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References

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Education

Ph.D. in Economics, University of Warwick, UK	2024 (*expected*)
M.Res. in Economics, University of Warwick, UK (*distinction*)	2020
MSc. in Economics, University of Bath, UK (*distinction*)	2017
BSc. in International Trade and Economics, CUFE, China (*merit*)	2016

Research Fields

Econometrics, Computational Economics, Macroeconomics

Research Interests

Machine Learning, Numerical Methods in Structural Models, Statistical Learning

Personal

Nationality: **Chinese**

Working papers

"Operator Learning in Macroeconomics" **(Job market paper)**

Abstract: This paper proposes a novel solution framework for the class of dynamic macroeconomic models with a continuum of heterogeneous agents and aggregate uncertainty. In these models, an agent's state variables include her individual state vector and a distribution function representing all agents' states, an infinite-dimensional object. Unlike the prevalent benchmark method that approximates the distribution function with a high-dimensional vector of simulated agents, this paper suggests the formulation of the policy function as an operator that maps

between function spaces. The operator is parameterized by a cutting-edge neural network architecture known as the neural operator. This proposed framework offers significant computational advantages due to its three defining properties: discretization-invariance, permutation-invariance, and aggregation-sharing. The effectiveness of this approach is demonstrated by solving the Bewley-Huggett-Aiyagari model with aggregate uncertainty, a benchmark in computational economics literature. The proposed framework not only demonstrates computational efficiency as it manages tens of thousands of agents during simulations to precisely approximate the distribution function but also showcases its superior performance, achieving solutions with less than a one percent relative error in a shorter computational time compared to the benchmark method.

"The Father and Child Inequality in Health and Cognition" (with Jiaqi Li)

Abstract: The literature on child development traditionally emphasizes maternal time use, female labor supply, and their impact on child outcomes. This study uncovers two key findings: First, fathers exhibit significantly greater variation in time spent with their children compared to mothers. Second, there is a strong positive relationship between fathers' labor market participation and their involvement in childcare—a trend not observed among mothers. This suggests that the long-assumed trade-off between labor market participation and childcare does not apply to fathers in the same way it does to mothers. To quantify the impact of this paternal time investment heterogeneity on child development inequality, this study estimates production functions for cognitive and health development in children aged 1-18, using data from both fathers and mothers in the PSID time diary and child development supplement. The analysis, based on a nonlinear latent factor model with gender-specific labor demand shocks as instruments, reveals a striking result: Eliminating paternal time investment heterogeneity reduces the variance in child cognition by 22 percent and child health variance by an impressive 49 percent, particularly among children aged 12-18. These findings underscore the significant role of fathers in child development and contribute to the literature on intergenerational mobility by investigating factors based on parental actions, rather than parental identity, with a special emphasis on the heterogeneity of fathers' time allocation.

"Solving Markov Equilibrium Games by Multi-Agent Deep Reinforcement Learning"

Abstract: This study delves into the numerical resolution of a critical economic model category, Markov Equilibrium Games, employing a multi-agent deep reinforcement learning algorithm for strategy optimization. Specifically, it focuses on a duopoly context, resembling a Stackelberg game, where two firms engage in sequential decision-making each period. Characterized as model-free learners, these firms initially lack economic theoretical knowledge and develop optimal decision-making strategies solely through mutual interactions in simulations. Their policy functions are defined using neural networks, and training is executed via the Multi-Agent Deep Deterministic Policy Gradient (MA-DDPG) algorithm, a concept from deep reinforcement learning. The study aims to investigate if, under these conditions, the economy can attain an equilibrium where each firm's behavior is optimal. This exploration is set in a linear-quadratic framework, allowing for analytical derivation of the firms' optimal policy functions. The experimental findings indicate a nuanced outcome: the economy occasionally aligns with the analytical equilibrium, but diverges at times. These outcomes provide valuable insights for economists in refining model formulation and applying model-free numerical solutions in economic analysis.

Reports

"Replication Report: Market-Based Monetary Policy Uncertainty" (with Cristina Griffa, Benjamin Tatlow and Miquel Oliver i Vert)

Abstract: This report replicates and examines Bauer et al.'s (2021) paper on monetary policy transmission to financial markets. The paper introduces novel measures of monetary policy uncertainty and analyses its drivers. It also investigates the impact of uncertainty changes on interest rates and financial asset prices. We assess reproducibility, consolidate market uncertainty measures using PCA and Factor Analysis, and rigorously test the reduction of uncertainty after Federal Market Open Committee (FOMC) announcements. Our findings support the paper's claim of reduced uncertainty on meeting days. Additionally, we explore the implications of the uncertainty channel on various financial assets, such as Gold, the Swiss Franc, European stock indexes, and Bitcoin.

Training

Deep Learning for Solving and Estimating Dynamic Models (online) 2023
The Econometric Society

MATH + ECON + CODE masterclasses 2022
Prof. Alfred Galichon (Science Po)

Text Data in Economics 2022
Prof. Elliott Ash (ETH Zurich)

Research Software Engineering with Python 2022
Alan Turing Institute

Summer School in Economic Network 2021
University of Oxford

Camp in Computer Science Algorithms 2018
Tsinghua University

Programming

Python and Julia (Scientific Programming, Machine Learning)
Co-Organizer of the Warwick Economics Coding Group (Topics in Python, VS Code and Git)
Github: https://github.com/YaolangZhong

Teaching Experience

Teaching Assistant, University of Warwick
EC220 Mathematical Economics 1A Term 1, 2021-2022

Presentations

3^{rd} Annual Southern Economics PhD Conference 2023
University of Sussex, UK
10^{th} Meeting of the Society for the Study of Economic Inequality 2023
Aix-Marseille School of Economics, France
Warwick-Oxford Economics workshop 2023
University of Warwick, UK
Warwick-Turing Economics and Data Science workshop 2023
University of Warwick, UK
Wariwck Economics PhD forum 2022
University of Warwick, UK
Wariwck Economics PhD forum 2021
University of Warwick, UK

Scholarships and Awards

Departmental Scholarship, Economics Department, University of Warwick 2018-2024

Language

Chinese (native), Cantonese (native), English (fluent), Japanese (basic)

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