Journal of Ambient Intelligence and Humanized Computing (2019) 10:3739–3745
https://doi.org/10.1007/s12652-019-01425-9

EDITORIAL

Special issue on bio-medical signal processing for smarter mobile healthcare using big data analytics

Gwanggil Jeon[1] · Awais Ahmad[2] · Salvatore Cuomo[3] · Wei Wu[4]

Published online: 24 August 2019

With the technological advancements, quality of human health measurements has reached to a new realm. Medical devices are routinely used to detect and record physiological signals that are essential for human health monitoring. Health monitoring and sensing devices are ranging from thermometers, heart rate monitors, blood oxygen monitors, and EEG recorders to ultrasound and MRI machines. Further, with the increase in human population, the data generated in hospitals and other health concerned places rapidly growing. However, the processing of huge amount of data generated from various sources such as Body Area Network (BAN), IoT-enabled health devices such as blood pressure and sugar monitoring devices, etc. is becoming an alarming issue in near future. Nevertheless, current health monitoring systems can be further improved by facilitating real-time signal measurements, modeling, and processing using Hadoop ecosystem, SPARK, GraphX and other data analytical tools. However, the existing advancements significantly influence the early diagnosis of a disease or disorder, while empowering preventive care practices, drug administration processes, and rehabilitation of physically disabled people. Moreover, noise filtration is demanded the betterment of bio-signal processing to determine dynamic models to understand the characteristics and behaviors that provide prominent features in detecting abnormalities within those signals.

In the last decade, a significant development has been made in the area of medical signal processing measurement techniques, e-health monitoring through body area networking, medical assisted rehabilitation, and remote clinical diagnosis. However, integrating health services with the existing communication technology and performing remote health treatments with accuracy and precision is still challenging job. Therefore, it is necessary to analyze the existing data using various data analytics techniques and tools such as Hadoop ecosystem etc. The development of sensors technology that can accurately measure the bio-signals generated from a patient body in various forms and diagnosis different diseases based on these signals revolutionized the new era of modern health techniques. These concepts can be used in future in minimizing the doctors' efforts and telemedicine activities. However, still sophisticated and dynamic medical techniques and approaches are needed to overcome the challenges present in the current research. The goal of this special issue is to provide a forum for the research activities currently going on in the above fields and also developing and designing techniques for efficient sensing, processing, and analyzing the patient health conditions based on the bio-signal processing. In addition, novel mechanisms and algorithms are needed to overcome the deficiencies present in the current models for EEG, ECG, and MEG signals. Further, the data generated from various health services, such as hospitals, clinics, etc. is in huge and enormous form. Therefore, it is difficult to present a dynamic and autonomous system based on the conventional data analysis techniques. Therefore, a solution and system is needed which efficiently analyze and process data in real-time. Similarly, autonomous system can build on top of the hospital services to provide first-aid activities in various environments such as disasters, accidents, etc.

Starting from the above considerations, this special issue aims to bring together researchers coming from both

✉ Gwanggil Jeon
gjeon@inu.ac.kr

Awais Ahmad
aahmad.marwat@gmail.com

Salvatore Cuomo
salvatore.cuomo@unina.it

Wei Wu
wuwei@scu.edu.cn

[1] Incheon National University, Incheon, Korea

[2] National University of Computer and Emerging Science, Islamabad, Pakistan

[3] University of Naples Federico II, Naples, Italy

[4] Sichuan University, Chengdu, Korea

academia and industry, asking them to contribute to refining technologies and services aimed at personalization, monitoring, and recommendation in multimedia applications in using various techniques for Bio-medical Signal Processing for Smarter Mobile Healthcare using Big Data Analytics. This issue is intended to provide a highly recognized international forum to present recent advances in *Ambient Intelligence and Humanized Computing*. We welcomed both theoretical contributions as well as papers describing interesting applications. Papers were invited for this special issue considering aspects of this problem, including:

- Signal processing techniques for geriatric disease assessment using Big Data analytics.
- Analysis of Big Signal Data using Hadoop ecosystem.
- Sensing and data gathering techniques of bio-signals via WSN.
- Analysis and processing of Bio-signal Dataset.
- Application of BAN in data generation and analysis.
- Techniques to analyze brain signals using existing techniques and datasets.
- E-health monitoring using bio-signals in real-time using SPARK, GraphX, etc.
- Design architecture for IoT-enabled health activity monitoring devices.
- Medical signal processing using digital signal processing techniques.
- Designing advanced telemedicine techniques based existing telemedicine data.
- Analysis of various diseases such as Aphasia, etc. using bio-signal processing.
- Advance techniques to measure EEG, ECG, etc. signals.
- Designing of embedded devices for smart health.

