

Online Pricing with Offline Data: Phase Transition and Inverse Square Law



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Abstract:

Classical statistical learning distinguishes between offline learning and online learning. Motivated by the idea of bridging the gap between these two types of learning tasks, this work investigates the impact of the pre-existing offline data on online learning in the context of a dynamic pricing problem. We consider a seller offering a single product with an infinite amount of inventory over a selling horizon. The demand in each period is determined by the price of the product according to a linear demand model with unknown parameters. We assume that the seller has some offline data before the start of the selling horizon, and wants to utilize both the pre-existing offline data and the sequentially-revealed online data to minimize the regret of the online learning process. We characterize the joint effect of the size, location and dispersion of the offline data on the optimal regret rate of online learning. Our results reveal surprising transformations of the optimal regret rate with respect to the size of the offline data, which we refer to as phase transitions. In addition, our results also demonstrate that the location and dispersion of the offline data have a fundamental impact on the optimal regret rate, which is quantified via the inverse-square law. This is joint work with David Simchi-Levi and Yunzong Xu.

Biography:

Jinzhi Bu is an Assistant Professor in the Department of Logistics and Maritime Studies at the Hong Kong Polytechnic University. Her research interests include stochastic modeling and optimization, statistical and machine learning, data-driven decision making, and their applications in supply chain management and revenue management. Prior to joining PolyU, she was a postdoctoral associate in Institute of Data, Systems, and Society at Massachusetts Institute of Technology. She obtained her Ph.D. degree from the Chinese University of Hong Kong and B.S. degree from Nanjing University.

Your attendance is most welcome!