Guest Editorial Preface

Smart IoT and Fog/Edge Computing for Mobile Digital Healthcare:
Recent Trends and Future Directions

Pradeep Kumar Singh, ABES Engineering College, Ghaziabad, India
Artur Ziviani, National Laboratory for Scientific Computing (LNCC), Brazil
Isabel de la Torre Díez, University of Valladolid, Spain
Po Yang, Department of Computer Science, Faculty of Engineering, University of Sheffield, UK
Ping Li, The Hong Kong Polytechnic University, Hong Kong

INTRODUCTION

Mobile digital health is an extension of electronic healthcare. It supports the users to have access to clinical data and latest knowledge discovery on medical datasets. On the other side, it helps patients with different chronic diseases to connect with a doctor under continuous observation. Due to the mobile digital health evolution, there are many new opportunities and challenges along with its integration with recent technologies, which include blockchain for security, cognitive and analytics for knowledge discovery, IoT and fog/edge computing for data processing and many more technologies bring a lot of innovative solutions for healthcare applications. Internet of Medical Things (IoMT) is an integrated solution composed of connected sensors, wearable medical devices, and clinical systems capable of improving the quality of medical treatment with reduced cost and timely delivery of responses. These emerging technologies are coming up with many innovative solutions for mobile digital health, and there are many more possibilities for future research. This special issue is an effort to explore the innovations from ongoing research in mobile digital health and to further explore the future possibilities for the improvement of healthcare services and for more informed decisions by healthcare professionals.

OBJECTIVE

The prime objective of this proposed special issue is to present new advancements on theories, systems, methods, algorithms, and applications in mobile digital health. It will explore the novel ideas and research toward the recent developments in E-Healthcare. Unpublished, novel research work describing advanced prototypes, systems, tools, and techniques and general survey papers indicating future directions are also encouraged. The purpose of this special issue is to provide a unique venue for researchers, engineers, and practitioners to submit their recent research findings concerning the advances and emerging applications of mobile digital health.

ABOUT SPECIAL ISSUE

The call for papers of the special issue was initially sent out to several prospective authors who are working in the area of e-health and medical communications. In this special section, we received 21 articles out of which 19 were sent for detailed blind peer review by at least three reviewers. After the rigorous review and revision submitted by the authors, finally six papers are accepted for publication in this special section. Each article is discussed in brief as; first paper is on title "Noise Removal in Lung LDCT Images by Novel Discrete Wavelet-Based Denoising With Adaptive Thresholding Technique" by Ziyad et *al.* using LDCT approach. The paper focuses that the cancer is presently one of the prominent causes of death in the world. Low-dose computed tomography, a commonly used imaging test for screening lung cancer, has a risk of exposure of patients to ionizing radiations. Increased radiation exposure causes higher risk of developing lung cancer whereas reduced radiation dose results in noisy LDCT images. To address this issue of noisy images in computer diagnostic tools, a novel denosing method based on discrete wavelet transform with adaptive thresholding is proposed. The discrete wavelet transform applied on the LDCT images at three levels decomposes the image into approximate and detailed subbands. Each of these approximate bands undergoes thresholding where the optimum threshold level is computed by the genetic algorithm. The inverse of DWT is applied on the images after thresholding to retrieve the denoised image.

The second manuscript is based on the title "A Novel Method for Despeckling of Ultrasound Images using Cellular Automata-Based Despeckling Filter" written by Bhardwaj et *al.* based on the concept of ultrasound imaging. It uses high-frequency sound waves to characterize tissues in the human body. Ultrasound images are obtained by processing the echo signals reflected by body tissues. The current work proposed a cellular automata based despeckling filter (CABDF) that implements a local spatial filtering framework for restoration of the noisy image. A dual transition function is applied consecutively to obtain better results. The outcome is the convolution of transition rules applied. The analysis includes a comparison of different standard despeckling filters on the basis of image quality parameters. The proposed filter found efficient in terms of filtering and in terms of restoration of the result. The method applied in the manuscript outperform the filtering in the digital form of ultrasound images and it may further be uploaded and processed in mobiles and other digital gadgets.