After review, a total of 34 papers out of 49 submissions have been accepted for publication in this issue.

Diabetes is featured by the high prevalence and low control resulting in high premature mortality rate. Maintaining the blood glucose level can bring considerable medical benefits and reduces the risk of diabetes. In real-time, continuous monitoring of blood glucose level is the major challenge. However, monitoring only glucose level without considering other factors such as ECG and physical activities can mislead to improper medication. To address the aforesaid issues, the contribution by Ravi et al. "Fog-assisted Personalized Healthcare-Support System for Remote Patients with Diabetes" proposes an energy efficient fog-assisted healthcare system to maintain the blood glucose level. By deploying fog computing, an emergency alert is generated immediately for precautionary measures.

Wireless body area network (WBAN) plays an important role in human health monitoring for mobile healthcare. The improvement of service performance and low-power consumption are the two challenges for these medical WBANs, because those energy-limited wireless medical sensors must transmit the monitoring data to the personal server (PS) via intra-WBAN in time. Further, precise mathematical modeling combining with the sleeping state to measure this improvement theoretically is still lack. In the contribution by Guan et al. "A Polling Access Control with Exhaustive Service in Wireless Body Area Networks for Mobile Healthcare using the Sleeping Schema," a polling control with exhaustive service using the sleeping schema is proposed to address the problem in WBANs communication for smart health.

Wireless Body Area Network is the emerging field in domain of healthcare to monitor vital signs of patients with the support of bio-medical sensors. The design of delay-aware and energy efficient routing protocol based on the traffic prioritization is the key research theme in WBAN. In addition, WBAN has challenging issues of packet loss, temperature rise, delay with retransmission of the lost packets due to which it does not extend the network life time and is not acceptable for life critical data. The contribution by Ullah et al. "Traffic Priority based Delay-Aware and Energy Efficient Path Allocation Routing Protocol for Wireless Body Area Network" proposes a method which selects the optimal paths with high residual energy of nodes with minimum temperature rise. Specially, the design of Tripe-EEC routing protocol is mostly divided into four Folds.

Personal Health Records (PHR) System serves not just as static repositories for data but it also combines knowledge and software tools with patients' data that results in empowering patients to become active participants in their own healthcare management by providing their own medical history. In the contribution by Asif et al. "Towards Reliable and Trustful Personal Health Record Systems: A Big Data case of Cloud-Dew architecture based Provenance Framework," a framework for PHR system is proposed which goes beyond the trivial network/storage/service concept to a new micro-service level concept offering high scalability and availability in vertically distributed computing hierarchy. It pushes the frontiers of computing applications, data, and low-level services away from centralized virtual nodes to the end users. To measure the benefits of enabling provenance in dew computing, the pre-collected provenance and services of the proposed framework are utilized.

In spatiotemporal multi-channel surface Electromyogram (EMG) images where the x-axis is time, the y-axis is EMG channels and the gray level is EMG amplitude, the motor unit action potential (MUAP) appears as a linear Gaussian structure. The appearance of this MUAP pattern in the spatiotemporal images is mostly distorted either by the destructive superposition of other MUAPs occurring in the conducting volume or by various noises such as a power line, bad electrode and skin contacts and movement artifacts. For accurate automatic detection of MUAP, EMG image

enhancement is needed to suppress the background noises and enhance the line-like MUAP propagation patterns. The contribution by Hanif et al. "Spatio-temporal sEMG image enhancement and Motor Unit Action Potential (MUAP) detection: algorithms and their analysis" presents several candidate filters to enhance the MUAPs propagation pattern in spatiotemporal EMG images. The filters, which can detect and enhance line-like structure in digital images, are used.

Metaheuristic algorithms are popular techniques used to solve several optimization problems. Among the key algorithms, cuckoo search (CS) is a comparatively novel and promising metaheuristic algorithm. Various researchers have shown that it performs better when compared to other metaheuristic algorithms while searching for optimal value and is being used to solve various real-world problems. However, the basic cuckoo search (CS) algorithm can be improved by enhancing the probabilities of survival of the eggs. The contribution by Imran et al. "An Alternative Approach to Neural Network Training based on Hybrid Bio Meta-Heuristic Algorithm" proposes a new method known as Hybrid Accelerated Cuckoo Particle Swarm Optimization (HACPSO) algorithm, based on two metaheuristic algorithms. In the proposed HACPSO algorithm, APSO provides communication for looking better place having the best nest with greater survivability for cuckoo birds.

