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

Probabilistic Sequential Shrinking: A Best Arm Identification Algorithm for Stochastic Bandits with Corruptions

by

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Date	:	**30 April 2021 (Friday)**
Time	:	**10:30 - 11:45 am**
Zoom ID	:	**961 8647 4544 (passcode 405397)**

Abstract: Motivated by the issues of fraudulent clicks in online recommendation systems and contaminated samples in medical trials, we consider a best arm identification (BAI) problem for stochastic bandits with adversarial corruptions. The goal is to identify the best arm with a fixed number of pulls (which are also known as time steps), in the presence of an adversary who can corrupt the stochastic outcomes of the arms.

We design a novel randomized algorithm, PROBABILISTIC SEQUENTIAL SHRINKING (PSS), which is agnostic to the amount of corruptions. In the absence of corruptions, our proposed algorithm achieves the state-of-the-art performance guarantee. In the presence of corruptions, we construct settings where the state-of-the-art BAI algorithm (Karnin et al. 2013) fails to identify the best arm with probability at least 0.5, whereas PSS identifies the best arm with high probability. En route, we demonstrate the importance of randomized sampling for mitigating the impact of corruptions.

In addition, we identify the amount of corruptions per step (CPS) to be a crucial parameter that characterizes the possibility of BAI. When the CPS is below a certain threshold, PSS identifies the best arm with high probability. Otherwise, the optimality gap of the identified arm degrades gracefully with the CPS, while there is no guarantee on the probability of identifying the best arm. We demonstrate the necessity of such a bifurcation, by showing that BAI is impossible when the CPS is above a certain threshold.

Bio: Dr Wang-Chi Cheung is currently an Assistant Professor at the Department of Industrial Systems Engineering and Management (ISEM), National University of Singapore. He completed his PhD in the MIT Operations Center, advised by David Simchi-Levi. Dr Cheung is interested in online learning and data driven optimization, with applications to revenue management and service operations. He is a finalist in the George Nicholson Student Paper Competition in 2015, and a finalist in POMS-JD.com Best Data-Driven Research Paper Competition (2019).

All interested are welcome!

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