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Machine Learning and End-to-end Deep Learning for the Detection of Chronic Heart Failure from Heart Sounds

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ABSTRACT:-

Cardiovascular diseases have become one of the most prevalent threats to human health throughout the world. As a noninvasive assistant diagnostic tool, the heart sound detection techniques play an important role in the prediction of cardiovascular diseases. In this paper, the latest development of the computer-aided heart sound detection techniques over the last five years has been reviewed. There are mainly the following aspects: the theories of heart sounds and the relationship between heart sounds and cardiovascular diseases; the key technologies used in the processing and analysis of heart sound signals, including denoising, segmentation, feature extraction and classification; with emphasis, the applications of deep learning algorithm in heart sound processing. In the end, some areas for future research in computer-aided heart sound detection techniques are explored, hoping to provide reference to the prediction of cardiovascular diseases.

1. INTRODUCTION

Cardiac diseases are leading cause of death in the worldwide and this situation is especially worse in developing countries because of shortage of medical professionals [1]. Automated and early diagnosis of cardiac disorders can be a possible solution to prevent mortality in rural areas. Clinically physical examination of human heart using auscultations via stethoscope is an easy, efficient and computationally cheap method but requires trained medical experts [2].

Signal processing based heart sound analysis may be a valuable initiative for automated diagnosis of cardiac disorders without the help of professional doctors. Heart sound analysis

maybe of great helps in primary health centers for early diagnosis and screening of cardiac disorders. Some efforts have been made in this direction where body auscultations are being analyzed for early and automated diagnosis of diseases.

2. LITERATURE SURVEY

[1] Title – Machine learning-based classification of cardiac diseases from PCG recorded heart sounds

Author - Anjali Yadav, Anushikha Singh, Malay Kishore Dutta

Abstract - This paper presents a machine learning-based automatic classification system based on heart sounds to diagnose cardiac disorders. The proposed framework involves strategic processing and framing of heart sound to extract discriminatory features for machine learning. The most prominent features are selected and used to train a supervised classifier for automatic detection of cardiac diseases. The biological abnormalities disturbing the physical functioning of the heart cause variations in the auscultations, which is strategically used in terms of some discriminatory features for machine learning-based automatic classification. The proposed method achieved 97.78% accuracy.

[2] Title – Cardiac disorders detection approach based onlocal transfer function classifier

Author - Ahmed Hamdy1, Nashwa El-Bendary2

Abstract - This paper proposes an approach based on localtransfer function classifier as a new model of neural networks forheart valve diseases detection. In order to achieve this objective,and to increase the efficiency of the predication model, Boolean reasoning discretization algorithm is introduced to discretion theheart signal data set, then the rough set reduction techniqueis applied to find all reducts of the data which contains theminimal subset of attributes that are associated with a classlabel for classification.Project was Heart murmurclassification withfeature selection used Local data base81 recordings and 17 features extracted using SFSS and classifier used is SVM with 95.74% of accuracy.

[3] Title – Classification of heart sounds based on the least squares support vector machine

Author - Guraksin et al.

Abstract -This paper used Classification of heart sound based on the least squares support vector machine (LS-SVM)dataset used was Local database of 120 recordings whereas feature extraction and selection wasWavelet features but they haven't reported the accuracy and results.

