Title: A Markovian Approach to Choice Modeling and Assortment Optimization

Abstract: Assortment optimization is an important problem that arises in many practical applications such as retailing and online advertising where the goal is to select a subset of items to offer from a universe of substitutable items such that the expected revenue is maximized. One of the fundamental challenges in these problems is to identify a "good" model for customer preferences and substitution behavior especially since the preferences are latent and not observable in data.

We consider a Markovian approach to address the model selection problem where substitutions are modeled as state transitions in a Markov chain. We show that this model provides a good approximation for all random utility based discrete choice models including the multinomial logit, the nested logit and mixtures of multinomial logit models, thereby addressing the model selection problem.

Furthermore, we present an efficient iterative algorithm for assortment optimization under the Markov chain model that gives an optimal for the unconstrained version and an approximation for the capacity constrained version. Our algorithm is based on a "local-ratio" framework that allows us to linearize the revenue function and also provides interesting insights for the assortment optimization problem over other choice models.