Heart Anomaly Detection using Deep Learning Approach Supported Signal Analysis

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Abstract - Phonocardiography is an effective technique Which helps for the recording of heart sounds during the heart cycle Identification and further diagnosis of human related diseases Heart. Contraction of the heart muscles and closure of the heart valve the heart produces sound, which can be analysed by the experienced Cardiologist. The aim of this study is to create an automated classification method using a one-dimensional solution Neural network based on phonocardiogram data for discrepancies in the heart sound.

The proposed system consists of three phases.
1) Data Acquisition 2) Pre-Process
2) Feature Extraction and Classification.

We have proposed an intelligent neural network approach for the classification of PCG data. Heart sound recording (PCG data) Which is nothing but a audio file converted in its time Domain representation. This is provided as converted PCG data input for the Neural Network. Was also emphasized on Noisy heart sound recording. It Can reduce noise efficiency Classification because it disrupts the values of the neural network. The accuracy of the proposed system is 91.5% with sensitivity of 0.92 and specificity 0.91.

Keywords -Convolution neural network, PCG data, phonocardiogram, heart sound.

1. INTRODUCTION

According to the World Health Organization (WHO), cardiovascular disease (CVD) is the most common cause. Death globally. CVD kills more people than any other disease in the world. More than 17.5 million people worldwide have died Is due to cardiovascular diseases. About 610,000 people Every year in the United States die of heart disease is the same. More than 29% of total deaths in 1 in 4 deaths 2004 is due to cardiovascular diseases and is number one Is increasing every day. Coronary heart disease (CHD) is the most common type of heart disease, 37 kills more than 370,000 People annually. Existing methods of finding the primary Signs of abnormalities in the heart are very expensive. They may not be Where it is cheaper in underdeveloped and developing countries the economic condition of the country is not so good. So, their A possible and reliable system is needed for early detection Heart disorders. Any method that can help you find it Signs of heart disease can therefore have a significant effect on world health.

A stethoscope is an acoustic medical device for isolation or for listening to the internal sounds of the human body. That is A primary device for hearing the heart sound. The advantage of This is to use an electronic stethoscope over an acoustic stethoscope Its properties like amplified sound output, enhanced frequency Range, ambient noise reduction, etc. It includes an amplifier to amplify low intensity heart sound. Electronic stethoscopes transmit sound electronically, therefore, it can be wireless Can be a device or a recording device. It can also provide a scene Performance of recorded heart sound.

PCG recordings have four heart sound signals
I.e. S1, S2, S3, S4. The first two are normal heart sounds Normal heart valves are produced by opening. S3 and S3 have unusual heart sounds like S1 S2 and S4. These unusual sounds are called rumblings. Current Medical testing techniques that can detect the deformity Heart sounds are very expensive. It is not affordable for the average human being. So, the main challenge is to develop such Accurate, reliable and affordable technology.

Heart sound is still the primary tool for detection and Analysis of the condition of the human heart. Proper interpretation of the state of the heart is largely based on experience Cardiologists. It can be fraught with error. More reliable Computer based technology needs to be developed.

Several methods are being suggested for the medical system Development for the diagnosis of heart disease. The purpose is ours the study aims to propose an intelligent algorithm to determine the presence of abnormalities in the sound of patient data. Also, with this we wanted to make it possible and affordable Solution.

2. METHODOLOGY

The proposed method [1] in this study is the basic three Step Architecture 1) Data Acquisition 2) Pre-Processing 3) Classification

2.1. Data Acquisition and Data Preparation

Use of data sets for supervised machine learning purposes Pascal is a data set that includes the sound of the heart Artifact, recordings labelled by three categories of common name Heart sounds and abnormal heart sounds. About 400 HS files There is in the Pascal data set.

In the processing step, we made two identical copies of Data set. In the first copy of a data set, labels are common and the unusual is replaced by a non-artifact label. This is done for signal quality...
assessments. Analogs are converted after HS, in the domain introduction of his time [2]. The advantage of converting analogue data to a time domain is that analogs are converted into a statistical equivalent representation which an analog machine is an understandable structure, and it is also easy for the purpose of analysis. There can be various mathematical functions that apply to statistics and can be used for So time domain introduction is very important.