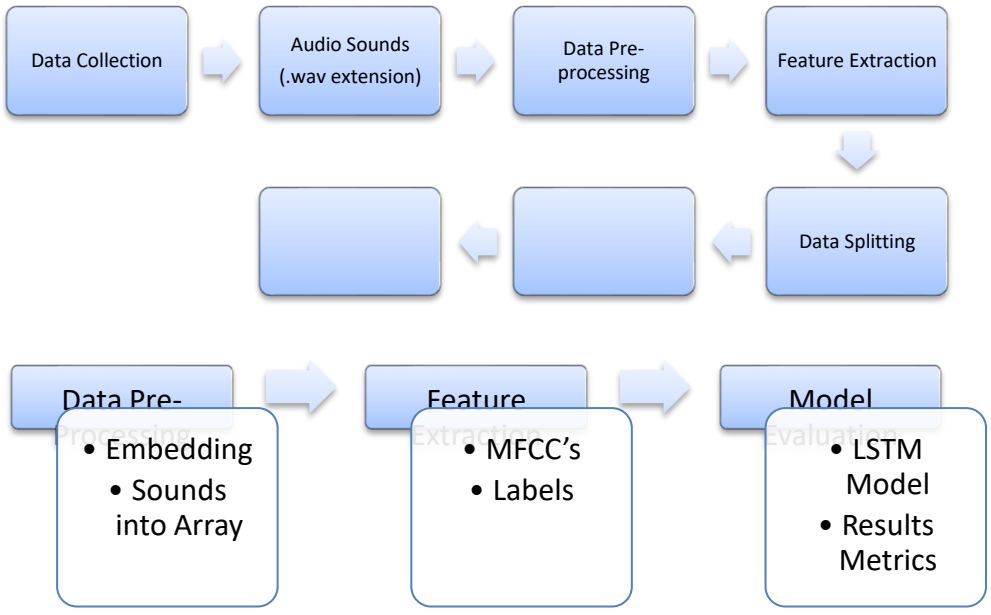
[5] Title – Classification of heart sounds based on the least squares support vector machine

Author - Guraksin et al.

Abstract -This paper used Classification of heart sounds on the basis of wavelets and neural networks. Data base used is Local data base consisting of 250 recordings. Feature considered was Wavelet coefficients. There were no criteria mention for feature selection .Classification has been done using Multilayer perceptron neural network for classification purpose with an accuracy of 92% .

3. DESIGN METHODOLOGY

System architecture:-



Activity Diagram:

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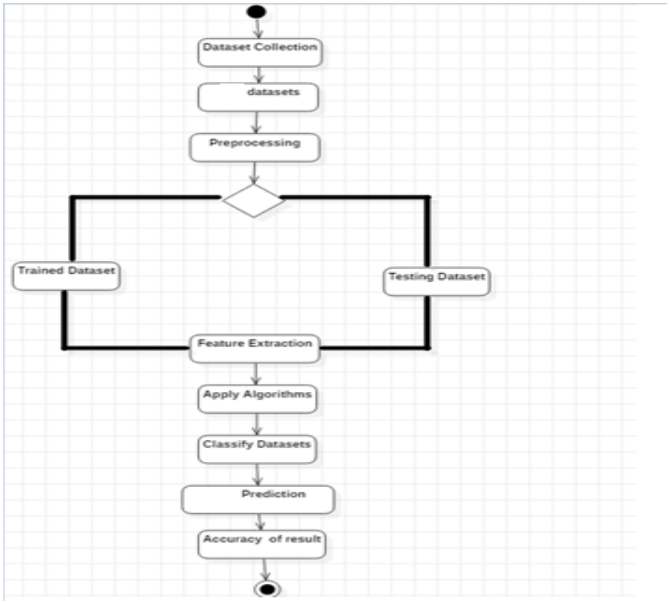
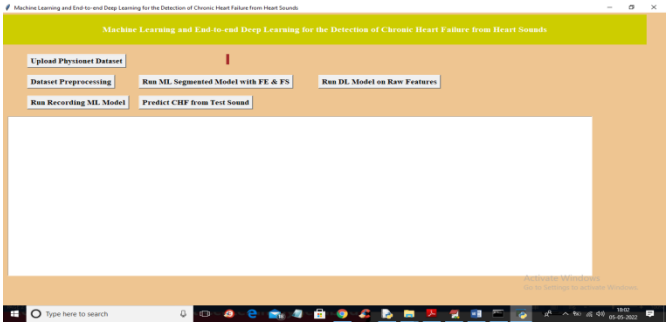
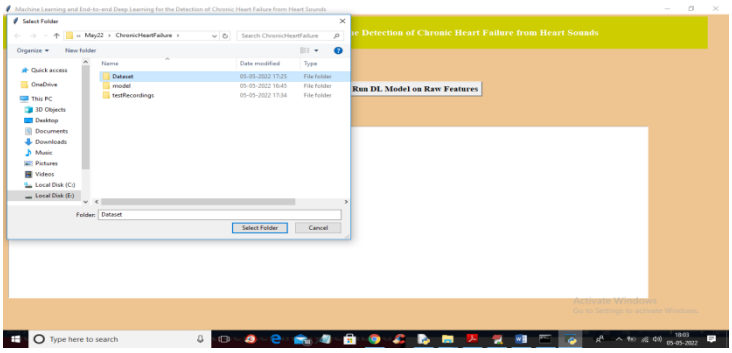


