Classificaion of Arrhythmia by using deep learning with 2-D ECG spectral Image Represntation

Introduction:

According to the World Health Organization(WHO),about one third of the world caused bywcardiovascular disease every year statistically. Cardiovascular disease has become on of the leadingcauses of death fromnon-infectiousand non-transmissible diseases in the world Therefore, prevention and early diagnosis are key for a successful clinical management.

Cardiovascular diseases are the main reason of death around the world. In human body there may be many kinds of cardiac diseases like heart attack, stroke, and ischemia. The main focus in different researches is on two diseases; first one is Myocardial Infarction i.e. Heart Attack and second one Arrhythmia. Myocardial Infarction is because of blockade in blood vessels and Arrhythmia is related to irregular heartbeats [1]. The biomedical signal which is generally used in the field of medical science is, Electrocardiogram (ECG). It is a periodic signalby this the doctor can see the electrical activities of the heart [2]. The doctors can identify the risk by analysing ECG of particular patient and give important treatment regarding that risk [3].The main target of studying ECG data is to classify the ECG into different categories like normal ECG or abnormal ECG and stage of risk in patient but for classifying ECG data is a tedious task due to its non-stationary nature.

Heart abnormalities are rising with the passage of time an people worry about the health ofthe entire world.Till today ,ECG signals are the best procedure to detect heart abnor-mality and functionality. Fordecades, their regular func-tionality of the hearth as been seen. A lot of heart and cancer problems are gradually increasing because of the sedentary and lethargic lifestyle.A healthy heart activity can be seen with ECG and its relatedter minologies like P wave, QRS complex, T wave, and Q Tinterval & eabnor- mality can be detected by reading these features or electrical waves with precise and accurate medical knowledge. & deep learning methods worked and observed the heart conditions that affectt he heart rate.Be cause of theim-proper signal,the heart rate can be slow, fast, or unforeseen. If the proper treatment will not betaken, then it leads to heart stroke and heart failure. Anormal healthy person’s ECG is represented by Normal Sinus Rhythm(NSR). & the other condition is a chronic condition where the blood pumping is affected,and it is represented by Congestive Heart Failure (CHF). Because of the in appropriate blood circulation, the heart becomes weaker, and its functionality affects at a high rate and frequency.

Literature Review

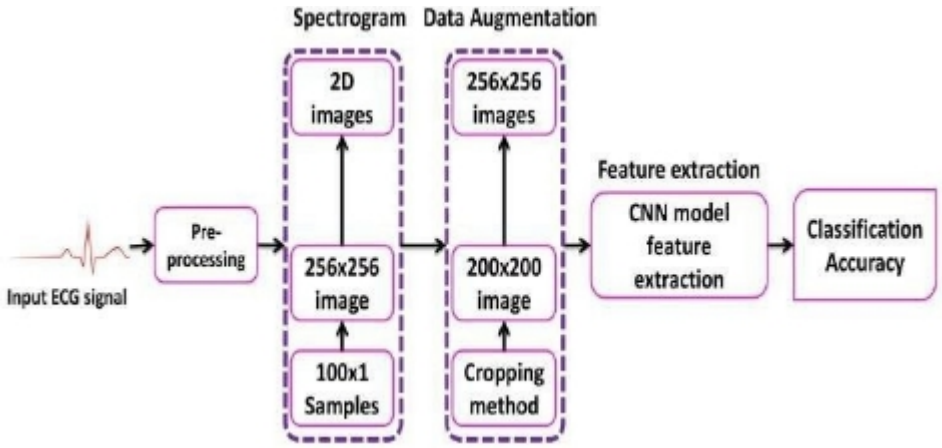
S.NO:[1]
year:2022
Author name:
Rizwana Naz Asif, Kiran Sultan, SuleimanAli Alsaif, Sagheer Abbas , Muhammad.

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

Abstract:

Two-dimensional (2-convolutionalneuralnetwork(CNN) model forth classification ofECG signals into eight classe We achievedastate-of-theartaverage classification accuracy of arrhythmia.

Design Methodology:



Evaluation:

The experimental setup consisted of an eighth-generation ASUS server with 32GB internalRAM, 500 GB external SSD hard drive with the addition of internal hard drive, and NVIDIA 1080 GPU with 11 GB memory.

Advantages:

1.The proposed 2-
D CNN model attained better accuracy,sensitivity, and specificity (in eight class classification) than the FFNN model, which classified only four kinds of arrhythmia.

