

# Zhou (Joe) Lan

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## SUMMARY

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I am a computational and statistical investigator at Brigham and Women's Hospital and Harvard Medical School, with strong interests in biomedical data, particularly brain imaging, genetics, and cardiovascular data. My work can be viewed in two major components.

The first component focuses on building end-to-end pipelines that transform raw, large-scale datasets into reliable resources for clinical discovery. Leveraging these resources, I develop statistical and machine learning methodologies to address challenges such as high dimensionality, spatial correlation, and complex data structures. Reproducibility and accessibility are central to my work: each paper is accompanied by well-documented Python/R/C/C++ software (available at <https://github.com/lanzhouBWH>), enabling others to apply and extend my methods.

The second component centers on providing statistical contributions—including survival analysis, causal inference, and predictive modeling—for studies that utilize diverse biomedical data sources such as electronic health records, clinical trial data, and population-based cohorts. This involves, design of experiments, hands-on analysis, statistical plan drafting, and manuscript/grant preparation.

My work has been published in leading statistical journals (Technometrics, Biometrics, Bayesian Analysis, Journal of the Royal Statistical Society: Series A, Data Science in Science), as well as in top neuroimaging, genetics, bioinformatics, and medical journals (Imaging Neuroscience, NeuroImage: Clinical, Bioinformatics, JAMIA Open, The New England Journal of Medicine). In addition, as a statistical consultant, I have co-authored more than 50 collaborative papers in high-impact biomedical and clinical journals, including the Journal of the American Heart Association, Circulation, and Radiology. Currently, I am expanding my work to incorporate artificial intelligence for biomedical discovery and clinical translation.

## WORK EXPERIENCE

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<b>Brigham and Women's Hospital, Harvard Medical School</b> <i>Investigator; Instructor in Medicine</i>	Oct 2022 – present
<b>Yale Medical School</b> <i>Statistician Consultant</i>	Jul 2020 – Sep 2022
<b>Pennsylvania State University</b> <i>Bruce Lindsay Visiting Assistant Professor</i>	Aug 2019 – Jul 2020
<b>Eli Lilly &amp; Company</b> <i>Ph.D. Statistics Intern</i>	May 2018 – Aug 2018
<b>Ventana Medical Systems (Roche)</b> <i>Imaging Scientist Intern</i>	May 2016 – Jul 2016

## EDUCATION

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<b>North Carolina State University</b> , Raleigh, North Carolina Ph.D. in Statistics, July 2019
<b>Georgia Institute of Technology</b> , Atlanta, Georgia M.S., Statistics (Mathematics), May 2015
<b>Zhejiang University</b> , Hangzhou, China B.S., Biology, May 2012

## EXPERTISE

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<b>Programming</b>	Python, R, C/C++, Bash, Slurm Workload Manager
<b>Statistics &amp; Machine Learning</b>	Bayesian Modeling, Probabilistic Graphical Models, Quantile Regression, Spatial Statistics, Matrix-Variate Methods, High-Dimensional Data Analysis
<b>Computation</b>	High-Performance Computing, Parallel Computing, Algorithm Development
<b>Biomedical Applications</b>	Radiology, Genetics, Neuroimaging, Diffusion MRI, Magnetic Resonance Spectroscopy

