Bingkai Wang

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Research Interest

Clinical trials
Covariate adjustment, cluster randomized trials, robustness to model misspecification, covariate-adaptive designs, data integration

Causal inference
Causal machine learning, test-negative designs for vaccine efficacy, conformal causal inference

Array data analysis
Matrix regression, multi-modal data modeling, brain imaging

Position

Assistant Professor *May 2024 - Present*
Department of Biostatistics, School of Public Health, University of Michigan
Faculty member at the Michigan Institute for data & AI in Society (MIDAS), Institute for Health Policy & Innovation (IHPI), and Center for Global Health and Equity.

Postdoctoral researcher *April 2021 - April 2024*
Department of Statistics and Data Science, Wharton School, University of Pennsylvania
Mentors: Dylan Small and Nicholas Jewell

Education

Ph.D. in Biostatistics *Aug 2016 - Mar 2021*
Bloomberg School of Public Health, Johns Hopkins University
Advisors: Michael Rosenblum and Brian Caffo

B.S. in Mathematics *Sep 2012 - May 2016*
Fudan University
Advisor: Shuqin Zhang

Grant

NIH NIAID K99/R00 AI173395 *05/01/2023-05/31/2026*
Improving the design and statistical analysis of cluster-randomized trials on tropical infectious diseases
Role: Principal Investigator

Award

Institute of Mathematical Statistics (IMS) New Researcher Travel Award, 2024

Phi Beta Kappa Society (honor for excellence in scholarship), 2021

Student paper award, 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.

Publication

Statistical methodology

1 **Bingkai Wang** and Yu Du. "Improving the mixed model for repeated measures to robustly increase precision in randomized trials". In: *The International Journal of Biostatistics* 20.2 (2024), pp. 585–598.

2 **Bingkai Wang**, Michael O Harhay, Jiaqi Tong, Dylan S Small, Tim P Morris, and Fan Li. "On the mixed-model analysis of covariance in cluster-randomized trials". In: *Statistical Science* (2024), in press.

3 **Bingkai Wang**, Chan Park, Dylan S Small, and Fan Li. "Model-robust and efficient covariate adjustment for cluster-randomized experiments". In: *Journal of the American Statistical Association* (2024), pp. 1–13.

4 **Bingkai Wang**, Xueqi Wang, and Fan Li. "How to achieve model-robust inference in stepped wedge trials with model-based methods?" In: *Biometrics* 80.4 (2024), ujae123.

5 **Bingkai Wang**, Suzanne M Dufault, Dylan S Small, and Nicholas P Jewell. "Randomization inference for cluster-randomized test-negative designs with application to Dengue studies: Unbiased estimation, partial compliance, and stepped-wedge design". In: *The Annals of Applied Statistics* 17.2 (2023), pp. 1592–1614.

6 **Bingkai Wang**, Ryoko Susukida, Ramin Mojtabai, Masoumeh Amin-Esmaeili, and Michael Rosenblum. "Model-robust inference for clinical trials that improve precision by stratified randomization and covariate adjustment". In: *Journal of the American Statistical Association* 118.542 (2023). pp. 1152–1163. **Cited by the FDA Guidance for Industry on covariate adjustment in 2023**. URL: `https://www.fda.gov/media/148910/download`.

7 Yi Zhao, **Bingkai Wang**, Chin-Fu Liu, Andreia V Faria, Michael I Miller, Brian S Caffo, and Xi Luo. "Identifying brain hierarchical structures associated with Alzheimer's disease using a regularized regression method with tree predictors". In: *Biometrics* 79.3 (2023), pp. 2333–2345.

8 **Bingkai Wang**, Brian S Caffo, Xi Luo, Chin-Fu Liu, Andreia V Faria, Michael I Miller, and Yi Zhao. "Regularized regression on compositional trees with application to MRI analysis". In: *Journal of the Royal Statistical Society Series C: Applied Statistics* 71.3 (2022), pp. 541–561.

9 **Bingkai Wang**, Xi Luo, Yi Zhao, and Brian Caffo. "Semiparametric partial common principal component analysis for covariance matrices". In: *Biometrics* 77.4 (2021), pp. 1175–1186.

10 Yi Zhao, Brian S Caffo, **Bingkai Wang**, Chiang-Shan R Li, and Xi Luo. "A whole-brain modeling approach to identify individual and group variations in functional connectivity". In: *Brain and behavior* 11.1 (2021), e01942.

11 Yi Zhao, **Bingkai Wang**, Stewart H Mostofsky, Brian S Caffo, and Xi Luo. "Covariate assisted principal regression for covariance matrix outcomes". In: *Biostatistics* 22.3 (2021), pp. 629–645.

12 **Bingkai Wang**, Elizabeth L Ogburn, and Michael Rosenblum. "Analysis of covariance in randomized trials: More precision and valid confidence intervals, without model assumptions". In: *Biometrics* 75.4 (2019), pp. 1391–1400.

Scientific collaboration

13 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. "Durability of cryoballoon ablation in neoplastic Barrett's esophagus". In: *Techniques and Innovations in Gastrointestinal Endoscopy* 24.2 (2022), pp. 136–144.

14 Marcia Irene Canto, Arvind J Trindade, Julian Abrams, Michael Rosenblum, John Dumot, Amitabh Chak, Prasad Iyer, David Diehl, Harshit S Khara, F Scott Corbett, Matthew McKinley, Eun Ji Shin, Irving Waxman, Anthony Infantolino, Christina Tofani, Jason Samarasena, Kenneth Chang, **Bingkai Wang**, John Goldblum, Lysandra Voltaggio, Elizabeth Montgomery, Charles Lightdale, and Nicholas Shaheen. "Multifocal cryoballoon ablation for eradication of Barrett's esophagus-related neoplasia: a prospective multicenter clinical trial". In: *The American Journal of Gastroenterology* 115.11 (2020), pp. 1879–1890.

