Yinbin Han

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EDUCATION

University of Southern California Sep 2021 – Present
Ph.D. Student in Industrial and Systems Engineering

Chinese University of Hong Kong, Shenzhen Sep 2017 – Jun 2021
B.S. in Mathematics

University of California, Berkeley Jan 2020 – May 2020
Exchange Student

RESEARCH INTERESTS

- Applied Probability, Stochastic Modeling, and Stochastic Control
- Stochastic Optimization
- Reinforcement Learning
- Mathematical Finance

PROJECTS

Policy Gradient Finds Global Optimum of Nearly Linear-Quadratic Control Systems Jan 2022 - Present
Advisor: Meisam Razaviyayn, Renyuan Xu *USC*

- Studied an optimal control problem with quadratic cost and nonlinear dynamics consisting of a linear part and a nonlinear kernel basis governed by a policy which is the sum of a linear and the kernel function.
- Investigated the optimization landscape of the cost function. Proved a local strong convexity property of the cost function in the neighborhood of a carefully chosen initialization. Showed that the globally optimal solution must be attained near the initialization when the kernel is small.
- Proposed a zeroth-order policy gradient descent algorithm with a carefully designed initialization scheme. Proved the linear convergence rate of the algorithm and analyzed the sample complexity.
- Han, Y., Razaviyayn, M., & Xu, R. Policy gradient finds global optimum of nearly linear-quadratic control systems. In OPT 2022: Optimization for Machine Learning (NeurIPS 2022 Workshop).

Optimal Switching Policy for Batch Servers Sep 2020 – Nov 2022
Advisor: Zizhuo Wang *CUHKSZ*

- Studied an optimal switching problem for batch servers: for two arrival stochastic processes and two batch servers, given the current arrivals, decide whether to switch the two servers in order to maximize the expected total number of customers by the end of the time horizon.
- Proved the optimality condition, derived an explicit formula of the optimal value function, and designed an optimal threshold-based switching policy.
- Examined the monotonicity of optimal switching time thresholds with respect to the parameters including time horizon, arrival rates, and server capacities.
- Established an upper and a lower bound of the long-run benefits with switching flexibility and provided the $\Theta(\sqrt{T})$ asymptotic tight bound under the proposed regime.
- Organized numerical experiments to evaluate the performance of the optimal switching policy, illustrate the monotonicity of time thresholds in parameters and validate the asymptotic bound.

- Han, Y., & Wang, Z. Optimal switching policy for batch servers. Submitted to Operations Research Letters.

Deep Optimal Stopping May 2020 – Sep 2020
Research Assistant (Part-time) *Remote*

- Developed a deep neural network to approximate the value function in a discrete-time optimal stopping problem; applied the method to Bermudan option pricing
- Compared the simulation results to a theoretical outcome from the Black-Scholes Model for European option pricing to validate the correctness
- Replicated the deep learning for optimal stopping algorithm; analyzed convergence and performance of the neural network; concluded the prior work's limitations: strong assumptions and large sample complexity
- Established a mathematical model via dynamic programming principle for optimal stock selling/buying decision in the bull/bear switching market and made every single decision through deep optimal stopping

Reinforcement Learning Based Ride Sharing Feb 2019 – Aug 2019
Research Assistant (Part-time) *Remote*

- Applied deep reinforcement learning (DRL) algorithm to find the optimal consecutive batch-matching time interval for online ride-hailing platforms.
- Replicated the experiment results from prior works; verified the correctness of the algorithms and analyzed the performance of previous methods.
- Established a traffic network in PyTorch; generated passenger-driver data through a mixed Gaussian model. Organized the numerical experiments to verify the feasibility of our method. Imp roved the number of matched orders by over 5% through DRL methods.

INVITED TALKS

- NeurIPS 2022 Workshop OPT2022, Dec 2022.
- INFORMS Annual Meeting, Nov 2022.

REVIEWERS

- Conferences: NeurIPS, AISTATS

TEACHING EXPERIENCE

- **Undergraduate Student Teaching Fellow** at CUHKSZ: provide weekly tutorial sessions, office hours
  - Ordinary Differential Equations Spring 2021
  - General Biology Summer 2019

AWARDS & HONORS

- National Scholarship of China 2020
- Academic Performance Scholarship, CUHKSZ 2018, 2019, 2020
- Dean's List, CUHKSZ 2018, 2019, 2020

TECHNICAL SKILLS

- **Programming Languages:**
  - Proficient in Python, Numpy, Pandas, R, and MATLAB
  - Familiar with Java, C/C++, MySQL
  - Experience with Hadoop, Spark, and CUDA