Classification of arrhythmia by using deep learning with 2D ECG spectral image representation

INTRODUCTION :

The success of arrhythmia classification tasks with Machine Learning (ML) algorithms is based on the handcrafting extraction of features from Electrocardiography (ECG) signals. However, feature extraction is a time-consuming trial-and-error approach. Deep Neural Network (DNN) algorithms bypass the process of handcrafting feature extraction since the algorithm extracts the features automatically in their hidden layers. However, it is important to have access to a balanced dataset for algorithm training. In this exploratory research study, we will compare the evaluation metrics among Convolutional Neural Networks (1D-CNN) and Support Vector Machines (SVM) using a dataset based on the merged public ECG signals database TNMG and CINC17 databases. Results: both algorithms showed good performance using the new, merged ECG database. For evaluation metrics, the 1D-CNN algorithm has a precision of 93.04%, an accuracy of 93.07%, a recall of 93.20%,and an F1-score of 93.05%. The SVM classifier (λ = 10, C = 10 × 109) achieved the best classification metrics with two combined, handcrafted feature extraction methods: Wavelet transforms and R-peak. Interval features, which achieved an overall precision of 89.04%, accuracy of 92.00%, recall of 94.20%, and F1-score of 91.54%. As an unique input feature and SVM (λ = 10, C = 100), wavelet transforms achieved precision, accuracy, recall, and F1-score metrics of 86.15%, 85.33%, 81.16%, and 83.58%.

[1].LITERATURE REVIEW:

- The major contribution of this research is to construct a reliable and adaptable deep learning classification approach by combining pre-trained convolutional neural networks with a mixture of higher-order spectrum estimates of arrhythmias ECG information.
- When employing third cumulants and GoogleNet, the highest average accuracy was reached at 97.8%. The suggested technique is an efficient automated cardiac arrhythmia classification method.
- It delivers a dependable identification system based on well-established CNN architectures rather than training a deep CNN from scratch.

ADVANTAGES:

- The development of computerized Electrocardiography (ECG) systems has increased the possibility of collecting more ECG data at the clinic or remotely
- This produces a large amount of patient data that needs to be reviewed by a cardiologist.

DISADVANTAGES:

- The disadvantage of CNN algorithms is that it has higher computational processing cost.
- In the absence of access to powerful computational processing, SVM can be a reliable solution.

[2].LITERATURE REVIEW:

- Large datasets are necessary for training deep learning models in order for them to function successfully.
- The ECG readings can detect rhythmic anomalies in the heart, often known as arrhythmias.
- The majority of existing solutions for automated AF categorization are based on hand-crafted characteristics.

ADVANTAGES:

1.In this research work a brief study on ECG signals have been performed.

2.The earlier models are unable to get deep analysis.

DISADVANTAGES:

1.The features like alpha, beta, delta and gamma have been analyses and get signal become strong.

2. The earlier models with PSO, GA, RFO and Machine learning are not that much efficient.

[3].LITERATURE REVIEW:

Cardiovascular (CVD) diseases are globally recognised as the main cause of death, and they manifest themselves in the form of myocardial infarction or heart attack. Accord_ing to the WHO [1], CVD is responsible for 17.7 million deaths. Approximately 31% of all deaths occur in poor and middle-income nations, with 75% of these deaths happening in these countries. Arrhythmias are the type of CVD that represents irregular patterns of heartbeats, such as the beating of the heart too fast or too slow. Examples of arrhythmias Include: a trial Fibrillation (AF), premature ventricular contraction (PVC), ventricular fibril_lation (VF), and Tachycardia. Although single cardiac arrhythmias may have little impact On one's life, a persistent one might cause fatal problems, such as prolonged PVC that occasionally turns into Ventricular Tachycardia (VT), or Ventricular Fibrillation that can immediately lead to heart failure.

ADVANTAGES:

1.Arrhythmia classification is the most crucial subject in healthcare. An arrhythmia is a rhythm or heart rate irregularit.

2.This paper proposed an approach for the automated study of cardiac arrhythmias using the 2D-CNN-LSTM model

DISADVANTAGES:

1. The heavy computing burden caused by the use of CWT is a drawback.

2. We could never achieve a complete inter-subject state, even though doing so will signif_icantly.

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