Recently, commercial physiological sensors and computing devices have become cheaper and more accessible, while computer systems have become increasingly aware of their contexts, including but not limited to users' emotions. Consequently, many studies on emotion recognition have been conducted. However, boredom has received relatively little attention as a target emotion due to its complex nature. Moreover, only a few researchers have tried classifying boredom using electroencephalogram (EEG). In the contribution by Sohn et al. "Machine learning approaches for boredom classification using EEG," authors first reviewed studies that tried classifying emotions using EEG. Further, authors designed and executed an experiment, which used a video stimulus to evoke boredom and non-boredom, and collected EEG data from 28 Korean adult participants. After collecting the data, authors extracted its absolute band power, normalized absolute band power, differential entropy, differential asymmetry, and rational asymmetry using EEG, and trained these on three machine learning algorithms: support vector machine, random forest, and k-nearest neighbors.

The levels of student engagement refer to the degree to which students are immersed in learning when they are being taught in class. This paper deals with an ambient intelligence algorithm for a smart classroom; the algorithm provides information to the teacher by measuring the level of student engagement in real time. In this study, the algorithm for assessing student engagement levels has been presented; it evaluates the psychological states of students by measuring a thermal infrared image. The contribution by Kim et al. "Ambient Intelligence in a Smart Classroom for Assessing Students' Engagement Levels" proposes a method which allows teachers to provide feedback to students while monitoring their students in real time. The measurement model for representing the student engagement level by using thermal infrared imaging is presented. The color of the teacher's mobile phone application changes in real time according to the immersion levels of the students in class.

Medical image segmentation has been widely used in clinical practice. It is an important basis for medical experts to diagnose the disease. However, weak edges and intensity inhomogeneity in medical images may hinder the accuracy of any traditional active contour segmentation methods. In the contribution by Han et al. "Boundary Constraint Factor Embedded Localizing Active Contour Model for Medical Image Segmentation," authors propose an improved active contour method by embedding a boundary constraint factor and adding the local information of images to the energy function of Chan-Vese model. Then graph cuts method is used to optimize the new energy function of the improved active contour method in this paper.

Recently, Internet of Vehicles (IoVs) is captivating a lot of interest due to a wide range of applications in various domains. These applications rely on up-to-date information of vehicles for provisioning various services. However, frequent message transmissions by a sheer number of vehicles may not only engulf a centralized server but may also cause a severe congestion which is not suitable for ongoing services specially in emergency situations. The contribution by Imran et al. "Congestion Avoidance through Fog Computing in Internet of Vehicles" presents a fog-assisted congestion avoidance scheme for IoV named Energy Efficient Message Dissemination (E2MD). Unlike most of the existing schemes, E2MD capitalizes the merits of fog computing to minimize communication cost and manage services. Each vehicle is required to update their status to a fog server frequently, either directly or through intermediate nodes. The performance of the proposed scheme is validated through NS 2.35 simulations.

Motor Neuron Disease (MND)/Amyotrophic Lateral Sclerosis (ALS) is a progressively degenerative disease of nervous system that mainly affects spinal cord, brain stem, and cerebral cortex motor neurons. Due to the unclear pathogenesis, early clinical symptoms are occult and heterogeneous, and lack of biological markers and characteristic neuroimaging changes. At present, there are difficulties in its early diagnosis and correct diagnosis. The contribution by Nana et al. "Big data of clinical manifestations combined with neuro-electro-physiologic features in the early diagnosis of motor neuron disease" studies how to explore the early diagnosis of ALS and the factors that affect early diagnosis by collecting case data and literature review. The purpose

of this study was to explore the early diagnosis of ALS and the factors that affect early diagnosis by collecting case data and literature review. The authors retrospectively analyzed ALS patients from 23,427 patients in department of neurology in Xi'an Gaoxin Hospital between December 2006 and March 2017. The gender, age at onset, time of diagnosis, first site, first symptom, and neurophysiological examination of ALS patients were collected, including the first time of neurophysiological examination, needle electromyography (EMG) data, and nerve conduction velocity data.

