Digital Economics and AI Tutorial Application

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I am writing to apply for the NBER Tutorial on Digital Economics and Artificial Intelligence. I am a Ph.D. candidate in Quantitative Marketing at the Foster School of Business, University of Washington.

I began my doctoral studies in December 2021. During the first two years, I took Ph.D.-level coursework spanning marketing, economics, and computer science. My economics coursework includes the microeconomics and econometrics sequences, applied microeconomics, and game theory. In the computer science department, I completed graduate courses in machine learning and AI, specifically, interactive learning, natural language processing, and machine learning for big data. Within the marketing department, I participated in research seminars covering dynamic discrete choice models, behavioral decision theory, and machine learning methods in marketing. This interdisciplinary training provides a strong foundation for engaging with research at the intersection of digital economics and AI.

My research lies at the intersection of quantitative marketing, digital economics, causal inference, and AI alignment. Broadly, I study how firms can leverage experimentation, machine learning, and observational data to improve decision-making in digital environments. My dissertation, "Essays on Data-Driven Marketing: Causal Inference, AI Alignment, and Experimentation," consists of three projects described below, which I worked on throughout the PhD program.

My first project, "Effective Adaptive Exploration of Prices and Promotions in Choice-Based Demand Models," (Marketing Science 2024), develops and evaluates adaptive experimentation methods for pricing decisions. We designed and implemented a Thompson

sampling–based framework that exploits the structure of multinomial logit demand models and an extension to incorporate neural network components. The approach efficiently learns heterogeneous consumer preferences and reduces regret in dynamic price and promotion environments. This project contributed to methodological innovation in adaptive experimentation and strengthened my interest in how digital platforms optimize decisions through interactive learning.

A second line of my work lies in health economics and causal analysis of advertising effects. Using comprehensive advertising and market demand data, we examine how advertising for prescription drugs and over-the-counter cessation products affects consumers' choices and cigarette demand. We find that advertising for prescription medications leads to the largest reductions in cigarette consumption, while advertising for over-the-counter products tends to divert consumers away from more effective prescription options. This work illustrates how frictions such as access barriers shape substitution patterns and highlights the importance of digital and traditional advertising in healthcare markets. This research has recently been published in Marketing Science as "Investigating the Impact of Advertising on Smoking Cessation: The Role of Direct-to-Consumer Prescription Drug Advertising".

I am right now working on a project on fine-tuning language models for business outcomes, which is my job market paper. This work focuses on the challenge of fine-tuning large language models (LLMs) using observational data in settings with high-dimensional treatments such as text. Although observational data is abundant, directly fine-tuning on it often induces spurious correlations due to confounding. Using multiple real-world datasets, I provide empirical evidence that naive fine-tuning causes models to learn biases that degrade downstream performance.

My research works on addressing this challenge. I first propose a two-part framework to remove the influence of known confounders prior to fine-tuning. Second, I develop more advanced approaches inspired by Double Machine Learning (DML) and deep instrumental variable estimation to obtain debiased supervision signals. This work has been accepted

to the NeurIPS 2025 Workshop on CauScien: Uncovering Causality in Science and was presented as a poster at ACM EC 2025. I am currently extending the second method to accommodate high-dimensional treatments, enabling DML-style estimation for text-based interventions.

I am grateful for the guidance and support of my two co-chairs and the rest of my dissertation committee, whose expertise has been invaluable to the development of my research. Below I list the members of my committee:

- Ali Goli (Co-chair)
- Amin Sayedi (Co-chair)
- Jacques Lawarrée (GSR)
- Shirsho Biswas
- Lalit Jain
- Hema Yoganarasimhan

I sincerely appreciate the opportunity to apply for this tutorial. Attending the NBER Tutorial on Digital Economics and Artificial Intelligence would be an invaluable experience at this stage of my doctoral training. It would be very helpful for me to participate, hear presentations by leading scholars, and interact with the research community whose work has shaped the fields of digital economics and AI. The opportunity to discuss my research, receive feedback, and further refine my job market paper would be especially valuable.

Best,

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