2.The computational resources and the simulation time for training and testing modes also increase and this is the main reason for using a carefully selected CNN model.

Disadvantages:

1. limited data transfer.

2.The speed of the convergence was very slow.

S.no:[2]

year:2022

Author name:

Rizwana Naz,Kiran Sultan,Suleiman Ali Alsaif

[2] ECG
Classification for Detecting ECG ArrhythmiaEmpowered with Deep Learning App roache

Abstract:

1.transfer learning methods to ensure accuracy and time management to detect the ECG in a better way in comparison to the previous and machine learning methods.

2.implementation of the proposed method.

Design Methodology:

1. Start
2.Input ECG data from kaggle3
Augmented data
3. ECG preprocess data

4. Load data & pre-trained (transfer learning) model6
Trained model using transfer learning.

Evaluation:

1. Res Net and inception, CAD and machine learning ,Database supervised ML algorithms, Database supervised ML algorithms ,CNN layers.

2.Three deep learning approaches, AlexNet, SqueezeNet, and ResNet50.

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Advantages:

There are a lot of problems like loss of data, data size limitations, redundancyDeep learning is already i n practice to do a variety of tasks in pattern and image recognition and motivated the medical research to work in this state of theart.
Blood Pressure (BP) estimation can be evaluated by th eECG signals

Disadvantages:

1.The quality of morphological features extraction in the ECG greatly a & ects the recognition and classification rate of ECG signals

2.Detectionof irregular heartbeats from ECG signals is a significant task for the automatic diagnosis of cardiovascular disease

s.no:[3]

year:2020

Author name:

Muhammad Adnan Khan,Amir Mosavi,Shashank Yadav,Upendra Kumar.

[3] A Review on Cardiac Abnormalities Classificationusing Electrocardiogram with Machine
Learning and Deep Learning Classification Techniques.

Abstract:

1.This survey is focusing on the latest research papersin which machine learning and deep learning classification techniques are applied in different manners.

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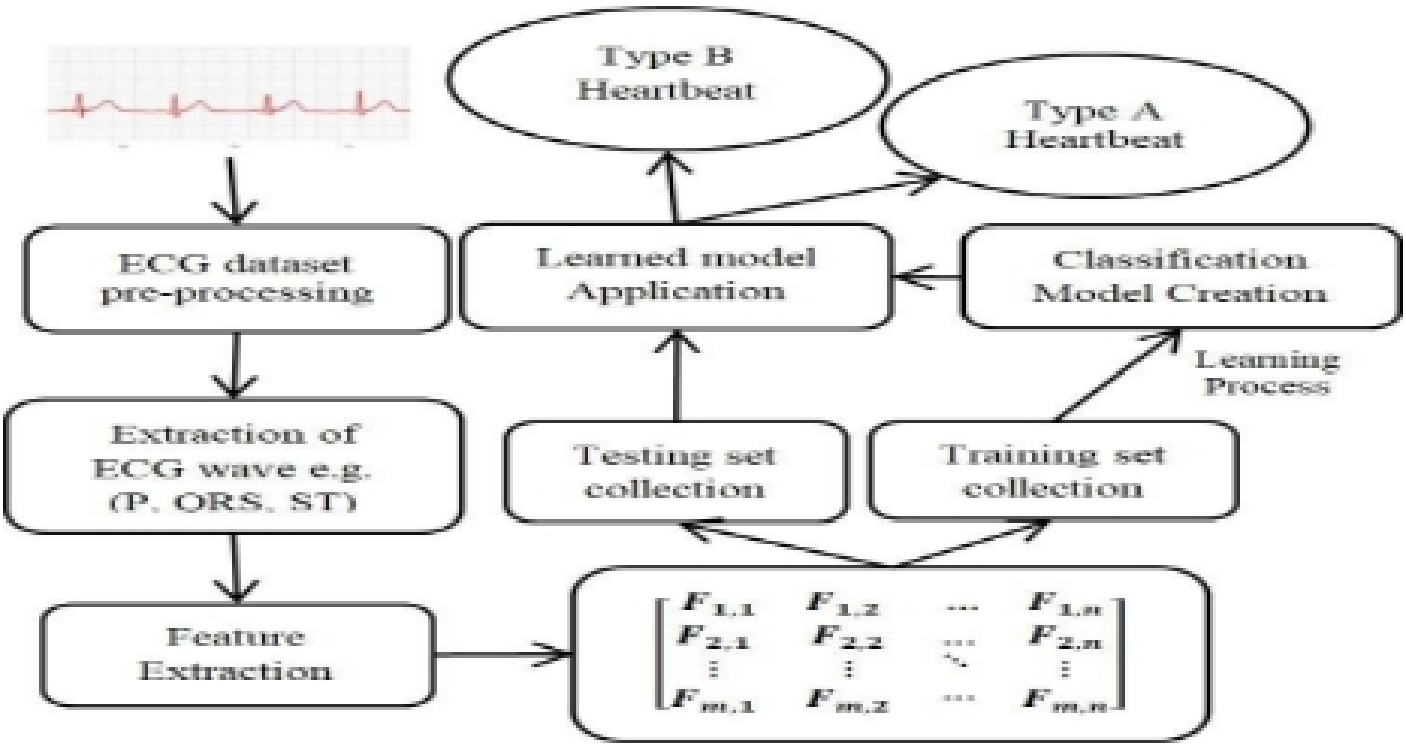
Design Methodology:



