Wenjun Zhao

CONTACT INFORMATION

Department of Mathematics
Wake Forest University

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https://wenjunzhaowo.github.io

EMPLOYMENT

Department of Mathematics, Wake Forest University

Tenure-track Assistant Professor, (deferred) 2025-

Department of Mathematics

PIMS-Simons Postdoctoral Fellow, 2024-2025

- Supervisors: Khanh Dao Duc, Geoffrey Schiebinger, and Young-Heon Kim

Division of Applied Mathematics, Brown University

LFZ Postdoc/Assistant Professor, 2021-2024

- Mentor: Bjorn Sandstede

EDUCATION

Courant Institute of Mathematical Sciences, New York University

Ph.D. , Atmosphere Ocean Science & Mathematics, 2021
M.Phil. , Atmosphere Ocean Science & Mathematics, 2021

- Advisor: Esteban G. Tabak

School of the Gifted Young, University of Science and Technology of China

B.S. in Information and Computational Sciences, 2016

- Advisor: Yu-Hong Dai (Chinese Academy of Sciences)

INTERNSHIP & VISITING

Argonne National Laboratory, Mathematics and Computer Science Dept.

Wallace Givens Associate, 2020

- Mentor: Hong Zhang

University of Oxford, Department of Computer Science

Visiting student, 2015

- Host: Alessandro Abate

RESEARCH INTERESTS

Optimal transport and its applications in statistics; data analysis methods for single-cell transcriptomics; shape analysis techniques in for biomedical imaging data.

PUBLICATIONS

Lipnick, A., Tabak, EG., Trigila, G., Wang T., Ye, X., Zhao, W. *The Monge optimal transport barycenter problem*, submitted to Information and Inference.

Yu, S., Kushner, A., Teasell. E., Zhao,W., Srebnik, S., & Dao Duc, K. *Advanced Coarse-grained Model of the Ribosome Exit Tunnel for Fast Simulation of Nascent Polypeptide Chain Dynamics*, submitted to Biophysical Journal.

Tabak, E.G., Trigila, G. & Zhao, W., *The Hierarchical Barycenter: Conditional Probability Simulation with Structured and Unobserved Covariates*, submitted to Machine Learning.

Zhao, W.,Maffa, S., & Sandstede, B., *Data-driven Continuation of Patterns and their Bifurcations*, SIAM Journal on Applied Dynamical Systems (2025). https://doi.org/10.1137/24M165644X

Zhao, W.,Larschan, E., Sandstede, B.,& Singh,R., *Optimal transport reveals dynamic gene regulatory networks via gene velocity estimation*, PLOS Computational Biology (2025). https://doi.org/10.1371/journal.pcbi.1012476

Zhao, W. & Tabak, E.G., *Adaptive Kernel Conditional Density Estimation*, Information and Inference: A Journal of the IMA (2025). https://doi.org/10.1093/imaiai/iaae037

Tabak, E.G., Trigila, G. & Zhao, W., *The Conditional Barycenter Problem, its Data-Driven Formulation and its Solution through Normalizing Flows*, Communications in Mathematical Science (2024). https://dx.doi.org/10.4310/CMS.2024.v22.n6.a8

Zhang, H. & Zhao, W., *A Memory-Efficient Neural Ordinary Differential Equation Framework Based on High-Level Adjoint Differentiation*, IEEE Transactions on Artificial Intelligence (2022). https://doi.org/10.1109/TAI.2022.3230632

Tabak, E.G., Trigila, G. & Zhao, W., *Distributional barycenter problem through data-driven flows*, Pattern Recognition (2022). https://doi.org/10.1016/j.patcog.2022.108795.

Zhao, W. *Sample-based Optimal Transport in Statistical Data analysis*, PhD Thesis.

Tabak, E.G., Trigila, G. & Zhao, W., *Conditional density estimation and simulation through optimal transport.* Machine Learning (2020). https://doi.org/10.1007/s10994-019-05866-3.

