MARKETING COLLOQUIA
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BAYESIAN NONPARAMETRIC CUSTOMER BASE ANALYSIS WITH MODEL-BASED VISUALIZATIONS

ABSTRACT: Marketing managers are responsible for understanding and predicting customer purchasing activity, a task that is complicated by a lack of knowledge of all of the calendar time events that influence purchase timing. Yet, isolating calendar time variability from the natural ebb and flow of purchasing is important, both for accurately assessing the influence of calendar time shocks to the spending process, and for uncovering the customer-level patterns of purchasing that robustly predict future spending. A comprehensive understanding of purchasing dynamics therefore requires a model that flexibly integrates both known and unknown calendar time determinants of purchasing with individual-level predictors such as interpurchase time, customer lifetime, and number of past purchases. In this paper, we develop a Bayesian nonparametric framework based on Gaussian process priors, which integrates these two sets of predictors by modeling both through latent functions that jointly determine purchase propensity. The estimates of these latent functions yield a visual representation of purchasing dynamics, which we call the model-based dashboard, that provides a nuanced decomposition of spending patterns. We show the utility of this framework through an application to purchasing in free-to-play mobile video games. Moreover, we show that in forecasting future spending, our model outperforms existing benchmarks.

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