Qingtao Cao

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EDUCATION

Northeastern University (USA), College of Engineering

- Ph.D. Candidate in Industrial Engineering, MAGICS Lab — GPA: 3.92/4 — 2017 – Current (Expected Dec 2022)
  Advisor: Prof. Babak Heydari
- M.S in Operations Research — GPA: 3.92/4 — 2014 – 2015

South China Normal University (CHN), College of Science

- B.S in Applied Mathematics — GPA: 3.33/4 — 2008 – 2012

INDUSTRY EXPERIENCE

Operations Coordinator, 4Excelsior Inc, Los Angeles, USA — 2016 – 2017

- Managed the inventory to satisfy the demand for manufacturing and operation activities.
- Reported directly to the COO for daily operations and assisted the COO to design the standard of process in the warehouse.

Financial Analyst Assistant (Internship), E Fund Management Co., Ltd. Guangzhou, China — Summer 2015

- Collected the information and data of the domestic market and the global stock market, and then reported it to the senior financial analysts.
- Assisted senior financial analysts to predict the stock price by the regression model.

RESEARCH PROJECTS

The Analysis of the Mobility Pattern Change Caused by the Outbreak of Covid-19 in MA – *Python* — 2021 – Current

- Used detailed mobility data from SafeGraph to describe the mobility flow over multi-level networks and analyzed the change of the mobility pattern overtime.
- Predicted the further mobility flow on networks by the *Dyadic Regression model* and the *Graph Neural Network model* with demographic data.
- Ran the *multivariate linear regression model* to predict the number of Covid confirmed cases of towns in MA by the mobility, index of the mobility network and demographic data.

Learning Platforms: Adaptive Competition using Deep Reinforcement Learning – *Python* — 2021 – 2022

- Used the Machine learning Approach to solve the new challenge of the platform's governance caused by multi-level interactions between agents in the experimental complex ecosystem.
- By using *Deep Reinforcement Learning (DRL)*, the AI platform can learn a high-performance dynamic adaptive policy to compete with another platform in a multi-sided market.
- By modularizing the initial strategy space, the learned policy by DRL can reveal a high ability of interpretation and, furtherly, be inferred as the heuristic policy for humans.

Micro-level Social Contact Structures and the Success of COVID-19 National Policies – *Python* — 2020 – 2021

- Created an *explainable epidemic model* based on a new algorithm that transforms national-average data on micro-level social interaction into a small-scale social network.
- Integrated top-down (National Policies) and bottom-up (Micro-level Social Contact) factors to show how the interaction of these two factors leads to the differences in the success rate of containing the pandemic between countries by *the simulation model*.
- Using national-average, un-calibrated data made our model computationally more efficient, thus our model is suitable to be used in counterfactual analysis and policy scenario studies.

Theoretical Analysis of Platforms' Competition on Multi-Sided Markets – *Python* — 2018 – 2020

- Combined *customers' behavior theories* (e.g., bounded rationality) and the *dynamic game theory* to *mathematically model* the price competition between platforms on a multi-sided market.
- We proved that even in the presence of cross-sided network effects, the "winner-takes-all" nature of multi-sided platforms can be replaced by the possibility of multiple equilibria.
- Figured out the structure of the platform's local optimal price, consisting of the magnitude of the network effect and the customers' rationality level, in the equilibrium of the competition.

OTHER SELECTED PROJECTS

Cuebiq location data analysis – *Python, SQL* — Spring 2022

- With millions of Cuebiq users' track datapoint collected from Cuebiq, we provided insights into human mobility during the pandemic and have fueled research to understand movement patterns during lockdown periods.

Data Visualization and Data Analysis – *R, ggplot2* — Spring 2019

- Visualized and analyzed the modification of the transportation behavior (Taxi and Subway Usage) in New York City after the launch of Uber.

PUBLICATIONS

- ***Cao Q***, Heydari B. Micro-level Social Contact Structures and the Success of COVID-19 National Policies[J]. Accepted by Nature Computational Science.
- Chou C A, ***Cao Q***, Weng S J, et al. Mixed-integer optimization approach to learning association rules for unplanned ICU transfer[J]. Artificial Intelligence in Medicine, 2020, 103: 101806.
- ***Cao Q***, Heydari B. Competition Among Two-Sided Platforms with Myopic Agents[J]. Journal Manuscript.
- ***Cao Q***, Chen Q, Heydari B. Learning Platforms: Adaptive Competition using Deep Reinforcement Learning[C]. Eighth International Engineering Systems Symposium (CESUN 2021)
- ***Cao Q***, Heydari B. Market Equilibria and Pricing Strategies for Multi-sided Platforms with Bounded-Rational Agents [C]. CESUN 2020 Engineering Systems Symposium.

SKILLS and INTERESTS

- **Concentration**: Complex System Modeling, Data Analysis, Machine Learning, Graph Theory and Simulation
- **Computer software**: Python, PyTorch, R, SQL, NetLogo and AMPL
- **Language:** English (fluent), Cantonese (native), Mandarin (native)