

A Learning and Optimization Framework for Personalized Product Design



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Time: 11:00 – 12:30

Abstract:

The problem of product design aims to select a combination of features for a new product that maximizes the revenue from selling it. We consider a logit-based modeling framework for personalizing product design to customers. The model incorporates customer features, product features, and possible interaction between customer and product features when interpreting customers' choices. We present a statistical learning framework for estimating model parameters from choice-based conjoint datasets, which are commonly used in traditional conjoint experiments and advanced data collection on digital platforms. In addition, we provide finite sample performance guarantees for our estimation and optimization results. Our results fill a gap in the single product design literature by providing the first statistical learning performance guarantee. It also reveals a missing angle in the literature by examining the impact of assortment size on the convergence speed of a learning method used in choice-based conjoint analysis. Interestingly, unlike the sample size in classic statistical analysis, the assortment size has a convex effect on the convergence rate. Furthermore, we investigate the optimal assortment size for different levels of product design attractiveness through theoretical analysis, providing practical insights for collecting conjoint data more efficiently. We validate our theoretical findings with numerical experiments and demonstrate the efficiency of our method with case studies based on a COVID-19 vaccine dataset from a large-scale survey and a hotel room dataset from a multinational hotel chain company.

Biography:

Meng Qi is an Assistant Professor of Operations, Technology and Information Management at Cornell University SC Johnson College of Business. Her research focuses on data-driven solutions for new models of revenue and supply chain management in modern e-commerce. Specifically, her research provides both methodologies and practical solutions combining tools and concepts from optimization, machine learning, and statistics. Meng received her Ph.D. in Industrial Engineering and Operations Research from UC Berkeley and her B.S. in Mathematics and Physics from Tsinghua University.

Your attendance is most welcome!