Large-Scale Demand Estimation: Frontier Methods and Applications

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Abstract

In recent years, there has been a growing interest in estimating demand for large product assortments. However, many common demand estimation approaches do not scale well, lack sufficient flexibility, or cannot accommodate sparse purchases. This session will discuss frontier solutions to these problems and present empirical applications in the areas of competition and market power, pricing, and targeted marketing. Large-Scale Demand Estimation with Search Data Tomomichi Amano, Andrew Rhodes, and Stephan Seiler In many online markets, traditional methods of demand estimation are difficult to implement because assortments are large and individual products are sold infrequently. At the same time, data on consumer search behavior are often available and more abundant than purchase data. We propose a structural demand model with consideration set formation that capturing substitution patterns between products in a flexible fashion. We apply the model to a data set containing search and purchase information across 50 products, recover the elasticity matrix, and solve for optimal prices. Who runs Spotify? Measuring the Power of Content Producers on Digital Music Streaming Platforms Max J. Pachali and Hannes Datta Today, platforms have replaced traditional revenue streams of content producers across many industries. Policy-makers are increasingly concerned about the growing power of digital platforms and the negative consequences for consumer choice and competition. We estimate a demand model of consumer playlist choice using data on more than 1.2m playlists collected from Chartmetric.com and compare how Spotify and the major labels can harm each other's revenue generation by executing power through promotions, recommendations, and content availability on the platform. Next-Basket Prediction in Large Assortments with Gated Recurrent Unit State-Space Models Luuk van Maasakkers, Dennis Fok, and Bas Donkers State-space models are widely used in time series forecasting, but can be infeasible to estimate with high-dimensional output variables. In this research, we show that the predictions based on a well-known machine learning technique, the gated recurrent unit (GRU), provide a scalable, possibly non-Gaussian generalization of the classical state space model predictions. We use the GRU for the purpose of next-basket prediction and show that it is able to accurately rank products based on their attractiveness to consumers. Shrinkage Priors for High-Dimensional Demand Estimation Adam Smith and Jim Griffin We study high-dimensional log-linear demand systems and propose a hierarchical extension of the class of global-local shrinkage priors to allow the direction and rate of shrinkage to depend on a product classification tree. We use both simulated data and retail scanner data to show that estimates of cross-price elasticities and demand predictions can be improved by imposing shrinkage to higher-level group effects rather than zero. "

Keywords:

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