Classification of Arrhythmia by Using Deep Learning with 2-D ECG Spectral Image Representation.

INTRODUCTION:

The electrocardiogram (ECG) is one of the most extensively employed signals used in the diagnosis and prediction of cardiovascular diseases (CVDs). The ECG signals can capture the heart's rhythmic irregularities, commonly known as arrhythmias. A careful study of ECG signals is crucial for precise diagnoses of patients' acute and chronic heart conditions. In this study, we propose a two-dimensional (2-D) convolutional neural network (CNN) model for the classification of ECG signals into eight classes; namely, normal beat, premature ventricular contraction beat, paced beat, right bundle branch block beat, left bundle branch block beat, atrial premature contraction beat, ventricular flutter wave beat, and ventricular escape beat. The one-dimensional ECG time series signals are transformed into 2-D spectrograms through short-time Fourier transform. The 2-D CNN model consisting of four convolutional layers and four pooling layers is designed for extracting robust features from the input spectrograms. Our proposed methodology is evaluated on a publicly available MIT-BIH arrhythmia dataset.

[1]Literature Review:

1. Cardiovascular diseases (CVDs) are the leading cause of human death.
2. A normal heartbeat varies with age, body size, activity, and emotions.
3. The electrocardiogram (ECG) recordings are widely used for diagnosing and predicting cardiac arrhythmia for diagnosing heart diseases.

[1]Advantages:

1. An accurate taxonomy of ECG signals is extremelyhelpful in the prevention and diagnosis of CVDs.
2. Deep CNN has proven useful in enhancing the accuracy of diagnosis algorithms in the fusion of medicine.

[1]Disadvantages:

1. The present research uses only a single-lead ECG signal.
2. The effect of multiple lead ECG data to further improve experimental cases will be studied in future work.

[2]Literature Review:

1. It is due human activities such as work, relationship or finance, stress in daily life, and prolonged stress can negatively impact a person's immune system, which can lead to several health problems and aggravate cardiac diseases such as myocardial infarction, hypertension and diabetes.
2. Most deep learning algorithms utilize enormous number of nodes and hidden layers.
3. This increases model and computational complexity, and increases inference time, while degrading the performance of the algorithms.

[2]Advantages:

1. Make a significant impact.
2. Make it easier to automate algorithm.

[2]Disadvantages:

1. We want to use statistical testing to test for bias.
2. variance associated with the aforementioned methods.

[3]Literature Review:

1. Mapping multichannel time-series data into a more abstract yet informative bi-dimensional domain and exploring visual patterns help the processing of signals in a wide range of applications.
2. These mappings have benefits including better noise robustness and more options regarding augmentation.
3. Bi-dimensional transformations applied on time-series data have been used in many studies ranging from pattern recognition in patient pathology to emotion detection.

[3]Advantages:

1. Investigated the possibility of visual pattern recognition in information flows and directionality of the interaction between channels by taking advantage of pretrained classifiers.
2. In this technique, spectral and phase information were encoded as a bi-dimensional representation.

[3]Disadvantages:

1. Bi-dimensional maps generated based on estimating direction in the frequency.
2. Domain perform quite well in classification of multichannel non-linear signals using image-based transfer learning.

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