

**Please cite the Published Version**

Bashir, AK, Mumtaz, S, Menon, VG and Tsang, KF (2021) Guest Editorial: Cognitive Analytics of Social Media for Industrial Manufacturing. IEEE Transactions on Industrial Informatics, 17 (4). pp. 2899-2901. ISSN 1551-3203

**DOI:** <https://doi.org/10.1109/TII.2020.3028762>

**Publisher:** Institute of Electrical and Electronics Engineers

**Version:** Accepted Version

**Downloaded from:** <https://e-space.mmu.ac.uk/627608/>

**Usage rights:** © In Copyright

**Additional Information:** This is an Author Accepted Manuscript of an article published in IEEE Transactions on Industrial Informatics.

**Enquiries:**

If you have questions about this document, contact [openresearch@mmu.ac.uk](mailto:openresearch@mmu.ac.uk). Please include the URL of the record in e-space. If you believe that your, or a third party's rights have been compromised through this document please see our Take Down policy (available from <https://www.mmu.ac.uk/library/using-the-library/policies-and-guidelines>)

# Cognitive Analytics of Social Media for Industrial Manufacturing

Ali Kashif Bashir, *Senior Member, IEEE*. Shahid Mumtaz, *Senior Member, IEEE*. Varun G. Menon, *Senior Member, IEEE*, and Kim Fung TSANG, *Senior Member, IEEE*

**Abstract**— This Special Issue aims at providing a platform for sharing the state-of-the-art research and development on Cognitive Analytics of Social Media for Industrial Manufacturing and publishing original research and peer-reviewed articles targeted to all readers of IEEE Transactions on Industrial Informatics. This special issue is targeted to stimulate the discussion on the design, use, and evaluation of cognitive models for social media analytics and leverage more in-depth insights from the vast amount of generated data for industrial sensing. The social data's cognitive analytics allows delving the voluminous data for machine intelligence, information, and decision-making processes; there are still some open issues, such as security and privacy, data trustworthiness and quality, participation motivation & incentive, which need to be addressed. Eight papers have been selected for publication in this part of the section, following several rounds of rigorous reviews. The summary of the selected articles in this special section is also presented here.

**Index Terms**— Social Media analysis, Internet of Things, Cognitive computing

## I. INTRODUCTION

Business innovation and industrial intelligence pave the way to a future in which smart factories, intelligent machines, networked processes, and big data are brought together to foster industrial growth and shift the modalities. Industry 4.0 or the Industrial Internet-of-Things is the latest catchphrase of technological innovation in manufacturing with the goal of increasing productivity in a flexible and efficient manner. Concurrently, the new collaborative Web (called Web 2.0) resiliently defines the notion of the techno-social system of computer-mediated, web/internet-based technologies and channels that have the primary objective of creating and

enabling a collaborative and interactive virtual community of participants who can share or communicate information. These social technologies are essentially transforming the way we communicate, collaborate, consume, and create data and characterize one of the insurgent impacts of information technology on any industry, both within and outside industrial boundaries. Social media augments as a non-trivial element to this industrial value chain with the intent of making it more efficient. Collaborative sensing or crowd sensing can be used to help producers, suppliers, and customers understand and use insights learned from large amounts of sensing data in order to obtain competitive advantages and design better user experiences.

Recently, cognitive analytics as a technology-based solution has attracted a lot of attention from both researchers and practitioners. This approach to information discovery and decision-making uses multiple intelligent technologies such as machine learning, deep learning, artificial intelligence, natural language processing, and image recognition to understand data generate insights. This technology can be directed at improving industrial manufacturing efficiency.

Thus, this special issue is targeted to stimulate discussion on the design, use, and evaluation of cognitive models for social media analytics to leverage more in-depth insights from the vast amount of generated data for industrial sensing. Though the social data's cognitive analytics allows delving the voluminous data for machine intelligence, information and decision-making processes still have some open issues, such as security and privacy, data trustworthiness and quality, participation motivation & incentive, that need to be addressed. This special section will discuss the prospective developments and innovative ideas in advanced deep learning algorithms for Industrial Internet of Things (IIoT).

