Ruoqing Zhu — Curriculum Vitae

Contact Information

605 E. Springfield Ave. 137 CAB
Champaign, IL, 61820, U.S.A.
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Education

Ph.D., Biostatistics, 2008 - 2013
The University of North Carolina at Chapel Hill, Chapel Hill, NC

M.A., Statistics, 2006 - 2008
Bowling Green State University, Bowling Green, OH

B.S., Mathematics, 2002 - 2006
Nanjing University, Nanjing, China

B.S., Financial Engineering, 2003 - 2005
Nanjing University, Nanjing, China

Professional Experience

Associate Professor, Department of Statistics, 2022 -
University of Illinois Urbana-Champaign, Champaign, IL

Affiliate, National Center for Supercomputing Applications, 2018 -
University of Illinois Urbana-Champaign, Champaign, IL

Course Associate Director, Carle Illinois College of Medicine, 2017 -
University of Illinois Urbana-Champaign, Champaign, IL

Affiliate, Carl R. Woese Institute for Genomic Biology, 2016 -
University of Illinois Urbana-Champaign, Champaign, IL

Assistant Professor, Department of Statistics, 2015 - 2022
University of Illinois Urbana-Champaign, Champaign, IL

Postdoctoral Associate, Biostatistics, 2013 - 2015
Yale University, New Haven, CT

Research Interests

Personalized Medicine; Reinforcement Learning; Random Forests; Survival Analysis; Sufficient Dimension Reduction.
Infectious Diseases, Food and Nutrition, Cancer Genomics/Genetics.

Honors and Awards

NCSA Faculty Fellowship Award ($25,000), UIUC 2020-2021
NCSA Faculty Fellowship Award ($25,000), UIUC 2018-2019
Teachers Ranked as Excellent, UIUC, Spring 2018, Spring 2022

Grants

Title: Point of Care Device for Reducing Overuse of Antibiotics in Potentially Septic Hospital Populations (1R43CK000521-01)
Agent: Centers for Disease Control and Prevention, SBIR; Date: 09/01/2017 – 02/28/2018
Role: Co-Investigator; PI Bobby Reddy; Amount: $150,000

Title: OmiX Development: A Visual Analytics Platform for Multi-Omic Microbiome Data
Agent: NCSA; Date 6/2018 – 5/2019
Role: PI; Amount: $30,000

Title: Parsimonious Personalized Dose Finding Models for Precision Medicine
Agent: UIUC Campus Research Board; Date: 2019-2020
Role: PI; Amount: $10,093

Title: Science Support for Laboratory of Infectious Disease (LID)
Agent: NIAID, NIH; Date: 9/28/18 – 9/27/19
Role: Co-Investigator; PI: Colleen Bushell, Amount: $123,496

Title: Machine Learning Approaches for Quantifying and Visualizing Dietary Effect in Personalized Nutrition
Agent: NCSA; Date: 07/2020 – 6/2021
Role: PI; Amount: $30,000

Title: Science Support for Laboratory of Infectious Disease (LID)
Agent: NIAID, NIH; Date: 09/28/2019 – 09/27/2020
Role: Co-Investigator; PI: Colleen Bushell, Amount: $160,000

Title: Precision immunoprofiling to reveal diagnostic biomarkers of latent TB infection
Agent: NIH (Sub-award grant from University of Michigan); Date: 07/01/2019 –06/30/2024
Role: Co-Investigator; PI: Ryan Bailey; Amount (UIUC site): $459,724

Title: Science Support for Laboratory of Infectious Disease (LID)
Agent: NIAID, NIH; Date: 09/29/2020 – 09/28/2021
Role: Co-Investigator; PI: Colleen Bushell; Amount: $294,018

Title: Collaborative Platform for Developing Sepsis Products by Leveraging sepsis Endotypes Developed Using a Unified Biomarker-Clinical Dataset (R44GM139529)
Agent: Department of Health and Human Services, SBIR; Date: 09/05/2020 – 07/31/2022
Role: Co-Investigator; PI: Bobby Reddy; Amount: $1,979,045

Title: Collaborative Research: Integrative Heterogeneous Learning for Intensive Complex Longitudinal Data (#2210657)
Agent: DMS; Date: 08/01/2022 - 07/31/2025
Role: PI; Amount: $120,000

PUBLICATIONS /
PREPRINTS

† indicates trainee at UIUC
* indicates equal contribution
For more information, please see **G**oogle Scholar

Statistical Method & Theory:

In Revision/Submitted/Manuscript:

Cui, Y.*, Kosorok, M. R.*, Sverdrup, E.*, Wager, S.*, and **Zhu, R.***. "Estimating Heterogeneous Treatment Effects with Right-censored Data via Causal Survival Forests." arXiv:2001.09887.

