

Guest Editorial Preface

Special Issue on Intelligent Healthcare Systems: New Trends and Applications

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Intelligent Healthcare Systems play a vital role in assisting physicians to evaluate health examination data. These systems are developed using intelligent techniques (IT). IT is a term refers to methods or algorithms which can be applied to almost any data problem. ITs enable computer systems to think and understand, to gather and incorporate domain knowledge, to apply knowledge and experience for manipulating the environment and to conclude situation with fuzziness and uncertainty. Its major application areas are medical, human resource management, planning, business, manufacturing and web services. This special issue focuses specially on medical systems. The five articles cover the following research area: cervical cancer detection, knee disease prediction, Osgood-Schlatter disease, health detection of wheat crop and retinal vessel segmentation.

Cervical cancer is second most prevailing cancer in women all over the world and Pap smear is one of the most popular techniques used to diagnosis cervical cancer at an early stage. Developing country like India has to face challenges in order to handle more cases day by day. This paper implemented online and offline machine learning algorithms on benchmarked data sets to detect cervical cancer. It also addresses the problem of segmentation with hybrid techniques and optimizes the number of features using extra tree classifiers. Accuracy, precision score, recall score and F1 score are increasing in proportion of data for training and attained up to 100% by some algorithms. Algorithm like logistic regression with L1 regularization has accuracy of 100% but it is too much costly in term of CPU time in comparison to some algorithms that obtains 99% accuracy in less CPU time.

Artificial intelligence is emerging as a persuasive tool in the field of medical science. This research article also primarily focuses on development of a tool to automate the diagnosis of inflammatory diseases of the knee joint. The tool will also assist physicians and medical practitioners for diagnosis. Diseases considered for this research under inflammatory category are Osteoarthritis, Rheumatoid Arthritis and Osteonecrosis. A five-layer adaptive neuro-fuzzy (ANFIS) architecture was used to model the system. The ANFIS system works by mapping input parameters to the input membership functions, input membership functions are mapped to the rules generated by the ANFIS model which are further mapped to the output membership function. Finally, the output membership functions are mapped to single-valued output. Data of approximately 300 patients was used to train the ANFIS system. The system is tested on 170 patients and has successfully given 96.9% of testing accuracy. A comparative performance analysis of fuzzy system and ANFIS system is also done and results generated shows that the ANFIS system outperformed fuzzy system in terms of testing accuracy, sensitivity and specificity.

The medical field is very complex as it deals with life of human being. Various medical expert systems are designed to diagnose different diseases that deals with vague values. In the human skeletal system, the knee is the joint which holds the weight of our body. This research article is for the early diagnosis of inflammatory disease named Osgood-Schlatter disease of the knee joints. As the system deals with fuzzy values, the fuzzy logic controller is used for implementation. Knowledge engineering phase is done with the help Orthopedic expert. Four symptoms are used for diagnosing the severity of disease. Also, it provides treatment for the respective level of disease. Data collection is completed by survey method and various defuzzification methods are used to check the accuracy. The proposed system is tested on 25 patients.

Agriculture plays a vital role in India's economy. 44% of the employment in India is engaged in agriculture and allied activities and it also contributes 17% of the gross value added. As most of the country's people are in agriculture sector and out of them only few are literate about how to protect their cultivation which ultimately give rise to severe problems like low economy in the sector and starvation for the nation. The job of the research is to help the farmers to save crops from disease. The authors came up with the thought of combining pattern recognition method and image processing technique. The system allows to follow a particular pattern of growing crops so that threats will be analysed earlier and alongside image processing technique is used which allows to click the picture of the diseases part. Combining this with the power of Internet of Things, the authors can automate the process without the need of human resources, which is a much reliable process. This research can ultimately make the agriculture process fast and farmers can cultivate more in less amount of time.

The last research article presents an algorithm for the segmentation of retinal blood vessels for the detection of diabetic retinopathy eye disease. This disease is occurred in patients with untreated diabetes for a long time. Since this disease related to retina to the images, it can eventually lead to vision impairment. The proposed algorithm is a supervised learning method of blood vessels segmentation in which the classification system is trained with the features that are extracted from the images. The proposed system is implemented on the images of DRIVE, STARE and CHASE_DB1 databases. The pre-processing process is done with extraction of green channel, filtering and adaptive contrast limited histogram equalization. The segmentation is done by forming clusters with the features of patterns. The features were extracted using Independent Component Analysis and the classification is performed by Support Vector Machines (SVM). The results of parameters given by accuracy, sensitivity, specificity, positive predictive value, the false positive rates are compared with the Particle Swarm Optimization (PSO), Firefly Optimization Algorithm (FA) and Lion Optimization Algorithm (LOA).

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