

Guest Editorial: Intelligent Ubiquitous Computing and Advanced Learning Systems for Biomedical Engineering

Introduction: The health monitoring for disease diagnosis and prognosis in a desired smart medical structure is realized by interpreting the health data. The advances in sensor technologies and biomedical data acquisition tools have led to the new era of big data, where different sensors collect massive medical data every day. This special issue explores the latest development in emerging technologies of biomedical engineering, including big medical data, artificial intelligence, cloud/fog computing, federated learning, ubiquitous computing and communication, internet of things, wireless technologies, and, security and privacy. The biological wearable sensors can enhance the decision-making and early disease diagnosis processes by intelligently investigating and collecting large amounts of biomedical data (i.e., big health data). Hence, there is a need for scalable advanced learning, and intelligent algorithms that lead to reliable and interoperable solutions to make effective decisions in emergency medicine technologies. The optimization algorithms can be used in order to acquire the sensor data from multiple sources for fast and accurate health monitoring.

Papers in the Special Issue: In this special issue, nine manuscripts are published, the papers directly or indirectly are related to advanced learning systems for biomedical engineering with intelligent computing. As follows, we briefly reviewed the main contribution of each manuscript.

Lin *et al.* present a novel approach based on Artificial Intelligence in Electronic Communication Engineering for medical applications. Authors highlight a new architecture with LPWAN technology to improve the security of wireless communication system of internet of things for health applications. Information transmission instructions of "temperature, light, air pressure and humidity" were recorded and analyzed.

Liu *et al.* present a study on the detection and defense of malicious code under network security over biomedical devices. The proliferation of massive varieties and unknown malicious viruses, it is difficult to achieve effective and timely defense by anti-virus technology with virus signature matching as the core. Thus, detection of malicious code under network security is done for biomedical devices and it was found that when the number of infected nodes reaches about half, the infection speed begins to slow down.

Li *et al.* present an approach on distributed lossless coding system based on cloud computing in video transcoding for MRI and Neuroimaging. The authors highlighted a distributed lossless coding system based on cloud computing to increase the video transcoding capacity of the new media interactive broadcasting.

Tie *et al.* highlight the optimal supply chain inventory information forecasting and control system in Biomedical Instruments. Biomedical informatics and computer vision techniques have been combined in a variety of inter-multidisciplinary disciplines during the past few decades. We are all aware that poor or insufficient cloud access management and controls can expose a company to a number of risks. The work that follows offers intelligent supply chain, upgraded service management, and control telephone network architecture.

Wang *et al.* explore the application of vibration compensation in track displacement monitoring using image processing. The authors proposed to use the principle of vibration compensation to test, use rail image feature points for vibration compensation. They used the biomedical image-based processing concept to realize the track displacement monitoring method, which meets the requirements of non-contact measurement, and the degree of automation is high, it can be monitored and alarmed in real time, and it has a good application prospect.

Zhang *et al.* present anti-cracking performance test under vibration fatigue load for critical health infrastructure. This paper considers the relevant cement-based solid metal structures fire- retardant coatings available on the market as the test object and performs high-cycle fatigue stress experiments on steel structural elements painted with cement-based thick steel structure fire-retardant varnishes.

Yongbo *et al.* propose a manufacturing vibration monitoring system using Hilbert-Huang transformation feature extraction, to monitor the running state of the spindle of an electrocardiogram machine. Real-time monitoring of the time-frequency characteristic quantity of the spindle vibration signal for ECG signals has been made possible due to the online empirical mode decomposition method. The system is capable of not only accurately monitoring the characteristic quantity in the frequency domain of the vibration signal produced by the machine tool spindle, but also of successfully implementing the monitoring of the time-frequency characteristic quantity in real time.

Zhao *et al.* present an approach based on heart rate monitoring of physical fitness training load based on wavelet transform. The detection of fluctuations is a crucial step in the process of isolating heart rate oscillation signals. A method of R-wave identification for heart rate monitoring of physical fitness training load based on wavelet transform is proposed.

Sun *et al.* present an intelligent ubiquitous compression technique for DNA sequencing. The major objective of designing the proposed method is to find a

solution to the challenge of lowering the quantity of data storage required for practical applications of large amounts of biomedical data and making effective use of the storage devices. It effectively reduces redundant information by using the local correlation of data and uses the computing resources of a cloud platform that is used for biological information processing to support the efficient storage, transmission, and sharing of data.

Summary: All the papers selected for this Special Issue show that the field of computing and learning systems in biomedical engineering is steadily moving forward. This continuous and exponential growth is facilitated by investments and research activities originating from industry, academia, and governments while the penetration of these technologies is also driven by the high-technology acceptance rates of both consumers and technologists across disciplines.

Acknowledgments: Firstly, we wish to express our thanks to Ms. Emily Summerbell, Managing Editor, for her continuous assistance throughout this process. We wish to express our gratitude to all the contributors who submitted novel scientific results in this forum, and to our anonymous reviewers, whose expert work helped us to have the realization of this endeavor. We hope that this effort will contribute to the further development of innovative works and raise the scientific and technological community's interest in the relevant area. As the last point, we should not forget to express our appreciation to the journal's Editors-in-Chief and all the members of the Journal Editorial Office (JEO) for their support throughout this adventure.



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