4. SCREEN SHORTS

To run project double click on 'run.bat' file to get below screen



In above screen click on 'Upload Physionet Dataset' button to upload dataset



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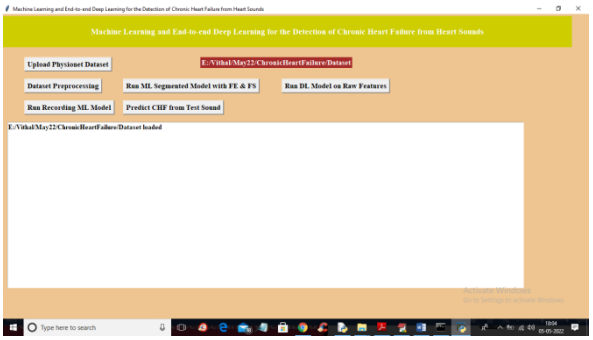
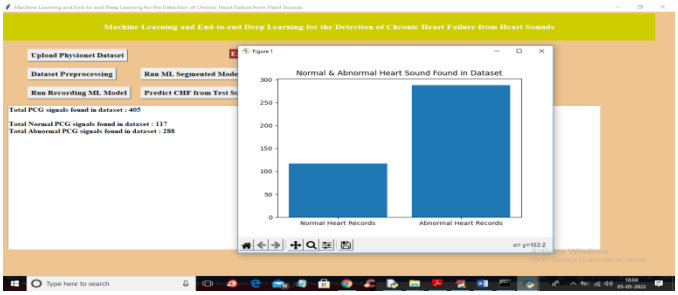
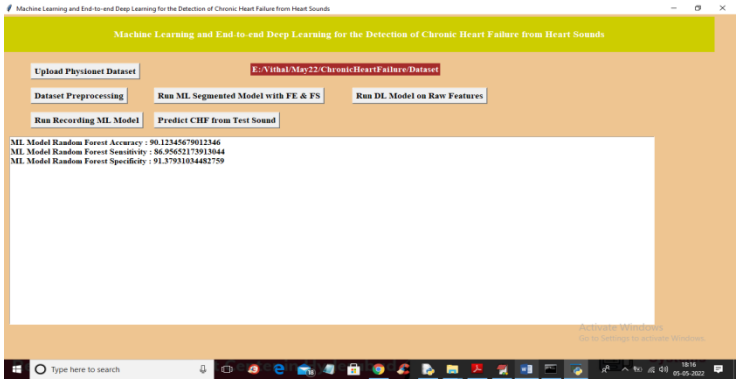
In above screen selecting and uploading ‘Dataset’ folder and then click on ‘Select Folder’ button to load dataset and to get below output



In above screen dataset loaded and now click on ‘Dataset Preprocessing’ button to read all dataset file and then extract features from it



In above screen we can see dataset contains 405 heart sound files from 405 different person and 117 are the Normal sound and 288 are abnormal and in graph x-axis represents normal or abnormal and y-axis represents number of persons for normal or abnormal. Now close above graph and then click on ‘Run ML Segmented Model with FE & FS’ button to train Classic ML segmented model on above dataset and get below output