15 Paniz Charkhchi, **Bingkai Wang**, Brian Caffo, and David M Yousem. "Bias in neuroradiology peer review: Impact of a "ding" on "dinging" others". In: *American Journal of Neuroradiology* 40.1 (2019), pp. 19–24.

Comments, Statistical Guides, and Others

16 Fan Li, **Bingkai Wang**, and Patrick J Heagerty. "What Is a Stepped-Wedge Cluster Randomized Trial?" In: *JAMA Internal Medicine* (2025).

17 **Bingkai Wang**, Ryoko Susukida, Ramin Mojtabai, Masoumeh Amin-Esmaeili, and Michael Rosenblum. "Comment: Inference after covariate-adaptive randomisation: aspects of methodology and theory". In: *Statistical Theory and Related Fields* 5.3 (2021), pp. 190–191.

18 Michael Rosenblum and **Bingkai Wang**. "The Critical Role of Statistical Analyses in Maximizing Power Gains From Covariate-Adaptive Trial Designs". In: *JAMA Network Open* 2.4 (2019), e190789–e190789.

19 **Bingkai Wang**, Elizabeth L. Ogburn, and Michael Rosenblum. "Rejoinder to "Robustness of ANCOVA in Randomized Trials with Unequal Randomization" by Jonathan W. Bartlett". In: *Biometrics* 76.3 (Dec. 2019), pp. 1039–1039.

Manuscripts

1 Xi Fang, **Bingkai Wang**, Liangyuan Hu, and Fan Li. "Estimands and doubly robust estimation for cluster-randomized trials with survival outcomes". In: *Submitted* (2025).

2 Fan Li, Jiaqi Tong, Chao Cheng, Xi Fang, Brennan Kahan, and **Bingkai Wang**. "Model-robust standardization in cluster-randomized trials". In: *Submitted* (2025).

3 **Bingkai Wang** and Fan Li. "Asymptotic inference with flexible covariate adjustment under rerandomization and stratified rerandomization". In: *arXiv preprint arXiv:2406.02834* (2024).

4 **Bingkai Wang**, Fan Li, and Rui Wang. "Handling incomplete outcomes and covariates in cluster-randomized trials: doubly-robust estimation, efficiency considerations, and sensitivity analysis". In: *arXiv preprint arXiv:2401.11278* (2024).

5 **Bingkai Wang**, Fan Li, and Mengxin Yu. "Conformal causal inference for cluster randomized trials: model-robust inference without asymptotic approximations". In: *arXiv preprint arXiv:2401.01977* (2024).

6 Kan Chen, **Bingkai Wang**, and Dylan S Small. "A differential effect approach to partial identification of treatment effects". In: *arXiv preprint arXiv:2303.06332* (2023).

7 Mengxin Yu, Kendrick Qijun Li, Nicholas Jewell, Eric Tchetgen Tchetgen, Dylan Small, Xu Shi, and **Bingkai Wang**. "Test-negative designs with various reasons for testing: statistical bias and solution". In: *arXiv preprint arXiv:2312.03967* (2023).

Invited Talk

Flexible covariate adjustment in rerandomization

Statistical Issues in Clinical Trials (SICT) UPenn Conference — April 2025
IISA Conference — June 2025
JSM — Aug 2025

Test-negative designs with various reasons for testing: statistical bias and solution

ENAR — Mar 2025

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

CFE-CMStatistics — Dec 2024

Model-robust and efficient inference for cluster-randomized experiments

Pacific Causal Inference Conference — Jul 2024
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 — Feb 2022

Model-robust inference for clinical trials that improve precision by stratified randomization and covariate adjustment

JSM — Aug 2024

ICSA Applied Statistics Symposium — Jun 2024
Society for Clinical Trials Annual Meeting — May 2024
ICSA Applied Statistics Symposium — Sep 2021
Novartis Statistics Seminar — Sep 2021
JSM — Aug 2021
Johns Hopkins University, Biostatistics Departmental Seminar — Sep 2020
Johns Hopkins University, Data harmonization Initiative — Aug 2020

Teaching

Instructor
UMich Biostat 619: Clinical Trials — Fall 2024, Fall 2025

Mentoring

Hanna Venera, co-advised PhD student with Dr. Kelley Kidwell, UMich — 2025-present
Tom Liu, PhD student, UMich — 2024-present
Liangbo Lyu, co-advised PhD student with Dr. Donglin Zeng, UMich — 2024-present
Yueyan Meng, Master student, UMich — 2024

Professional Service

Journal reviewer

Journal of the American Statistical Association (5), Journal of the Royal Statistical Society: Series B (1), Biometrika (2), Biostatistics (1), Biometrics (3), Statistics in Medicine (8), Annals of Applied Statistics (3), Observational Studies (2), Biometrical Journal (1), Clinical Trials (1), The International Journal of Biostatistics (2), Journal of the Royal Statistical Society: Series C (1), BMC Medical Research Methodology (2), Statistics in Biopharmaceutical Research (1), Applied Science (1), Pharmaceutical Statistics (1), Nature Cardiovascular Research (1)

Grant reviewer

NSF Methodology, Measurement, and Statistics Program — 2022
PCORI Methods — 2024

Leadership

Co-leader of the ASA-BIOP Covariate Adjustment Scientific Working Group — 2024-present

Internal service

UM Biostat Seminar & Brown Bag Committee — Sep 2024-May 2026