Omnichannel Assortment Optimization under the Multinomial Logit Model with a Features Tree
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Abstract: We consider the assortment optimization problem of a retailer who operates both a physical store and an online store. Products are described by their features and we capture the relationship between the products and the features with a tree. Non-leaf vertices correspond to features and leaf vertices correspond to products, so that the path from the root to a leaf describes the features that make up a product. A customer observes a feature if any product with that feature is offered in the physical store. A customer is either a physical store customer or an online store customer, and each customer chooses amongst the products offered in her respective store. However, an online store customer also visits the physical store to try out the products. The utilities of products in the online store are revised based on the features that an online customer sees in the physical store. The retailer offers the full assortment of products in the online store, and the goal is to find an assortment to offer in the physical store that maximizes the total expected revenue from both types of customers.

First, we consider the case with only online store customers, so that the physical store serves as a showroom for customers to try out products. We give an efficient algorithm to find the optimal assortment to display in the physical store. Second, we consider a mix of customers. The assortment optimization problem is NP-hard and we give a fully polynomial-time approximation scheme (FPTAS). Via numerical experiments, we demonstrate that our model can approximate the case where the products are arbitrary combinations of features without a tree structure and our FPTAS performs much better than its theoretical guarantee.

This is joint work with Professor Huseyin Topaloglu at Cornell University.

Bio: Dr Venus Lo is an Assistant Professor at Department of Management Sciences at the City University of Hong Kong. Prior to joining CityU, Dr Lo completed her PhD in the School of Operations Research and Information Engineering at Cornell University, and her B.Math, M.Acc, and M.Math at the University of Waterloo. The main focus of her work is assortment optimization problems in revenue management. In particular, Dr Lo’s research focuses on designing efficient algorithms with provable performance guarantees for choice models in the modern retail environment.

All interested are welcome!
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