Evaluation:

The first step included the calculation of statisticaland temporal features of the heart-beat. Next step was for minimizing the size of features by using Genetic Algorithm (GA), Principal Component Analysis (PCA), and Independent Component Analysis (ICA). The third or final step was classification process which included SVM, Decision Tree (DT), k- Nearest Neighbor (k-NN), and Neural Network (NN) for classifying the nine types of ECG beats.

Advantages:

1.They found highest accuracy rate 99.3% by using k-NNclassification by feeding genetic algorithm features.

2.They recorded ECG signals in two differentsituationstechnique on the WEKA software for clas sificationand they utilized MIT-BIH arrhythmia database.
During classification they found accuracy rate of 88.49%.

Disadvantages:

The adoption of featureds specifically switched theextraction features manually and this approach couly help in examining cardiac patient efficiently by the doctors.

Training and testing sets, they transformed one dimensional ECG signals to two- dimensional image and classified the ECG data into five classes with 99.21% average accuracy.

s.no.[4]

year:2021

Author name:

Ali Haider Khan,Muzammil Hussain,Muhammad Kamran Malik

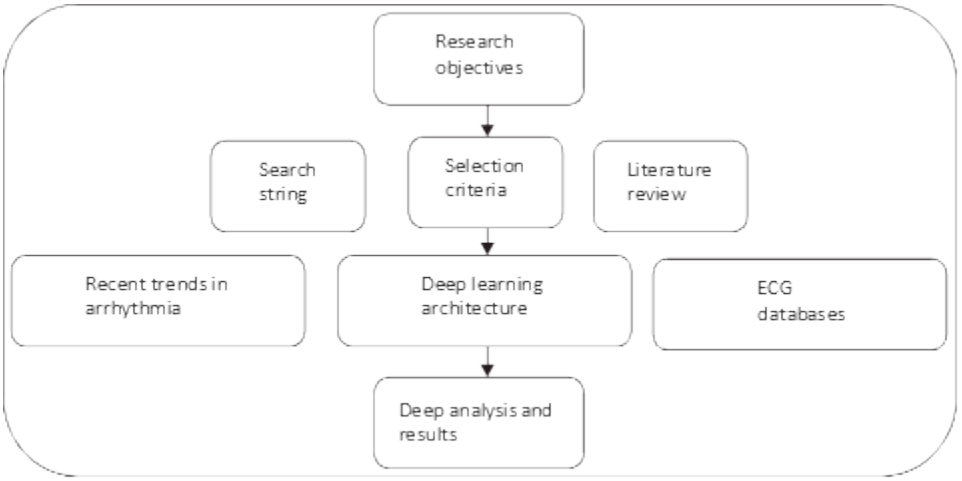
[4] Arrhythmia Classification Techniques Using Deep Neural Network

Abstract:

1. The Cardiac disorder and arrhymia detection, analysis of electrocardiogram (ECG) Signals has become the focus of numerous reserches.

2. 2D Graph Fourier transforn (GFT) was developed.

Design Methodology:



Evaluation:

Recurrent neural network, longshort termmemory,Autoencoder Convolution neural network,Deepbeliefnetwork.

Advantages:

1.All the classes of ECG Arrhythmia and give the accuracyagainst training set and validation dataset.

2.Tables shows the percentage Accuracy of different transferlearning approaches for the proposed CAA-TL modeland discovered that all three different transfer learningap- proaches performed well.

Disadvantages:

1. E most ECG databases are not specific to theirclinical context.

2. E description of the patient population in which these ECGs were obtained is lacking. important in interpreting the methodology and clinical utility in context.

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