Tansheng Zhu

✉ zts25@mails.tsinghua.edu.cn ✉ tshzhu@gmail.com ⚙ tshzhu ⌂ tshzhu.github.io

EDUCATION

Tsinghua University — Aug. 2025 – Present
Ph.D. Student in Computer Science, Institute for Interdisciplinary Information Sciences — Beijing, China
Advisor: Prof. Jian Li

- Research Interests: *Machine Learning Theory, Optimization, High-Dimensional Probability*

Shanghai Jiao Tong University — Aug. 2021 – June 2025
B.S. (Honors) in Mathematics and Applied Mathematics, Minor in Finance, Zhiyuan College — Shanghai, China
Advisor: Prof. Zhenli Xu

- Major GPA: 90.80/100, 3.94/4.3
- Core Courses: Probability, Stochastic Processes, Economitrics, Foundations of Data Science, Numerical Analysis, Optimization Methods, Mathematical Programming, Numerical Methods for ODEs and PDEs

The Chinese University of Hong Kong — Jan. 2024 – Sept. 2024
Exchange Student | Junior Research Assistant, Department of Mathematics — Hong Kong, China
Advisor: Prof. Fenglei Fan

RESEARCH EXPERIENCE

Scaling Limits of Infinitely Deep Neural Networks — Jan. 2024 – Aug. 2025
Advisor: Prof. Fenglei Fan, The Chinese University of Hong Kong

- Established the theoretical framework of neural networks with infinite depth and finite width by weakly dependent random processes.
- Analyzed the Gaussian process behavior and neural tangent kernels of infinitely deep networks, and leveraged the ergodic theory to interpret the width-depth equivalence of neural networks.

Density-based Exploration Strategy for Scalable Bayesian Optimization — Apr. 2024 – June 2025
Advisor: Prof. Zhenli Xu, Shanghai Jiao Tong University

- Proposed the Bayesian optimization by kernel regression and density-based exploration (BOKE) algorithm, which generalized the count-based exploration to Bayesian optimization, and proved its global convergence
- Conducted experiments to verify its competitive performance in space-filling design and optimization.

Monte-Carlo Tree Search in Continuous Action Spaces via Kernel Regression — Nov. 2022 – Apr. 2024
Advisor: Prof. Zhenli Xu, Shanghai Jiao Tong University

- Proposed the BOKR-MCTS algorithm to leverage Monte-Carlo tree search into continuous state-action spaces.
- Conducted experiments to show its computational efficiency and competitive performance in online planning tasks.

HONORS AND AWARDS

Shanghai Outstanding Graduate (Top 1%)	June 2025
Outstanding Bachelor Thesis Award, Shanghai Jiao Tong University (Top 1%)	June 2025
Zhiyuan Distinguished Scholarship, Shanghai Jiao Tong University (30 winners annually)	June 2025
Zhiyuan Outstanding Leader Scholarship, Shanghai Jiao Tong University (25 winners annually)	Dec. 2022
A-class Academic Excellence Scholarship, Shanghai Jiao Tong University (Top 1%)	Dec. 2022
Winning Prize in S.-T. Yau College Student Mathematics Contest, Appl. & Comp. Mathematics Track	May 2024
Finalist Winner in Mathematical Contest in Modeling (Top 3% of 18000+ teams)	May 2024
1st Prize in Shanghai Region of Chinese Mathematics Competitions	Nov. 2023
1st Prize in Huashu Cup National Mathematical Contest in Modeling (solo winner)	Aug. 2023
1st Prize in Chinese High School Mathematics League	Oct. 2020

PUBLICATIONS

[1] **Tansheng Zhu**, Hongyu Zhou, Ke Jin, Xusheng Xu, Qiufan Yuan, and Lijie Ji*. *Bayesian Optimization by Kernel Regression and Density-based Exploration.* 2025. arXiv: 2502.06178 [`math.OC`]. Under Review.

[2] Ke Jin, **Tansheng Zhu**, Hongyu Zhou, Xusheng Xu, Qiufan Yuan, and Lijie Ji*. *Bayesian-Optimized Progressive Widening via Kernel Regression for Monte Carlo Tree Search in Continuous Action Spaces.* 2025. Under Review.

COURSE PROJECTS

Dendritic Computing with Bilinear Rules and Artificial Neural Networks　　　　　Fall 2023

Topic Course III (95/100), lectured by Prof. Douglas Zhou

- Constructed bilinear rules of dendrite integration from theory to practice. Implemented artificial neural network models hLN and DBNN to fit real neuron data, and discussed the limitation of ANN's parametric space.

Solving Differential Equations with Deep Learning　　　　　Fall 2023

Foundations of Data Science (97/100), lectured by Prof. Xiaoqun Zhang and Prof. Zhi-Qin John Xu

- Implemented the framework of physics-informed neural network (PINN) for both direct and inverse problems. Analyzed the components of prediction error and improved them by incorporating more physics information.

Modeling and Optimization of Biological Transport Networks　　　　　Spring 2023

Topic Course II (99/100), lectured by Prof. Dan Hu

- Analyzed the dynamics of the biological transport network. Implemented different optimization algorithms, and explained the entangled-network phenomenon of results based on the spectrum of the graph Laplacian matrix.

Computational Mean-field Optimal Control　　　　　Spring 2023

Numerical Methods for ODEs and PDEs (96/100), lectured by Prof. Lei Li

- Studied a class of reaction-diffusion equation mean-field information dynamics. Implemented the primal-dual hybrid gradient algorithm to solve the concerned saddle point problem.

SKILLS

Programming Languages: Python, Matlab, C/C++

Toolkits: NumPy, SciPy, Sklearn, Skopt, Pandas, Statsmodels, PyTorch, Numba, CVXPY, COPT

Leadership: Leadership Team Member, *Mathematical Modelling Association of SJTU*　　　　　2022 – 2024
　　　　　　　Class President, *Zhiyuan College, Shanghai Jiao Tong University*　　　　　2021 – 2023

REFERENCES

Jian Li, `lijian83@mail.tsinghua.edu.cn`
Professor, Tsinghua University, Beijing, China.

Zhenli Xu, `xuzl@sjtu.edu.cn`
Professor, Shanghai Jiao Tong University, Shanghai, China.

Fenglei Fan, `fenglfan@cityu.edu.hk`
Assistant Professor, City University of Hong Kong, Hong Kong, China.