Kai Feng

November 7, 2025

Office Contact Information

Institution of Economics, Tsinghua University
Mingzhai Building, Tsinghua University
Haidian District, Beijing 100084
Webpage: https://kaifengas.github.io/

Email: fengk22@mails.tsinghua.edu.cn
Mobile: +86 18610740692

References

Professor Ke Tang
Institution of Economics, Tsinghua University
ketang@tsinghua.edu.cn

Professor Han Hong
Department of Economics, Stanford University
doubleh@stanford.edu

Professor Victor Chernozhukov
MIT Department of Economics
vchern@mit.edu

Professor Denis Nekipelov
Department of Economics, University of Virginia
dn4w@virginia.edu

Professor Jessie Li
Economics Department, UC Santa Cruz
jeqli@ucsc.edu

Education

Tsinghua University — Sep. 2022 – Jun. 2026
PhD, Economics
Dissertation: "Machine Learning & Decision Making: Theory & Applications"
Advisor: Professor Ke Tang

Massachusetts Institute of Technology (MIT) — Oct. 2025 – Feb. 2026
Visiting Student
Host: Professor Victor Chernozhukov

Stanford University — Oct. 2023 – Feb. 2024
Visiting Student Researcher
Host: Professor Han Hong

Beihang University
M.E. in Computer Science and Technology — Sep. 2018 – Mar. 2021
B.E. in Computer Science and Technology — Sep. 2014 – Jul. 2018
Dual B.S. in Mathematics — Sep. 2015 – Jul. 2018

Fields

Primary Fields: Econometrics, Machine Learning
Secondary Fields: FinTech, Applied Economic Theory

Publications

"Statistical Tests for Replacing Human Decision Makers with Algorithms" (with Han Hong, Ke Tang and Jingyuan Wang) *Management Science*, Vol. 71, No. 11, 9145–9170, 2025. Journal.

This paper proposes a statistical framework of using artificial intelligence to improve human decision making. The performance of each human decision maker is benchmarked against that of machine predictions. We replace the diagnoses made by a subset of the decision makers with the recommendation from the machine learning algorithm. We apply both a heuristic frequentist approach and a Bayesian posterior loss function approach to abnormal birth detection using a nationwide data set of doctor diagnoses from prepregnancy checkups of reproductive-age couples and pregnancy outcomes. We find that our algorithm on a test data set results in a higher overall true positive rate and a lower false positive rate than the diagnoses made by doctors only.

Working Papers

"Statistical Inference of Optimal Allocations I: Regularities and their Implications (with Han Hong and Denis Nekipelov) 2^{nd} round (minor) revision requested at *Journal of Econometrics*. Link.

In this paper, we develop a functional differentiability approach for solving statistical optimal allocation problems. We derive Hadamard differentiability of the value functions through analyzing the properties of the sorting operator using tools from geometric measure theory. Building on our Hadamard differentiability results, we apply the functional delta method to obtain the asymptotic properties of the value function process for the binary constrained optimal allocation problem and the plug-in ROC curve estimator. Moreover, the convexity of the optimal allocation value functions facilitates demonstrating the degeneracy of first order derivatives with respect to the policy. We then present a double / debiased estimator for the value functions. Importantly, the conditions that validate Hadamard differentiability justify the margin assumption from the statistical classification literature for the fast convergence rate of plug-in methods.

"Variational Perspectives on Optimal Allocations" (Job Market Paper)

This paper presents an unified framework to the optimal allocation problems. We formulate a broad class of population-level allocation problems as optimization problems over a space of critical functions, a representation that admits strong expressive power. This formulation accommodates constrained multi-treatment policy learning and multi-class classification as special cases. Within this framework, we establish tools for statistical estimation and inference, with emphasis on constrained policy learning and classification. We draw on the marginal approach to Lagrangian duality to characterize constrained optimization and guide the construction of estimators. Building on sample analogs of the Lagrangian function, we purpose and provide heuristic rationale to a triple machine learning approach for plug-in estimation.

"Mitigating Moral Hazard in Delegated Investment through Recommendation Algorithms" (with Wenshi Wei and Zhiheng He) Link.

