

Mingduo Zhao (pronounced Ming-dwo Jow)

CONTACT INFORMATION	Department of Economics, UC Berkeley 530 Evans Hall, Berkeley, CA 94720	Phone: (734) 478-5655 Email: mingduo@berkeley.edu
EDUCATION	University of California, Berkeley Ph.D., Economics 2026 M.S., Computer Science 2025 M.A., Statistics 2023 Graduate Certificate in Entrepreneurship & Technology Graduate Certificate in Applied Data Science	
	University of Michigan, Ann Arbor B.Sc. with High Distinction 2018 Highest Honors in Economics High Honors in Mathematics Honors in Statistics	
RESEARCH INTERESTS	Statement: My research explores the intersection of marketing, economics, computer science, and statistics, with a focus on how technological advancements profoundly transform society, both economically and politically Topics: Social Media, Recommender Systems, Digital Platforms, User Generated Content, Human Computer/AI Interaction (HCI/HAI), Political Economics Methodologies: Statistical Machine Learning, Causal Inference, Structural Model, Field/Lab Experiment, Deep Learning, Natural Language Processing (NLP)	
JOB MARKET PAPER	“News Consumption, Recommender Systems, and Polarization” <i>Abstract:</i> As algorithm-driven recommender systems increasingly shape news consumption, political polarization has emerged as a major challenge in the world today. In this study, we conduct two complementary field experiments to causally identify how user preferences and recommendation algorithms reinforce one another—ultimately exacerbating polarization. In the first study, we develop a custom browser extension and recruit 2,065 U.S. participants, assigning each a blank Google account and capturing detailed, iteration-level data as they engage with the Google News platform. This setup allows us to track both the recommendations users receive and the articles they choose for each iteration. We also use pre- and post-study political surveys to evaluate changes in individual polarization. Leveraging the exogeneity of the first-round recommendations, which are free from prior browsing history, we find causal evidence that a rise in partisan-aligned recommendations leads to more consumption of ideologically aligned news. In contrast, increasing the share of misaligned content does not lead to as much clicks. These asymmetric responses compound over iterations and interact with the supply side—that is, how user clicks influence subsequent recommendations. To causally isolate the supply side, we conduct our second study. This study is a randomized-click field experiment using Selenium bots. These bots click on news content at random. The results reveal an reinforcing algorithmic response: each click	

increases the share of content that aligns with the clicked article’s slant and drives up the ideological extremity of subsequent recommendations. The feedback loop between clicks and recommendations lead to a measurable increase in users’ levels of polarization. To further interpret these results and evaluate potential interventions, we estimate a structural model that incorporates a supply-side multi-armed bandit framework and a demand-side discrete choice model. The model confirms a strong positive-feedback mechanism: users gravitate toward ideologically aligned content, and the system amplifies this preference over time. We then evaluate a counterfactual “ideology-blind” recommendation policy that curates content without regard to political slant. While this intervention meaningfully alleviates both affective and ideological polarization, it also reduces short-term engagement by delivering fewer articles aligned with user political slant. Together, these findings provide causal evidence that algorithmic personalization reinforces partisan content consumption and contributes to political polarization. They also highlight a fundamental tradeoff between reducing polarization and maintaining user engagement, which offers guidance for both platform designers and policymakers.

PUBLICATIONS

“Longitudinal Targeted Minimum Loss-based Estimation with Temporal-Difference Heterogeneous Transformer” (with Yi Li, Yuxuan Li, Sky Qiu, Toru Shirakawa, Yulun Wu, Hiroyasu Iso*, and Mark J. Van Der Laan*) ¹ [arXiv]

- *Proceedings of the 41st International Conference on Machine Learning (ICML 2024)*
- A+ conference as ranked by CORE (Computing Research and Education)
- Peer-reviewed with 27.5% acceptance rate

WORKING PAPERS

“Game Against AI” (with Yahu Cong)

- Under Review at *Marketing Science*

“Unmasking the Deception: The Interplay between Fake Reviews, Ratings Discrepancy, and Consumer Demand” (with Yunhao Huang and J. Miguel Villas-Boas) [SSRN]

- Under Review at *Journal of Marketing Research*

“Identity-Based Bias, Algorithm Bias, and Self-Censorship in Online Reviews”

“From Fame to Office: Electoral Advantage of Political Influencers” (with Ganesh Iyer and Yi Yu)

“Ownership Consolidation and Performance of Earned Media when Building Political Brands” (with Hulya Eraslan, Przemyslaw Jeziorski, and Gizem Kosar)

