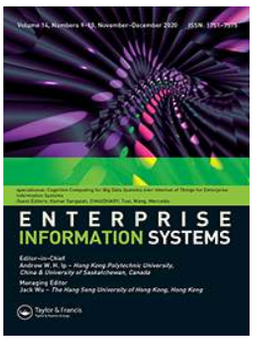

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EDITORIAL

Cognitive computing for big data systems over internet of things for enterprise information systems

Introduction

The paradigm of the Internet of Things (IoT) has become a key component for enterprise information systems (EIS). Low-cost sensing and actuation are available to the whole world. It enables seamless information exchange and networked interactions of physical and digital objects in enterprise computing. This interconnectivity together with large-scale data processing, advanced machine learning, robotics and new fabrication techniques steadily bring innovation and business models of the digital space into the physical world. Cognitive computing has broad horizons, which cover different characteristics of cognition. The field is highly trans-disciplinary in nature, combining ideas, principles and methods of psychology, computer and Internet technologies, linguistics, philosophy, neuroscience, etc. Cognitive computing is the creation of self-learning systems that use data mining, pattern recognition and natural language processing (NLP) to solve complicated problems without constant human oversight. Cognitive computing will bring a high level of fluidity to analytics. Core Data Technologies are covering the underpinning mathematical, statistical and computer systems expertise and research concerned with new scalable approaches for capturing, storing, managing, analysing and visualising large scale, complex and diverse data from multiple sources. Data's science techniques have been adopted to improve the IoT in terms of data throughput, optimisation and management. The data techniques and technologies will impact the future of the IoT, allowing researchers to reproduce scenarios, and optimise the acquisition, analysis and visualisation of the data acquired by IoT devices for EIS. One of the most ambitious and exciting challenges in data technologies is to model and replicate how people think and learn.

This special issue submission explores domain knowledge and reasoning of Data Technologies and Cognitive methods over the IoT for EIS. The idea of embodying this concept would be to extend existing data technologies approaches by incorporating knowledge from experts as well as a notion of artificial intelligence, and performing inference on the knowledge. The main focus is the design of best cognitive-embedded data technologies to process and analyse the large amount of data collected through IoT and help for good decision-making in enterprise architecture design and modelling. The Cognitive data computing research facilitates a platform to the scientific community to work for the best solution of challenges related with cognitive methods and data technologies model issues to support IoT solutions towards smart infrastructure and meet the requirement of EIS design and applications.

Big data solutions in EIS

This section of collected papers is providing an overview of data analytics in IoT from opportunities, challenges and enabling technologies for EIS. The current study (Dai et al. 2019) presents an in-depth survey on big data analytics in manufacturing Internet of Things (MIoT). This paper first presents a life cycle of big data analytics in MIoT and discusses the necessities as well as challenges of big data analytics in MIoT. Then, the enabling technologies of big data analytics in MIoT are summarised according to three phases in the life cycle of big data analytics: data acquisition, data preprocessing and storage, and data analytics.

Precision agriculture involves the manipulation of variations in-field productivity, maximisation of income, scale backing of wastes, and minimising of the impact on surroundings using automated machine-controlled information assortment and documentation. This work (Keswani et al. 2020) focuses on the efficient control of farm irrigation by exploiting the capabilities of Internet of Things (IoT) and Big Databased Decision Support System (DSS) to generate adequate valve control commands. Three varieties of prediction techniques such as Deep Neural Network (DNN), Random Forest (RF) and Resilient Back-Propagation Neural Network model are tested to predict soil Moisture Content (MC). An integrated IoT-based DSS framework is proposed to accumulate 17 numbers of soil and environmental parameters to predict the future variation of soil MC in 1 h advance. The complete system architecture, deployment strategy and performance of the proposed IoT-based DSS mechanism is discussed in this article.

A stochastic algorithm has been revealed as powerful and popular swarm intelligence models to solve diverse optimisation problems. The paper (Lan et al. 2019) presents a two-stage approach, named Cooperatively Coevolving Competition Swarm Optimiser (C^3SO), for large-scale optimisation. C^3SO first detects interactions among the original variables by a differential grouping algorithm, therein decomposing a largescale problem into several sub-components. In this work, authors have proposed C^3SO as a new optimiser for large-scale optimisation. In contrast with some existing methods, the proposed method benefits from the merits of the DG2 algorithm and the competition mechanism. The comparative studies on various benchmark functions demonstrated that C^3SO is a useful optimisation algorithm that can address large scale and complex optimisation problems.

Cognitive analytics for EIS

Recently, the Cognitive Internet of things (CIoT) aimed at improving day-to-day human life and attracted huge research attention in EIS. Human activity recognition plays an important role in cognitive computing over IoT environments. The current research work (Sung, Guo, and Park 2019) presents a novel scenario division method based on Bayesian probability for human activity recognition research over IoT proposed to improve scenario division quality. The probabilities among several consecutive sensory value tuples (SVTs) were considered in this paper rather than considering the probabilities between only two consecutive SVTs in smart space.

