Pulong Ma

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Employment

School of Mathematical and Statistical Sciences, Clemson University, Clemson, SC
Assistant Professor in Statistics — Aug 2021 - Present

Department of Statistical Science, Duke University, Durham, NC
Postdoctoral Associate — Aug 2018 - July 2021
Mentors: Prof. Jim Berger and Prof. Li Ma.

Statistical and Applied Mathematical Sciences Institute, Research Triangle Park, NC
Postdoctoral Fellow — Aug 2018 - July 2021
Program on Model Uncertainty: Mathematical and Statistical (MUMS)

Education

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

Research Interests

Foundations of Statistics and Data Science; Spatial and Spatio-Temporal Statistics; Uncertainty Quantification; Bayesian Learning; Objective Bayes; Bayesian Nonparametrics; Computational Statistics; Machine Learning; Functional Data Analysis; Big Data Analytics; Interdisciplinary Research in Environmental Science, Climate Science, Remote Sensing Science, Engineering Science, Social Science, Medical Science, Public Health.

Grants

1. 2020-2021. NSF XSEDE Startup Allocation: "Statistical Emulation for Storm Surge"; $4,180; Principal Investigator. DMS180042 (Renewal).
2. 2019–2021. "Quantifying and Communicating Numerical Model Uncertainty"; Awarded by the U.S. Army Corps of Engineers under the CESU Program; $172,506; Ma Co-Investigator (39%) with Rick Luettich (PI) at University of North Carolina, Chapel Hill.
3. 2018-2019. NSF XSEDE Startup Allocation: "Statistical Emulation for Storm Surge"; $415; Principal Investigator. DMS180042.

Publications

Submitted papers

1. **Ma, P.** and Bhadra, A. (2020+) "Beyond Matérn: On A Class of Interpretable Confluent Hypergeometric Covariance Functions." *Journal of the American Statistical Association, Theory and Methods*. In Revision. arXiv:1911.05865.
2. **Ma, P.**, Karagiannis, G., Konomi, B. A., Asher, T. G., Toro, G. R., and Cox, A. T. (2020+) "Multifidelity Computer Model Emulation with High-Dimensional Output: An Application to Storm Surge." *Journal of the Royal Statistical Society: Series C*. In Revision. arXiv:1909.01836.

Peer-reviewed and published papers

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. (2021) "Analyzing Stochastic Computer Models: A Review with Opportunities." *Statistical Science*. Accepted. arXiv:2002.01321.
4. **Ma, P.**, Mondal, A., Konomi, B. A., Hobbs, J., Song, J. J., and Kang, E. L. (2021) "Computer Model Emulation with High-Dimensional Functional Output in Large-Scale Observing System Uncertainty Experiments." *Technometrics*. Accepted. 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*, 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*, 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*, 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, 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 NCAR/TN-530+STR*, 31 pp, DOI:10.5065/D6WH2NCQ.

Statistical Software

1. **Ma, P.** (2020) R package "ZiGaSP: Zero-Inflated Gaussian Stochastic Process Emulation for Computer Models." `https://github.com/pulongma/ZiGaSP`.
2. **Ma, P.** (2020) R package "GaSP: Tools for Gaussian Stochastic Process Modeling with Spatial Data, Spatio-Temporal Data, and Computer Experiments." `https://github.com/pulongma/GaSP`.
3. **Ma, P.** (2020) R package "ARCokrig: Autoregressive Cokriging Models for Multifidelity Codes." `https://CRAN.R-project.org/package=ARCokrig`. R package version 0.1.1.
4. **Ma, P.**, Hammerling, D., and Katzfuss, M. (2016) R package "DABayes: Bayesian Statistical Model for Climate-Change Detection and Attribution." `https://github.com/pulongma/DABayes`.

Research Experience

Statistical and Applied Mathematical Sciences Institute, Research Triangle Park, NC
Graduate Research Fellow — Aug - Dec 2017
Participated in the program on Mathematical and Statistical Methods for Climate and the Earth System (CLIM).

