
Guest editorial: Interpretable AI-enabled online behavior analytics

Guest editorial

401

Introduction

In the era of big data, the proliferation of online behavior data enables the development of profound implications for both scholars and practitioners alike in enhancing the effectiveness of the business operation. Online behavior data varies in forms and quantities, thus signifying the importance of applying an advanced analytics approach to process data and generate meaningful results.

As one of the promising advanced analytical techniques, AI-enabled analytics with big data has gained notable attention in various fields. However, there is still a lack of research studies examining interpretable AI-enabled data analytics. Therefore, it is imperative to investigate the interpretable AI-enabled online behavior analytics because data analytics, without creating an interpretable model/value/approach, is difficult to make significant contributions and actionable implications to the field. Interpretable AI-enabled online behavior analytics should directly benefit (Lau *et al.*, 2018) or provide competitive advantages (Timoshenko and Hauser, 2019). The call for research on interpretable AI and the related application has echoed in other fields such as computer science (Rudin, 2019) and healthcare (Jia *et al.*, 2020).

To this end, this special issue aims to deepen and broaden the current understanding of the embedded business value of interpretable AI-enabled analytics with online behavior data. The focus is on how the AI-enabled online behavior analytic methods are applied for supporting business operations and how to demonstrate the real impact of AI-enabled online behavior analytics. We are interested in interpretable AI-enabled online behavior analytics in various contexts (e.g. online social media, e-commerce and digital government) and its main impact (e.g. users' reactions, customers' experience and government policy).

A summary of the special issue

We received ample submissions, holding different methodological, theoretical and empirical perspectives. After a rigorous peer-review process, 12 full-length papers were selected and included in this special issue. These papers covered a wide range of research questions from authors in different aspects of interpretable AI-enabled online behavior analytics, which will deepen and broaden the current understanding of the embedded business value of interpretable AI-enabled analytics with online behavior data.

The first article by Daejin Kim, Hyung-Goo Kang, Kyounghun Bae and Seongmin Jeon develops a text-based industry classification method by extracting textual features from business descriptions in financial reports. The text-based approach can capture new information in annual reports and the computing concerns of high dimensionality (Kim *et al.*, 2022).

The second article by Babak Abedin proposes a novel framework for managing the opposing effects of AI explainability and addresses polarized beliefs about the benefits of AI explainability and its counterproductive effects. It posits that there is no single best way to maximize AI explainability, and instead, the co-existence of enabling and constraining effects must be managed (Abedin, 2022).



The third article by Hui Yuan and Weiwei Deng presents an interpretable doctor recommendation method by combining a health knowledge graph and deep learning techniques. It provides a practical solution and managerial implications for online platforms that confront information overload and transparency issues (Yuan and Deng, 2022).

The fourth article by Runyu Chen adopts a cooperative learning model with multimodal information to predict advertising clicks. Micro-video platforms can apply the prediction results to optimize their advertisement allocation strategies and better manage network traffic. It can greatly help the more effective development of the micro-video advertisement industry (Chen, 2022).

The fifth article by Xusen Cheng, Ying Bao, Alex Zarifis, Wankun Gong and Jian Mou examines consumers' trust and response to a text-based chatbot in e-commerce. It investigates the moderating role of task complexity and chatbot identity disclosure. It provides a deep understanding of consumers' responses to a chatbot (Cheng *et al.*, 2022).

The sixth article by Zekun Yang and Zhijie Lin designs an interpretable video tag recommender system by using a multimodal deep learning model and realizes the interpretability by the layer-wise relevance propagation. It provides a practical solution for interpretable multimodal tag recommendation (Yang and Lin, 2022).

The seventh article by Mahasweta Saha and Sangeeta Sahney explores the relationships between the pre-purchase information search and pattern. It investigates the moderating effects of the online shopping experience with their influence on the behavior of socialization agents for buying branded apparel (Saha and Sahney, 2022).

The eighth article by Wei Du, Qiang Yan, Wenping Zhang and Jian Ma develops an interpretable knowledge-aware patent recommendation model for patent trading. It first creates a patent knowledge graph and then leverages paths in the patent knowledge graph to achieve recommendation interpretability. The proposed model achieves good performance and transparency (Du *et al.*, 2022).

The ninth article by Ju Fan, Yuanchun Jiang, Yezheng Liu and Yonghang Zhou designs a deep learning method with multi-attention mechanisms for Massive Open Online Courses (MOOC) recommendation. It explores students' preferences to enhance recommendation performance and improves the interpretability of MOOC recommendations (Fan *et al.*, 2022).

