

Zhouzhou Gu

Princeton University, JRRB A03

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EDUCATION

- Peking University** Beijing, China
B.S. in Physics, B.A. in Economics. GPA: 3.80 (overall), 3.91/4.0 (Major) Sep. 2018 - June 2022
Featured Courses: Analysis I&II, Function of Real Variables, Complex Analysis, PhD Stochastic Analysis, PhD Group Theory, Partial Differential Equations, Ordinary Differential Equations, Linear Algebra, Probability and Statistics, Numerical Analysis; PhD Macro Theory I&II (at Princeton), PhD Micro Theory I&II, PhD Econometrics I, PhD Macro-Finance & Monetary Economics (at Princeton), PhD Corporate Finance Theory, PhD Contract Theory, Industrial Organization

CURRENT POSITION

- Senior Research Specialist, Bendheim Center for Finance, Princeton University** NJ, USA
Advisor: Prof. [Jonathan E. Payne](#) & Prof. [Markus K. Brunnermeier](#). Sep. 2022 - Present
Field: macro-finance, heterogeneous agent macroeconomics, machine learning.

RESEARCH INTEREST

Macro-finance, Macroeconomics, Banking, Machine Learning

RESEARCH PAPERS

- Deep Learning for Solving and Estimating Dynamic Macro-Finance Models (with [Wenhao Li](#), [Lu Lu](#), Benjamin Fan, Eddie Qiao and Anran Jiao).** *Draft available [here](#).*
Abstract: Deep learning has been shown to be an effective method for solving partial differential equations (PDEs) by embedding the PDE residual into the neural network loss function. In this paper, we design a methodology that utilizes deep learning to simultaneously solve and estimate canonical continuous-time general equilibrium models in financial economics, including (1) industrial dynamics of firms and (2) macroeconomic models with financial frictions. Through these applications, we illustrate the advantages of our method: generality, simultaneous solution and estimation, leveraging the state-of-art machine-learning techniques, and handling large state space.
- Deep Learning Solutions to Master Equations for Continuous Time Heterogeneous Agent Macroeconomic Models (with [Jonathan E. Payne](#), [Mathieu Laurière](#) and [Sebastian Merkel](#)).** *Draft available [here](#).*
Presentation: SED Conference (submitted), IMSI, USC Marshall (scheduled)
Abstract: We propose a new global solution algorithm for continuous time heterogeneous agent economies with aggregate shocks. We first approximate the state space so the master equation becomes a high, but finite, dimensional partial differential equation. We then approximate the value function using neural networks and solve the master equation using deep learning tools. The main advantage of this technique is that it breaks the “curse of dimensionality” and allows us to find global solutions to high dimensional, non-linear problems. We demonstrate our algorithm by solving two canonical models in the macroeconomics literature: the Aiyagari model and the Krusell-Smith model.
- Bank Opacity, Leverage Spirals and Optimal Regulation (with [Haotian Xiang](#)).** *Draft coming soon.*
- Financial System Design and Inequality (with [Jonathan E. Payne](#)).** *In progress.*

SELECTED RESEARCH EXPERIENCE

- University of Southern California, Marshall School of Business** Remote
Research Assistant to Prof. [Wenhao Li](#) June 2021 - June 2022
- Department of Physics, Peking University** Beijing, China
Independent Research supervised by Prof. [Xuzong Chen](#) Feb. 2020 - Oct. 2021
Honor Thesis: Essays on Ultra-cold Atom Physics and Dynamic Quantum Phase Transition
This project aims at studying the dynamical critical behavior of ultracold atom gases. I developed a dynamical algorithm

with MATLAB (based on stiff ODE solver and sampling) to figure out the order parameters and Loschmidt echos' time-dependent curve. Further, the critical behavior very close to nonanalytical points is analyzed. Extracted simulation results reveal that there exists a universal critical exponent of the dynamical phase transition.

SELECTED HONORS AND AWARDS

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| • First Prize in National Undergraduate Math Contest | 2021 |
| • Chinese Economic Research Scholarship | 2021 |
| • Benz Scholarship (Top 5%) | 2021 |
| • Merit Student (Top 5%) | 2021, 2020 |
| • Peking University First Prize Scholarship (Top 2%) | 2020 |
| • Academic Excellent Award | 2019 |
| • Gold Medal in 19th Asian Physics Olympiad | 2018 |
| • Gold Medal in 34th Chinese Physics Olympiad (selected to <i>Chinese National Team</i>) | 2017 |

ADDITIONAL EXPERIENCE

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|---|----------------|
| • Teaching Assistant for Undergraduate Microeconomic Theory, Peking University | Beijing, China |
| Instructor: Prof. Xin Wang | Fall 2021 |
| • Instructor and Developer for Junior Physics Lab, Peking University | Beijing, China |
| Topic: Quantum Interference and Entanglement | 2020 |

ADDITIONAL INFORMATION

- **Programming.** Python (Pytorch), R, C++, Matlab, \LaTeX , Julia, Stata
- **Language.** Chinese (native), English (fluent)
- **Test Scores.** TOEFL: 107 (Speaking 23), GRE: 326+4.5

Last Updated: February 17, 2023