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EDITORIAL

HETEROGENEOUS CROWD-SOURCED DATA ANALYTICS

Advances in computing, communication, storage, and sensing technologies have reshaped the lives of people by changing the way they live, work, interact with their environments, and even socialize. Modern information systems collect valuable information about every aspect of our lives. Such data is becoming increasingly voluminous and readily available. Data is heterogeneous, contributed by the crowd of people, coming from different sources and with diverse formats. Broadly, such data is generated mainly from three sources: Internet and Web applications, sensor networks, and mobile/wearable devices. The scale and richness of the multimodal, mixed data sources present us with an opportunity to compile the data into a comprehensive picture of individuals' daily life facets, transform our understanding of our lives, organizations and societies, and enable completely innovative urban services, including public people and freight transportation, public safety, city resource management, environment monitoring, and social interaction assistance. However, raw data is heterogeneous, redundant, fragmented, and quality-variant, which prevents their direct use for analysis, management, forecasting and planning. Consequently, emerging data analytics targeted to their sessions, including data co-mining, data fusion, data selection, need to be studied and applied more thoroughly.

In this Special Section in IEEE ACCESS, we have included 17 high-quality articles to cover many of the cited research challenges including data management in crowd-sensing systems and wireless sensors networks, social network data analysis for resolving real-life problems (such as fighting radicalization and terrorism), representing and querying data in the Internet of Things world, Innovative urban services and applications, etc.

Crowd-sensing smart environments and networks provide efficient data communication between the stakeholders involved. In the work by Shao *et al.* (*Heuristic Optimization for Reliable Data Congestion Analytics in Crowdsourced eHealth Networks*), an efficient data routing algorithm was proposed to reduce data congestion and improve the data delivery ration by a factor of ten compared to standard routing mechanisms. Along the same lines, Fiandrino *et al.* (*Crowd-SenSim: a Simulation Platform for Mobile Crowdsensing in Realistic Urban Environments*) proposed a simulator to assess the performance of crowd-sensing based urban environments and smart city services. The work by Shu *et al.* (*When Mobile Crowd Sensing Meets Traditional Industry*) reviewed the use

and the operability of mobile crowd sensing technologies to a wide range of industrial applications and showcased their benefits.

Social networks have become one of the key mediums through which people communicate, work and socialize. They are also exploited by terrorist organizations to radicalize vulnerable individuals and recruit them to commit acts. In the work by Lara-Cabrera *et al.* (*Measuring the Radicalization Risk in Social Networks*), a set of radicalization indicators were proposed to analyze social networks with the purpose of identifying violent radicalized individuals who are in relation with terrorist organizations. In the work by Shi *et al.* (*Event Detection and User Interest Discovering in Social Media Data Streams*), an event detection model was proposed to identify the hot events on social networks. The proposed model has the particularity of considering that the user's interest could evolve over time, which can resolve the so-called data sparsity problem in social networks.

The work by Yu *et al.* (*A Novel Multi-Feature Representation of Images for Heterogeneous IoTs*) addressed the problem of describing and representing images with complex scenes from IoT systems. The proposed method is suitable for intermediate feature extraction and conducive to multi-feature fusion. In the work by Zhang *et al.* (*Axial Signal Analysis and Image Reconstruction in Acoustic Lens Photoacoustic Imaging System*), a solution is proposed to analyze and reconstruct axial photo-acoustic images. The simulation results show that the solution is convenient for low frequency samples.

Wireless sensor networks became omnipresent in modern information systems, especially with the growing adoption of Internet of Things in various application domains. In the work by Lei *et al.* (*Energy-Efficient Abnormal Nodes Detection and Handlings in Wireless Sensor Networks*), a new method is proposed to detect the nodes in sensor networks that are used to monitor gas distribution. The proposed method has the advantage of optimizing energy consumption of nodes. In the work by Rahman *et al.* (*DPCA: Data Prioritization and Capacity Assignment in Wireless Sensor Networks*), an approach is proposed to prioritize data packets and manage their transmission based on their priorities. The experiments conducted showed that congestion and packets dropping are lower than those incurred with existing solutions. In the work by Tang *et al.* (*An Energy-Aware Spatial Index Tree for Multi-Region Attribute Query Aggregation Processing in Wireless*

Sensor Networks), a novel model for building multi-attribute spatial index trees is proposed. The model is showcased to outperform existing state-of-the-art approaches significantly in terms of energy consumption, query time, and network lifetime. In the work by Harb *et al.* (*Comparison of Different Data Aggregation Techniques in Distributed Sensor Networks*), an efficient data aggregation approach for clustering-based periodic wireless sensor networks is proposed. The approach is showcased to substantially improve the performance of sensor networks. In the work by Chen *et al.* (*A Reconfigurability-Based Security Service Path Construction Scheme*), a novel security scheme for next generation networks is presented. The reported experimental study shows that the proposed scheme meets the security requirements and greatly improves the efficiency of network resources.

The work by Zheng *et al.* (*Internet Use and Its Impact on Individual Physical Health*) investigated the correlation between internet use and the physical health of people. Conditions such as dry eyes, decreased vision, and cervical pain were found to be correlated with internet use. In the work by Lei *et al.* (*A Novel Side Face Contour Extraction Algorithm for Driving Fatigue Statue Recognition*), a framework is proposed to recognize the driver's face and infer their fatigue status. The reported experiments showcased the efficacy of the solution based on real-life examples.

In the work by Sun *et al.* (*A Stable Online Scheduling Strategy for Real-Time Stream Computing Over Fluctuating*

Big Data Streams), the authors proposed a scheduling algorithm for data computation over fluctuating big data streams. The algorithm makes it possible to tradeoff between high system stability and acceptable response time objectives in big data stream computing environments.

In the work by El Fazziki *et al.* (*An Agent Based Traffic Regulation System for the Roadside Air Quality Control*), an agent-based approach is proposed to monitor air quality in urban road networks. The solution provides recommendations for road users to reduce vehicle emissions in the most polluted road sections and maximize the vehicle flow.

In the work by Tan *et al.* (*Multi-Objective Metrics to Evaluate Deduplication Approaches*), the authors proposed a performance evaluation framework to analyze the performance of existing data deduplication approaches with multiple performance objectives, including compression ratio, data read performance, data write performance, and data reliability.

MAHMOUD BARHAMGI

e-mail: mahmoud.barhamgi@univ-lyon1.fr

ZHANGBING ZHOU

e-mail: zhangbing.zhou@gmail.com

CHAO CHEN

e-mail: cschaochen@cqu.edu.cn

JEAN-CLAUDE THILL

e-mail: Jean-Claude.Thill@uncc.edu



MAHMOUD BARHAMGI is currently an Associate Professor with Université Claude Bernard Lyon 1 and a member of the LIRIS Research Laboratory. His research interests include service oriented computing, software engineering, security, and privacy.



ZHANGBING ZHOU is currently a Professor with the China University of Geosciences, Beijing, China, and an Adjunct Associate Professor at TELECOM SudParis, France. He has authored over 100 referred papers. His interests include services computing and business process management.



CHAO CHEN is currently an Associate Professor with the College of Computer Science, Chongqing University, Chongqing, China. His research interests include pervasive computing, mobile computing, urban logistics, data mining from large-scale GPS trajectory data, and big data analytics for smart cities.



JEAN-CLAUDE THILL is currently a Knight Distinguished Professor of public policy with the College of Liberal Arts and Sciences, University of North Carolina at Charlotte, Charlotte, NC, USA. His research interests includes geospatial data analytics, geocomputation, space-time pattern and processes, urban analytics, and transportation systems.

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