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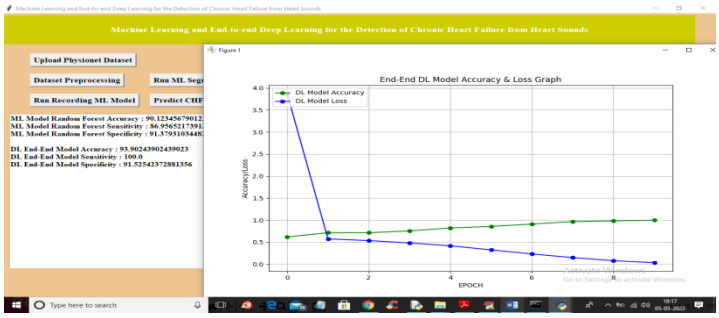
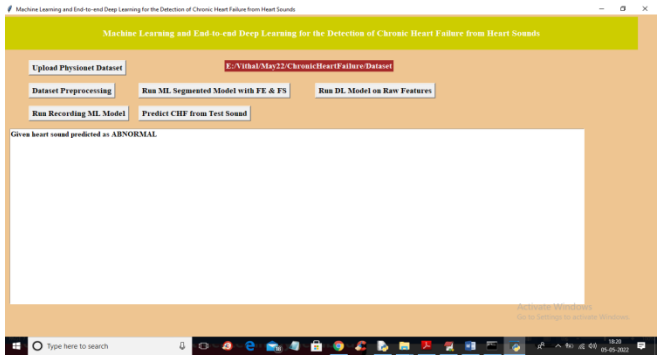
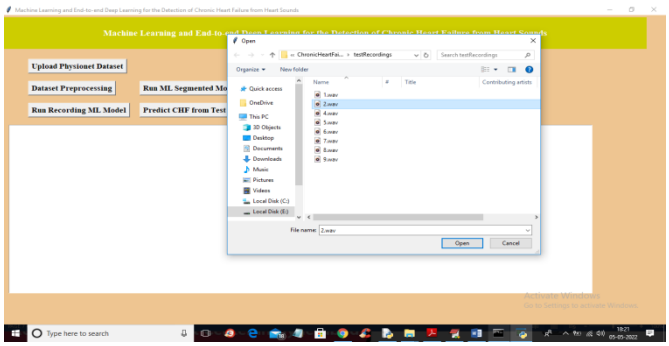
In above screen with Classic ML we got 90% accuracy and now click on 'Run DL Model on Raw Features' to get below output



In above screen with DL model we got 93% accuracy and in graph x-axis represents epoch or iterations and y-axis represents accuracy or loss values and green line represents accuracy and blue line represents LOSS and we can see with each increasing epoch accuracy got increase and loss got decrease and now close above graph and then click on 'Run Recording Model' button to get below output



In above screen uploaded heart sound file predicted as ABNORMAL and similarly you can upload other files and test



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For 2.wav' file below is the output

5. CONCLUSION

In this developed algorithm, a deep learning-based classification technique is applied to classify the PCG recorded heart sounds as normal/abnormal also in abnormal subtype as murmur, artifact and extrasystole.MFCC is used to remove the noise that gets recorded along with the heart sound features. Various statistical features are extracted from filtered heart sound signals. In the proposed work, the features were strategically considered which are likely to be affected during an abnormal heart functioning. Those features improved the performance of deep learning algorithms in terms of time complexity and accuracy. The proposed method achieved 94.4% accuracy for abnormal and normal heart sound classification when tested on heart sound database. The proposed model of automated diagnosis shows high accuracy with low time complexity as compared to existing method ofclassification.

6. REFERENCES

1. Mendis S, Puska P, Norrving B, World Health Organization (2011) Global atlas on cardiovascular disease prevention and control (PDF). World Health Organization in collaboration with the World Heart Federation and the World Stroke Organization, pp 3–18. ISBN: 978-92-4-156437-3

2. Wilks S (1883) Evolution of the stethoscope. Popular Science 22(28):488–491

3. Leatham A (1975) Auscultation of the heart and phonocardiography. Churchill Livingstone, London

4. Azmy MM (2015) Classification of normal and abnormal heart sounds using new mother wavelet and support vector machines. In: 2015 4th international conference on electrical engineering (ICEE), Boumerdes, pp 1–3. https://doi.org/10.1109/intee.2015. 7416684. December 2015

5. Vadicherla D, Sonawane S (2013) Decision support system for heart disease based on sequential minimal optimization in support vector machine. Int J Eng Sci Emerg Technol 4(2):19–26

6. Kumar D, Carvalho P, Antunes M, Paiva RP, Henriques J (2010) Heart murmur classification with feature selection. In: 2010 annual international conference of the IEEE engineering in medicine and biology, Buenos Aires, 2010, pp 4566–4569

7. Guraksin GE, Uguz H (2011) Classification of heart sounds based on the least squares support vector machine. Int J InnovComput Inf Control 7(12):7131–7144

8. Hadi HM, Mashor MY, Mohamed MS, Tat KB (2008) Classification of heart sounds using wavelets and neural networks. In: 5th international conference on electrical engineering, computing science and automatic control, 2008. CCE 2008. Mexico City, 2008, pp 177–180. https://doi.org/10.1109/iceee.2008.4723403

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