National Center for Atmospheric Research (NCAR), Boulder, CO
Research Intern supervised by Dr. Dorit Hammerling — May - July 2016
Developed an R package called "DAbayes" that implements a Bayesian hierarchical model for climate-change detection and attribution and worked on damage assessment of ground-level ozone.

Honors and Awards

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

Departmental Seminars

1. Department of Mathematics, Syracuse University, Syracuse, NY, Online, Mar 2021 (Canceled).

2. Department of Statistics, University of Manitoba, Winnipeg, MB, Canada, Online, Mar 2021. Title: "Uncertainty Quantification for Storm Surges."
3. Department of Mathematical Sciences, Durham University, Durham, UK, Online, Feb 2021. Title: "Uncertainty Quantification for Storm Surges."
4. School of Mathematical and Statistical Sciences, Clemson University, Clemson, SC, Online, Feb 2021. Title: "Gaussian Process Modeling with Applications in Remote Sensing and Coastal Flood Hazard Studies."
5. Department of Statistics and Actuarial Science, University of Waterloo, Waterloo, ON, Canada, Online, Feb 2021. Title: "Gaussian Process Modeling with Applications in Remote Sensing and Coastal Flood Hazard Studies."
6. Department of Mathematical Sciences, New Jersey Institute of Technology, Newark, NJ, Online, Jan 2021. Title: "Gaussian Process Modeling with Applications in Remote Sensing and Coastal Flood Hazard Studies."
7. Department of Mathematics & Statistics, University of South Florida, Tampa, FL, Online, Jan 2021. Title: "Gaussian Process Modeling with Applications in Remote Sensing and Coastal Flood Hazard Studies."
8. Department of Mathematical Sciences, Durham University, Durham, UK, Online, Jan 2021. Title: "Kriging: Beyond Matérn."
9. School of Engineering, The University of Melbourne, Online, Dec 2020. Title: "Multifidelity Computer Model Emulation with High-Dimensional Output: An Application to Storm Surge."
10. Jet Propulsion Laboratory, Online, Aug 2020. Title: "Efficient Surrogate Modeling for Uncertainty Quantification in Assessment of Remote Sensing Retrievals and Storm Surges."
11. Department of Statistics, Virginia Tech, Blacksburg, VA, Jan 2020. Title: "Kriging: Beyond Matérn."
12. Department of Statistics, University of Wisconsin-Madison, Madison, WI, Jan 2020. Title: "Kriging: Beyond Matérn."
13. School of Mathematical and Statistical Sciences, Arizona State University, AZ, Jan 2020. Title: "Kriging: Beyond Matérn."
14. IMAGe Brown Bag Seminar, National Center for Atmospheric Research, Boulder, CO, June 2016; Title: "Semiparametric Inference via Sparsity-Induced Kriging for Massive Spatial Data."

Conference/Workshop Presentations

Invited Presentations

1. Invited Talk, "Uncertainty Quantification in Assessing Storm Surge Hazards," Joint Statistical Meetings, Online, 2021.
2. Invited Talk, "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.
3. Invited Talk, "Multifidelity Computer Model Emulation with High-Dimensional Output: An Application to Storm Surge," Data Science, Statistics & Visualization 2020, Online, July 2020.

4. Invited Talk, "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.
5. Invited Talk, "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.
6. Invited Talk, "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.
7. Invited Talk, "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.
8. Invited Talk, "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.
9. Invited Lecture, "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.
10. Invited Poster, "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.
11. Invited Talk, "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.