### Statistical Methods and Analyses for Diffusion Magnetic Resonance Imaging (MRI)

- **Background:** The structural connections within the brain's white matter are essential for its function. Diffusion MRI tractography allows for the in vivo reconstruction of white matter fiber pathways. Diffusion MRI poses significant challenges due to its high dimensionality, spatial correlation, and complex signal structures.
- **Focus:**
  - I collaborated with colleagues to develop a nonparametric modeling pipeline for diffusion MRI harmonization and led the evaluation of its performance.
  - Using the established imaging processing pipelines (*UKFTractography*: <https://github.com/pnlbwh/ukftractography> and *whitematteranalysis*: <https://github.com/SlicerDMRI/whitematteranalysis>), I led development of statistical and computational methods for analyzing diffusion MRI tractography to address high dimensionality, spatial correlation, and complex signal structures inherent to such data.
- **Data:** Human Connectome Project (HCP), Adolescent Brain Cognitive Development (ABCD) Study, Alzheimer's Disease Neuroimaging Initiative (ADNI).
- **Collaborators:** Lauren J. O'Donnell (Brigham and Women's Hospital, Harvard Medical School)
- **Selected Publications:**
  - [1] Zhou Lan, Yuqian Chen, Jarrett Rushmore, Leo Zekelman, Nikos Makris, Yogesh Rath, Alexandra J. Golby, Fan Zhang, and Lauren J. O'Donnell. *Fiber Microstructure Quantile (FMQ) Regression: A Novel Statistical Approach for Analyzing White Matter Bundles from Periphery to Core*. *Imaging Neuroscience*, 3, imag\_a\_00569 (2025). doi:10.1162/imag\_a\_00569.
  - [2] Lei Yan, Xin Zhang, Zhou Lan, Dipankar Bandyopadhyay, and Yichao Wu. *Variable Screening and Spatial Smoothing in Frechet Regression with Application to Diffusion Tensor Imaging*. *Annals of Applied Statistics*, 19(1), 2025. doi:10.1214/24-AOAS1978.
  - [3] Arkaprava Roy, Zhou Lan, and Zhengwu Zhang, "Nonparametric Modeling of Diffusion MRI Signal in Q-Space", *Data Science in Science* **6**, 4 (2024). (doi: doi.org/10.1080/26941899.2024.2412017)
  - [4] Legarreta, Jon Haitz, Zhou Lan, Yuqian Chen, Fan Zhang, Edward Yeterian, Nikos Makris, Jarrett Rushmore, Yogesh Rath, and Lauren J. O'Donnell, "Towards an Informed Choice of Diffusion MRI Image Contrasts for Cerebellar Segmentation", *Human Brain Mapping* **46**, 11 (2025).(doi: doi.org/10.1002/hbm.70317)

### Statistical Methods and Analyses for Magnetic Resonance Spectroscopy (MRS)

- **Background:** MRS is a tool for exploring the neurometabolic underpinnings of brain function, providing unique insights into the biochemical composition of tissues.
- **Focus:**
  - I mentored a student to develop an automatic MRS data processing pipeline that avoids the manual data quality control.
  - I led the invention of NMetNet, which is a novel network-based statistical approach in analyzing the alteration of metabolites between functional neurological disorders (FND) and controls
- **Data:** Internal Data from Center for Clinical Spectroscopy, Department of Radiology, Harvard Medical School, Brigham and Women's Hospital
- **Collaborators:** Alexander Lin (Brigham and Women's Hospital, Harvard Medical School), Kasia Kozłowska (University of Sydney)
- **Selected Publications:**
  - [1] Beroukhim B, McComas S, Joyce JM, Schuhmacher LS, Koerte I, Lan Z, Lin A, "A novel automated pipeline to assess MR spectroscopy quality control: Comparing current standards and manual assessment.", *J Neuroimaging* **35**, 1 (2025). (DOI: doi.org/10.1080/26941899.2024.2412017)
  - [2] Zhou Lan, Sheryl Foster, Molly Charney, Max van Grinsven, Katherine Breedlove, Kasia Kozłowska, Alexander Lin, "Neurometabolic Network (NMetNet) for Functional Neurological Disorder in Children and Adolescents", *NeuroImage: Clinical* **46**, (2025).(doi.org/10.1016/j.nicl.2025.103767)