The intelligent treatment of urban garbage is an important component of creating a smart city and also solves several problems associated with urban garbage. Many traditional garbage cans are widely distributed, leading to a high consumption of human and material, untimely government. The current research work (Jia et al. 2019) has proposed an intelligent system based on edge computing and the narrow-band

Internet of things (NB-IoT) for monitoring smart trash cans (STCs). The experimental results demonstrate that the proposed STC system improves the load capacity of garbage cans, requires few human and material resources, and allows for intelligent management of garbage in smart cities.

Field geological practice is not only an important part of teaching. However, how to vividly explain the geological practice in the field and intuitively show the geographical environment and its evolution is a difficult problem for geological educators. In this study (Huixian 2019) has used Pingtan Island as a research case. Based on HTML 5 and open-source framework Three.js of network graphics library WebGL, 3D interactions were embedded in the website. Besides, POI was built through Java, and annotation and image information was marked to realise data uploading, navigation, and 3D simulation platform functions. The research is to form a theoretical and practical teaching system.

Recently, face recognition (FR) in videos has become a core research issue in the field of computer vision. In this paper (Lei et al. 2019) has proposed a hybrid method based on Deep Learning (DL) and visual tracking, RFR-DLVT, to achieve effective face recognition (FR). First, video sequences are divided into reference frames (RFs) and non-reference frames (NRFs). Then, the target face is identified through the DL-based FR method in RFs. In the meantime, the Kernelized-correlation-filters-based visual tracking method is used in NRFs to speed up FR. Our proposed method is tested on common data sets and achieves better performance. Particularly, RFR-DLVT has an accuracy of 99.6% and an efficiency of 30 (FPS) in the real-time FR on real-life surveillance videos.

IoT in EIS

Currently, IoT systems are expected to improve the intelligence of EIS, promote the interaction between the human and the environment, to enhance the reliability, resilience, operational efficiency and energy efficiency and resource consumption. Many of the IoT systems and technologies are relatively novel, and there are still many untapped applications areas in enterprise modelling and computing systems, numerous challenges and issues that need to be improved. The present study (Wang 2020) has investigated on the basis of data analysis and clustering algorithm in the IoT technology and used to design an intellectual property policy analysis system to optimise resource allocation, so as to better serve the parties using the system. The research results showed that the use of IoT data to analyse and systematically design intellectual property policy system. With their continuous development, Internet of Things (IoT) technology and big data have become the analytical tools widely applied in many technical fields. Through the analysis of IoT data, the optimal resource configuration could be obtained, which would guide both governments and enterprise managers to make scientific decisions in terms of future development.

The current work (Singh and Kumar 2019) presented multi-objective tournament harmony search-based coverage aware load-balanced clustering algorithm (MH-CACA) is presented. The coverage aware memory consideration, random selection and tournament selection-based pitch adjustment to remove clumps and to fill voids is imposed while harmony improvisation by altering the status of the on-duty sensors to off-duty and off-duty sensors to on-duty, respectively. To show the effectiveness, a large sample network is considered, and the results are demonstrated with different parameters including coverage rate, dead gateways, dead sensors, energy consumption and network

lifetime in comparison to the other existing techniques and found significantly improved in the proposed approach.

In this paper (Gao et al. 2019), IoT (Internet of Things) information technology has been widely applied to the supply chain risk management (SCRM). Firstly, the source of risks has been sorted out, the external and internal risks have been described in detail with the risk management of the supply chain system. Secondly, the supply chain risk and case reasoning were mentioned. Finally, the work actively explored the supply chain risk management by the IoT information, such as 3G network, RFID and GPS. The research on SCRM based on IoT information contributes to the construction and improvement of supply chain informatisation.

One of the essential parts of every sentiment analysis application is the aggregation mechanism used to combine results obtained from a lower granularity level into an overall result. In this paper (Basiri et al. 2019), the effects of the sentiment lexicon, aggregation level, and aggregation method on the sentiment polarity and rating classification of Persian reviews are investigated. To this aim, a new sentiment aggregation method based on the cross-ratio operator is proposed. The results on four Persian review data sets show that the review-level aggregation can improve rating classification, although this approach does not have a positive impact on polarity classification.

A production information management system based on industrial Internet of Things (IIoT) technology is designed. It makes the manufactory enterprise have the ability of dynamic shop floor scheduling. To solve the rescheduling problem, a hybrid method combining the game theory method and the rolling horizon rescheduling strategy (HGR) is proposed. In a computational experiment, the values of the relative error (RE) and mean ideal distance (MID) are 11.3 and 13.74, respectively, which illustrates the feasibility and efficiency of the proposed HGR method. An engineering experiment shows that the proposed method can handle the practical engineering problems (Tian et al. 2019).

Internet of Things (IoT) connects billions of objects and devices to furnish a really useful opportunity for enterprises. Fourth industrial revolution must ensure efficient communication and labour by considering the factors of costs and performance. Transition to the fourth industrial revolution generates challenges for enterprises. This study (Abdel-Basset et al. 2019) identifies the main challenges affecting the transition process using non-traditional methods. Decision-makers may provide misjudgements leading to partial failure of enterprises. This article proposed a hybrid combination between analytical hierarchical process (AHP) as an MCDM method and neutrosophic theory to detect and handle the uncertainty and inconsistency challenges successfully.

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