Wenxiao Yang | Resume for PhD Application

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Education

Bachelor of Science

University of Illinois at Urbana-Champaign   *2020–2023 (expected)*

- Triple-Major: *Mathematics, Statistics, Economics*; Minor: *Computational Science & Engineering*
- GPA – 3.97/4.00; Dean's list for all semesters; Phi Beta Kappa
- *Spring 2021: Visiting Research Student at HKUST Business School (Advisor: Song Lin)*

Undergraduate coursework

Zhejiang University   *2018–2020*

- Experimental Class of Social Science (Major Economics)
- *Spring 2020: GEM Trailblazer Exchange Student at Nanyang Technological University*

Research Projects

Writing Sample

Information Acquisition and Design in Privacy-Preserving Advertising Auctions

Solo-authored working paper, submitted as my writing sample   *Ongoing*

- Keywords: *Privacy, Game Theory, Rational Inattention, Bayesian Persuasion*
- Supervised by Prof. *Yunchuan (Frank) Liu* (UIUC) and Prof. *Song Lin* (HKUST)
- Presented at *ISMS Marketing Science Conference 2022*
- **Abstract:** I study how an online platform should design a privacy-preserving information environment for advertising auctions. Due to privacy protection, with imprecise data, advertisers need to acquire information prior to bidding for an ad slot. At the same time, the platform needs to pool multiple advertisers together through keywords. By designing the keywords for an advertising slot, the platform can release common information, building on which advertisers can decide how to obtain additional information at a cost. I illustrate that the information acquisition of an advertiser can lead to divergent beliefs, which may lower the bidding cost of the other advertiser. Thus, asymmetric equilibrium may arise where one advertiser engages in information acquisition whereas the other does not. I show that both advertisers will participate in an auction only when the ad slot has an intermediate matching probability. In an optimal information design, the platform maximizes the advertisers' belief about the ad slot while motivating them to bid for it. Furthermore, the platform has the incentive to raise advertisers' cost of information acquisition when the ad slot's prior matching probability is low and to reduce it when the prior matching probability is high. I discuss the implications for privacy-preserving ad auction design and first-party data collection.

Other Projects:

Predicting Long-run Coupons Effects with Customer Learning (Preliminary)

An attempt to combine analytical modeling with deep learning   *Ongoing*

- Keywords: *Deep Learning, Bayesian Inference, Hidden Markov Model*
- This is a research project integrating analytical models into a deep learning model to study the long-term effect of coupons. Coupons have been shown to have an impact on future brand consumption by Anderson and Simester (2004). Unlike Gabel and Timoshenko's model (2022), which predicts purchase probabilities with coupons in one step, my goal is to create a deep learning model that incorporates the customer learning effect to predict the long-term effects of coupons. To assist the deep learning model in detecting insignificant customer conversions, I first use an analytical model to infer the customers' knowledge of each brand, which should be strongly correlated with customer conversion behaviors. More importantly, by using the inferred customer knowledge, I can more easily avoid local optima and find globally optimal coupon settings that maximize long-term profits

NFT Royalty Structure Design and Regulation (Preliminary)

with Prof. Song Lin (HKUST) and Prof.Zijun (June) Shi (HKUST)   *Ongoing*

- Keywords: *Non-fungible Token, Game Theory*
- This ongoing preliminary project is about the NFT (Non-fungible token) royalty structure. NFT creators can earn a commission on each transaction. I create a game-theoretic model with one creator and several potential customers. The buyers are either collectors who value NFT or speculators who buy NFT in order to sell it. I analyze how creators can change the NFT royalty structure to control the resale process of NFT among different types of potential buyers.

Should Firms Pay for Useless Referrals? (Resting)

The project in algorithmic game theory PhD seminar   *2021 Spring*

- **Abstract:** Many firms provide referral programs for consumers, which allows consumers to get rewards by referring new customers. Firms pay for successful referrals that lead to new customers. This project discusses another kind of program, and I call it the same return program. The program rewards customers according to the number of friends they refer. In the program, a firm pays for all referrals, no matter whether it generates new customers. The project proves that if the product is hard for consumers to infer others' valuations towards it, the same return program is better than the referral programs because the same return program could eliminate the game in the referral programs and remains the best equilibrium for firms and consumers.

Advertising Coupon (Resting)

The project completed during the semester I visited HKUST   *2021*

○ Keywords: *Game Theory, Analytical Modeling, Advertising*
○ Supervised by Prof. *Song Lin* (HKUST)
○ **Abstract:** I create a new promotional model that combines coupons and advertising. Customers can help the company by advertising in exchange for coupons for products. I compare this program with discounts. If the profit on the product is low, the program is profitable compared to a discount because free advertising is preferable to the profit generated by selling the product. Suppose the profit from the sale of the product is relatively high, and the consumer's estimate of the value of the product is very high. In that case, the company will use this option in order to profit from free advertising to consumers. When the profits from the product's sale are relatively high, and the product's value to the consumer is moderate, the company will use discounts to avoid the loss of consumers as a result of using the new promotional program.

Research Assistant

Illinois Risk Lab, Department of Mathematics, UIUC

Research Associate   *2020 Fall*

○ Topic: Financial Mathematics, Stochastic Optimization
○ Research associate in the program of *AI-Powered Life-cycle Financial Planning* lead by Prof. *Zhiyu (Frank) Quan* and Prof. *Runhuan Feng*.
○ This project aims to build algorithms that optimize decision making process for meeting important financial goals in life. I played a pivotal role in the group that working on develop life cycle strategy in asset management.
○ 1. Built a Stochastic Linear Programming model independently to optimize the expected utility under uncertainties (factors including death rate, the interest rate of risk asset.) with heterogeneous goals. 2. Assist in implementing the model by utilizing Python.

Core Coursework

Social Science, Economics, and Business

○ Intermediate Microeconomics and Macroeconomics
○ Intro to Psychology, Brain and Mind, Finance, Accounting, and Management
○ Game Theory; Industrial Organization; Public Economics; International Economics
○ Applied Econometrics; Numerical Methods in Economics; Statistical Economic Analysis
○ *Microeconomic Theory I*   *(Microeconomics Sequence; PhD level)*
○ *Math Models in Marketing*   *(Marketing Modeling; PhD level)*
○ *Computational Modeling of Cognition*   *(Cognition Science; PhD level)*

Math, Statistics, and OR

○ Calculus I, II; Linear Algebra; Probability Theory and Mathematical Statistics
○ Real Analysis
○ Complex Function and Integral Transforms
○ Ordinary Differential Equation
○ Abstract Linear Algebra
○ Abstract Algebra I
○ Stochastic Processes
○ Mathematical Statistics
○ Applied Regression and Design (Statistics)
○ Sampling and Categorical Data (Statistics)
○ Linear Programming (Math)
○ Nonlinear Programming (Math)
○ Optimization (Engineering)
○ *Pricing and Revenue Management*   *(Operations Research; PhD level)*
○ *Game Theory and Fair Division*   *(Algorithmic Game Theory; PhD level)*

Computation and Engineering

○ Numerical Methods
○ Statistical Learning
○ Deep Learning
○ Data Science Programming Methods
○ Computational Math(computations on graphs, computational topology, quantum computing, etc.)
○ *Computational Inference and Learning*   *(Machine Learning and Statistical Inference; PhD level)*

Other Experience

Risk Management Intern

Wanxiang Trust   *2019 Summer*

Student Reporter

Zhejiang University Student Press Corps   *2018–2019*

Student Member

Marketing Association of Zhejiang University   *2018–2019*