Bingkai Wang

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Research Interests

- Causal inference
  - Causal machine learning
  - Robustness to model misspecification
  - Complex designs of randomized trials
  - Heterogeneous treatment effect
  - Test-negative designs for infectious diseases
- Array data modeling and analysis
  - Functional brain imaging with application to Alzheimer's disease research

Education

- Ph.D. in Biostatistics, Johns Hopkins University, Sep. 2016 – Mar. 2021
  Advisors: Michael Rosenblum and Brian Caffo.
  Thesis: Statistical Methods for Analyzing Randomized Trials and Brain Imaging data
- B.S. in Mathematics, Fudan University, China, Sep. 2012 – May. 2016
  Advisor: Shuqin Zhang.

Professional Experiences

- Postdoctoral Researcher, Statistics and Data Science Department of the Wharton School, University of Pennsylvania, April 2021 – present.
  Mentors: Dylan Small and Nicholas Jewell.
- Summer Internship, Statistical Methodology & Consulting Group, Novartis, 2018.

Honors and Awards

- Election to membership of the Phi Beta Kappa Society (honor for excellence in scholarship), 2021.
- Best student paper runner-up, ASA Biopharmaceutical Section, 2021.
- Margaret Merrell Award (awarded to one doctoral student per year for outstanding research), Johns Hopkins University Department of Biostatistics, 2021.
- Distinguished student paper award, ENAR International Biometric Society, 2021.
- Student paper award, the Statistical Meeting in Imaging, 2020.

- Center of Excellence in Regulatory Science and Innovation (CERSI) Scholarship, U.S. Food and Drug Administration and Johns Hopkins University, 2017-2021.
- Shanghai outstanding undergraduate student (for top 1% senior-year undergraduate students), 2016.
- Fudan University undergraduate research fellowship, 2015-2016.
- National Scholarship (for top 1% undergraduate students in China per year), 2014-2015.
- Shanghai Scholarship (for top 5% undergraduate students in Shanghai), 2013.

Publications

Statistical methodology

1. Yi Zhao, **Bingkai Wang**, Chin-Fu Liu, Andreia V. Faria, Michael I. Miller, Brian S. Caffo, and Xi Luo. (2022). "Identifying brain hierarchical structures associated with Alzheimer's disease using a regularized regression method with tree predictors." *Biometrics*, in press.

2. **Bingkai Wang**, Suzanne M. Dufault, Dylan S. Small, and Nicholas P. Jewell. (2022). "Randomization Inference for Cluster-Randomized Test-Negative Designs with Application to Dengue Studies: Unbiased estimation, Partial compliance, and Stepped-wedge design." *Annals of Applied Statistics*, 17(2): 1592-1614.

3. **Bingkai Wang**, Brian S. Caffo, Xi Luo, Chin-Fu Liu, Andreia V. Faria, Michael I. Miller, and Yi Zhao. (2022). "Regularized regression on compositional trees with application to MRI analysis." *Journal of the Royal Statistical Society: Series C (Applied statistics)*, 71(3): 541-561.

4. **Bingkai Wang**, Ryoko Susukida, Ramin Mojtabai, Masoumeh Amin-Esmaeili, and Michael Rosenblum. (2021). "Model-Robust Inference for Clinical Trials that Improve Precision by Stratified Randomization and Adjustment for Additional Baseline Variables." *Journal of American Statistical Association: Theory and Methods*, in press.
    - cited by the FDA in their 2023 Guidance for Industry: "Adjusting for Covariates in Randomized Clinical Trials for Drugs and Biologics."

5. Yi Zhao, Brian Caffo, **Bingkai Wang**, R. Li Chiang-shan, and Xi Luo. (2021). "A Whole-Brain Regression Method to Identify Individual and Group Variations in Functional Connectivity." *Brain and Behavior*, 11(1): e01942.

6. **Bingkai Wang**, Xi Luo, Yi Zhao, and Brian Caffo. (2021). "Semiparametric Partial Common Principal Component Analysis for Covariance Matrices." *Biometrics*, 77(4): 1175-1186.

7. Yi Zhao, **Bingkai Wang**, Stewart Mostofsky, Brian Caffo, and Xi Luo. (2019). "Covariate Assisted principal regression for covariance matrix outcomes." *Biostatistics*, 22(3): 629–645.

8. **Bingkai Wang,** Elizabeth L. Ogburn, and Michael Rosenblum. (2019). "Analysis of covariance in randomized trials: More precision and valid confidence intervals, without model assumptions" with discussion. *Biometrics*, 75(4): 1391-1400.

Scientific collaboration

9. Mohamad Dbouk, Malorie Simons, **Bingkai Wang**, Michael Rosenblum, Olaya I. Brewer Gutierrez, Eun J. Shin, Saowanee Ngamruengphong, Lysandra Voltaggio, Elizabeth Montgomery, and Marcia Irene Canto. (2022). "Durability of Cryoballoon Ablation in Neoplastic Barrett's Esophagus." *Techniques and Innovations in Gastrointestinal Endoscopy*, 24(2): 136-144.

10. Canto, M.I., Trindade, A.J., Abrams, J., Rosenblum, M., Dumot, J., Corbett, F.S., Diehl, D., Chak, A., Khara, H., McKinley, M. Shin, E.J., Waxman, I., Infantolino, A., Tofani, C., Samarasena, J., Chang, K., **Wang, B**., Goldblum, J., Voltaggio, L., Montgomery, E., Lightdale, C.J., Shaheen, N.J. Multifocal Cryoballoon. (2020). "Ablation for Eradication of Barrett's Esophagus-Related Neoplasia: A Prospective Multicenter Clinical Trial." *American Journal of Gastroenterology*, 15(11): 1879-1890.

