Guest Editorial Special Issue on Advanced Cognitive Computing for Data-Driven Computational Social Systems

COMPUTATIONAL social systems (CSSs) focus on topics such as modeling, simulation, analysis, and understanding of social systems from the quantitative and/or computational perspective. "Systems" can be man–man, man–machine, and machine–machine organizations and adversarial situations as well as social media structures and their dynamics [1], [2]. With the advance of the Internet of Things and communication technologies, various kinds of data from diverse areas can be acquired nowadays. As a result, CSSs are becoming ever more complex. Data-driven CSSs aim to conduct pre-competitive research on architectures and design, modeling, and analysis techniques for cyber-physical systems, with emphasis on making full use of big data and artificial intelligence. These applications include transportation systems, automation, security, smart buildings, smart cities, medical systems, energy generation and distribution, water distribution, agriculture, military systems, process control, asset management, and robotics [3], [4], [5]. However, due to the progressive transformation from host-centric networking to information-centric networking, CSSs pose fundamental challenges in multiple aspects, such as heterogeneous data generation, efficient data sensing and collection, real-time data processing, and greater request arrival rates. Thus, there is a great need for a powerful way that can deal with emerging issues in data-driven CSSs more efficiently and effectively in the age of big data.

Recently, cognitive computing has emerged to provide new opportunities for the revolution of data-driven CSSs. It has been proven to be effective in a wide spectrum of fields, such as affective computing, social computing, graph-based machine learning, and so on. It is able to solve problems containing many entities linked together in a complex way with the model of perception, action, attention, learning and memory, decision making, language processing, communication, reasoning, problem-solving, and consciousness aspects of cognition. The biggest advantage of cognitive computing is its ability to "understand" unstructured data, including emotion, language, images, and video. With the help of advanced cognitive computing methods, we are able to discover new patterns and knowledge from large-scale datasets, and to extract novel valuable information, which can promote product innovation, improves operation level, and production operation efficiency of manufacturing enterprises, and expand novel business models. To this end, exploring advanced cognitive computing technologies have great potential and capacity to enable new methodology, applications, and dramatic improvements for data-driven computational social systems.

This special issue aims to solicit high-quality original research papers, which address the cutting-edge theories, models, and applications for data-driven computational social systems, supported by advanced cognitive computing technologies. Topics include but are not limited to:

1) cognitive computing methods and theory;
2) cognitive computing for socio-technical systems;
3) cognitive computing for cyber-physical systems;
4) brain–computer interface-based CSSs;
5) big data-driven cognitive computing for CSSs;
6) cognitive-inspired computing systems;
7) AI-assisted cognitive computing approaches;
8) affective learning for decision support systems in CSSs; and
9) application of new and novel cognitive computing methods in data-driven CSSs.

What Do We Cover in This Issue

In this special issue, 23 articles were finally accepted, which addressed the hot topics using cognitive computing solutions for data-driven computational social systems. There are six articles concerning medical big data analysis, particularly in health monitoring based on psychophysiological data. Four articles are on the Social Internet of Things emphasizing localization and positioning. Four articles are related to complex network analysis, focusing on network dynamics and theory. Seven articles introduced the latest intelligent systems and applications in data-driven computational systems. In addition, two articles present advanced algorithms, including sparse pinball twin bounded support vector clustering and robust matrix factorization.

The intelligent medical system is one of the typical application scenarios of data-driven computational systems with increasing data acquisition ability. In [A1], Anand and Singh proposed an image fusion-based robust and secure watermarking scheme which takes advantage of spatial and transform domains. In [A2], Gu et al. present a multi-source domain transfer discriminative dictionary learning modeling for promoting the performance of emotion recognition methods. In [A3], Chakraborty and Kishor proposed an Internet of Medical Thing (IoMT)-based cloud-fog diagnostics

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for heart disease. In [A4], Fang et al. proposed a multitarget interested region extraction method for wrist X-ray images based on optimized AlexNet and two-class combined model, which can simultaneously extract multiple regions of interests with high accuracy. In [A5], Lv et al. proposed a feature extraction algorithm under transfer learning based on tangent space selection to optimize the digital twin cognitive computing system. In [A6], Cheng et al. provided systematic guidance on EEG-based cognitive status computation of construction workers by conducting a thorough search and evaluation of relevant peer-reviewed journal articles.

The development of the Internet of things has dramatically benefited data-driven computational systems, which enable the possibility of large-scale data sensing, acquisition, transformation, and storage. In [A7], Yu and Sun proposed a lightweight personalized sensor data classification model to classify E-health sensor data in edge computing. In [A8], Zhou et al. proposed a localization approach for the Social IoT by combining the fuzzy rough set theory and the ridge regression extreme learning machine. In [A9], Liu et al. proposed indoor high-precision visible light positioning under the sparse light source. In [A10], Gao et al. proposed to apply the main idea of between-class learning intrusion detection based on cognitive computing.

Four articles introduced the latest development in network dynamics and theory. In [A11], Liu et al. introduced a novel framework to improve the cost and efficiency of rumor propagation control by designing a soft dynamic quarantine strategy. In [A12], Wan et al. proposed an importance identification method for multilayer heterogeneous network nodes by incorporating multi-relational information. In [A13], Gao et al. proposed the joint method of triple attention and novel loss function for entity relation extraction by few-shot learning in computational social systems. In [A14], Hou et al. proposed constructing an attribute spatio-temporal graph to model the region spatio-temporal correlations.

Seven articles presented typical intelligent systems and applications of data-driven computational systems. In [A15], Djenouri et al. investigated hashtag suggestions in a heterogeneous and huge social network and a cognitive-based deep learning solution based on distributed knowledge graphs. In [A16], Bhattacharya et al. proposed a SaTYa scheme that leverages a blockchain (BC)-based deep-learning (DL)-assisted classifier model that forms a trusted chronology in fake news classification. In [A17], Deng et al. proposed an information flow (IF) extraction method based on data flow (DF) text to realize automated mapping between logical DF and physical IF based on text analysis. In [A18], Jain et al. constructed a predictive recommendation model for airline reviews by exploiting an associate degree ensemble of two different models. In [A19], Jain et al. proposed a new similarity measure based on the Jaccard and Gower coefficients and the efficient Gowers–Jaccard–Sigmoid Measure for improving recommendation systems. In [A20], Yin et al. explored the unique characteristics of query-less hotel users and proposed a novel multiscenario queryless search network. In [A21], Sun et al. provided an online computation approach to address MLaaS's cold-start problem and innovatively took into account the level of distraction as a reference metric to make recommendations in parallel with learner preferences.

In [A22], Tanveer et al. enhanced the performance of existing plane-based clustering algorithms by introducing a novel algorithm where the loss function can provide stability for resampling data. In [A23], Li et al. designed a robust low-rank matrix factorization approach to deal with various types of noise in a unified manner.

All 23 articles tackle different aspects of cognitive computing-inspired data-driven computation social systems. We believe this Special Issue will promote the development of computational social systems.

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APPENDIX: RELATED ARTICLES

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