Tabak, E.G., Trigila, G. & Zhao, W., *Data Driven Conditional Optimal Transport.*

- Shorter version: 33*rd* Conference on Neural Information Processing Systems (NeurIPS) OTML Workshop (2019). https://arxiv.org/abs/1910.11422
- Longer version: Tabak, E.G., Trigila, G. & Zhao, W. Machine Learning (2021). https://doi.org/10.1007/s10994-021-06060-0

Teaching Experience

Fall	2024	Small Class Instructor, Differential Calculus	UBC
Spring	2024	Instructor, Essential Statistics (Enrollment: 95)	Brown
Fall	2023	Instructor, Honors Statistical Inference I (Enrollment: 34)	Brown
Summer	2023	Instructor, MATLAB mini-course for EDGE program	Brown
Spring	2023	Instructor, Essential Statistics (Enrollment: 73)	Brown
Fall	2022	Instructor, Honors Statistical Inference I (Enrollment: 84)	Brown
Spring	2022	Instructor, Essential Statistics (Enrollment: 64)	Brown
Fall	2021	Instructor, Statistical Inference I (Enrollment: 203)	Brown
Spring	2021	Recitation leader, Intro to Fluid Dynamics, Complex Variables	NYU
Fall	2020	Grader, Linear Algebra for Data Science	NYU
Spring	2020	Recitation leader, Introduction to Math Modeling	NYU
Fall	2019	Recitation leader, Introduction to Math Modeling	NYU
Spring	2019	Recitation leader, Ordinary Differential Equations	NYU
Fall	2018	Substitute lecturer/Grader, Partial Differential Equations	NYU
Fall	2015	Teaching assistant, Multivariable Calculus	USTC

Advising

2025	Co-mentored summer REU projects (denoising GRN and shape VAE), UBC
2024	Directed Reading Program (constructive approximation of functions), Brown
2022	Co-mentored summer REU (OT for matching judicial records), Brown

Honors and Awards

2025	Postdoc Teaching Prize in the Department of Mathematics, UBC
2024	Rising Stars in Computational and Data Sciences, Oden Institute
2024	PIMS-Simons Postdoctoral Fellowship
2023	Dean's Award for Excellence in Teaching, Brown
2021	Named LFZ Assistant Professorship of Applied Mathematics, Brown
2020	Nomination for Dean's Dissertation Fellowship, NYU
2019	NeurIPS travel award
2019	Moses A. Greenfield Research Prize, NYU Courant
2016–now	Henry MacCracken Fellowship, NYU
2015	Summer research fellowship at University of Oxford
2015	Meritorious Winner in Mathematical Contest of Modeling
2013	First prize in USTC Contest of Electromagnetics
2012–2016	China National Encouragement Scholarship

Services

- Leading organizer of NITMB workshop on "Representing and Learning morphology and shape dynamics from biological data" (2025)
- Leading organizer of SMB minisymposium on "Mathematical Methods for Biological Shape Analysis" (2025)
- Co-organizer of Kantorovich Initiative Seminar at PIMS/UBC (2024-2025)
- Mini-course instructor for EDGE (Enhancing Diversity in Graduate Eduation) (2023)
- Co-organizer of Pattern Theory Group Seminar at Brown (2022-2024)
- Ad hoc reviewer for:
  Bulletin of Mathematical Biology, Pattern Recognition, Journal of Machine Learning for Modeling and Computing, Bioinformatics, RECOMB, Journal of Neuroscience Methods, Cell System, Mathematical Biosciences,ACM-BCB
- Provide reference letters for 20+ undergraduate students

Conferences & Workshops

Dynamical GRN inference via optimal transport (talk), SMB minisymposium on Data-Informed differential equation modeling in cancer, Edmonton, Canada. (July 2025)

Data analysis through Wasserstein barycenter with general factors (talk), BIRS workshop on Wasserstein Gradient flows in Math and Machine Learning, Banff, Canada. (June 2025)

Data-Driven Methods for Two Inference Problems in Mathematical Biology via Optimal Transport (talk), ICERM workshop on UQ in mathematical biology, Providence, US. (May 2025)

Some metrics and statistics on quantification of shape variability (Talk), PIMS Postdoc Summit, Calgary, Canada. (Apr 2025)

Gene Regulatory Networks (GRNs) Inference Through Optimal Transport (Talk), SIAM Conference on the Life Sciences, Portland, US. (Jun 2024)

Data-driven quantification of patterns and their transitions (Talk), Boston University/Keio University/Tsinghua University workshop, Boston, US. (May 2024).