## Statistical Contributions for Medical, Clinical and Epidemiological Studies

- **Background:** Complex biomedical data sources such as electronic health records, clinical trial data, and population-based studies need rigorous statistical approaches to draw reliable inferences and inform medical practice.
- **Focus:**
  - Authored and reviewed high-quality statistical deliverables, including protocols, statistical analysis plans (SAPs), and reports for cross-functional collaborators and stakeholders for medical, clinical, and epidemiological Studies.
- **Selected Publications:**
  - [1] Shah, Nisarg, Zhou Lan, C. Justin Brown, Seth S. Martin, and Alexander Turchin, “Impact of Statin Nonacceptance on Cardiovascular Outcomes in Patients With Diabetes”, *Journal of the American Heart Association* **14**, 11 (2025).(doi: <https://doi.org/10.1161/JAHA.124.040464>)
  - [2] Gregory Piazza, Behnood Bikdeli, Arvind K. Pandey, Darsiya Krishnathasan, Candrika D. Khairani, Antoine Bejjani, Ruth H. Morrison, Heather Hogan, Sina Rashedi, Mariana Pfeferman, Junyang Lou, John Fanikos, Nicole Porio, Lisa Rosenbaum, Piotr Sobieszczyk, Zhou Lan, Marie Gerhard-Herman, Umberto Campia, Samuel Z. Goldhaber, for the HI-PRO Trial Investigators, “Apixaban for Extended Treatment of Provoked Venous Thromboembolism (HI-PRO Trial)”, *New England Journal of Medicine* , (2025). (DOI: 10.1056/NEJMoa2509426)
  - [3] Zhou Lan, Alexander Turchin, “Impact of Possible Errors in NLP-Derived Data on Downstream Epidemiologic Analysis”, *JAMIA Open* **6**, 4 (2023). (DOI: 10.1093/jamiaopen/ooad111)
  - [4] Zhou Lan, Le Bao, “Multivariate Spatial Modeling for Predicting Missing HIV Prevalence Rates Among Key Populations”, *Journal of the Royal Statistical Society Series A (Statistics in Society)* **187**, 2 (2024). (DOI: 10.1093/jrssa/qnad113)

## Statistical Methods and Analyses for Genetic Network Data

- **Background:** Network marker selection on genome-scale networks plays an important role in the understanding of biological mechanisms and disease pathologies. A unified approach for network-based feature selection on general large-scale networks and creating an easy-to-use software package is in demand.
- **Focus:**
  - I led the development of an R package, the Bayesian network feature finder (BANFF), providing a package of posterior inference, model comparison, and graphical illustration of model fitting.
  - The model was extended to a more general form, and a parallel computing algorithm for the Markov chain Monte Carlo-based posterior inference and an expectation maximization-based algorithm for posterior approximation were added.
- **Data:** Spellman yeast cell cycle microarray data
- **Collaborators:** Jian Kang (University of Michigan), Tianwei Yu (The Chinese University of Hong Kong)
- **Selected Publications:**
  - [1] Zhou Lan, Yize Zhao, Jian Kang, Tianwei Yu, “Bayesian network feature finder (BANFF): an R package for gene network feature selection”, *Bioinformatics* **32**, 23 (2016). (DOI: 10.1093/bioinformatics/btw522)

## REPRESENTATIVE PUBLICATIONS

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Full list on Complete List of Published Work in Google Scholar <https://scholar.google.com/citations?user=fB87fIgAAAAJ>

- **Informatics/Computational/Statistical Methodology**

Zhou Lan, Arkaprava Roy, “Spatial von-Mises Fisher Regression for Directional Data”, *Technometrics* **Accepted**, (2025+).(doi.org/10.1080/00401706.2025.2519303)

Zhou Lan, Yuqian Chen, Jarrett Rushmore, Leo Zekelman, Nikos Makris, Yogesh Rathi, Alexandra J. Golby, Fan Zhang, and Lauren J. O'Donnell, “Fiber Microstructure Quantile (FMQ) Regression: A Novel Statistical Approach for Analyzing White Matter Bundles from Periphery to Core”, *Imaging Neuroscience* **3**, imag\_a.00569 (2025).(doi.org/10.1162/imn.2025.3.00569)

Zhou Lan, Sheryl Foster, Molly Charney, Max van Grinsven, Katherine Breedlove, Kasia Kozłowska, Alexander Lin, “Neurometabolic Network (NMetNet) for Functional Neurological Disorder in Children and Adolescents”, *NeuroImage: Clinical* **46**, (2025).(doi.org/10.1016/j.nicl.2025.103767)

Arkaprava Roy, Zhou Lan , “Double Soft-Thresholded Model for Multi-Group Scalar on Vector-Valued Image Regression”, *Bayesian Anal.* **Advance Publication**, (2025).(doi.org/10.1214/24-BA1483)

Beroukhim B, McComas S, Joyce JM, Schuhmacher LS, Koerte I, Lan Z, Lin A, “A novel automated pipeline to assess MR spectroscopy quality control: Comparing current standards and manual assessment.”, *J Neuroimaging* **35**, 1 (2025).(doi.org/10.1080/26941899.2024.2412017)

Roy Arkaprava, Zhou Lan, and Zhengwu Zhang, “Nonparametric Modeling of Diffusion MRI Signal in Q-Space”, *Data Science in Science* **6**, 4 (2024). (doi.org/10.1080/26941899.2024.2412017)

