
Preface

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Biographical notes: Fatos Xhafa received his PhD in Computer Science in 1998, from the Department of Computer Science of the Technical University of Catalonia (UPC), Spain. Currently, he holds a permanent position of Professor Titular (Hab. Full Professor) at UPC. He was a Visiting Professor at University of London, UK, 2009–2010 and Research Associate at Drexel University, USA, 2004/2005. He has published in international journals, conferences/workshops, chapters, books and proceedings. He is the Editor-in-Chief of *IJGUC* and *IJSSC*, Inderscience journals, of the Elsevier book series *Intelligent Data-Centric Systems* and of Springer Book series *Lecture Notes on Data Engineering and Communication Technologies*. His research interests include parallel and distributed algorithms, massive data processing and collective intelligence, optimisation, networking, P2P, cloud computing, security and trustworthy computing, among others.

With the ever-increasing amounts of data generated in cyber-physical systems (CPS) in a variety of forms, such as text, images, videos, etc., secure, reliable and intelligent processing remain among the most important issues for researchers, developers, users, and stakeholders alike. The challenges arise not only due to the exponential growth in data size, requiring efficient, scalable and reliable algorithms but also due to the requirement to address the complexity of secure access, authentication, privacy, etc., to data sets at cloud data centres, data streams from cloud IoT systems, etc.

This special issue publishes recent research findings and advances in the field of secure, reliable and intelligent data processing in CPS. The study of new schemes, algorithms and techniques to cope with large data sets generated in CPS was the main topic covered by the papers of the special issue. The seven selected papers include findings of both the foundational theory on secure, reliable and intelligent data processing in CPS and practical applications in the field. The papers of the special issue and their key contributions are arranged as follows.

In the first paper ‘On the rotation Boolean permutation’, Zhou investigates encryption algorithms for the internet of things within a piece of small-area and small-scale. The author obtains some rotation Boolean permutation by the matrix of linear expressions, and constructs three methods of rotation nonlinear Boolean permutations. The sub-functions of the three permutations have some properties with three monomials, high degree, 2-algebra immunity. Disjoint spectra Boolean functions are derived as well.

The second paper ‘A publicly verifiable network coding scheme with null-space HMAC’ by Chen et al. tackles the challenging topic of how to design a secure, efficient and publicly verifiable homomorphic network coding (NC) scheme. The aim is to

overcome some limitations of existing cryptography-based NC schemes. The authors provide a new NC scheme based on null-space HMAC with hierarchically sharing keys. The scheme enables balancing the computation efficiency and the public verifiability for the NC system with a symmetric key cryptosystem scheme.

Xu et al. in the third paper 'Edge computing-based security authentication algorithm for multiple RFID tags' propose a multi-tag authentication algorithm based on edge computing to improve the performance of RFID Cloud-based systems. The algorithm regards RFID reader and tag as the nodes of edge computing, and uses the tag and reader's computing ability to process and streamline the security authentication information. The authentication server can perform multiple tags' certification and identify false tags in RFID systems. The algorithm is shown to have several advantages for the RFID authentication process.

In the fourth paper 'An improved trusted method for global congestion price computing based on software defined networking in data-centred network' Chun and Xiao-Long aim to take full advantage of the feature that the global link status information can be grasped by the central controller of software defined networking (SDN) architecture and propose a two-tier trusted method for global congestion price computing (GCPC). The ratio argument vector B is given by the upper-tier method with the machine learning algorithm and fuzzy C-means clustering algorithm according to the global network operating status information. The link status price is computed according to ratio argument vector B . The simulation results show that the link status price calculated by GCPC method is trusted.

The fifth paper 'Modelling behaviour of cyber-physical system and verifying its safety based on algebra of event' by Tuo et al. study the behaviour modelling of CPS as complex hybrid system that integrates computing, control and communication technology. The aim is to get insights on the dynamic behaviour of the system in the physical world and to make certain whether the system meets the requirements by analysing and verifying the key attributes of the system at design phase. The authors model the behaviour of CPS by the extended hybrid automata and simulate CPS and analyse its safety based on the obtained model.

Minghu et al. in the sixth paper 'Image super-resolution via Gaussian scale patch group sparse representation', propose the use of Gaussian scale patch group sparse representation method to solve the shortage problem of traditional image super-resolution restoration schemes. The proposed method is focused on the optimisation of sparse representation method model, which brings the method and performance improvement to image sparse reconstruction. The experimental simulation results show that the proposed method can maintain both the clarity of the edge and also inhibit the bad artefacts, while providing better recovery performance than the framework using original algorithm at low peak signal to noise ratio.

Finally, the seventh paper 'Multi-hypothesis compressed video sensing by two-step iterative thresholding' by Chen et al. deals with distributed video coding schemes in order to achieve compression by using a single reference frame for side information, which plays a key-role in determining the performance of the codec. The authors propose a novel side information generation algorithm by using two neighbouring key frames as reference. The proposed algorithm uses multi-hypothesis predictions to fully utilise the intra and inter frame correlations. Experimental results demonstrate that the proposed algorithm outperforms the original schemes in refining the side information as well as improving the reconstruction performance.

As we conclude this editorial preface, we give special thanks to the Editor-in-Chief of *IJIDS* journal Prof. Ngoc-Thanh Nguyen for the opportunity to edit this special issue. We would like to thank all the authors for contributing to this special issue and the reviewers for their constructive feedback to authors. The support from the journal manager is also appreciated.