborne Remote Sensing at Mammoth Mountain, California." *Biogeosciences*, **15**(24), 7403-7418. DOI:10.5194/bg-15-7403-2018.

Technical report

1. Kaufman, W., **Ma, P.**, Hammerling, D., and Lombardozzi, D. (2016) "Ozone and Foliar Damage Analysis: NCAR and St. Louis." *NCAR Technical Note*, NO. NCAR/TN-530+STR. DOI:10.5065/D6WH2NCQ.

Statistical Software

1. **Ma, P.** (2021) R package "GPBayes: Tools for Gaussian Process Modeling in Uncertainty Quantification." `https://CRAN.R-project.org/package=GPBayes`. R package version 0.1.0-5.
2. **Ma, P.** (2020) R package "ARCokrig: Autoregressive Cokriging Models for Multifidelity Codes." `https://CRAN.R-project.org/package=ARCokrig`. R package version 0.1.2.

Honors and Awards

O'Bayes 2022 Travel Award, Santa Cruz, CA 2022

Winner of Student Paper Competition, the Section on Statistics and the Environment of American Statistical Association 2018

SIAM Student Travel Award, the 2018 SIAM Conference on Uncertainty Quantification, Garden Grove, CA 2018

Visiting Graduate Research Fellowship, SAMSI, Research Triangle Park, NC 2017

Winner of Student Paper Competition, the 2017 ICSA Applied Statistics Symposium, Chicago, IL 2017

Charles Phelps Taft Dissertation Fellowship, University of Cincinnati 2016-17

Honorable Mention in Student Paper Competition, the Section on Statistics and the Environment of American Statistical Association 2016

Outstanding Academic Performance for First Year PhD Student Award, Department of Mathematical Sciences, University of Cincinnati 2014

Seminars at Colleges, Universities, or Research Organizations

1. School of Science and Technology, Georgia Gwinnett College, Lawrenceville, GA, Online, Oct 2022. Title: "Uncertainty Quantification for Remote Sensing and Coastal Flood Hazard Studies."
2. Department of Public Health Sciences, Medical University of South Carolina, Charleston, SC, Sep 2022. Title: "Gaussian Process Modeling with Applications in Environmental Sciences and Public Health."
3. Department of Mathematics and Statistics, Auburn University, Auburn, AL, Online, March 2022. Title: "Beyond Matérn: On A Class of Interpretable Confluent Hypergeometric Covariance Functions."

4. Department of Mathematical Sciences, Durham University, Durham, UK, Online, Jan 2021. Title: "Kriging: Beyond Matérn."
5. School of Engineering, The University of Melbourne, Online, Dec 2020. Title: "Multifidelity Computer Model Emulation with High-Dimensional Output: An Application to Storm Surge."
6. Jet Propulsion Laboratory, Online, Aug 2020. Title: "Efficient Surrogate Modeling for Uncertainty Quantification in Assessment of Remote Sensing Retrievals and Storm Surges."
7. IMAGe Brown Bag Seminar, National Center for Atmospheric Research, Boulder, CO, June 2016. Title: "Semiparametric Inference via Sparsity-Induced Kriging for Massive Spatial Data."