We study investor-optimal algorithm design when heterogeneous, type-unaware investors contract with a portfolio manager who has risk-chasing incentives due to limited liability. Algorithms act as information gatekeepers and commitment devices that discipline managers' excessive risk-taking without altering contracts, leveraging platform scale. Optimal

recommendation rules are non-monotonic in historical returns. Unlike consumption platforms, algorithms here extract noisy signals about managerial actions from past performance, reduce recommendations when signals are ambiguous, and potentially compensate for clear signals, leading to an information rent paid by investors.

"Maximum AUC and MRC Estimation" (with Jessie Li, Han Hong, Ke Tang and Jingyuan Wang) revision requested at *Journal of Business & Economic Statistics*. Link. We derive the formal properties of statistical procedures related to the area under the ROC curve (AUC), which is a common performance measure used in binary classification problems. We show that for a parametric discrete choice model, the maximum AUC estimator which maximizes the sample AUC is essentially the maximum rank correlation estimator. For multi-class problems, we formulate a maximum multi-rank correlation (MRC) estimator which is an extension of the binary maximum rank correlation estimator. We formulate pairwise model selection tests using test statistics based on the difference between the sample AUCs or sample MRCs of the two models. In an empirical application, we use pairwise AUC model selection tests to compare different methods of predicting whether an internet domain name will be sold. We find that using the maximum AUC estimator leads to significantly better predictive accuracy than using either linear regression or logistic regression and is fairly easy to compute using standard optimization solvers in Matlab.

Working in Progress

"AI-Assisted Diagnosing" (with Jingyuan Wang, Edoardo Gallo, Zimeng Li, Ke Tang and Han Hong)

"Statistical Inference of Optimal Allocations II, III" (with Han Hong and Jessie Li)

"Distributionally Robust Optimal Allocation"

"Multi-Agent Reinforcement Learning in Automated Market Makers Simulation" (with Kunyan Wu and Ke Tang)

Pre-PhD Works

"Impact of Temperature and Relative Humidity on the Transmission of COVID-19: a Modelling Study in China and the United States" (with Jingyuan Wang, Ke Tang, Xin Lin, Weifeng Lv, Kun Chen and Fei Wang) *BMJ Open*, Vol. 11, Issue 2, e043863, 2021. ESI highly cited. Journal.

"Deep Trajectory Recovery with Fine-Grained Calibration Using Kalman Filter" (with Jingyuan Wang, Ning Wu, Xinxi Lu and Wayne Xin Zhao) *IEEE Transactions on Knowledge and Data Engineering*, Vol. 33, Issue 3, 921-934. Journal.

"SVM-Based Deep Stacking Network" (with Jingyuan Wang and Junjie Wu) *Proceeding of the AAAI Conference on Artificial Intelligence*, Vol. 33, No. 1, 5273-5280. Conference.

Presentations

AFA PhD Student Poster Session, Philadelphia — 2026

Econometric Society North America Winter Meeting, San Francisco — 2025
CUHK-Shenzhen, Shenzhen
Econometric Society World Congress, Seoul

Asian Meeting of Econometrics Society, Hangzhou — 2024

Asian Meeting of Econometrics Society, Beijing — 2023

AAAI Conference on Artificial Intelligence, Honolulu — 2019

Teaching Experience

Econometrics I (Undergraduate), Tsinghua University — 2022, 2023, 2025

Teaching assistant to Professor Ke Tang

Foundations and Frontiers of Digital Economic, Tsinghua University — 2024

Teaching assistant to Professor Danxia Xie

"Distributionally Robust Linear Regression" — 2025

Undergraduate thesis advisor to Zhonghao Huang (Fudan → HKU)
Awarded first prize for outstanding undergraduate academic paper, Fudan University School of Economics

"Agent-Based Simulation of Trading Behavior under Clock Auction Mechanisms" — 2025

Undergraduate thesis advisor to Xun Guo (Tsinghua)

Honors and Awards

AFA PhD Travel Grant — 2026

Tsinghua University Computational Social Science Award Program — 2025

Best Doctoral Paper, — 2024
China Information Economics Society Annual Meeting

Beijing Higher Education Institutions Outstanding Graduate — 2021

National Scholarship — 2019

1^{st} Class Academic Scholarship, Beihang University — 2015

Outstanding Undergraduate Student, Beihang University — 2015

Miscellaneous

Above-average ちいかわ meme usage frequency.

Good at multi-sport appreciation.