The Hong Kong University of Science and Technology

Department of Information Systems, Business Statistics and Operations Management

Webinar Announcement

Deep Reinforcement Learning for Sequential Targeting

by

Ms. Wen Wang

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Date : **Monday, 13 December 2021**

Time : **9:30 am - 11:00 am (Hong Kong Time)**

Zoom Details : [Click here to join Zoom](#)
Meeting ID: 954 7599 5651(Passcode: 246467)

Abstract: Deep reinforcement learning (DRL) has opened up many unprecedented opportunities in revolutionizing the digital marketing field. In this study, we designed a DRL-based personalized targeting strategy. We show that the strategy is able to address four important challenges in this area. 1) Sequential-decisions: accounting for the dynamic sequential behavior of consumers; 2) Forward-looking: balancing between a firm's current revenue and future revenues; 3) Earningwhile-learning: maximizing profits while continuously learning through exploration-exploitation; 4) Scalability: coping with a high-dimensional state and policy space. We illustrate the above through a novel design of a DRL-based artificial intelligence (AI) agent. Further, in order to better understand the potential underlying mechanisms, we conducted multiple interpretability analyses to explain the patterns of learned optimal policy at both the individual and population levels. Our findings provide important managerial-relevant and theory-consistent insights. For instance, consecutive price promotions at the beginning can capture price-sensitive consumers' immediate attention, while carefully spaced non-promotional "cool-down" periods between price promotions can allow consumers to adjust their reference points. Besides, consideration of future revenues is necessary from a long-term horizon, but weighing the future too much can also dampen revenues. In addition, analyses of heterogeneous treatment effects suggest that the optimal promotion sequence pattern highly varies across the consumer engagement stages. Overall, our study results demonstrate DRL's potential to optimize these strategies' combination to maximize long-term revenues.

Bio: Wen Wang is a fifth-year Ph.D. Candidate in Information Systems at Carnegie Mellon University. Her research interests lie in using innovative and interpretable machine leanings/deep learning/AI to improve business decisions and social welfare. She also spent two summers at the Amazon AWS AI lab as a research scientist. She is the founder and main organizer of the KDD 2021 workshop on Machine Learning for Consumers and Markets. She won the Best Paper in Track Award at ICIS 2021.