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

Nonprogressive Diffusion on Social Networks: Approximation and Applications

by

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Date	:	**11 April 2025 (Friday)**
Time	:	**10:30 – 11:45 AM**
Venue	:	**Lecture Theatre (G012), G/F, LSK Business Building**

Abstract: Nonprogressive diffusion models the spread of behavior on social networks, where agents are allowed to reverse their decisions as time evolves. To provide an efficient framework for evaluating and optimizing nonprogressive diffusion, we introduce a comprehensive model along with a Fixed-Point Approximation (FPA) scheme, which admits both theoretical guarantee and computational efficiency. We show that the approximation error depends on the network structure and derive order-optimal bounds for this error based on a newly proposed network measure. Additionally, we propose two easy-to-calculate network metrics, one at the node level and the other at the network level, that serve as reliable indicators of FPA performance. Our results indicate that the FPA scheme is particularly accurate for dense and large networks, which are typically challenging to analyze via simulation. To showcase the broad applicability of our approach, we apply the FPA scheme to well-known problems like influence maximization and optimal pricing on social networks. Finally, we conduct extensive numerical experiments on both synthetic and real-world networks. On real-world networks, the FPA scheme achieves computational speedups of 70-230 times compared to naive agent-based simulation and 23-30 times compared to more advanced simulation method, while maintaining a mean absolute percentage error of less than 3.48%.

Bio: Yunduan Lin is an assistant professor in the Department of Decisions, Operations and Technology, the Chinese University of Hong Kong. She received her BEng in Civil Engineering from Tsinghua University and her PhD and MS in Civil and Environmental Engineering from the University of California, Berkeley. Her research interests broadly lie in social network analytics and platform operations. Her papers have been published and under revisions in leading journals, such as Management Science and Manufacturing & Service Operations Management.

All interested are welcome!

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