Contributed Presentations

12. Contributed Talk, "Multifidelity Computer Model Emulation with High-Dimensional Output: An Application to Storm Surge," ISBA 2021, Online, 2021
13. Contributed Talk, "Kriging: Beyond Matérn," Joint Statistical Meetings, Online, Aug 2020.
14. Contributed Talk, "Multifidelity Computer Model Emulation with High-Dimensional Output: An Application to Storm Surge," Joint Statistical Meetings, Denver, CO, Aug 2019.
15. Poster Session, "Computer Model Emulation with High-Dimensional Functional Output in Large-Scale Observing System Uncertainty Experiments," WuFest: A Conference on Engineering Statistics and Related Topics, Atlanta, GA, May 2019.
16. Poster Session, "Spatial Statistical Downscaling for Constructing High-Resolution Nature Runs in Global Observing System Simulation Experiments," The 2019 Spring Research Conference (SRC), Blacksburg, VA, May 2019.
17. Poster Session, "Low-Cost Bayesian Inference for Additive Approximate Gaussian Process," Joint Statistical Meetings, Baltimore, MD, Aug 2017.
18. Poster Session, "Low-Cost Bayesian Inference for Additive Approximate Gaussian Process," Workshop on Statistical Perspectives of Uncertainty Quantification, Atlanta, GA, May 2017.
19. Contributed Talk, "A Class of Nonseparable and Nonstationary Covariance Functions for Multi-output Gaussian Process," The 10th ICSA International Conference, Shanghai Jiao Tong University, Shanghai, China, Dec 2016.
20. Contributed Talk, "Semiparametric Inference via Sparsity-Induced Kriging for Massive Spatial Data," Joint Statistical Meetings, Chicago, IL, July 2016.

21. Contributed Talk, "Semiparametric Inference via Sparsity-Induced Kriging for Massive Spatial Data," The 2016 ICSA Applied Statistics Symposium, Atlanta, GA, June 2016.
22. Contributed Talk, "Conditional Simulation for Downscaling Very Large Spatial Data," Joint Statistical Meetings, Seattle, WA, Aug 2015.

Teaching and Mentoring Experience

Clemson University, Clemson, SC

- *Instructor*, STAT 3090 - Introductory Business Statistics, Section 007 Fall 2021

North Carolina State University, Raleigh, NC

- *Co-mentor* a Ph.D. student in Statistics with Prof. Brian Reich with dissertation topic on spatial extremes. Aug 2019 - Aug 2020

SAMSI Education and Outreach Programs and Workshops, Durham, NC

- Undergraduate Modeling Workshop May 16-May 18, 2020
  Project leader, Designed and led a three-day project for undergraduates on "Statistical Learning for Tropical Cyclones with Historical Storm Data".
- The 25th Industrial Mathematical and Statistical Modeling Workshop July 14 - 25, 2019
  Faculty mentor, Served as faculty mentor to help graduate students work on the project titled "Analysis and Visualization of Continuous Glucose Monitoring Data".
- Undergraduate Modeling Workshop May 28-June 2, 2019
  Project leader, Designed and led a week-long project for undergraduates on "Predictive Modeling for Tropical Cyclones with Historical Storm Data".
- The Story of Data Science and Machine Learning Workshop Mar 2019
  Mentor, Hands-on session on R.
- 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
  Full responsibility for the class with 35 students.
- *Teaching Assistant*, MATH 1062 - Calculus II section 010 and 011 Spring 2014
  Recitation leader with responsibilities: Grading tests, preparing and giving lectures.
- *Teaching Assistant*, MATH 1061 - Calculus I section 012 and 021 Fall 2013
  Recitation leader with responsibilities: Grading tests, preparing and giving lectures.

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

Professional Service

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

Academic Service

- 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
- Faculty mentor, The 25th Industrial Mathematical and Statistical Modeling Workshop, North Carolina State University, NC, July 2019
- 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, Aug 2017

Referee Service: (excluding revisions)

- Annals of Applied Statistics (3).
- Bayesian Analysis (4);
- Computational Statistics (1);
- Econometrics and Statistics (1);
- Electronic Journal of Statistics (1);
- Environmetrics (2);
- Journal of Agricultural, Biological, and Environmental Statistics (1);
- Journal of Computational and Graphical Statistics (2);
- Journal of the American Statistical Association, Theory and Methods (1);
- Journal of the American Statistical Association, Applications and Case Studies (1);
- Journal of the Royal Statistical Society: Series A (1);
- PLoS ONE (1);
- SIAM/ASA Journal on Uncertainty Quantification (1);
- Statistical Analysis and Data Mining (1);
- Statistics and Public Policy (1);
- Statistica Sinica (1);
- Statistics Surveys (1);

Computing Skills

Programming languages: R, MATLAB, C, C++, Julia, Python

Software & platform: SAS, Linux, Unix, LaTeX

Last updated: August 01, 2021