In the modern health industry, the massive amount of information can do the wonder for the welfare of society. In the similar direction, the third manuscript covers the big data storage issues in context of mobile digital health by Sehgal et al. on title "On Performance of Big Data Storage on Cloud Mechanics in Mobile Digital Healthcare". The big data in heath industry has attracted many researchers due to great potential hidden in it. As this data originated from the different sources like hospital records, biomedical research, data generated from real time automated Internet of Things devices, it requires the proper management, synchronization and security. To tackle these three aspects of bigdata in health care, a small effort has contributed to improve the performance of big data storage on cloud mechanics as the integration of Mobile Digital Healthcare. The proposed framework involves the process of refining the sensitivity by using a deep learning approach. After this, it involves the step of computing or storage in the cloud base server in an optimized manner. The experimental analysis provides a significant improvement in terms of cost, time, and accuracy.

Fourth manuscript focuses on "Data Mining-Based Privacy Preservation Technique for Medical Dataset Over Horizontal Partitioned" by Mewada et *al.* to further secure medical databases. Data invasion and privacy are one of major concerns associated with mined information. Recently, privacy preserving data mining technique are widely adopted for securing and protecting the information and data. These techniques convert the original dataset into protected dataset through swapping, modification, and deletion functions. This technique works in two steps. In first step, cloud computing considers as service platform to determine the optimum horizontal partitioning in given data. In this work, K-Means^{++} algorithm is implemented to determine the horizontal partitioning on cloud platform without disclosing the cluster centers information. The second steps contain data protection and recover

phases. In second step, noise is incorporated in database to maintain the privacy and semantic of the data. Moreover, the seed function is used for protecting the original databases.

Garg et *al.* proposed an IoT based Camera Surveillance system and entitled the manuscript "Improving Performance During Camera Surveillance by Integration of Edge Detection in IoT System". The main objectives of research is to detect suspicious activities by camera automatically and take decisions by comparing current frames to previous frames. Major motivation behind research work is to enhance the performance of IoT based system by integration of edge detection mechanism. The research work carried out in this paper is making use of numerous cameras, canny edge detection based compression module, picture database, and picture comparator. Canny edge detection has been used to minimize size of graphical content to enhancing the performance of the proposed system. Simulation of results of this work is carrier out in the MATLAB simulation tool along the use of IoT based camera surveillance system along with traditional system. The novelty of the work lies in the proposed scheme as this system requires less space and it takes less time to inform regarding any suspicious activities.

It is concluded as healthcare domain gets wide attention among research community due to incremental data growth, advanced diagnostic tools, medical imaging process and many more. Enormous healthcare data is generated through diagnostic tool and medical imaging process, but handling of these data is quit tough task due to its nature. Large number of machine learning techniques are presented for handling the healthcare data and right diagnosis of disease. So, there is a great demand of mobile digital healthcare. However, the accuracy is one of primary concern regarding the disease diagnosis. Finally, efforts are made by Malik et *al.* to develop a novel method for handling stroke using optimization techniques, the manuscript is entitled on "Artificial Bee Colony Optimized Deep Neural Network Model for Handling Imbalanced Stroke Data: ABC-DNN for Prediction of Stroke". Hence, this study explores the applicability of deep neural network (DNN) technique for handling the imbalance healthcare data. The main objective of proposed DNN technique is to improve the diagnosis rate of stroke patients using artificial bee colony (ABC). Prior to implement the DNN, an artificial bee colony technique is adopted to determine the relevant features of stroke disease, called ABC-FS optimized DNN.

ACKNOWLEDGMENT

All guest editors express their sincere gratitude to Prof. Joel Rodrigues, Editor in Chief (EiC). IJEHMC for his constant support, suggestions, and motivation. We are also thankful to the editorial team and special thanks to Josh Christ and Alexis Miller from IGI editorial team.

Pradeep Kumar Singh
Artur Ziviani
Isabel de la Torre Díez
Po Yang
Ping Li
Guest Editors
IJEHMC