


Chapter 6

Medical Data Analysis Using Feature Extraction and Classification Based on Machine Learning and Metaheuristic Optimization Algorithm

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ABSTRACT

A metaheuristic-based data optimization algorithm with machine learning-based feature extraction and classification architectures is proposed. The medical data collected from hospital database and public health dataset are input to analyze abnormalities through IoT. The data optimization is carried out using metaheuristic-based gravitational search algorithm. When the data is optimized, the loss function during the feature extraction, classification will be minimized for ML architecture. The feature extraction has been carried out for the medical data using Bi-LSTM-based RNN architecture, and the extracted data has been classified using a deep belief network with CNN (DBN-CNN). Collected data have been classified for prediction of abnormal and normal data range. Experimental results show the efficiency of the proposed method when compared to existing techniques, namely accuracy, precision, recall, and F1-score. Confusion matrix shows actual class and predicted class of normal and abnormal data predicted from input data.

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INTRODUCTION

A better healthcare system is the main problem for a growing global population in the modern world. IoMT is a goal for a more comprehensive and accessible healthcare system. IoMT is the wireless integration of medical devices that allows for D2D communication. The most difficult issue in recent days has been the time required for web services by Nayyar et al., (2018). By keeping up with the current technology advances, three-dimensional (3D) video can be downloaded at random intervals. For reliable data measurement, the acquired voluminous data is obtained with minimum time. It will improve device resource allocation and provide faster speeds for diverse networks. Wi-Fi, Bluetooth, ZigBee, and other cellular platforms are among the heterogeneous networks that make up the IoMT. D2D communication is a critical component of the IoMT platform, as it is both efficient and reliable by Nayyar et al., (2018). The essential characteristics of an intelligent healthcare system are low delay, high throughput, and reliability, all of which are critical for accurate and successful diagnosis and consultation. For emergency healthcare applications, the critical time analysis is the most important parameter to consider. IoT-driven wearable devices can provide extremely dependable and delay-tolerant communication and data transmission by Nayyar et al., (2018).

In partitioning clustering method, metaheuristic optimization methods are used. Based on particular measures, it partitions dataset into group of subsets. Nature of group formation is influenced by fitness function. To transfer partitioning process into optimization issue, fitness function is selected by Nayyar et al., (2019). Web text mining and image pattern recognition in computer science, portfolio management studies, medical anthropology to classify diseases based on a combination of patient records and genomic investigations, WSN for distributing sensors to improve lifetime and coverage area, and library mathematics for grouping publications by content by Rathee et al., (2019).

This research contribution is as follows:

- To develop Metaheuristic based data optimization algorithm with machine learning based feature extraction and classification architectures.
- To optimize the data using Metaheuristic based gravitational search algorithm
- To extract the features of medical data using Bi-LSTM based RNN architecture
- To classify the extracted data using deep belief network with convolutional neural networks (DBN-CNN). This classification results will show normal as well as abnormal range of data.
- Experimental results shows accuracy, precision, recall and F-1 score. The confusion matrix shows normal and abnormal data.

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