Zhou, W.†, **Zhu, R.**, and Qu, A.. "Solving Infinite Horizon Dynamic Treatment Regimes: A Proximal Temporal Consistency Learning Approach." arXiv:2110.10719.

Xu, T.†, Shao, X., and **Zhu, R.**. "On Variance Estimation of Random Forests." arXiv:2202.09008.

Formentini, S. E.†, Liang, W., and **Zhu, R.**. "Confidence Band Estimation of Random Survival Forests." arXiv:2204.12038.

Qiu, R., Yu, Z., and **Zhu, R.**. "Random Forests Weighted Local Fréchet Regression with Theoretical Guarantee." arXiv:2202.04912.

Chen, Y., Xu, T.[†], Hakkani-Tur, D., Jin, D., Yang, Y., and **Zhu, R.** (2022). "Calibrate and Debias Layer-wise Sampling for Graph Convolutional Networks." arXiv:2206.00583

Zhou, H.[†], **Zhu, R.**, Ung, A., and Schatz, B.. "Sensor Analysis of Walking Intensity Predicts Mortality in UK BioBank."

Cao, X., Li, H., **Zhu, R.**, and Folta, T.. "Analyzing the Online Word of Mouth Dynamics: A Novel Approach."

Published/Accepted:

Loyal, J. D.[†], **Zhu, R.**, Cui, Y., and Zhang, X. (2021+). "Dimension Reduction Forests: Local Variable Importance using Structured Random Forests." arXiv:2103.13233. *JCGS*, Accepted.

Li, Y.[†], **Zhu, R.**, Yeh, M., and Qu, A. (2021+). "Dermoscopic Image Classification with Neural Style Transfer." arXiv:2105.07592. *JCGS*, Accepted.

Li, K., Yao, S., Zhang, Z., Cao, B., Wilson, C., Kuan, P. F., **Zhu, R.**, and Wang, X. (2021+). "Efficient gradient boosting for prognostic biomarker discovery." *Bioinformatics*, 38(6), 1631-1638.

Guo, B.[†], Holscher, H. D., Auvil, L. S., Welge, M. E., Bushell, C. B., Novotny, J. A., Baer, D. J., Burd, N. A., Khan, N. A., and **Zhu, R.** (2021). "Estimating Heterogeneous Treatment Effect on Multivariate Responses Using Random Forests." *Statistics in Biosciences*, Accepted.

Zhou, W.[†], **Zhu, R.** and Zeng, D. (2021). "A Parsimonious Personalized Dose Finding Model via Dimension Reduction." *Biometrika*, 108(3), 643-659.

Li, Y.[†], **Zhu, R.**, Qu, A., Ye, H., and Sun, Z. (2021). "Topic Modeling on Triage Notes With Semiorthogonal Nonnegative Matrix Factorization." *Journal of the American Statistical Association A&C*, 116(536), 1609-1624.

Cui, Y., **Zhu, R.**, Zhou, M., and Kosorok, M. (2021). "Consistency of survival tree and forest models: splitting bias and correction." *Statistica Sinica*, Accepted.

Zhao, Y-Q., **Zhu, R.**, Chen, G., and Zheng Y. (2020). "Constructing Dynamic Treatment Regimes with Shared Parameters for Censored Data." *Statistics in Medicine*, 39(9), 1250-1263.

Zhu, R., Zhang, J., Zhao, R., Xu, P., Zhou, W., and Zhang, X. (2019). "orthoDr: Semiparametric Dimension Reduction via Orthogonality Constrained Optimization." *The R Journal*, 11(2), 24-37.

Feng, Z., Lin, L., **Zhu, R.**, and Zhu, L. (2019). "Nonparametric variable selection and its application to additive models." *Annals of the Institute of Statistical Mathematics*, 72(3), 827-854.

Mi, X., **Zhu, R.**, and Zou, F. (2019). "Bagging and Deep Learning in Optimal Individualized Treatment Rules." *Biometrics*, 75(2), 674-684.

Sun, Q.[*], **Zhu, R.**[*], Wang, T., and Zeng, D. (2019). "Counting Process Based Dimension Reduction Method for Censored Outcomes." *Biometrika*, 106(1), 181-196.

Cui, Y., **Zhu, R.**, and Kosorok, M. R. (2017). "Tree based weighted learning for estimating individualized treatment rules with censored data." *Electronic Journal of Statistics*, 11(2), 3927–3953.

