

The Hong Kong Polytechnic University
Department of Logistics and Maritime Studies
Research Seminar

Bayesian Dynamic Learning and Pricing with Strategic Customers

by

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(Conducted in English)

Abstract:

We consider a seller who repeatedly sells a nondurable product to a single customer whose valuations of the product are drawn from a certain distribution. The seller, who initially does not know the valuation distribution, may use the customer's purchase history to learn, and wishes to choose a pricing policy that maximizes her long-run revenue. Such a problem is at the core of personalized revenue management where the seller can access each customer's individual purchase history and offer personalized prices.

In this paper, we study such a learning problem when the customer is aware of the seller's policy, and thus may behave strategically when making a purchase decision. By using a Bayesian setting with a binary prior, we first show that a naive myopic Bayesian policy (MBP) by the seller may lead to incomplete learning --- the seller may never be able to ascertain the true type of the customer and the regret may grow linearly in time. The failure of the MBP is due to the strategic action taken by the customer. To resolve this issue, we propose a randomized Bayesian policy (RBP), which updates the posterior belief of the customer in each period with a certain probability. We show that the seller can learn the customer type exponentially fast with the RBP even if the customer is strategic, and the regret is bounded by a constant. We also propose policies that achieve asymptotically optimal regrets when only a finite number of price changes is allowed.

Bio:

Dr. Zizhuo Wang is an Assistant Professor from the Department of Industrial and Systems Engineering (ISyE) at the University of Minnesota. He received his PhD in Operations Research from Stanford University in 2012. Prior to that, he graduated from Department of Mathematical Sciences in Tsinghua University at 2007 and obtained his M.S. in Mathematical Finance in 2011 from Stanford University. His research interests mainly focus on optimization and stochastic modeling, especially with applications to pricing and revenue management. He has published several papers in top journal in the field of operations research, including Operations Research, Management Science, Manufacturing and Service Operations Management (MSOM), Mathematics of Operations Research, Production and Operations Management Mathematical Programming, etc.

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All are welcome!