The input size of CNN is already fixed. So, the recordings have to be converted to a certain length before training [3]. We converted the signal into fixed size data of 8-11 seconds.

If it is longer than the specified time, we cut the data in fixed size. If it is short, we extend it by repeating the original signal to make it to the original length. Down sampling is applied to omit ineffective data. Down sampling improves normalization on data sets. Is there some really low frequency noise recorded electronically through one low pass filter, especially the rumble that passes through the signal? If it is short, we extend it by repeating the original signal to make it to the original length. Down sampling is applied to omit ineffective data. Down sampling improves normalization on data sets. Is there some really low frequency noise recorded electronically through one low pass filter, especially the rumble that passes through the signal?

2.2. Signal pre-processing:
The signal is pre-processed for quality assessment. The artwork contains sound files that are weak with quality. The H.S. The signs are not suitable for classification.

2.3. Feature Extraction and Classification
The signal quality assessment block [4] ensures that these files should be deleted. Now the data set is only with good quality audio dub files which is potentially fit for classification.

Fig -1: Proposed block diagram

CNN can be useful for classification and can be used as good or bad quality [5]. So, here are the advantages of Neural networks that exploit signal quality assessment. Classify heart sound files into good quality files free from noise and poor-quality files that contain artifacts. The heart sound data set is given to the Convolution neural network which classifies data into two categories called artifacts and non-artifacts. The main reason for doing this is to prevent Values of neurons due to distortion. While training Neural network, values of neurons in each age CNN come closer and closer to the real value and therefore functionality of the features presented on the neural network grows slowly. So, if we delete the recordings in them, we can increase the efficiency of classification. Neural networks are therefore also known as CNN-1, good or bad. Classifying a quality signal can also be seen as a first step towards increasing the accuracy of the system. Greater Accuracy of CNN-1 to better filter poor quality signal there will be a demonstration of CNN-2 for general and classification.

For binary classification, the last layer has 2 neurons shown. It can also be done using 1 neuron, but only for the better presentation and understanding we have selected for 2 neurons instead.
The following purpose in the implementation of the neural network
Left: PCG data (.wav file) is converted to binary data Fixed
length using time domain representation which is next Bored of
the CNN model. Right: CNN Architecture includes a lot
Convulsion and maximum pooling levels, batch normalization
levels Fully connected or followed by dense layers.

2.4. Dropout layer [6]:-
The term "dropout" means leaving units (both hidden) And
visible) in the neural network. That's the decent thing to do, and
it should end there Performance of the average model with a
neural network. Model the average is a natural response to the
uncertainty of the model. This The dropout level allows
regularization by random setting Zero some neurons in the
previous layers during training

1) Max Pooling [6]: :- Max Pooling is intended Input
presentation for down-sample. It helps reduce Eliminates
dimensionality and convenience extraction. It reduces
Computing cost by reducing the number of parameters To learn.

Batch normalization allows each level of the nerve A network
for learning a little more independently Another level. It
reduces over-fitting and increases stability Neural network.

2) Batch normalization: :- Batch normalization allows everyone
The level of the neural network for learning a little more
independently than the second level. It reduces and increases
over-fitting Stability of the nerve network.

3. RESULTS:
General and absolute accuracy of the classification system
Abnormal heart sound is 91.5%. The accuracy of a good or bad
quality classifier or CNN -1 that is responsible for the signal.
The quality assessment is 86.7%.
4. CONCLUSION

This study is very complex and attempts to solve the complex Problems in the medical field. It tries to classify the heart Sound is obtained by PCG in normal and abnormal hearts Sound. This will significantly help the health care industry due to the heart Related problems. The method adopted for classification has a technology in computer science known as neural network. The one-dimensional neural network is demonstrated. The model proposed in this study demonstrates a novelty Approach to classification of noisy data containing artifacts. The first step is quality assessment. The advantage of this step Voiced data does not disturb the original neural A network that is used for the classification of good quality hearts Sound file in normal and abnormal heart sound. Instead, a separate neural network is used for the same purpose i.e. Classification of noisy heart sound data from good quality heart sound Data. The limitation is that the system will not produce significant Satisfactory results if the data set contains more files Noisy data.

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