Invited Conference/Workshop Presentations

1. "Residual Treed Gaussian Processes," KAUST Statistics and Data Science Workshop, KAUST, Saudi Arabia, Nov 2023.
2. "Residual Treed Gaussian Processes," Joint Statistical Meetings, Toronto, Canada, Aug 2023.
3. "Classes of Multivariate and Space-Time Power-Law Covariance Functions," EcoSta 2023: The 6th International Conference on Econometrics and Statistics, Online, Aug 2023.
4. "Classes of Multivariate and Space-Time Power-Law Covariance Functions," Spatial Statistics 2023: Climate and the Environment (Session in Honor of Noel Cressie), Boulder, CO, July 2023.
5. "Residual Treed Gaussian Processes," The 64th ISI World Statistics Congress, Ottawa, Canada, July 2023.
6. "Residual Treed Gaussian Processes," The ICSA 2023 Applied Statistics Symposium, University of Michigan, Ann Arbor, MI, June 2023.
7. "Uncertainty Quantification in Assessing Storm Surge Hazards," AIRES 4: Machine Learning for Robust Digital Twins, Oak Ridge National Laboratory, Oak Ridge, TN, April 2023.
8. "Uncertainty Quantification in Assessing Storm Surge Hazards," The 2022 Rising Star Symposium, Clemson University, Clemson, SC, Sep 2022.
9. "Uncertainty Quantification in Assessing Storm Surge Hazards," The 2022 SIAM Conference on Uncertainty Quantification, Atlanta, GA, April 2022.
10. "Uncertainty Quantification for Storm Surge," The 5th EAC-ISBA Conference: A Satellite Meeting of the 2020 ISBA World Meeting in Celebrating James O Berger's 70th Birthday, Online, Nov 2021.
11. "Beyond Matérn: On a Class of Interpretable Confluent Hypergeometric Covariance Functions," The 34th New England Statistics Symposium, Online, Oct 2021.
12. "Uncertainty Quantification in Assessing Storm Surge Hazards," Joint Statistical Meetings, Online, Aug 2021.
13. "Computer Model Emulation with High-Dimensional Functional Output in Large-Scale Observing System Uncertainty Experiments," Virtual Breakout Meeting on Uncertainty Quantification for Remote Sensing Inverse Problems, Jet Propulsion Laboratory, Online, Oct 2020.
14. "Multifidelity Computer Model Emulation with High-Dimensional Output: An Application to Storm Surge," Data Science, Statistics & Visualization 2020, Online, July 2020.
15. "Efficient Surrogate Modeling for Uncertainty Quantification in Assessment of Remote Sensing Retrievals and Storm Surges," US CLIVAR Working Group on Emerging Data Science Tools for Climate Variability and Predictability, Online, June 2020.
16. "Spatio-Temporal Data Fusion for Massive Sea Surface Temperature Data from MODIS and AMSR-E Instruments," The 2019 ICSA Applied Statistics Symposium, Raleigh, NC, June 2019.
17. "An Emulator Approach to Quantifying the Risk Due to Storm Surge," The SAMSI MUMS Transition Workshop and SPUQ, University of North Carolina at Chapel Hill, NC, May 2019.

18. "Spatio-Temporal Data Fusion for Massive Sea Surface Temperature Data from MODIS and AMSR-E Instruments," The SAMSI MUMS Program on Data Fusion, SAMSI, NC, Oct 2018.
19. "A Fused Gaussian Process Model for Very Large Spatial Data," The International Conference on Advances in Interdisciplinary Statistics and Combinatorics, University of North Carolina at Greensboro, Greensboro, NC, Oct 2018.
20. "Spatial Statistical Downscaling for Constructing High-Resolution Nature Runs in Global Observing System Simulation Experiments," The 2018 SIAM Conference on Uncertainty Quantification, Garden Grove, CA, April 2018.
21. "Spatio-Temporal Data Fusion for Massive Sea Surface Temperature Data from MODIS and AMSR-E Instruments," The Remote Sensing, Uncertainty Quantification and a Theory of Data Systems Workshop, California Institute of Technology, Pasadena, CA, Feb 2018.
22. "A Fused Gaussian Process Model for Very Large Spatial Data," Winner of Student Paper Competition, The 2017 ICSA Applied Statistics Symposium, Chicago, IL, July 2017.

Courses Taught

Iowa State University, Ames, IA

- *Instructor*, STAT 615 - Advanced Bayesian Methods — Fall 2023
- *Instructor*, STAT 475/575 - Introduction to Multivariate Data Analysis — Fall 2023

Clemson University, Clemson, SC

- *Instructor*, MATH 8050 - Data Analysis (two sections) — Fall 2022
- *Instructor*, STAT 3090 - Introductory Business Statistics — Fall 2021, Spring 2022

SAMSI Education and Outreach Programs and Workshops, Durham, NC

- Undergraduate Workshop on Uncertainty Quantification — Feb 2019
  Lecturer, R tutorials.

Department of Mathematical Sciences, University of Cincinnati

- *Instructor*, MATH 1014 - The Mathematics of Social Choice — Spring 2018
- *Teaching Assistant*, MATH 1062 - Calculus II section 010 and 011 — Spring 2014
- *Teaching Assistant*, MATH 1061 - Calculus I section 012 and 021 — Fall 2013

The Institute for Mathematics Applied to Geosciences (IMAGe) at NCAR

- *Lecturer*, "Introduction to Bayesian Analysis" in Data Analytics Boot Camp for High School Students — 2016
- *Coach*, Workshop on Beyond P-values: Introduction to Bayesian Statistics — 2016

Student Advising

Student Committee (member, non-major professor)

1. Aditya Ranade, Ph.D., Department of Statistics, Iowa State University, Current.
2. Kunal Das, Ph.D., Department of Statistics, Iowa State University, Current.
3. Katherine Kreuser, M.S., School of Mathematical and Statistical Sciences, Clemson University, 2022.
4. Yangyi Li, M.S., School of Mathematical and Statistical Sciences, Clemson University, 2022.