FELLOWSHIPS & AWARDS

<i>Doctoral Completion Fellowship</i> , UC Berkeley	2025
<i>The George Break and Helen Schnacke Break Endowed Fellowship</i> , UC Berkeley	2023
<i>Department Fellowship</i> , UC Berkeley	2020–2024
<i>The Ferrando Honors Prize</i> , University of Michigan	2018
<i>The Sims Honors Scholarship</i> , University of Michigan	2018
<i>James B. Angell Scholar</i> , University of Michigan	2017
<i>University Honors</i> , University of Michigan	2016-2018

¹* denotes corresponding authors

GRANTS ²	<i>Xlab Research Grant</i> (with Yahu Cong)	2025
	<i>Behavioral Lab Mini Grant</i> (with Yunhao Huang, J. Miguel Villas-Boas)	2024
	<i>Xlab Research Grant</i>	2023
	<i>MITRE Research Award</i> (with Mu Zhang)	2023
	<i>EGAL Research Grant</i> (with Yunhao Huang, J. Miguel Villas-Boas)	2023
	<i>Junior Development Research Fund</i> (with Xuan Teng)	2023
	<i>National Institutes of Health (NIH) Grant</i> (with coauthors of the ICML paper)	2023
	<i>Xlab Research Grant</i> (with Yunhao Huang, J. Miguel Villas-Boas)	2023
	<i>Behavioral Lab Mini Grant</i> (with Yunhao Huang, J. Miguel Villas-Boas)	2022
	<i>UC Berkeley Public Health Research Grant</i> (with coauthors of the ICML paper)	2022

CONFERENCE PRESENTATIONS ³	<i>Marketplace Innovation Workshop (MIW)</i> , virtual	2025
	<i>Paris Conference on Digital Economics</i> , Polytechnic Institute of Paris	2025
	<i>AI in Management Conference</i> , University of Southern California	2025
	<i>FTC Conference on Marketing and Public Policy</i> , Federal Trade Commission	2024
	<i>AI in Management Conference</i> , University of Southern California	2024
	<i>Rising Scholars Conference</i> , MIT (virtual)	2023
	<i>INFORMS Annual Meeting</i> , Phoenix	2023
	<i>California Quantitative Marketing Ph.D. Student Conference</i> , Stanford University	2023

TEACHING EXPERIENCE	<i>Teaching Assistant</i> , Industrial Organization (undergraduate)	2024
	<i>Teaching Assistant</i> , Behavioral Economics (undergraduate)	2024
	<i>Teaching Assistant</i> , Financial Economics (undergraduate)	2023
	<i>Teaching Assistant</i> , Game Theory (undergraduate)	2023
	<i>Teaching Assistant</i> , Econometrics (undergraduate)	2022
	<i>Teaching Assistant</i> , Econometrics (PhD)	2022
	<i>Teaching Assistant</i> , Econometrics (PhD)	2021
	<i>Teaching Assistant</i> , Econometrics (PhD)	2021

REFERENCES

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²include coauthor grants on our projects

³include coauthor presentations on our papers

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**PROFESSIONAL
EXPERIENCE &
SERVICE**

I.O. Seminar Coordinator, Department of Economics, *UC Berkeley*
Research Assistant, Department of Economics, *UC Berkeley*
Research Professional, Department of Economics, *Princeton University*

SKILLS

Programming: Python, C++, R, Stata, Java, C++, SQL
Hobbies: tennis, golf, basketball, cello
Language: English (fluent), Mandarin Chinese (native)

**SELECTED
COURSEWORK****Marketing & Industrial Organization:**

Marketing: Choice Modeling; Behavioral Economics, AI, and Marketing; Marketing Strategy; Topics in Game Theory
Industrial Organization: Industrial Organization I, II, III; Topics in Industrial Organization; Algorithmic Revenue Management

Economics:

Theory: Microeconomics I, II; Macroeconomics I, II; Game Theory; Mechanism Design; Information Design; Contract Theory; Matching Theory; Comparative Statics; Mathematical Economics
Topics: Behavioral Economics; Labor Economics; Economic History; International Economics I, II; Corporate Finance

Econometrics & Statistics:

Econometrics: Econometrics I, II; Applied Econometrics; Time Series; Semiparametric Efficiency Bound
Statistics: Probability Theory; Theoretical Statistics; Causal Inference; Bayesian Statistics; Survival Analysis and Causality; Computational Statistics; Experimental Design; External Validity, Sensitivity Analysis, and Survey Weighting