The tenth article by Jisu Yi and Yun Kyung Oh examines the role of brand types in determining review content and investigates the moderating effects on the relationship between brand types and the number of attributes discussed in a review. It provides empirical evidence that review content differs by brand types of an innovative product (Yi and Oh, 2022).

The eleventh article by Hailiang Chen, Chuan Ai, Bin Chen, Yong Zhao, Kaisheng Lai, Lingnan He and Zhihan Liu proposes an agent-based modeling method for rumor propagation. It uses a graph-based framework to carry out the rumor propagation simulation experiments. It gives an effective immunization strategy for rumor governance (Chen *et al.*, 2022).

The twelfth article by Nur Azreen Zulkefly, Norjihani Abdul Ghani, Christie Pei-Yee Chin, Suraya Hamid and Nor Aniza Abdullah proposes a data-driven social impact prediction model for social entrepreneurs. It employs the state-of-art data mining models to predict the social impact and achieve good performance (Zulkefly *et al.*, 2022).

Conclusions and future directions

This special issue aims to build a bridge between advanced analytical techniques and business applications. For practice, the aim is to guide companies to better apply advanced analytical techniques and online behavior analytics based on business theories and interpretable requirements.

Online behavior analytics can help companies better understand user needs and preferences to implement more effective strategies. Improving the interpretability of data analytics can help to obtain more useful information, especially in the areas such as public affairs, finance and healthcare. With the diversification of online behavioral data structures and the increase in data, some AI-enabled data analytical techniques such as machine learning have emerged. Machine learning models are often referred to as “black boxes,” meaning that while we can get accurate predictions from them, we cannot clearly explain or identify the logic behind those predictions. Therefore, interpretability AI-enabled data analytics needs to break out of this kind of “black box” and provide human-readable and understandable explanations for decisions made by AI algorithms through different methods based on or even combining human knowledge.

With the development of advanced analytical techniques, there will be more research about AI-enabled analytics in the future. For example, the characterization, measurement and evaluation of the behavior of specific AI systems in different contexts can be further investigated, as well as the interaction and cooperation between AI systems, and the study of their behavioral evolution. In addition, AI-enabled analytics can not only analyze user behavior, but also have an impact on user behavior, such as echo chamber effect and polarization phenomenon. Researchers believe that with the interaction and dynamic evolution of human and AI systems, there will no longer be boundaries between humans and AI systems in the future (Rahwan *et al.*, 2019).

Wei Xu

Renmin, Department Head of Economic Information, University of China, Beijing, China

Jianshan Sun

Hebei University of Technology, Tianjin, China, and

Mengxiang Li

*Department of Finance and Decision Sciences, Hong Kong Baptist University,
Kowloon, Hong Kong*

References

- Abedin, B. (2022), “Managing the tension between opposing effects of explainability of artificial intelligence: a contingency theory perspective”, *Internet Research*, Vol. 32 No. 2, pp. 425-453.
- Chen, R. (2022), “Multimodal cooperative learning for micro-video advertising click prediction”, *Internet Research*, Vol. 32 No. 2, pp. 477-495.
- Chen, H., Ai, C., Chen, B., Zhao, Y., Lai, K., He, L. and Liu, Z. (2022), “The research on propagation modeling and governance strategies of online rumors based on behavior–attitude”, *Internet Research*, Vol. 32 No. 2, pp. 620-639.
- Cheng, X., Bao, Y., Zarifis, A., Gong, W. and Mou, J. (2022), “Exploring consumers’ response to text-based chatbots in e-commerce: the moderating role of task complexity and chatbot disclosure”, *Internet Research*, Vol. 32 No. 2, pp. 496-517.
- Du, W., Yan, Q., Zhang, W. and Ma, J. (2022), “Leveraging online behaviors for interpretable knowledge-aware patent recommendation”, *Internet Research*, Vol. 32 No. 2, pp. 568-587.
- Fan, J., Jiang, Y., Liu, Y. and Zhou, Y. (2022), “Interpretable MOOC recommendation: a multi-attention network for personalized learning behavior analysis”, *Internet Research*, Vol. 32 No. 2, pp. 588-605.
- Jia, X., Ren, L. and Cai, J. (2020), “Clinical implementation of AI technologies will require interpretable AI models”, *Medical Physics*, Vol. 47 No. 1, pp. 1-4.
- Kim, D., Kang, H.-G., Bae, K. and Jeon, S. (2022), “An artificial intelligence-enabled industry classification and its interpretation”, *Internet Research*, Vol. 32 No. 2, pp. 406-424.