Biomedical data classification tasks are very challenging because data is usually large, noised and imbalanced. Particularly the noise can reduce system performance in terms of classification accuracy, time in building a classifier and the size of the classifier. Accordingly, most existing learning algorithms have integrated various approaches to enhance their learning abilities from noisy environments, but the existence of noise can still introduce serious negative impacts. A more reasonable solution might be to employ some preprocessing mechanisms to handle noisy instances before a learner is formed. The contribution by Chang et al. "A New Complement Naïve Bayesian Approach for Biomedical Data Classification" introduces a method called double learning (DL), which is to improve the classification performance. The main idea of this paper is to construct a model using noised instances. This approach minimizes the model construction time by reducing the number of instances and improves classification performance.

Nowadays, radar technique is widely used in many applications, such as electronic warfare, weather prediction, navigation, and self-driving car. Large amounts of radar data have been generated by the wide use of radar technique. Analyzing radar data has a quite important role in daily life, as well as in military. Finding the frequent sequences in radar data is significant for radar data analysis. However, traditional analysis systems using standalones cannot process big data due to the four features of big data, namely, volume, velocity, variety and value. In the contribution by Yang et al. "A system based on Hadoop for radar data analysis," authors propose a method where Hadoop Distributed File System offers stable data storage, and Spark offers efficient in-memory calculation. In this work, a three-node Hadoop-Spark cluster was built to perform the distributed data mining algorithm. To make the analysis of radar data accurate, authors proposed ideas of preprocessing radar data and post processing mining results.

The knowledge of dependency of a particular factor on another is a very important aspect in the healthcare field. If one has a rough idea about the effect a prescribed drug has on the cure of a disease or sufficient information about certain symptoms of a disease being linked to each other, one can make an informed decision about its treatment over a period of time. The contribution by Chilamkurti et al. "Analysis of Inter-Concept dependencies in Disease Diagnostic Cognitive Maps using Recurrent Neural Network and Genetic Algorithms in Time Series Clinical Data for targeted Treatment" proposes a method which makes use of a special kind of Recurrent Neural Network (RNN) known as Long Short Term Memory network to make predictions for time series data. This method makes use of the weight matrices obtained after training the neural network It is shown to be an improvement over the previous work done in this domain.

The contribution by Dawood et al. "Detail-preserving switching algorithm for the removal of random-valued impulse noise" presents a new algorithm for the de-noising of images corrupted with random-valued impulse noise (RVIN). It employs a switching approach that identifies the noisy pixels in the first stage and then estimates their intensity values to restore them. Local statistics of the textons in distinct orientations of the sliding window are exploited to identify the corrupted pixels in an iterative manner; using an adaptive threshold range. Textons are formed by using an isometric grid of minimum local distance that preserves the texture and edge pixels of an image, effectively. At the noise filtering stage, fuzzy rules are used to obtain the noise-free pixels from the proposed tri-directional pixels to estimate the intensity values of identified corrupted pixels. The proposed de-noising algorithm also has robust de-noising and restoration power on biomedical images such as, MRI, X-Ray and CT-Scan.

Reduced bit representations of video sequences are employed in order to mitigate the computational complexity of block matching algorithms. The idea is to explore computationally cheaper matching criteria than the conventional sum of absolute difference or fuzzy theory. Such low cost matching criteria result in substantial time saving and can therefore achieve real time video compression. To reduce the computational burden of such algorithms even further, the contribution by Kim et al. "Efficient Motion Estimation Using Two-Bit Transform and Modified Multilevel Successive Elimination" uses a method which reduces the number of search points in the search window. The speedup in computation as a result of using two-bit transform is rectified by imposing a modified version of multilevel successive elimination algorithm in orthogonal form.

Emotions play an important role in human communication, interaction, and decision making processes. Therefore, considerable efforts have been made towards the automatic identification of human emotions, in particular electroencephalogram signals and Data Mining (DM) techniques have been then used to create models recognizing the affective states of users. However, most previous works have used clinical grade EEG systems with at least 32 electrodes. These systems are expensive and cumbersome, and therefore unsuitable for usage during normal daily activities. The contribution by Ortiz-Barrios et al. "Affective Recognition

from EEG Signals: An Integrated Data-mining Approach" investigates the accuracy and applicability of previous affective recognition methods on data collected with an Emotiv headset while participants used a personal computer to fulfill several tasks. Several features were extracted from four channels only (AF3, AF4, F3 and F4 in accordance with the 10–20 system). Both Support Vector Machine and Naïve Bayes were used for emotion classification.