Zhu, R., Zhao, Y., Chen, G., Ma, S., and Zhao H. (2016). "Greedy Outcome Weighted Tree Learning of Optimal Personalized Treatment Rules." *Biometrics*, 73(2), 391–400.

Zhu, R., Zhao, Q., Zhao, H., and Ma, S. (2016). "Integrating Multidimensional Omics Data for Cancer Outcome." *Biostatistics*, 17(4), 605-18.

Zhu, R., Zeng, D., and Kosorok, M. R. (2015)."Reinforcement Learning Trees." *Journal of the American Statistical Association*, 110 (512), 1770-1784.

Zhu, R., Zhao, H., and Ma, S. (2014). "Identifying Gene-Environment and Gene-Gene Interactions Using a Progressive Penalization Approach." *Genetic epidemiology*, 38(4), 353-368.

Zhu, R., and Kosorok, M. R. (2012). "Recursively imputed survival trees." *Journal of the American Statistical Association*, 107(497), 331-340.

Zhu, L., **Zhu, R.**, and Song, S. (2008). "Diagnostic checking for multivariate regression models." *Journal of Multivariate Analysis*, 99(9), 1841-1859.

Book Chapters:

Formentini, S.[†], Cui, Y., and **Zhu, R.** (2021+) "Random Forests for Survival Analysis and High-Dimensional Data." Springer Handbook of Engineering Statistics, 2nd ed. Editor: Hoang Pham. Springer London

Zhou, W.[†*], Li, Y.[†*], and **Zhu, R.** (2021+) "Optimal Policy Learning for Individualized Treatment on Infinite Time Horizon." (invited book chapter) Precision Medicine: Methods and Applications. Editor: Yichuan Zhao. Springer London

Collaborative Research:

Shinn, L. M.[†], Mansharamani, A., ..., **Zhu, R.** and Holscher, H. D. (2022). Fecal Metabolites as Biomarkers for Predicting Food Intake By Healthy Adults. The Journal of Nutrition.

D'Agnillo, F., Walters, K., ..., **Zhu, R.**, ..., and Taubenberger J. (2021). "Pulmonary epithelial and endothelial cell damage, loss of repair, inhibition of fibrinolysis, and cellular senescence in fatal COVID-19". *Science Translational Medicine*, 13(620), eabj7790.

Robison, H., Chapman, C. A., Zhou, H.[†], ..., **Zhu, R.**, Bailey, R., and Escalante, P. (2021). "Risk assessment of latent tuberculosis infection through a multiplexed cytokine biosensor assay and machine learning feature selection". *Scientific Reports*, 11(1), pp.1-10.

Taneja, I., Damhorst, G. L., Lopez-Espina, C., Zhao, S. D., **Zhu, R.**, Khan, S., ..., and Bashir, R. (2021). "Diagnostic and prognostic capabilities of a biomarker and EMR-based machine learning algorithm for sepsis." *Clinical and Translational Science*, 14, 1578–1589.

Shinn, L.[†], Li, Y.[†], Mansharamani, A., Auvil, L. S., Welge, M. E., Bushell, C., Khan, N. A., Charron, C. S., Novotny, J. A., Baer, D. J., **Zhu, R.**, Holscher, H. D., (2020). "Fecal bacteria as biomarkers for predicting food intake in healthy adults." *The Journal of Nutrition*, 151(2), 423-433.

Miao, R.[†], Badger, T.C., Groesch, K., Diaz-Sylvester, P.L., Wilson, T., Ghareeb, A., Martin, J.A., Cregger, M., Welge, M., Bushell, C. and Auvil, L., **Zhu, R.**, Brard L. Braundmeier-Fleming, A. (2020). Assessment of peritoneal microbial features and tumor marker levels as potential diagnostic tools for ovarian cancer. *PloS one* 15(1): e0227707.

Walters, K.A., **Zhu, R.**, Welge, M., Scherler, K., Park, J.K., Rahil, Z., Wang, H., Auvil, L., Bushell, C., Lee, M.Y. and Baxter, D. (2019). "Differential Effects of Influenza Virus NA, HA Head, and HA Stalk Antibodies on Peripheral Blood Leukocyte Gene Expression during Human Infection." mBio, 10(3), pp.e00760-19.

Yi, M., **Zhu, R.**, and Stephens R. M. (2018). "GradientScanSurv—An exhaustive association test method for gene expression data with censored survival outcome." *PloS one*, 13(12), e0207590.

