Computer Assisted Methods in Engineering and Science
30(2): 107–109, 2023

Preface to Special Issue on Scientific Computing and Learning Analytics for Smart Healthcare Systems (Part I)

This special issue introduces intelligent healthcare emerging technologies that incorporate big medical data, artificial intelligence, cloud/fog scientific computing, federated learning, bio-inspired computation, the internet of medical things, security and privacy, semantic databases, etc. The health monitoring and diagnosis for the target structure of interest are achieved by interpreting collected data. The advances in sensor technologies and data acquisition tools have led to a new era of big data, where different sensors collect massive amounts of medical data. This special issue offers valuable perceptions to researchers and engineers on designing intelligent healthcare technologies and improving patient information delivery care remotely. Sensors can enhance the decision-making process and early disease diagnosis by intelligently investigating and collecting large amounts of healthcare data (i.e., big data). Hence, there is a need for scalable machine learning, deep learning, and intelligent algorithms that lead to more interoperable solutions and make effective decisions in emerging sensor technologies. More specifically, the proposed special issue intends to study the impact of integrating artificial intelligence, advanced learning and scientific computing systems, and the internet of medical things ideas on secured health data processing and analytics.

In this issue, eight articles are published. The papers, directly or indirectly, are related to cutting-edge learning and computing for advanced healthcare systems using artificial intelligence systems. As follows, we briefly present the main contribution of each study.

Sunpreet Kaur Nanda *et al.* [1] present digital video forensics for fraud medical anomaly detection using soft computing. The proposed system precisely differentiates between the images of a person wearing a mask and not wearing one. The proposed models can be implemented on other datasets such as smart healthcare imaging systems for anomaly detection in various diseases and tumors, image processing systems, digital media, etc.

Lakshmi T.K. and J. Dheeba [2] propose methods for classifying and segmenting periodontal cysts on dental radiographs using convolutional neural network (CNN), visual geometry group 16 (VGG16), and U-Net models. Their work

yields promising results, and in the future, it will be extended to include other pre-trained models and their comparison.

Sunita P. Deshmukh *et al.* [3] present a hybrid deep learning technique for liver cancer detection. This research focuses on the image analysis of two types of cancer: cholangiocarcinoma and hepatoblastoma. The framework's performance is evaluated using 2871 images, and a dual hybrid model used in the study accomplishes superb performance.

Gaganjot Kaur and Prinima Gupta [4] describe the role of denial-of-service attacks for internet of things (IoT)-based health systems. This work improves attack detection accuracy by using the abnormal traffic detection method called the double P-value of transductive confidence machines for K-nearest neighbors (DPTCM-KNN). Additionally, this research develops a unique method for detecting distributed denial of service (DDoS) assaults on software defined networking (SDN) using the proposed approach in healthcare systems.

Anshu Sharma *et al.* [5] present a system that monitors live-body temperature, cough detection, pulse rate, and other health criteria such as weight loss, chest pain detection, blood sugar level, HB-WBC-RBC (hemoglobin, white blood cell, red blood cell) level, etc. NodeMcu, an open-source firmware, is used for wireless data transmission on an IoT platform. The data is stored on a web server so the physician and patient can access it to obtain information about the patient's condition and help the physician to diagnose tuberculosis (TB).

F. Sammy and S. Maria Celestin Vigila [6] propose the decentralized device authentication for cloud systems with blockchain using the skip graph method. The devices communicating in the cloud environment range from tiny IoT devices to large cloud data storage. This method ensures fast nodal retrieval in the mutual authentication process.

Tripti Sharma *et al.* [7] address the battery constraint issues for wireless sensor networks and resolve them using a fuzzy-based firefly and an ant colony optimization (ACO) algorithm. Such an algorithm can be successfully applied to environmental monitoring for healthcare systems where a dense sensor network is required and the stability period should be high.

Dibyahash Bordoloi *et al.* [8] describe an evolutionary model for skin disease classification and detection based on machine learning and image processing. This model integrates image preprocessing, image augmentation, segmentation, and machine learning algorithms for skin disease categorization and detection. The proposed methodology is beneficial for the accurate identification of skin disease using image analysis.

All eight papers tackle different but highly relevant health data acquisition domain topics. We believe this special issue will raise awareness in the scientific community by presenting and highlighting the advances and latest novel and emergent technologies, implementations, and applications concerning the

sensing, classifying, and analytics of health parameters and patient monitoring. In closing, we thank all the authors who submitted their research work to this issue. We would also like to acknowledge the contribution of many experts who have participated in the review process and provided helpful suggestions to the authors to improve the contents and presentations of the articles. We would like to thank the publishing team for their support, helpful suggestions, and comments during the various intricate stages of publishing this special issue.

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