The development in the field of advanced biomedical sensors has resulted in a large volume of data being collected and transmitted wirelessly. The IEEE 802.15.6-2012 standard has specified a communication protocol for body area networks (BAN), however existing general-purpose communication protocols such as Bluetooth and Zigbee are more widely used due to multiple reasons. One of the critical issues is the lack of baseband processing hardware modules that implement the aforementioned standard. In the contribution by Han et al. "A Baseband Processing ASIC for Body Area Networks," authors propose a baseband transceiver implementation in ASIC, which meets the 802.15.6-2012 standard requirements. Compared to other published designs, the proposed implementation exhibits better performance and low hardware cost, while also offering a complete standard implementation.

Latent fingerprints are acquired from crime places which are utilized to distinguish suspects in crime inspection. In general, latent fingerprints contain mysterious ridge and valley structure with nonlinear distortion and complex background noise. These lead to fundamentally difficult problem for further analysis. Hence, the image quality is required for matching those latent fingerprints. In the contribution by Manogaran et al. "Bio-Medical and Latent Fingerprint Enhancement and Matching Using Advanced Scalable Soft Computing Models," authors develop a model for enhancement of latent fingerprint and matching algorithm, which requires manually marked (ground-truth) ROI latent fingerprints. This proposed model includes two phases (i) Latent fingerprints contrast enhancement using type-2 intuitionistic fuzzy set (ii) Extract the minutiae and Scale Invariant Feature Transformation (SIFT) features from the latent fingerprint image.

In response to the increasing need of assistance services for people with disabilities and elderly, eAssistance focuses on the development of tools to increase their autonomy and self-sufficiency. In this paper, authors present a new eAssistance system based on Ambient Intelligence (AmI) designed to monitor the user's activities and to improve the self-sufficiency together with the Quality of Life of dependents. The system can be adapted to a wide range of users and easily integrated into their homes or residences. The contribution by Poncela et al. "Smart Care Home System: A platform for eAssistance" proposes an inference of user's behavior patterns with the support of the home automation system, the obtainment of high level conclusions and the possibility of identify derivations and anomalous actions.

Liver cirrhosis is an advanced, diffuse stage of liver injury which usually entails pathologists to check a large number of microscopic images. Obvious differences between liver cirrhosis microscopic images and normal microscopic images, such as the arrangement of hepatocytes, the degree of hepatic fibrosis and the appearance of pseudo lobule, can be efficiently used in medical images classification systems. In the contribution by Shi et al. "Data augmentation on mice liver cirrhosis microscopic images employing convolutional neural networks and support vector machine," deep learning and standard machine learning methods were applied for helping pathologists making disease diagnosis easier. In this work, the convolutional neural networks and support vector machine were employed to complete the pre-classification of mice liver cirrhosis microscopic images and normal images.

Software configurable radio with dynamic spectrum support is the inherent property of Cognitive radio. Interoperability of Cognitive radio with wireless sensor network would enable the sensor nodes to access and transmit the application data in licensed PU free channels. Since wireless sensor nodes operate in heavily crowded ISM bands (902 MHz/2.4 GHz), there will be severe performance degradation during channel saturation and increased collision rate. With opportunistic spectrum access, enhanced performance can be achieved by minimizing the channel access collisions and control message overhead delays. The contribution by Gohar et al. "Cognitive Radio Assisted WSN with Interference Aware AODV Routing Protocol" proposes a novel approach to integrate the sensor nodes with cognitive radio (CR) nodes to route sensor data to sink using licensed channels opportunistically. Then, the authors extend the method to cluster senor node and CR nodes to achieve energy efficiency.

As a potential way to dramatically save energy and live in a green and smarter planet, the Internet of Things (IoT) aims to utilize energy-efficient enabling technologies such as the RFID systems in our daily life applications. In the contribution by Choudhury et al. "Scheduling RFID Networks in the IoT and Smart Health Era," authors propose localized reader scheduling algorithms for RFID networks. The authors consider readers with limited amounts of energy, powered by a battery. Using only local information, the readers schedule themselves to minimize energy usage and maximize network lifetime. The authors compare the performance of localized algorithms to a centralized heuristic (the research problem is NP hard) based on a set cover approximation solution and show that the localized algorithms obtain equal or better performance in comparison to centralized solution.