- Lau, R., Zhang, W. and Xu, W. (2018), "Parallel aspect-oriented sentiment analysis for sales forecasting with big data", *Production and Operations Management*, Vol. 27 No. 10, pp. 1775-1794.
- Rahwan, I., Cebrian, M., Obradovich, N., Bongard, J., Bonnefon, J., Breazeal, C., Crandall, J.W., Christakis, N.A., Couzin, I.D., Jackson, M.O., Jennings, N.R., Kamar, E., Kloumann, I.M., Laroche, H., Lazer, D., McElreath, R., Mislove, A., Parkes, D.C., Pentland, A., Roberts, M.E., Shariff, A., Tenenbaum, J.B. and Wellman, M. (2019), "Machine behavior", *Nature*, Vol. 568, pp. 477-486.
- Rudin, C. (2019), "Stop explaining black box machine learning models for high stakes decisions and use interpretable models instead", *Nature Machine Intelligence*, Vol. 1 No. 5, pp. 206-215.
- Saha, M. and Sahney, S. (2022), "Exploring the relationships between socialization agents, social media communication, online shopping experience, and pre-purchase search: a moderated model", *Internet Research*, Vol. 32 No. 2, pp. 536-567.
- Timoshenko, A. and Hauser, J.R. (2019), "Identifying customer needs from user-generated content", *Marketing Science*, Vol. 38 No. 1, pp. 1-20.
- Yang, Z. and Lin, Z. (2022), "Interpretable video tag recommendation with multimedia deep learning framework", *Internet Research*, Vol. 32 No. 2, pp. 518-535.
- Yi, J. and Oh, Y.K. (2022), "Does brand type affect what consumers discuss? A comparison of attribute-based reviews of value and premium brands of an innovative product", *Internet Research*, Vol. 32 No. 2, pp. 606-619.
- Yuan, H. and Deng, W. (2022), "Doctor recommendation on healthcare consultation platforms: an integrated framework of knowledge graph and deep learning", *Internet Research*, Vol. 32 No. 2, pp. 454-476.
- Zulkefly, N.A., Ghani, N.A., Chin, C.P.-Y., Hamid, S. and Abdullah, N.A. (2022), "The future of social entrepreneurship: modelling and predicting social impact", *Internet Research*, Vol. 32 No. 2, pp. 640-653.

About the authors

Dr. Wei Xu is Professor and Department Head of Economic Information Management at the School of Information, Renmin University of China. He is a research fellow at Department of Information Systems, City University of Hong Kong. His research interests include big data analytics, business analytics and decision support systems. He has published over 150 research papers in international journals and top conferences, such as *Production and Operations Management*, *Decision Support Systems*, *Internet Research*, *European Journal of Operational Research*, *IEEE Trans.*, *Information Sciences*, *International Conference of Information System and International Joint Conferences on Artificial Intelligence*. He also serves as a MiniTrack Chair of HICSS Conference.

Dr. Jianshan Sun is associate professor at the School of Management at Hefei University of Technology. He obtained his PhD degree in the Department of Information Systems of City University of Hong Kong in 2014. His research focuses on big data analytics, user behavior analysis and recommender systems. His research papers have appeared in journals such as *Journal of the Association for Information Science and Technology*, *Decision Support Systems*, *British Journal of Educational Technology*, *Information Processing and Management*, *Computers in Human Behavior*, *Journal of Information Science*, *IEEE Transactions on Knowledge and Data Engineering* amongst others. His papers have also been presented in the leading conferences such as *International Conference on Information System (ICIS)*, *Hawaii International Conference on System Science (HICSS)* and *Americas Conference on Information Systems (AMCIS)*. He serves as guest editors for *British Journal of Educational Technology*, *IEEE Access* and *Information Discovery and Delivery*. He also served as a Track Chair of HICSS 2016–2019, and the Program Chair of Big Data and Business Analytics Workshop of IEEE Data Science on Cyberspace 2018–2019.

Dr. Mengxiang Li is Associate Professor of Information Systems at the Department of Finance and Decision Sciences, School of Business, Hong Kong Baptist University. He has published more than 30 research papers in the past six years, including top-tier journals such as *MIS Quarterly*, *Journal of MIS*,

Information and Management. Dr. Li's current research examines innovative technology use, strategic decision about technology, user-centered technology design, digital resilience, and remote everything. He has served as associate editor at Internet Research, Journal of Global Information Management and Journal of Electronic Commerce Research. Dr. Li received a PhD in Information Systems from College of Business, City University of Hong Kong in October 2013. Prior to joining HKBU, he worked as a faculty member at School of Computing and Information Technology, University of Wollongong, Australia.

Guest editorial