Introduction to the "Best papers of WSDM 2023" special issue

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CCS Concepts: • **Information systems → Recommender systems**; **Sentiment analysis**; **Query intent**; • **Theory of computation → Random network models**.

Additional Key Words and Phrases: Prediction explanations, graph neural networks, counterfactual reasoning, social networks, opinion polarization, preferential attachment, session-based recommendation, user intent analysis, contrastive learning, knowledge graph, multi-behavior recommendation, motif counting, random walk, sublinear

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1 Introduction

This special issue of the ACM Transactions on Intelligent Systems and Technology features extended versions of five of the best papers that were published at the 16th ACM International Conference on Web Search and Data Mining (WSDM 2023).

The first article, "GCFExplainer: Global Counterfactual Explainer for Graph Neural Networks" by Mert Kosan, Zexi Huang, Sourav Medya, Sayan Ranu and Ambuj Singh, describes a new algorithm for generating explanations of predictions made by graph neural networks (GNNs) using counterfactual reasoning. Their approach improves on the prior state of the art by providing global (as opposed to local) explanations, and by providing concise (as opposed to per-instance) summaries of counterfactual graphs. The article expands on the WSDM 2023 paper [3] by presenting additional proofs, providing additional examples, describing additional experiments, reporting on the runtime performance of the approach, and analyzing the sensitivity of the approach to the starting distribution.

The second article, "Local Edge Dynamics and Opinion Polarization" by Nikita Bhalla, Adam Lechowicz and Cameron Musco, describes a graph-based approach to study the evolution of opinion formation and polarization in social networks. The paper postulates a set of simple rules for edge creation and deletion in social networks, reflecting users' confirmation bias, which leads to severing ties with users whose opinions differ, and friend-of-friend recommendations, which lead to establishing ties with like-minded users. The proposed model is amenable to theoretical

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analysis. The experimental evaluation shows that real-world social networks evolve in a similar fashion to what this model predicts. The article expands on the WSDM 2023 paper [2] by adding several new lemmas and corollaries to the theoretical analysis of the model, by adding experiments on synthetic graphs that were omitted from the WSDM version due to space constraints, and by describing additional experiments on real-world graphs.

The third article, "Advancing Session-Based Recommendations with Atten-Mixer+: Dynamic and Adaptive Multi-Level Intent Mining" by Peiyan Zhang, Jiayan Guo, Chaozhuo Li, Liying Kang, Jaeboum Kim, Jie Xu, Xi Zhang, Yan Zhang, Haohan Wang and Sunghun Kim, describes a new approach to session-based recommendation. The article improves on the Multi-Level Attention Mixture Network (Atten-Mixer) approach by some of the same authors that appeared at WSDM 2023 [5]. Atten-Mixer+ improves on Atten-Mixer by introducing an Adaptive Intent Scaler (AIS) layer into the neural network, which dynamically determines the depth of multi-level user intent analysis.

The fourth article, "Knowledge Enhancement and Temporal Aware for Multi-Behavior Contrastive Recommendation" by Hongrui Xuan, Bohan Li, Wenlong Wu, Yi Liu and Hongzhi Yin, addresses the problem of multi-behavior recommendations. The proposed system captures users' personal behavioral preferences, and it addresses label sparsity in the target behavior (e.g. purchases as opposed to views in a product recommender system). The article expands on the WSDM 2023 paper [4] by refining the proposed neural architecture to include a multi-behavior encoder based on temporal signals and a collaborative attention mechanism based on behavior categories and time periods.

The fifth and final article, "DeMEtRIS: Counting (near)-Cliques by Crawling" by Suman K.Bera, Jayesh Choudhari, Shahrzad Haddadan, Sara Ahmadian, proposes a new sub-linear time algorithm for estimating the number of cliques and near-cliques in a graph. Clique counting in large graphs has been extensively studied; however, most algorithms assume that the entire graph is available off-line. DeMetRIS does not require knowledge of the complete graph; rather, the algorithm explores the graph (and counts cliques) through a random walk process. The article expands on the WSDM 2023 paper [1] by providing more detailed proofs related to the theoretical analysis of the algorithm, and expands the experimental section by reporting additional clique count statistics and be reporting on the runtime performance.

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References

[1] Suman K. Bera, Jayesh Choudhari, Shahrzad Haddadan, and Sara Ahmadian. 2023. DeMEtRIS: Counting (near)-Cliques by Crawling. In *Proceedings of the Sixteenth ACM International Conference on Web Search and Data Mining* (Singapore, Singapore) *(WSDM '23)*. Association for Computing Machinery, New York, NY, USA, 312–320. https://doi.org/10.1145/3539597.3570438

[2] Nikita Bhalla, Adam Lechowicz, and Cameron Musco. 2023. Local Edge Dynamics and Opinion Polarization. In *Proceedings of the Sixteenth ACM International Conference on Web Search and Data Mining* (Singapore, Singapore) *(WSDM '23)*. Association for Computing Machinery, New York, NY, USA, 6–14. https://doi.org/10.1145/3539597.3570442

[3] Zexi Huang, Mert Kosan, Sourav Medya, Sayan Ranu, and Ambuj Singh. 2023. Global Counterfactual Explainer for Graph Neural Networks. In *Proceedings of the Sixteenth ACM International Conference on Web Search and Data Mining* (Singapore, Singapore) *(WSDM '23)*. Association for Computing Machinery, New York, NY, USA, 141–149.

https://doi.org/10.1145/3539597.3570376

[4] Hongrui Xuan, Yi Liu, Bohan Li, and Hongzhi Yin. 2023. Knowledge Enhancement for Contrastive Multi-Behavior Recommendation. In *Proceedings of the Sixteenth ACM International Conference on Web Search and Data Mining* (Singapore, Singapore) *(WSDM '23)*. Association for Computing Machinery, New York, NY, USA, 195–203. https://doi.org/10.1145/3539597.3570386

[5] Peiyan Zhang, Jiayan Guo, Chaozhuo Li, Yueqi Xie, Jae Boum Kim, Yan Zhang, Xing Xie, Haohan Wang, and Sunghun Kim. 2023. Efficiently Leveraging Multi-level User Intent for Session-based Recommendation via Atten-Mixer Network. In *Proceedings of the Sixteenth ACM International Conference on Web Search and Data Mining* (Singapore, Singapore) *(WSDM '23)*. Association for Computing Machinery, New York, NY, USA, 168–176. https://doi.org/10.1145/3539597.3570445