The Hong Kong University of Science and Technology

Dept of Information Systems, Business Statistics and Operations Management
Dept of Industrial Engineering & Decision Analytics

Joint Seminar Announcement

An Asymptotically Tight Learning Algorithm for Mobile-Promotion Platforms

by

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Date : **18 March 2022 (Friday)**

Time : **10:30 - 11:45 AM**

Zoom ID : **978 2332 0242 (passcode 370129)**

Abstract: Operating under both supply-side and demand-side uncertainties, a mobile-promotion platform conducts advertising campaigns for individual advertisers. Campaigns arrive dynamically over time, which is divided into seasons; each campaign requires the platform to deliver a target number of mobile impressions from a desired set of locations over a desired time interval. The platform fulfills these campaigns by procuring impressions from publishers, who supply advertising space on apps, via real-time bidding on ad exchanges. Each location is characterized by its *win curve*, i.e., the relationship between the bid price and the probability of winning an impression at that bid. The win curves at the various locations of interest are initially unknown to the platform, and it learns them on the fly based on the bids it places to win impressions and the realized outcomes. Each acquired impression is allocated to one of the ongoing campaigns. The platform's objective is to minimize its total cost (the amount spent in procuring impressions and the penalty incurred due to unmet targets of the campaigns) over the time horizon of interest. Our main result is a *bidding and allocation policy* for this problem. We show that our policy is the best possible (asymptotically tight) for the problem using the notion of *regret* under a policy, namely the difference between the expected total cost under that policy and the optimal cost for the *clairvoyant problem* (i.e., one in which the platform has full information about the win curves at all the locations in advance): The regret under *any* policy is $\Omega(\sqrt{I})$, where I is the number of seasons, and that under our policy is $O(\sqrt{I})$. We demonstrate the performance of our policy through numerical experiments on a test bed of instances whose input parameters are based on our observations at a real-world mobile-promotion platform.

Bio: Prof Anyan Qi is an Associate Professor of Operations Management at Naveen Jindal School of Management, the University of Texas at Dallas. His current research focuses on strategic procurement and capacity management in modern supply chains. In his research, he uses tools of stochastic dynamic programming, data-driven optimization, game theory, and behavioral experiment. His works have been published or accepted for publication in *Management Science, Operations Research, Manufacturing & Service Operations Management,* and *Production and Operations Management,* and have been recognized as a finalist in 2013 MSOM Student Paper Competition and a finalist in 2012 POMS College of Supply Chain Management Student Paper Competition. He teaches the graduate core course of OPRE 6301 (Statistics and Data Analysis), and the undergraduate core courses of OPRE 3310 (Operations Management) and OPRE 3360 (Managerial Methods in Decision Making under Uncertainty). He has been recognized as the outstanding undergraduate teacher at JSOM in 2016. He serves as a Senior Editor for Production and Operations Management. He also serves as a referee for *Management Science, Operations Research, Manufacturing & Service Operations Management, Production and Operations Management, Strategic Management Journal, Naval Research Logistics, Decision Science, Economic Inquiry, OMEGA*, and *International Transactions in Operations Research*. He has received the *Management Science* Distinguished Service Award three times, and *M&SOM* Meritorious Service Award four times. He organized a cluster at INFORMS Annual Meeting in 2018 and sessions at various conferences. He advises doctoral students and serves on various committees at the department and school levels at UT Dallas. He is a member of INFORMS, MSOM Society, and POM Society. Prior to joining the Naveen Jindal School of Management, he earned a Ph.D. degree in Technology and Operations from the Ross School of Business, University of Michigan, a Bachelor's degree in Automation from the School of Information Science and Technology, and a Bachelor's degree in Economics from the School of Economics and Management in Tsinghua University in China.

All interested are welcome!

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