by Gaurav Dhiman, Atulya Nagar, and Seifedine Kadry

Explainable Artificial Intelligence for the Social Internet of Things

Analysis and Modeling Using Collaborative Technologies

Next-generation explainable artificial intelligence (XAI) is rapidly combining machine intelligence and human intelligence to generate social intelligence, which supports the rising interactions between social spaces. With transformative advances in science and society, a new challenge emerges when attempting to understand the basic mechanisms and principles of the evolving multidimensional reality. Next-generation wireless communication, such as the Internet of Things (IoT), will play a vital role in supporting complex wireless interconnectivity [1]. Social IoT (SIoT) systems promise to enable ubiquitous connectivity among users by merging human social behaviors with physical IoT devices.

This vast variety and variability, combined with the pervasive expansion of the IoT, presents new difficulties for academia, business, and standards organizations to handle. Adding more semantics to smart objects, on the other hand, can enable them to undertake previously inconceivable tasks and activities [2]. The social interaction of SIoT objects contributes a large volume of data to be processed and used by various applications in the areas of smart cities, smart homes, smart grids, and smart factories to satisfy human needs, interests, and objectives, such as social vehicular ad hoc networks, social connected health, SIoT-based recommendation services, traffic services, policing, energy management, and so on.

Such a dynamic landscape, with billions of social communities of objects and devices, necessitates the development of new models, theories, and approaches to interaction and collaboration, which could be established by drawing on the experience that people have gained in the social networking domain over the past few years [3]. Given these opportunities, this special section invited novel research and practical papers that improve SIoT systems using XAI methods in terms of architecture, technology, and applications. This special section on "Explainable Artificial Intelligence for the Social Internet of Things: Analysis and Modeling Using Collaborative Technologies" of *IEEE Systems, Man, & Cybernetics Magazine* attracted three outstanding research articles discussing new research results covering a wide range of the SIoT.

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Sugandh et al. provide a thorough analysis of the use of merging blockchain and the IoT in the creation of smart applications for smart agriculture. The study is broken into three parts. The first section contains a thorough survey and bibliometric study of blockchain in agriculture. Then, the authors present the issues that Indian farmers confront as well as the study aims and research questions. Finally, the study develops a novel blockchain model that has the potential to be used as a substantial solution to important issues in IoT-based smart agricultural systems. The study also assesses and extensively addresses the primary roles and strengths of the most prevalent blockchain platforms used in managing various subsectors in smart agriculture, such as crops, livestock grazing, and the food supply chain, among others.

Alotaibi and Yadav solve concerns by developing a social network information transmission model that incorporates XAI and is compatible with a normal communication connection. They propose a method of information transfer known as *local greedy*, which assists in the preservation of user privacy. Its influence serves as a buffer between the competing goals of privacy protection and information dissemination. To address the enumeration problem of seed set selection, an incremental strategy for creating seed sets with minimal time overhead is described; a local influence subgraph method for computing nodes is also proposed to efficiently evaluate the influence of seed set propagation. The group

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satisfies the privacy requirements. On the crawled Sina Weibo dataset, a solution is described for determining the upper bound on the chances of a node-leaking state without resorting to the time-consuming Monte Carlo approach with XAI. The proposed approach is validated experimentally and by example analysis, and the results indicate its use.

Alkwai proposes a unit vector and a unit description vector, which are then projected onto a particular relational space using hierarchical-type information, limiting the semantic content. The graph attention technique is then utilized to fuse topological structure information from the graph to determine the effects of various nearby points on the entity. To address the data-sparsity issue, multihop relationship information between entities is generated concurrently. Finally, global information between dimensions is collected using a decoder. Experiments with link prediction show that the multisource-information, combined-knowledge representation learning (XAI–convolutional neural network) model, which is based on XAI, can effectively use multisource SIoT information beyond triples and that others may outperform the baseline model.

About the Authors

Gaurav Dhiman (gdhiman0001@gmail.com) is with the Department of Computer Science, Government Bikram College of Commerce, Patiala 147001 India; University Centre for Research and Development, Department of Computer Science and Engineering, Chandigarh University, Gharuan, Mohali 140413 India; and Department of Computer Science and Engineering, Graphic Era (Deemed to be University), Dehradun 248002 India.

Atulya Nagar (atulya.nagar@hope.ac.uk) is with Liverpool Hope University, Hope Park L16 9JD U.K.

Seifedine Kadry (seifedine.kadry@noroff.no) is with the Department of Applied Data Science, Noroff University College, Mølleparken 4, 0459 Oslo Norway.

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