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PARTICLE SWARM OPTIMIZATION ENABLED MULTICLASS CONVOLUTION NEURAL NETWORK FOR CARDIOVASCULAR DISEASE CLASSIFICATION

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ABSTRACT

Cardiovascular disease classification is considered an important concern in the medical research community as heart problems are the growing cause of mortality around the world. Hence automated models for cardiovascular disease classification eliminate the serious complication of the people. Machine learning approaches have been considered to be optimal to classify the diagnosis data of the patient but those models lead to several complex characteristics on processing the disease features and it consumes more time for increasing the accuracy on disease discrimination. In order to mitigate those complications, deep learning architecture is considered to be effective as it operates the complex characteristics in a short span of time. In this paper, a new deep learning model is designed and proposed for cardiovascular disease classification. The design contains a multiclass convolution neural network along Metaheuristics optimization technique termed as particle swarm optimization to discriminate the disease on the basis of the risk level and clinical features of the disease. The preliminary dataset preparation involves filling in missing values within a high-dimensional electronic health dataset. Missing value imputation is employed using the K- Nearest Neighbour method. In many cases, dataset contains irrelevant attributes which leads to high complexity in processing of the architecture, therefore it is eliminated using dimensionality reduction and outlier removal techniques such as matrix factorization or singular value decomposition. Preprocessed data is normalized by incorporating the Z score Normalization technique to enhance the data integrity and uniformity in the attributes. Normalized categorical data is exposed to principle component analysis to extract the distinguishing disease feature. Extracted disease feature is processed with Metaheuristics technique represented as particle swarm optimization to yield optimal disease feature for cardiovascular disease classification. Optimal disease features have been employed in the Multiclass Convolution Neural network for Heart disease classification. In this architecture convolution layer and Max pooling layer has been employed to process the disease feature with kernel setting to produce the feature map. Moreover, sigmoid function is used as activation functions of the CNN layers to increase the classification performance of the model on the

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training stage in generating disease classes. Experimental analysis has been carried out on employing EHR dataset to evaluate the performance of the proposed discriminative deep learning framework on processing with optimized optimal disease features against the conventional approaches on the multi fold validation. Proposed framework achieves accuracy of 99% on disease classification using PSO when compared against the various optimization techniques.

KEYWORDS: *Cardiovascular Disease Classification, Convolution Neural Network, Particle Swarm Optimization, Principle Component Analysis, K- Nearest Neighbour, Z- Score Normalization, Missing Value Prediction, Singular value Decomposition*