## II. PAPERS INCLUDED IN THIS SPECIAL ISSUE

Opinion dynamics modeling is an exciting aspect of social media marketing as well used in elections. The paper ‘Modeling of Human Cognition in Consensus Agreement on Social Media and its Implications for Smarter Manufacturing Edge Server Quantification and Placement for Offloading Social Media Services in Industrial Cognitive Internet of Vehicle (IoV)’ studies how knowledge exchanged happened among members of social groups and how cognitive influence plays its role in decisions. The time-variant nonlinear of the

A. K. Bashir is with the Department of Computing and Mathematics, Manchester Metropolitan University, Manchester, M1 5GH, UK. He is also with National University of Science and Technology, H12, Islamabad, Pakistan and with University of Electronic Science and Technology of China, 611 731 Chengdu, Sichuan, China. (e-mail: dr.alikashif.b@ieee.org)

S. Mumtaz is with Instituto de Telecomunicacoes, Aveiro, 3810078, Portugal. (email: smumtaz@av.it.pt)

V. G. Menon is with the Department of Computer Science and Engineering, SCMS School of Engineering and Technology, Ernakulam, 683 576 Kerala, India. (email: varunmenon@scmsgroup.org)

K. F. TSANG is with the Department of Electrical Engineering, City University of Hong Kong, 83 Tat Chee Avenue, Kowloon Tong, Hong Kong. (email: ee330015@cityu.edu.hk)

model has been adapted to socio-psychological studies and their stability and convergences have been studied in this paper. One of the key features of the proposed model is its ability to accommodate both negative and positive ties among group members. The authors showed the accuracy of the model through two artificial networks.

Cognitive computing (CC) is emerging in several IIoT domains. To provide social media services to vehicles with low latency and high reliability, authors of 'Edge Server Quantification and Placement for Offloading Social Media Services in Industrial Cognitive IoV' adopt edge to complement cloud computing. In this work, the authors propose a collaborative method for the quantification and placement of edge servers in order to offer social media services in ICioV. In order to achieve a higher quality of service, they adopted a non-dominated sorting genetic algorithm III (NSGA-III). For experimentation, a real-world ITS social media dataset of China is being used.

The paper 'A Cognitive Joint Angle Compensation System Based on Self-Feedback Fuzzy Neural Network with Incremental Learning' proposed an online cognitive, joint angle error compensation method based on incremental learning to reduce joint angle error of robotic arms. The authors presented a joint angle error solver and a compensation module in the paper, which ensures that the robot can obtain effective joint angle compensation in various situations. The joint angle error solver is used to solve joint angle error, and the compensation module uses a self-feedback incremental fuzzy neural network to predict and update the compensation in real-time.

Cognitive manufacturing enables businesses to actively use advanced analytics to understand, reason, and learn the processes, people, and operations. Data classification can be applied in cognitively capable businesses for finding patterns in data. The paper 'A Deep Swarm-Optimized Model for leveraging Industrial Data Analytics in Cognitive Manufacturing' proposes an analytical model for real-time data classification. For this purpose, three soft computing techniques are being used: deep learning (convolution neural network and CNN), machine learning (Decision tree), and swarm intelligence. Two benchmarks dataset are used for experimentation and the results outperform the other existing cognition models in terms of classification accuracy.

The paper 'Fast and Accurate Convolution Neural Network for Detecting Manufacturing Data' introduces a clustering technique with Particle for Object Detection (CPOD). CPOD helps in solving the object detection problem in smart factories. The approach cleans outliers, explores correlations between the images, and learn from clusters. A particle swarm optimization algorithm is used for parameter optimization. VOC 2012 (standard dataset) and a motorcycle wheel producing line dataset is being used for experimentation. The

results are promising and detect objects with a short time and as well with high accuracy.

In the cognitive computing of intelligent IIoT, clustering is a fundamental machine learning problem to exploit latent data relationships. In the paper 'Multiple Kernel Driven Clustering with Locally Consistent and Selfish Graph in Industrial IoT', the authors proposed a graph-based multiple kernel clustering method to address the nonlinear clustering issue for cognitive computing of IIoT. A new graph model, 'Locally Manifold Kernel Graph (LMKG),' is introduced that preserves the local manifold structure of the data in kernel space for multiple LMKG. The quantity of affinity graph achieves significant improvement while considering the consistency and selfishness of LMKGs. They have shown that their method can effectively handle nonlinear data from intelligent IIoT and other industrial sensor networks.

Cognitive computing, a revolutionary Artificial Intelligent concept emulating the human brain's reasoning process, is progressively flourishing in the industry 4.0 automation. With the advancement of various technologies, the evolution towards improved decision-making and data-driven intelligent manufacturing has already been evident. However, several emerging issues yet to be resolved. The paper 'A Blockchain Federated Learning Framework for Cognitive Computing in Industry 4.0 Networks' proposes a novel Data-driven cognitive computing platform through the combined use of federated learning and blockchain for smart manufacturing in industry 4.0. Federated learning helps in providing privacy and efficiency while blockchain provides robustness against attacks.