Data-driven methods for inference in dynamical systems with optimal transport (Talk), Rising Stars in Computational and Data Sciences, Oden Instutute, US. (May 2024)

Quantifying patterns and their transitions in spatially extended systems (Poster), Dynamics Days, Davis, US. (Jan 2024)

Conditional optimal transport and its applications (Talk), Physical Applied Mathematics and Data Science, ShanghaiTech University, Shanghai, China. (Jan 2020)

Data Driven Conditional Optimal Transport (Poster), NeurIPS Optimal Transport in Machine Learning Workshop, Vancouver, Canada. (Dec 2019)

Seminar Talks

Two Inference Problems in Dynamical Systems from Mathematical and Computational Biology, PIMS Emergent Research Seminar (Mar 26 2025)

Data-driven Continuation of Patterns and their Bifurcations, Department Colloquium, Western Washington University (Feb 13 2025)

Data-driven Continuation of Patterns and their Bifurcations, MSG seminar, NYU Courant (Jan 30 2025)

Data-driven methods for inference in dynamical systems via optimal transport, Level Set Seminar, UCLA (May 22 2024)

Optimal transport with covariates: Wasserstein barycenter and its extensions, Applied and Computational Math Seminar, Dartmouth College (March 28 2024)

Wasserstein barycenter for conditional density estimation and simulation, Computational and Applied Math Seminar, Tufts University (May 1 2023)

Data-driven Wasserstein barycenter problem, Leslie Comrie Seminar Series, University of Greenwich (Mar 30 2022)

Optimal transport and beyond, Math Slam, Brown University (Dec 2 2021)

Data-driven Wasserstein barycenter problem, LCDS & Pattern theory seminar, Brown University. (Oct 4 2021)

Optimal transport with covariates and its applications, APMA colloquium, Brown University. (Sept 23 2021)

Barycentric Optimal Transport: algorithms and applications, CAOS student seminar, New York University. (Nov 2020)

Advanced Neural ODE Solver through PETSc, Summer Argonne Students' Symposium 2020, Argonne National Laboratory. (Apr 2020)

Conditional optimal transport and its applications, CAOS student seminar, New York University. (Nov 2019)

A simplified entrainment model based on shallow water equation, CAOS student seminar, New York University. (Nov 2018)

Conditional density estimation through optimal transport, CAOS student seminar, New York University. (Dec 2017)

Additional Training

Rossbypalooza, University of Chicago, Chicago, USA. (July 2024)

Launch Course Design Institute, Sheridan Center for Teaching and Learning, Brown University, Providence, USA. (August 2021)

Science Communications Workshop, Arthur L. Carter Journalism Institute, New York University, New York, USA. (Oct 2019)

NASA JPL-Caltech Summer School: Using Satellite Observations to Advance Climate Models, Pasadena, USA. (Aug 2018)

References

- Professor Bjorn Sandstede (Research, postdoc mentor)
  Division of Applied Mathematics, Brown University,
  bjorn_sandstede@brown.edu
- Professor Matthew Harrison (Teaching)
  Division of Applied Mathematics, Brown University,
  matthew_harrison@brown.edu
- Professor Ritambhara Singh (Research)
  Department of Computer Science, Brown University,
  ritambhara@brown.edu
- Professor Esteban G. Tabak (Research, PhD advisor)
  Department of Mathematics, New York University,
  tabak@cims.nyu.edu