Junyu (James) Guo

jamesjunyuguo.github.io

Email : junyuguo24@berkeley.edu
Mobile : (+1) 309-272-8894

EDUCATION

- **University of California, Berkeley** — Berkeley, CA
  Ph.D in Industrial Engineering & Operation Research — *Aug 2024 - June 2029*
  - **Advisor**: Javad Lavaei
- **Tsinghua University** — Beijing, CHN
  Bachelor of Science in Mathematics; GPA: 3.95/4.00; Ranking 3/55 — *2020 - Dec 2024*
  - **Selected Coursework**: Probability Theory (A+), Real Analysis (A), Complex Analysis (A+), Ordinary Differential Equation (A), Statistical Inference (A), Numerical Analysis (A-), Abstract Algebra (A+), Investment (A).
  - **Graduate Courses**: Stochastic Process (A), Introduction To Deep Learning.
- **Cornell University** — Ithaca, NY
  Exchange Student; GPA: 4.13/4.30 — *Jan 2023 - May 2023*
  - **Selected Coursework**: Multivariate Analysis (A+), Pricing Analysis (A).
  - **Graduate Courses**: Machine Learning (A+), Applied Time Series Analysis (A), Introduction to Reinforce Learning (A).

RESEARCH EXPERIENCE

- **Learning Graphon In Mean Field Game** — Cornell University, Ithaca
  Advisor: Prof. Andreea Minca, Cornell University — *Jan 2023 - June 2024*
  - **Manuscript**: Reinforcement Learning for SBM Graphon Games with Re-Sampling
  - Formulated a multi-population Mean-field Game with Graphon structure setting and designed a reinforce learning algorithm to learn the Nash Equilibrium, and demonstrated the effectiveness of the algorithm with a realistic epidemic model
  - Defined mathematically the concept of 'aggregate impact' to capture the graph structures in the Graphon-Mean Field Game.
  - Developed a strict proof of the algorithm's convergence to the equilibrium when the underlying agents' transition and reward functions are known and computed the convergence rate of the algorithm
  - Proved mathematically the convergence of state visitation distribution to stable mean-field under the TD learning algorithm and used the variational inequalities to compute the convergence rate of the TD learning algorithm
  - Designed a realistic epidemic model with Graphon-MFG structure and conducted numerical experiments on the model; The result of the experiment demonstrated the algorithm's efficiency to learn the true equilibrium under different settings

- **Optimal Porfolio Allocation In Incomplete Market**
  Advisor: Prof. Chenxu Li, Peking University, Prof. Yiwen Shen, HKUST — *March 2023 - Present*
  - Established an algorithm to compute the optimal portfolio allocation policies in incomplete market under CRRA utility and demonstrated the convergence property of the algorithm both mathematically and numerically
  - Decomposed the optimal policy under CRRA utility, obtained a new expression for the investor-specific price of risk, and used the simulated investor specific price of risk to compute each part of the optimal portfolio Allocation policy
  - Developed a Monte Carlo simulation-based algorithm to backwardly simulate the investor-specific risk using the boundary condition, and used the computed value to obtain the optimal policy
  - Proved the convergence rate and asymptotic property of the Monte Carlo simulation algorithm mathematically using Martingale and stochastic calculus techniques, and extended the simulation algorithm to high dimension case
  - Validated the algorithm by conducting numerical experiment on exponential volatility model with closed-form solution for the optimal policy, the result converged to the benchmark solution with theoretical convergence rate

- **Maximum Likelihood Estimation of Latent Affine Processes**
  Advisor: Prof.Chenxu Li, Peking University — *May 2022 - Dec 2022*
  - Developed an efficient parameter estimation scheme for latent affine process and validated it numerically
  - Used Fourier transformation and the affine property to update the conditional likelihood function for MLE
  - Implemented the algorithm numerically with Saddle-point approximation to update the conditional likelihood function; Accelerated the numerical implementation with c++ with high computation efficiency
  - Applied the numerical algorithm to Heston model and log variance model to validate the efficiency of the algorithm, the algorithm outperformed the benchmark MCMC method in terms of convergence speed and squared bias
  - Tested the performance of the algorithm under different parameter settings, and validated that the four-order expansion using Saddle-point approximation performed the best in terms of estimation bias and stability.

Research Interests

- **Applied Probability**: Stochastic modelling, Simulation Theory
- **Learning Theory**: Reinforce Learning, Optimization, Generative AI

Skills Summary

- **Languages**: C++, Python (Scientific Computation and Deep Learning), R (Data Visualization), Unix scripting, MATLAB, LaTeX.

Leadership Experience

- **Team Leader of Social Practice**: Organized a social practice to Shanxi Province in China to study the local agricultural production method; Arranged for the accommodation and the transportation during the trip
- **Secretary of the College Student Union**: Hosted academic activities such as academic lectures and college academic contests, responsible for inviting the guests and the reception part of the activities with over 20 participants on average
- **Deputy Captain of the College Football Team**: Played as the central backward defender on the field and the deputy captain of the team, and won the championship of Tsinghua University Football League

Honors and Awards

- Wolff Fellowship awarded by UC Berkeley, 2024

- First Prize in China Undergraduate Mathematics Competition (2021)

- Scholarship for Merit student of Tsinghua University (2020, 2021, 2022)

- Mathematics Department Academic Scholarship, Tsinghua University (2021)

- First Prize in China High School National Mathematics Olympics League (2019, 2018)