

## Editorial

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# Special section on Recent Trends in Information and Communication Technologies

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Resilient, scalable, and extensible mission-critical networks [1] are used to interconnect data centers [2], clouds [3], enterprises [4], customer sites [5], and mobile entities [6] using emerging Information and Communication Technologies (ICT) such as Artificial Intelligence (AI) [7], machine learning [8], and big data techniques [9]. Examples of systems in which these characteristics are needed to be included such as mission-critical healthcare [10], computation-intensive [11], transactions (such as banking) [12], automobile [13], transportation [14], entertainment [15], building architecture [16], energy [17], and mobile/wireless computing systems/networks/internet of things (IoT) [18]. A huge amount of data being generated by these applications and due to intense vast academic research and the data processing capabilities of ICT emerging technologies have attracted researchers across the globe to address the challenges and opportunities to provide reliable service by mission critical networks in adverse conditions. Therefore, there is a strong demand to investigate the present ICT emerging technologies to provide solutions for fault tolerance, reliability, and availability in applications of mission critical networks. We have received more than 40 manuscripts in total for this special section across the globe, and after the rigorous review process, only 14 manuscripts have been accepted for publication. A short review about the commitments for this special section is as follows.

*Chonglei Shao, Preet Kaur, and Rajeev Kumar* contributed an article entitled “An Improved Adaptive Weighted Mean Filtering Approach for Metallographic Image Processing” [19]. In this article, an adaptive weighted mean filtering method has been proposed to overcome the shortcomings of the standard mean filtering method. The proposed method shows that it can better protect the details of the image, has better filtering effect than the standard mean filtering, and its processing speed is faster than the median filtering of the large window.

*Qianhua Ling, Mohammad Asif Iqbal, and P. Kumar* contributed an article entitled “Optimized LMS algorithm for system identification and noise cancellation” [20]. In this article, the optimization of least mean square (LMS) algorithm is carried out with the help of particle swarm optimization and ant colony optimization. The results depict significant improvements in the performance and displayed fast convergence rate. Both the techniques displayed their own advantage and hold a very important application in the field of biomedical science.

*Ruiling Yu, Mohammad Asif Iqbal, and Abdul Rahman* contributed an article entitled “Improvement of substation Monitoring aimed to improve its efficiency with the help of Big Data Analysis” [21]. In this article, the authors have introduced the big data analysis and its corresponding application in the monitoring of substations. Furthermore, authors have proposed different types of distributed data analysis techniques, i.e., two relational online analysis, namely, Hive and Impala and one H Base multidimensional online analysis. The result depicts that the proposed model has an advantage in storage overhead and roll-up

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performance, when compared with the traditional method, although the data loading speed is approximately 1.7–1.9 times of the traditional model.

*Qi Yao, Mohammad Shabaz, Tarun Kumar Lohani, Mohammed Wasim Bhatt, Gurpreet Singh Panesar, and Raj Karan Singh* contributed an article entitled “3D modelling and visualization for Vision-based Vibration Signal Processing and Measurement” [22]. In this article, a vision-based remote measuring approach has been proposed for the analysis of vibration. To build the 3D visualization model, a visualization in mine production technique has been discussed. The proposed system is effectually able to perform cutting, volume calculation, and roaming in any direction. An accuracy value of 98.75%, a sensitivity of 99%, a specificity of 99.64%, and a positive prediction value (PPV) of 99.89% are achieved using the proposed 3D modelling and visualization algorithm for vibration signal processing and management.

*Junhong Meng, Maninder Singh, Manish Sharma, Daljeet Singh, Preet Kaur, and Rajeev Kumar* contributed an article entitled “Online Monitoring Technology of Power Transformer based on Vibration Analysis” [23]. This article presents a method for the study of the influence of stability of a power transformer on the power system based on the vibration principle. The proposed method utilizes a partial EMD screening along with the multiscale permutation entropy ensemble average empirical mode decomposition (MPEEMD) method for the online monitoring of power transformer. The proposed system is compared with empirical mode decomposition (EMD) and ensemble empirical mode decomposition (EEMD) algorithms in terms of the number of IMFs obtained by decomposition, maximum correlation coefficient, and mean square error. The inherent mode correlation, when compared with the mean square error of the reconstructed signal, shows that the proposed method outperforms both EMD and EEMD algorithms.

*Liwei Wang, Robert Abbas, Fahad M. Almansour, Gurjot Singh Gaba, Roobaea Alroobaea, and Mehedi Masud* contributed an article entitled “An empirical study on vulnerability assessment and penetration detection for highly sensitive networks” [24]. In this article, authors have studied various system security methods using penetration testing technology. The use of penetration testing technology is conducive to the realization of accurate positioning, accurate detection, active alarm of security vulnerabilities, and optimization of monitoring and rectification of the combination of network security management control system. In this study, taking penetration testing technology as one of the core elements of management and control, the risk index model is optimized to make network security management controllable and efficient, and effectively achieve management and control objectives.