11. Paniz Charkhchi, **Bingkai Wang**, Brian Caffo, and David M. Yousem. (2019). "Bias in Neuroradiology Peer Review: Impact of a 'Ding' on 'Dinging' Others." *American Journal of Neuroradiology*, 40(1): 19-24.

Invited commentary

12. **Bingkai Wang**, Ryoko Susukida, Ramin Mojtabai, Masoumeh Amin-Esmaeili, and Michael Rosenblum. (2021). "Comment: Inference after covariate-adaptive randomization: aspects of methodology and theory." *Statistical Theory and Related Fields*, 5(3): 187-189.

13. Michael Rosenblum and **Bingkai Wang**. (2019). "The Critical Role of Statistical Analyses in Maximizing Power Gains from Covariate-Adaptive Trial Designs." *JAMA Network Open*, 2(4): e190789-e190789.

Submitted manuscripts

14. Kan Chen, **Bingkai Wang**, Dylan Small. (2023). "A Differential Effect Approach to Partial Identification of Treatment Effects." arXiv: 2303.06332. Under review.

15. **Bingkai Wang**, Chan Park, Dylan Small, and Fan Li. (2022). "Model-robust and efficient inference for cluster-randomized experiments." arXiv:2210.07324. Under review.

16. **Bingkai Wang**, Michael O. Harhay, Dylan S. Small, Tim P. Morris, and Fan Li. (2021). "On the robustness and precision of mixed-model analysis of covariance in cluster-randomized trials." arXiv:2112.00832. Under review.

17. **Bingkai Wang**, and Yu Du. (2021). "Robustly leveraging post-randomization information to improve precision in randomized trials." arXiv:2110.09645. Under review.

Grant

- **1K99AI173395-01 (PI: Bingkai Wang)**
  05/01/2023-04/30/2026
  Title: Improving the design and statistical analysis of cluster-randomized trials on tropical infectious diseases.
  Role: Principal Investigator

Presentations

Invited talks

Model-robust and efficient inference for cluster-randomized experiments.

- *Society for Clinical Trials Annual Meeting,* May 2023

Randomization Inference for Cluster-Randomized Test-Negative Designs with Application to Dengue Studies

- *Scientific meeting of the World Mosquito Program,* February 2022

Model-Robust Inference for Clinical Trials that Improve Precision by Stratified Randomization and Covariate adjustment.

- *ICSA Applied Statistics Symposium,* September 2021
- *Novartis Statistics Seminar,* September 2021
- *JSM,* August 2021
- *Johns Hopkins University Biostatistics Departmental Seminar,* September 2020
- *Data harmonization Initiative at Johns Hopkins School of Public Health,* August 2020

Semiparametric Partial Common Principal Component Analysis for Covariance Matrices.

- *Statistical Meeting in Imaging,* May 2020

Contributed presentations

Model-robust and efficient inference for cluster-randomized experiments.

- *American Causal Inference Conference,* May 2023 (Poster)

Randomization Inference for Cluster-Randomized Test-Negative Designs with Application to Dengue Studies

- *American Causal Inference Conference,* May 2022 (Poster)

On the mixed-model analysis of covariance in cluster-randomized trials

- *Society of Clinical Trials Annual Meeting,* May 2022

Robustly leveraging post-randomization information to improve precision in randomized trials

- *Center for causal inference at University of Pennsylvania*, December 2021

Model-Robust Inference for Clinical Trials that Improve Precision by Stratified Randomization and Covariate adjustment.

- *JSM*, August 2020
- *ENAR*, March 2020

Clarifying how adjustment for prognostic baseline variables leads to more precision and less bias in randomized trials.

- *JSM*, August 2019
- *ENAR*, March 2018
- *JSM*, August 2017

Session Organizer

Using machine learning to analyze randomized trials: valid estimates and confidence intervals without model assumptions

- *ENAR*, March 2020

Trial Design and Analysis Methods for COVID-19 Treatment/Prevention

- *JSM*, August 2021
- *ENAR*, March 2021

R software

- CovariateAdjustment: covariate adjustment for randomized trials.
- Semi-parametric-PCPCA: Semiparametric partial common principal component analysis.
- compositional-hierarchical-tree-regression: Regularized regression on compositional trees.
- covariate-adaptive: model-robust inference for clinical trials using stratified randomization and covariate adjustment.
- CR-TND: randomization inference for cluster-randomized test-negative designs.

Reviewer

- *Journal of the American Statistical Association (2)*
- *The International Journal of Biostatistics (2)*
- *Biostatistics (1)*
- *Statistics in Medicine (4)*
- *Biometrics (2)*
- *Annals of Applied Statistics (2)*
- *Journal of the Royal Statistical Society: Series C (1)*
- *Observational Studies (1)*
- *Applied Science (1)*
- *National Science Foundation (1)*
- *Biometrical journal (1)*

Teaching Experience

- Lead teaching assistant, Statistical Methods in Public Health, 2020
- Teaching assistant, Statistical Methods in Public Health, 2018-2020
- Teaching assistant and guest lecturer, Advanced Data Science I-II, 2018
- Teaching assistant and guest lecturer, Statistical Theory I-IV, 2017-2018

Student Advising

- Advisee: Yang Dong, undergraduate student at University of Pennsylvania, 2021 – present (co-advised with Professor Dylan Small)
  Projects: R package for randomization inference in cluster-randomized trials; Predicting survival rate of cerebral malaria with pulse wave data; covariate-adaptive randomization for cluster-randomized trials