



## Special issue on ubiquitous computing in the IoT revolution

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This special issue is based on the best papers from the 13th International Conference on Future Networks and Communications (FNC'18) and the 15th International Conference on Mobile Systems and Pervasive Computing (MobiSPC'18) and the which were held on August 13–15, 2018, in Gran Canaria, Spain. Both conferences attracted a good number of scientific papers that contributed to the state-of-the-art in the areas of these conferences' themes. All the papers selected for this special issue have been extended from their original versions and underwent two rounds of rigorous peer-review process. Based on the reviewers' feedback, as well as the evaluations of the Guest Editors, 11 papers were selected for this special issue from 15 invited submissions. The accepted papers cover forthcoming development and emerging research along with cloud computing, security, scheduling in the internet of things, augmented and virtual realities, 5G mobile communication, recommendation systems, context awareness, smart factories, and enhancing machine learning applications performance.

The first paper by Makkaou et al. is entitled “*Fast Cloud-Paillier homomorphic schemes for protecting confidentiality of sensitive data in cloud computing*”. The authors of this paper discussed the importance of homomorphic encryption that can be considered as a useful solution to get over some concerns limiting the widespread adoption of cloud computing. The main aim of this paper is to propose two fast

variants of the Cloud-Paillier scheme. The proposed variants use moduli formed of  $k \geq 2$  distinct primes. The first variant utilizes the Chinese remainder theorem to decrypt. Whereas, the second variant slightly modifies the form of the Cloud-Paillier's encryption algorithm and decrypts as in the Cloud-Paillier. The proposed approach is validated by simulation.

The second paper by Chen et al. is entitled “*A Game-theoretic Approach for Channel Security Against Active Time-Varying attacks Based on Artificial Noise*”. This paper introduced an idea of inserting an artificial noise into the channel, which aims at disturbing the attackers and reducing the loss of the system once attacks occur. However, this technology would produce some side effects, and there is a trade-off between inserting artificial noise and minimizing information loss. In this paper, the authors dealt with this issue and proposed a game-theoretic framework to minimize the total losses. They modelled the problem as a Stackelberg security game between the attacker and the defender. They also proposed a novel method to reduce the searching space of computing the Strong Stackelberg Equilibrium which is the optimal defense strategy.

The third paper by Kim et al. is entitled “*Adaptive Packet Scheduling in IoT Environment Based on Q-learning*”. The traditional packet scheduling schemes are not effective for IoT since the data transmission pattern is not identified in advance. This paper presented a novel Q-learning scheme that updates the Q-table and reward table based on the condition of the queues in the gateway. The authors performed computer simulation that revealed their proposed scheme significantly increases the number of packets satisfying the delay requirement while decreasing the processing time compared to the existing scheme based on Q-learning with stochastic learning automaton (SLA). Additionally, the processing time is also minimized by omitting unnecessary computation steps in selecting the action in the iterative Q-learning operations.

The fourth paper by Parveau and Adda is entitled “*Toward a User-Centric Classification Scheme for Extended Reality Paradigms*”. This paper attempted to provide a new user-centered classification scheme to standardize the definition

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of virtual, augmented and mixed realities. The authors provided an overview of existing taxonomies of augmented, virtual realities. They also presented their user-centered classification that is based on three criteria called 3iVClass (Immersion, Interaction, Information). The authors proposed a weighting system with the objective to give a simple way for anyone, expert or not, to quickly characterize or define the best user experiences.

The fifth paper by Tsai and Liu is entitled “*An Effective Hyper-Dense Deployment Algorithm via Search Economics*”. The authors presented an effective search algorithm for solving the hyper-dense deployment problem (HDDP), called search economics for hyper-dense deployment problem (SE-HDDP). The aim was to enhance the performance of a 5G mobile communication environment. A distinctive feature of the proposed algorithm is that it divides the search space into a set of subspaces and dynamically allocates the computing resources to these subspaces based on their potentials during the convergence process.

The sixth paper by Afridi et al. is entitled “*Facilitating Research through Serendipity of Recommendations*”. This paper showed a novel user interface design for facilitating serendipitous recommendations generation in educational environments. The proposed user interface of this recommender system provides students with user controls and visualization in order to explore research articles. This work comprises user experience experiments conducted in an academic environment and evaluated by means of a user-centered design evaluation. It involves research articles recommender system named JabRef. The authors found that the user interface design can facilitate a serendipity recommender system in the learning environment.

The seventh paper by Beierle et al. is entitled “*What data are smartphone users willing to share with researchers?*”. This paper developed an Android app TYDR (Track Your Daily Routine), which tracks and records smartphone data and utilizes psychometric personality questionnaires. The authors also introduced a general context data model consisting of four categories that focus on the user’s different types of interactions with the smartphone. Moreover, they developed the Privacy Model for Mobile Data Collection Applications specifically tailored for apps that are related to the collection of mobile data, consisting of nine proposed privacy measures.

The eighth paper by Kim et al. is entitled “*Design and Performance Evaluation of Cost-Effective Function-distributed Mobility Management Scheme for Software-defined*

*Smart Factory Networking*”. The authors of this paper proposed a cost-effective function-distribution mobility management system that will build a future industrial Internet to meet the needs and convenience of users. They also proposed a novel network architecture for smart factories based on software-defined networking and network virtualization to support smart services, especially for Industry 4.0.

The ninth paper by Liu et al. is entitled “*A Hybrid GPU-FPGA based Design Methodology for Enhancing Machine Learning Applications Performance*”. The authors’ aim of this paper is to tackle the problem of high-density computing requirements of machine learning. They presented a hybrid, GPU-FPGA based design methodology for enhancing machine learning applications’ performance. The authors validated their approach using two use cases. The first is a handwritten digit recognition with the convolutional neural network; while the second use case is for predicting data center’s Power Usage Effectiveness with deep neural network regression algorithm.

The tenth paper by Malik and Mazhar is entitled “*EyeCom-An IoT Based Affordable Wearable Solution for Paralyzed People to Interact with Machines*”. This paper proposes a retina-controlled device called EyeCom for paralyzed people, which is constructed from off-the-shelf cost-effective yet robust IoT devices (i.e., Arduino microcontrollers, Xbee wireless sensors, IR diodes, and accelerometer).

The eleventh paper by Agrawal et al. is entitled “*An Improved Energy Efficient System for IoT enabled Precision Agriculture*”. This paper proposes a novel product density model to estimate the energy requirements at the base station in wireless sensor networks. Moreover, an improved duty cycling algorithm is also proposed using residual energy parameter. The performance of the proposed improved duty cycling is compared with two other algorithms. The proposed algorithm of this approach showed an improvement in terms of average energy consumption, residual energy performance, and throughput.

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