Computer Science:

Methodologies Natural Language Processing; Deep Reinforcement Learning; Large Language Model Agents; Computer Vision; Machine Learning Systems; Deep Unsupervised Learning; Statistical Learning Theory; Experimental Design for Machine Learning

Topics: Design of Algorithmic Media (e.g., recommender system); Social Justice in EECS (e.g., algorithmic fairness); Polarization and Social Media; Human-Computer Interaction; Gamification; AI in Education

Miscellaneous: Zero Knowledge Proofs; Blockchain and Decentralized Finance; Decentralized Intelligence; Entrepreneurship in Web3

Political Economics & Political Science:

Political Economics: Political Economics I, II

Political Science: Political Behavior; Ethnic Politics

Consumer Behavior & Psychology:

Consumer Behavior: Topics in Consumer Behavior; Topics in Open Science

Psychology: Social Psychology; Cognitive Psychology; Neuropsychology; Developmental Psychology; Industrial-Organization Psychology

ABSTRACTS OF
PAPERS

“Longitudinal Targeted Minimum Loss-based Estimation with Temporal-Difference Heterogeneous Transformer” (with Yi Li, Yuxuan Li, Sky Qiu, Toru Shirakawa, Yulun Wu, Hiroyasu Iso, and Mark J. Van Der Laan)

Abstract: We propose Deep Longitudinal Targeted Minimum Loss-based Estimation (Deep LTMLE), a novel approach to estimate the counterfactual mean of outcome under dynamic treatment policies in longitudinal problem settings. Our approach utilizes a transformer architecture with heterogeneous type embedding trained using temporal-difference learning. After obtaining an initial estimate using the transformer, following the targeted minimum loss-based likelihood estimation (TMLE) framework, we statistically corrected for the bias commonly associated with machine learning algorithms. Furthermore, our method also facilitates statistical inference by enabling the provision of 95% confidence intervals grounded in asymptotic statistical theory. Simulation results demonstrate our method’s superior performance over existing approaches, particularly in complex, long time-horizon scenarios. It remains effective in small-sample, short-duration contexts, matching the performance of asymptotically efficient estimators. To demonstrate our method in practice, we applied our method to estimate counterfactual mean outcomes for standard versus intensive blood pressure management strategies in a real-world cardiovascular epidemiology cohort study.

“Game Against AI” (with Yahu Cong)

Abstract: AI systems for dynamic pricing, targeted promotions, and individualized recommendations typically assume that observed consumer behavior truthfully reveals underlying preferences. However, when consumers recognize that their actions influence future targeting decisions, behavior becomes strategic rather than preference-revealing, undermining the validity of standard machine learning-based targeting. In order to address this challenge, we introduce Structural Transfer Learning (STL), a new framework that incorporates structural economic modeling into machine learning pipelines to account for strategic responses induced by policy interventions. STL constructs policy-dependent instance weights that adjust for endogenous domain shifts, enabling firms to learn targeting policies that remain effective even when consumers actively game the system. Furthermore, we demon-

strate the practical value of STL through a stylized online experiment in a consumer research setting. While simplified, the design captures a core strategic response common to many personalization environments, where targeting rules shape behavior. In this setting, naive behavioral targeting rules lead to substantial misallocation of incentives. Applying STL improves expected profits by up to 35% relative to the naive machine learning benchmark that ignores strategic responses, depending on the relative cost of incentives. These findings highlight the need for a fundamental shift in firmsâ personalization strategiesâfrom solely optimizing predictive models to designing incentive mechanisms that are robust to strategic consumer behavior.

“Unmasking the Deception: The Interplay between Fake Reviews, Ratings Discrepancy, and Consumer Demand” (with Yunhao Huang and J. Miguel Villas-Boas)

Abstract: In online marketplaces, consumers rely on reviews to make informed purchase decisions, making the presence of fake reviews detrimental. Previous literature implies that products with fake reviews can display some patterns in review distribution, such as a higher discrepancy in ratings. Consumers might take this pattern into account when making their purchase decisions. In this paper, we explore the interplay between fake reviews and ratings discrepancy, and their impact on consumer demand, while controlling for average product ratings. First, using a data set with fake review labels, we find that product ratings discrepancy is positively correlated with the probability that the product has fake reviews. Second, through an identification strategy exploiting ratings discrepancy changes due to rating distribution rounding, we find evidence consistent with a negative causal impact of ratings discrepancy on consumer demand. Then, we conduct two experiments to establish and quantify the mechanism of the impact of ratings discrepancy on consumer demand through consumer suspicion of fake reviews. The first experiment shows that higher ratings discrepancy increases consumer suspicion of fake reviews, and the second experiment shows that heightened suspicion reduces consumer willingness to pay. Together, these findings reveal that consumers use ratings discrepancies as a signal of fake reviews, and this suspicion impacts their purchase decisions. The findings highlight the importance of understanding the relationship between fake reviews, ratings discrepancies, and consumer demand in online marketplaces.