Hassan, U., **Zhu, R.**, and Bashir R. (2018). "Multivariate Computational Analysis of Biosensor's Data for Improved CD64 Quantification for Sepsis Diagnosis." *Lab on a Chip*, 18(8), 1231-1240.

Taneja, I., Bobby Reddy Jr, B., Damhorst, G., Zhao, D. Hassan, U., Price, Z., Jensen, T., Ghonge, T., Patel, M., Wachspress, S., Winter, J., Rappleye, M., Smith, G., Healey, R., Ajmal, M., Anwaruddin, S., Khan, M., Patel, J., Rawal, H., Sarwar, R., Soni, S., Davis, B., Kumar, J., White, K., Bashir, R., and **Zhu, R.** (2017). "Combining Biomarkers with EMR Data to Improve Sepsis Identification." *Scientific Reports*, 7(1), 10800.

La, E. H., Lich, K. H., Wells, R., Ellis, A. R., Swartz, M. S., **Zhu, R.**, and Morrissey, J. P. (2015). "Increasing Access to State Psychiatric Hospital Beds: Exploring Supply-side Solutions." *Psychiatric Services*, 67(5), 523-528.

La, E. H., **Zhu, R.**, Lich, K. H., Ellis, A. R., Swartz, M. S., Kosorok, M. R., and Morrissey, J. P. (2014). "The Effects of State Psychiatric Hospital Waitlist Policies on Length of Stay and Time to Readmission." *Administration and Policy in Mental Health and Mental Health Services Research*, 42(3), 332-342.

R Packages

Guo, B.[†] and **Zhu, R.** (2021). "MOTE.RF: Random Forests for Heterogeneous Treatment Effect Estimation with Multiple Responses." [GitHub]

Loyal, J.[†] and **Zhu, R.** (2021). "drforest: Dimension Reduction Forests." [GitHub]

Li, Y.[†] and **Zhu, R.** (2020). "MatrixFact: A Nonnegative Matrix Factorization Tool Box." [GitHub]

Zhao, R.[†], **Zhu, R.**, Zhang, J.[†], Zhou, W.[†], Xu, P.[†] (2019). "orthoDr: Semi-Parametric Dimension Reduction Models Using Orthogonality Constrained Optimization." [CRAN] [GitHub]

Zhu, R. (2021). "RLT: Reinforcement Learning Trees." [CRAN] [GitHub]

Editorships

Associate Editor, *Statistical Analysis and Data Mining*	2022 -
Editorial Board Reviewer, *Journal of Machine Learning Research*	2020 -
Editorial Board Member, *Journal of Biometrics & Biostatistics*	2017 - 2018

Methods and Systems for Characterizing Disease States (provisional patent filed), by Taneja, I., Reddy Jr., B., Damhorst, G., Zhao, S. D., and **Zhu, R.**.

System and Methods for Multistaged Data Processing (provisional patent filed), by Ellman, J., Lopez-Espina, C., Reddy Jr., B., Bhargava, A., Schmalz, L., Khan, S., Zhao, S. D., and **Zhu, R.**.

My Teaching Textbook: Statistical Learning and Machine Learning with R
- Available at ⊙ https://teazrq.github.io/SMLR/

Statistical Learning (STAT 542) [⊙ Course Website]   UIUC
- Spring 2022, Spring 2021, Fall/Spring 2020, Fall/Spring 2019, Spring 2018, Fall 2017, Fall 2016

Basics of Statistical Learning (STAT 432) [⊙ Course Website]   UIUC
- Spring/Fall 2022, Fall 2021, Spring 2021, Fall 2018

Foundations: Molecules to Populations [⊙ Course Website] Co-teaching at Carle Illinois College of Medicine
- Summer 2018/2019/2020/2021/2022

Data Science Project [⊙ Course Website] Co-teaching at Carle Illinois College of Medicine
- 2022, 2021

Practical Statistical Learning (CS 598)   UIUC
- Spring 2019

Methods of Applied Statistics (STAT 420)   UIUC
- Spring 2019, Spring 2017

Statistics and Probability I (STAT 400)   UIUC
- Spring 2018, Spring 2016

College Algebra (MATH 112)   BGSU
- Fall 2006, Spring 2007

Teaching Assistant
- Advanced Probability and Statistical Inference I (BIOS 760)   UNC-CH, Fall 2010
- Principles of Statistical Inference (BIOS 600)   UNC-CH, Fall 2010
- Advanced Probability and Statistical Inference II (BIOS 761)   UNC-CH, Spring 2010
- Student tutoring center   BGSU Spring 2008