With the rapid growth of medical big data, medical signal processing measurement techniques are facing severe challenges. Enormous medical images are constantly

generated by various health monitoring and sensing devices, such as ultrasound, MRI machines. In the contribution by He et al. "Pulse Coupled Neural Network based MRI Image Enhancement Using Classical Visual Receptive Field for Smarter Mobile Healthcare," authors propose a contrast enhancement of MRI image to improve the accuracy of clinical diagnosis for smarter mobile healthcare. As one premise, the parameters of DOG are estimated from the fundamentals of CVRF; then the PCNN parameters in image enhancement are estimated eventually with the help of DOG. As a result, the MRI images can be enhanced adaptively. Due to the exponential decay of the dynamic threshold and the pulses coupling among neurons, PCNN effectively enhances the contrast of low grey levels in MRI image.

Data science has been empowered with the emerging concept of big data that enables data scalability in many ways. Effective prediction systems for complex analytical problems dealing with big data can be created by the use of evolutionary computing and associate feature selection and reduction techniques. In the contribution by Paul et al. "A big data analytical framework for analyzing solar energy receptors using evolutionary computing approach," authors propose a big data analytical framework to analyze solar energy receptors based on a set of features to estimate pressure loss coefficients (PLC) that can greatly improve the design of a solar collector. This computation is a time and resource consuming process as the flow rate and Reynolds number changes at every riser-manifold pair. Moreover, a suitable and appropriate algebraic expression is not well defined that can approximate the complex relationship among different features and variables. The overall heat gain of the solar receptor is dependent upon flow rates in the risers and the flow distribution among them.

Anomalies in cardiac functionality can be fatal. Early detection of these anomalies, and in many cases their precursors, can save lives. The probability of the occurrence of these anomalies is extremely among people with a prediagnosed heart condition. In the contribution by Jabbar et al. "Using Casual Reasoning for Anomaly Detection Among ECG Live Data Streams in Ubiquitous Healthcare Monitoring Systems," authors discovered that much remote Electrocardiography (ECG) monitoring systems do not convey "enough" information to the diagnosing doctor or the nominated caregiver. A few examples of this information can be the type of cardiac abnormality, the exact waveform of the ECG signal, time and frequency of the occurrence of the anomaly, machine-understandable part so that medical SCADA be alerted about the case, and immediate preventative urgent steps correlated to that emergency. It is also important to delivery surrounding context to the Health Information System so that the medical expert make his/her diagnosis with ample support data.

Dermoscopy is an excellent method of detecting melanoma in its early stages. Skin is the principal organ of human body. It covers bones, muscles and all parts of the body. Melanoma is rare, but it is the most dangerous form of skin cancer. It is curable if it is detected in its early stages. Digital dermoscopy help dermatologists in the examination of cancerous skin lesions. It enables doctors to capture microscopic images of moles by using a mobile phone, corresponding application or any handy scope device. In the contribution by Jamil et al. "Melanoma Segmentation using Bio-medical Image Analysis for Smarter Mobile Healthcare," authors propose an approach that can automatically preprocess the image and then segment the lesion. The gradient magnitude of the image is calculated to filter the images. The proposed technique is tested on European dataset of dermoscopic images.

Delay tolerant networks is the most growing application of wireless multi-hop networking under the umbrella of research done so far in sensor networks. Numerous challenges have to be faced by such networks; because of disconnection in terms of intermittent community, long delays etc. in network due to drastic mobility. An intermediate node therefore interested to take custody of the transmission till subsequent notable appropriate is located toward destination. The contribution by Sajid et al. "History and Buffer Rule based Intelligent System for Storage level Big Data Congestion Handling in Smart Opportunistic Network" specializes on this key issue how selection as best custodian node in terms of storage capacity as mobile devices have limited storage capacity for the transmission to raise delivery of the packets with less drop rate. In this research a history and buffer based totally intelligent approach based expert gadgets has been added and validated and compared with existing MAXPROP protocol.