“Identity-Based Bias, Algorithm Bias, and Self-Censorship in Online Reviews”

Abstract: It is crucial whether individuals from marginalized groups are perceived as less persuasive, and whether this leads to their underrepresentation in influential positions with greater visibility and a reluctance to express their opinions. Amazon reviews provide a valuable and quantifiable context for investigation. This paper examines how the perceived identity of reviewers affects the helpfulness votes of their reviews on Amazon, the world’s largest e-commerce platform. Utilizing a data set of over 1.8 million reviews, we apply advanced natural language processing and computer vision tools to infer the gender and ethnicity of reviewers based on their user aliases and avatars. We find that reviews perceived as written by women, non-binary individuals, and ethnic minorities receive fewer helpfulness votes compared to those written by men and white individuals, after controlling for review quality and other relevant factors. Furthermore, we demonstrate how Amazon’s review ranking algorithm amplifies these initial disparities, creating a self-reinforcing loop that perpetuates the underrepresentation of marginalized voices. We also uncover evidence of self-censorship, as reviewers from these groups become less likely to contribute content after receiving fewer helpfulness votes on their past reviews. To address these biases, We propose two platform design interventions: identity-blind review displays and affirmative action policies in the review ranking algorithm. We further estimate a structural model that captures both the supply and demand sides of the review “market” to assess the welfare

implications of these interventions.

“From Fame to Office: Electoral Advantage of Political Influencers” (with Ganesh Iyer and Yi Yu)

Abstract: In recent years, numerous political candidates achieved electoral success after first becoming well-known as influencers in non-political fields. Famous examples include Donald Trump, Ronald Reagan, Arnold Schwarzenegger, and others. This study explores the relationship between one’s fame as an influencer and their performance in U.S. gubernatorial elections from 1865 to 2020. With a dataset of 3,942 candidates and their Wikipedia biographies, we used Large Language Models (LLMs) to identify influencers as individuals who achieved public prominence through roles such as entrepreneurs, professional experts, or athletes before entering politics. The findings reveal that influencer candidates hold a significant and substantial advantage and in some cases are 20% more likely to win governor elections. This effect is particularly pronounced in three cases: Republican candidates in general, especially those running in swing states, and individuals making their first run for office and/or lacking prior experience as a governor. As is common in much of the existing literature in this field, establishing causality presents a common challenge. To address this, we conduct a voting experiment with approximately 1,800 participants. The results show that the estimated advantage of being an influencer closely aligns with findings from the observational analysis, reinforcing the causal interpretation. This research provides important insights into the dynamics of American democracy, indicating that public recognition and celebrity status can serve as pathways to electoral success.

“Ownership Consolidation and Performance of Earned Media when Building Political Brands” (with Hulya Eraslan, Przemyslaw Jezierski, and Gizem Kosar)

Abstract: This study examines how media ownership consolidation influences the effectiveness of earned media in shaping political brands in U.S. mayoral elections. Using data from over 300 local radio markets between 1945 and 2006, we link radio station ownership records and news programming to local election outcomes. We find that increased market concentration strengthens the re-election prospects of incumbent mayors while hindering the performance of challengers. The effect of increased concentration is primarily driven by a reduction in the number of news-producing stations, and it disproportionately benefits lower-quality incumbents. We theoretically model this phenomenon within an oligopoly framework, demonstrating how ownership structure affects news quality, and ultimately, electoral outcomes. To address potential endogeneity in market structure, we leverage a novel instrument based on multi-market mergers. From both managerial and policy perspectives, our results underscore the broader consequences of media consolidation: it not only weakens the informative performance of earned media but also lowers the quality of decision-making, which poses serious risks to the electoral process, as it may prevent the most qualified candidates from winning. Additionally, for firms, more concentrated media ownership reduces opportunities for visibility through earned media, diminishing the impact of superior offerings and limiting entry of new products.