*Yongkuan Zhu, Gurjot Singh Gaba, Fahad M. Almansour, Roobaea Alroobaea, and Mehedi Masud* contributed an article entitled “Application of data mining technology in detecting network intrusion and security maintenance” [25]. In this article, an improved  $k$ -means algorithm and an improved Apriori algorithm applied in data mining technology to detect network intrusion and security maintenance have been proposed. The results show that the improved algorithm advances the detection efficiency and accuracy using the designed detection model. The improved and tested detection model is then applied to a new intrusion detection system, and the experimental results show that the proposed system improves detection accuracy and reduces the false alarm rate.

*Zhenzhuo Wang and Amit Sharma* contributed an article entitled “Research on transformer vibration monitoring and diagnosis based on Internet of things” [26]. This article presents an IoT-based approach for condition monitoring and controlling a large number of distribution transformers utilized in a power distribution network. Here, the vibration analysis method is used to carry out the research. The results show that the accuracy of the improved diagnosis algorithm is 99.01, 100, and 100% for normal, aging, and fault transformers. The designed system can effectively monitor the healthy operation of power transformers in remote and real-time.

*Zhenyi Zhao, Zhou Jian, Gurjot Singh Gaba, Roobaea Alroobaea, Mehedi Masud, and Saeed Rubaiee* contributed an article entitled “An improved association rule mining algorithm for large data” [27]. This article makes a systematic and detailed analysis of data mining technology by using the Apriori algorithm. Data mining technology is used for potentially useful information extraction and knowledge from big data sets. The results demonstrate that the precision ratio of the presented technique is high comparable to other existing techniques with the same recall rate, i.e., the R-tree algorithm. The proposed technique by the mining effectively controls the noise data, and the precision rate is also kept very high, which indicates the highest accuracy of the technique.

*Yang Zhang, Abhinav Asthana, Sudeep Asthana, Shaweta Khanna, and Ioan-Cosmin Mihai* contributed an article entitled “*Design of intelligent acquisition system for moving object trajectory data under cloud computing*” [28]. This article uses cloud computing technology, through clustering algorithm and density-based DBSCAN algorithm combined with Map Reduce programming model and design trajectory clustering algorithm. The passenger hot spot area is obtained by clustering the passenger load points in each time period, which verifies the feasibility of the passenger load point recommendation application based on trajectory clustering. The implementation results show the rationality of the recommended application design and the feasibility of practice.

*Xiahui Wang, Dan Zhang, Abhinav Asthana, Sudeep Asthana, Shaweta Khanna, and Chaman Verma* contributed an article entitled “*Design of English hierarchical online test system based on machine learning*” [29]. In this article, an online English test system based on machine learning has been proposed to facilitate the assessment of student’s college English courses. The online English test system based on machine learning (ML) breaks the shackles of the traditional paper English test and improves the efficiency of the English test. It also maintains the fairness of English test and improves the marking speed. The results show that the proposed model can help schools to conduct more systematic and scientific management.

*Lina Huo, Jianxing Zhu, Pradeep Kumar Singh, and Pljonkin Anton Pavlovich* contributed an article entitled “*Research on QR image code recognition system based on artificial intelligence algorithm*” [30]. In this article, an improved adaptive median filter algorithm and a quick response (QR) code distortion correction method based on back propagation neural networks have been proposed to improve the recognition rate of QR image codes. The two-dimensional code distortions are addressed in this study, which was a serious research issue in the existing software systems. The research outcomes obtained after emphasizing on the pre-processing stage of the image revealed that a significant improvement of 14% is observed for the reading rate of QR image code.

*Xiaofeng Liu, Pradeep Kumar Singh, and Pljonkin Anton Pavlovich* contributed an article entitled “*Accent labeling algorithm based on morphological rules and machine learning in English conversion system*” [31]. In this article, the labeling of primary accents uses a labeling algorithm that has been proposed using morphological rules and machine learning. The labeling of secondary accents is done entirely through machine learning algorithms. After ten rounds of cross-validation, the average tagging accuracy rate of primary stress was 94%, the average tagging accuracy rate of secondary stress was 94%, and the total tagging accuracy rate was 83.6%. This perceptual study separates the labeling of primary and secondary accents providing the promising outcomes.

*Asma’ Amro, Mousa Al-Akhras, Khalil El Hindi, Mohamed Habib, and Bayan Abu Shawar* contributed an article entitled “*Instance Reduction for Avoiding Overfitting in Decision Trees*” [32]. This article investigates the use of instance reduction techniques to smooth the decision boundaries before training the decision trees. The empirical experiments were conducted on 13 benchmark datasets from University of California at Irvine (UCI) machine learning repository with and without intentionally introduced noise. The results show that eliminating border instances improves the classification accuracy of decision trees and reduces the tree size, which reduces the training and classification times.

I hope that the quality research work published in this special section will be able to serve the concerned science, environment, and technology.

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