Other Advising

- Project leader for Undergraduate Modeling Workshop, SAMSI, summer 2019, summer 2021.
- Co-mentor (with Brian Reich) for a PhD student in Statistics, North Carolina State University, 2019 - 2020.
- Faculty mentor for the 25th Industrial Mathematical and Statistical Modeling Workshop, SAMSI, summer 2019.
- Mentor for the Story of Data Science and Machine Learning Workshop, SAMSI, summer 2019.

Professional Service

Editorial

- Associate Editor, *Journal of Agricultural, Biological, and Environmental Statistics (JABES)* 1/2022 - Present

Proposal Review: NSF Panelist (2023)

Journal Referee: *Annals of Applied Statistics*; *Bayesian Analysis*; *Computational Statistics*; *Econometrics and Statistics*; *Electronic Journal of Statistics*; *Environmetrics*; *IISE Transactions*; *Journal of Agricultural, Biological, and Environmental Statistics*; *Journal of Computational and Graphical Statistics*; *Journal of Machine Learning Research*; *Journal of the American Statistical Association, Theory and Methods*; *Journal of the American Statistical Association, Applications and Case Studies*; *Journal of the Royal Statistical Society: Series A*; *Journal of the Royal Statistical Society: Series B*; *PLoS ONE*; *SIAM/ASA Journal on Uncertainty Quantification*; *Statistical Analysis and Data Mining*; *Statistics and Public Policy*; *Spatial Statistics*; *Stat*; *Statistica Sinica*; *Statistics Surveys*; *Technometrics*.

Departmental Service

- Seminar Coordinator, Department of Statistics, Iowa State University, Spring 2024
- Computation Advisory Committee (CAC), Department of Statistics, Iowa State University, Spring 2024
- Statistics Seminar Committee Member, Clemson University, Clemson, SC, Aug 2021 - May 2023

Administrative Service

- SAMSI MUMS program working group administrator, Durham, NC, Aug 2018-May, 2019
- Mathematical Graduate Student Association (MGSA) Treasurer, University of Cincinnati, May 2015 - Dec 2017

Session Organizer and Chair

- Session organizer, *Gaussian Processes for Modeling High-Dimensional and Complex Data*, Joint Statistical Meetings, Toronto, Canada, August 2023
- Session co-organizer, *Random Partitioning Methods for Modeling Complex Data*, The 2023 ICSA Applied Statistics Symposium, Ann Arbor, Michigan, June 2023.
- Session co-organizer, *Advances in Multivariate Spatial Process Modeling for Environmental Data*, Joint Statistical Meetings, Washington, DC, August 2022
- Minisymposium organizer, *Bayesian calibration and machine learning methods for Uncertainty Quantification*, SIAM Conference on Uncertainty Quantification, Atlanta, GA, March 2022
- Session organizer, *Uncertainty Quantification Across the Boundaries*, Joint Statistical Meetings, Seattle, Washington, August 2021
- Session organizer and chair, *Emerging Issues in Uncertainty Quantification for Computer Experiments*, Joint Statistical Meetings, Philadelphia, PA, August 2020

- Session organizer and chair, *Bayesian Modeling for Complex Spatial and Spatio-Temporal Data*, ISBA 2020 World Meeting, Kunming, China, June 2020
- Minisymposium organizer, *Learning Parameters in Complex Physical Systems with Simulation Experiments*, SIAM Conference on Uncertainty Quantification, Munich, Germany, March 2020
- Session chair, *Bayesian Nonparametrics*, Section on Bayesian Statistical Sciences, Joint Statistical Meetings, Denver, CO, July 2019
- Session chair, *Inverse Problems and Data Assimilation II*, SIAM Conference on Uncertainty Quantification, Garden Grove, CA, April 2018
- Session chair, *Bayesian Models for Gaussian and Point Processes*, Section on Bayesian Statistical Sciences, Joint Statistical Meetings, Baltimore, MD, August 2017

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