According to the World Health Organization (WHO), a significant reduction in mortality and maternal morbidity has occurred in developed countries over the past decades. In contrast, these rates remain high in developing countries. Smart mobile-health (m-health) applications that use machine learning (ML) approaches are necessary tools for pregnancy monitoring in an accessible, reliable, and cost-efficient manner, making the prediction of high-risk situations possible during gestation. The contribution by Rodrigues et al. "Biomedical data analytics in mobile-health environments for high-risk pregnancy outcome prediction" proposes the development, performance evaluation, and comparison of ML algorithms based on Bayesian networks capable of identifying at-risk pregnancies based on the symptoms and risk factors presented by the patients. The contribution of this study focuses on finding a smart classifier for the development of novel mobile devices, which presents reliable results in the identification of problems related to pregnancy.

Lung cancer has been one of the major threats to human life for decades in both developed and under developed countries. Computer Aided Detection (CAD) can be an important tool for early lung nodule detection and preventing the deaths caused by the lung cancer. In the contribution by Ahmad et al. "Artificial Neural Network based Classification of Lung Nodules in CT Images Using Intensity, Shape and Texture Features," authors propose a novel technique for lung nodule detection using a hybrid feature set and artificial neural network. Initially, the lung volume is segmented from the input CT image using optimal thresholding which is followed by image enhancement using multi scale dot enhancement filtering. Next, lung nodule candidates have been detected from enhanced image and certain features are extracted.

Cloud Computing (CC) and the Internet of Things have emerged as new platforms in the ICT revolution of the 21st century. The adoption of the CloudIoT paradigm in the healthcare field can bring several opportunities to medical IT, and experts believe that it can significantly improve healthcare services and contribute to its continuous and systematic innovation. The contribution by Muhammad et al. "The Impact of the Hybrid Platform of Internet of Things and Cloud Computing on Healthcare Systems: Opportunities, Challenges, and Open Problems" presents a comprehensive review of the current literature on integration of CC and IoT to solving various problems in healthcare applications such as smart hospitals, medicine control, and remote medical services. This paper aims to present the state of the art and gap analysis of different levels of integration components, analyzing different existing proposals in CloudIoT-Health systems.

In recent times, a massive amount of smart devices or objects are connected that enhances the scale of the digital world. These smart objects are referred as "things" or physical devices that have the potential to sense the real-world physical objects, collect the data, and network with others. The objects are connected through the internet, which crafts the terminology of Internet of Things. In the contribution by Babar et al. "Real-Time Data Processing Scheme using Big Data Analytics in Internet of Things based Smart Transportation Environment," authors propose architecture for smart transportation system using Big Data analytics, in order to achieve real time processing and facilitate a friendly communication in the environment of Internet of Things based smart transportation. The proposed architecture is a 3-phase scheme which is responsible for the organization and management of Big Data, real-time processing of Big Data and service management.

The contribution by Alavalapati et al. "Chest X-ray segmentation using Sauvola thresholding and Gaussian derivatives responses" presents a simple, flexible and an effective lung segmentation technique called ST-GD (Sauvola thresholding-Gaussian derivatives) method. This technique for extraction of lung field area is consist of six main steps. This developed system tested on JSRT, Montgomery and a self collected dataset. The self-collected database has been collected from Northwest General Hospital and Research Center, Peshawar, Pakistan. The proposed system produced an accuracy of 94.57% on JSRT dataset, 90.75% accuracy on Montgomery dataset and 65.25% on Northwest dataset using Jaccard coefficient. Furthermore, it is also investigated that the proposed study has outperformed as compared to the state-of-the-art methods.

Alzheimer patients face difficulty to remember the identity of persons and performing daily life activities. This paper presents a hybrid method to generate the egocentric video summary of important people, objects and medicines to facilitate the Alzheimer patients to recall their deserted memories. Lifelogging video data analysis is used to recall the human memory; however, the massive amount of life logging data makes it a challenging task to select the most relevant content to educate the Alzheimer's patient. To address the challenges associated with massive life logging content, the contribution by Javed et al. "A Hybrid Egocentric Video Summarization Method to Improve the Healthcare for Alzheimer Patients" applied static video summarization approach to select the key-frames that are more relevant in the context of recalling the deserted memories of the Alzheimer patients. This paper consists of three main modules that are face, object, and medicine recognition. Experimental results signify the effectiveness of the proposed system in terms of providing the most relevant content to enhance the memory of Alzheimer patients.

We hope that this special issue would shed light on major developments in the area of *Ambient Intelligence and Humanized Computing* and attract attention by the scientific community to pursue further investigations leading to the rapid implementation of these technologies.

Acknowledgements We would like to express our appreciation to all the authors for their informative contributions and the reviewers for their support and constructive critiques in making this special issue possible.