Zhou Lan, Alexander Turchin, “Impact of Possible Errors in NLP-Derived Data on Downstream Epidemiologic Analysis”, *JAMIA Open* **6**, 4 (2023).(10.1093/jamiaopen/ooad111)

#### • Biomedical/Clinical/Scientific Collaborations

Gregory Piazza, Behnood Bikdeli, Arvind K. Pandey, Darsiya Krishnathasan, Candrika D. Khairani, Antoine Bejjani, Ruth H. Morrison, Heather Hogan, Sina Rashedi, Mariana Pfeferman, Junyang Lou, John Fanikos, Nicole Porio, Lisa Rosenbaum, Piotr Sobieszczyk, Zhou Lan, Marie Gerhard-Herman, Umberto Campia, Samuel Z. Goldhaber, for the HI-PRO Trial Investigators, “Apixaban for Extended Treatment of Provoked Venous Thromboembolism (HI-PRO Trial)”, *New England Journal of Medicine* , (2025). (DOI: 10.1056/NEJMoa2509426)

Shah, Nisarg, Zhou Lan, C. Justin Brown, Seth S. Martin, and Alexander Turchin, “Impact of Statin Nonacceptance on Cardiovascular Outcomes in Patients With Diabetes”, *Journal of the American Heart Association* **14**, 11 (2025).(doi: https://doi.org/10.1161/JAHA.124.040464)

Tyler A Lanman, Gilbert Youssef, Raymond Huang, Rifaquat Rahman, Matthew DeSalvo, Thomas Flood, Elmira Hassanzadeh, Min Lang, Jason Lauer, Christopher Potter, Albert Jiao, Ian Pan, Daniel P Cahill, Zhou Lan, Juan Pablo Ospina, Vihang Nakhate, Natalie E Stec, Diana Shi, Wenya Linda Bi, Samuel K McBrayer, Isabel Arrillaga-Romany, Eudocia Q Lee, Ugonma N Chukwueke, Lakshmi Nayak, Deborah A Forst, Elizabeth R Gerstner, Justin T Jordan, Jorg Dietrich, Julie Miller, Tracy T Batchelor, David A Reardon, Patrick Y Wen, L Nicolas Gonzalez Castro, “Ivosidenib for the Treatment of IDH1-mutant Glioma, Grades 2 to 4: Tolerability, Predictors of Response, and Outcomes”, *Neuro-Oncology Advances* **7**, 1 (2025).(doi: https://doi.org/10.1093/noajnl/vdae227)

Hassanzadeh, Elmira, Alyssa Ailion, Masoud Hassanzadeh, Alena Hornak, Noam Peled, Dana Martino, Simon K. Warfield, Zhou Lan, Taha Gholipour, and Steven M. Stuffebeam, “Imaging and Anesthesia Protocol Optimization in Sedated Clinical Resting-State fMRI”, *American Journal of Neuroradiology* **49**, 5 (2025+).(doi: https://doi.org/10.3174/ajnr.)

## PATENTS

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Chukka Srinivas, Zhou Lan, “System and Method for Color Deconvolution of a Slide Image to Assist in the Analysis of Tissue”, , US20200167965A1 (Priority Date: 2017/08/04; Publication Date: 5/28/2020 ).

## INVITED TALKS

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International Conference on Statistics and Data Science, Vancouver, Canada

Ferenc Jolesz First Monday Research Seminars, Boston, MA 2025

Ferenc Jolesz First Monday Research Seminars, Boston, MA 2023

ICSA 2022 Applied Statistics Symposium, Gainesville, FL 2022

ICSA 2019 Applied Statistics Symposium, Raleigh, NC 2019

Joint Statistical Meetings, Denver, CO 2019

Joint Statistical Meetings, Vancouver, BC Canada 2018

## PROFESSIONAL AFFILIATIONS AND SERVICES

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Member, American Statistical Association

Member, International Biometrics Society

Member, International Chinese Statistical Association

Referee for *Statistics in Medicine* , *Journal of the American Statistical Association* , *PLoS ONE* , *The Annals of Applied Statistics* , *Biometrics*, *Statistics in Biosciences* , *Nature Cardiovascular Research*