The paper 'Social Image Sentiment Analysis by Exploiting Multimodal Content and Heterogeneous Relations' includes an Attention-based Heterogeneous Relational Model (AHRM) to improve the multimodal sentiment analysis performance by incorporating rich social information. A novel progressive channel and region attention model is used to exploit the correlation between images and texts. They highlighted semantically rich image channels and a region attention schema representing emotional regions based on the attended channels. In addition, they aggregated the content information from social contexts to learn high-quality representations of data.

We would like to thank all the authors who submitted their work to this special section. We also would like to express our thanks to the experts in the field who voluntarily participated in the review process on a very tight schedule. Finally, we want to give our sincere thanks to the Editor-in-Chief, Prof. R. Luo, for providing us with timely guidance and support.

## Editors Biography



Ali Kashif Bashir is a Senior Lecturer/Associate Professor at the Department of Computing and Mathematics, Manchester Metropolitan University, UK. He is also with the National University of Science and Technology (NUST), Pakistan and with University of

of China (UESTC) as visiting professor. He is senior member of IEEE and Distinguished Speaker of ACM. He received his Ph.D. in computer science and engineering from Korea University, South Korea. He has authored over 150 research articles; received funding from research bodies of South Korea, Japan, EU, UK and Middle East. His research interests include internet of things, wireless networks, distributed systems, network/cyber security, network function virtualization, machine learning, etc. He is serving as the Editor-in-chief of the IEEE FUTURE DIRECTIONS NEWSLETTER. He has served/serving as editors (associate or guest) for several journals like IEEE Transaction on Industrial Informatics, IEEE Internet of Things Magazine, IEEE Access, etc.



Varun G Menon (SM' 19) is currently Associate Professor in Computer Science Engineering at SCMS School of Engineering and Technology, India. He is a Senior Member of IEEE and Distinguished Speaker of ACM. He is an Associate Editor of IET Quantum Communications and also an Editorial Board Member of IEEE Future

Directions: Technology Policy and Ethics. He completed Ph.D. in Computer Science and Engineering from Satyabhama University, India in 2017. Dr. Menon received the Top Peer Reviewer Award by Publons in 2018 and 2019. He has served over 20 conferences like IEEE INFOCOM 2020, ACM Mobicom 2020, ICC 2020, ICCCN 2020, IEEE COINS 2020, SigTelCom in leadership capacities including program co-Chair, track Chair, session Chair, and Technical Program Committee member. His research interests include Internet of Things, 5G communications, Fog Computing and Networking, Underwater Acoustic Sensor Networks, Hijacked and Predatory Journals, Ad-Hoc Networks, Opportunistic Routing, Wireless Sensor Networks.



Shahid Mumtaz is an IET Fellow, IEEE and ACM Distinguished speaker, recipient of IEEE ComSoC Young Researcher Award (2020), founder and EiC of IET "Journal of Quantum communication," Vice-Chair:

Europe/Africa Region- IEEE ComSoc: Green Communications & Computing society and Vice-chair for IEEE standard on P1932.1: Standard for Licensed/Unlicensed Spectrum

Interoperability in Wireless Mobile Networks. He is also a Senior 5G Consultant at Huawei, Sweden. He is the author of 4 technical books, 12 book chapters, 250+ technical papers (150+ Journal/transaction, 80+ conference, 2 IEEE best paper award- in the area of mobile communications. Most of his publication is in the field of Wireless Communication. He is serving as Scientific Expert and Evaluator for various Research Funding Agencies. He was awarded an "Alain Bensoussan fellowship" in 2012. He is the recipient of the NSFC Researcher Fund for Young Scientist in 2017 from China.



Kim Fung TSANG is an Associate Professor in the Department of Electrical Engineering, City University of Hong Kong. He has published more than 250 technical papers, four books/book chapter and some patents. KF's research area is in RF circuit and system design, wireless protocol design, AI algorithms, IoT system and applications.

KF is an Associate Editor of IEEE Transactions on Industrial Electronics; Associate Editor of IEEE Transactions on Industrial informatics; Associate Editor of IEEE Industrial Electronics Magazine; Editor (Electrical) of the HKIE Transactions, Editor of SmartVision, Smart City Consortium. He is also the Chairman of IEEE 2668 IoT Maturity Index Working Group.