IJNRD.ORG ISSN : 2456-4184
INTERNATIONAL JOURNAL OF NOVEL RESEARCH AND DEVELOPMENT (IJNRD) | IJNRD.ORG
An International Open Access, Peer-reviewed, Refereed Journal

ANALYSIS OF ECG SIGNALS USING MACHINE LEARNING TECHNIQUES

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Abstract : ECG examinations can be used to diagnose a patient's disorders and pathological states in addition to cardiovascular diseases. Preoperative/postoperative evaluation, drug efficacy evaluation, side effect identification, and health diagnosis are just a few of the many uses of ECG data in the medical or surgical system. As a result, this is an active field of study.

This research uses machine learning models to classify ECG diseases. A machine learning approach called an SVM model is used to recognise and categorise the various heart ailments. The dataset includes 3 distinct disease classes: congestive heart failure (CHF), normal sinus rhythm (NSR), and cardiac arrhythmia (ARR). The model's performance is evaluated using the performance parameters Accuracy, Precision, Recall, and F1-score.

INTRODUCTION

Human-computer interaction (HCI) is a growing field of study in the scientific world. Data mining is dominated by the application of machine learning algorithms to get the best results in numerous fields. Using bioelectrical signals to classify emotional states is one such topic. The purpose of the paper is to analyse the effectiveness, efficiency, and computing burdens of several algorithms utilised in scientific comparisons for emotional state recognition via cardiovascular physiological signals.

LITERATURE SURVEY

G. Sannino, and G. De Pietro, "developed a new deep learning system for ECG beat classification. Deep Neural Network (DNN) was developed using deep learning library from Google and tensor flow framework. The developed deep learning system comprises of seven hidden layers with 5, 10, 30, 50, 30, 10 and 5 neurons. This experiment was conducted on a publicly available dataset; MIT–BIH arrhythmia and compared the experimental outcomes with the recent scientific literature.

F. Akdeniz et al. use the Wigner-Ville distribution to detect arrhythmias in the ECG data. The database was accessed from the Physio Net database, and features from that database were used to locate the arrhythmia. In comparison to the current method, the accuracy, sensitivity, and specificity were higher while also requiring less computational time.

PROPOSED METHOD

Stage 1: Data for ECG signals are chosen from the MIT-BIH Physionet database's standard data collection.
Stage 2: For training and testing ECG signals, time domain features and frequency domain characteristics are retrieved.

Features of the time domain:

- Mean Heart Rate (in bpm)
- Mean RR (in ms): The mean RR interval value.
- SDNN (in ms): RR interval standard deviation.
- NN 50v1: Total number of beats having a beat-to-beat difference more than 50ms, variant 1.
- NN 50v2: Total beats with an interbeat delay of more than 50ms, version 2.
- pNN 50v1: NN 50v1 to ECG segment length ratio
- NN 50v2 to ECG segment length ratio (pNN 50v2)
- SDSD (in ms): The standard deviation between each segment's adjacent RR intervals or the variation between beats
- RMSSD: Root mean square of inter-beat differentials (in milliseconds).

Features of the frequency domain:

- The Wavelet Entropy
- Wavelet multiscale variance
- Two fractal coefficients

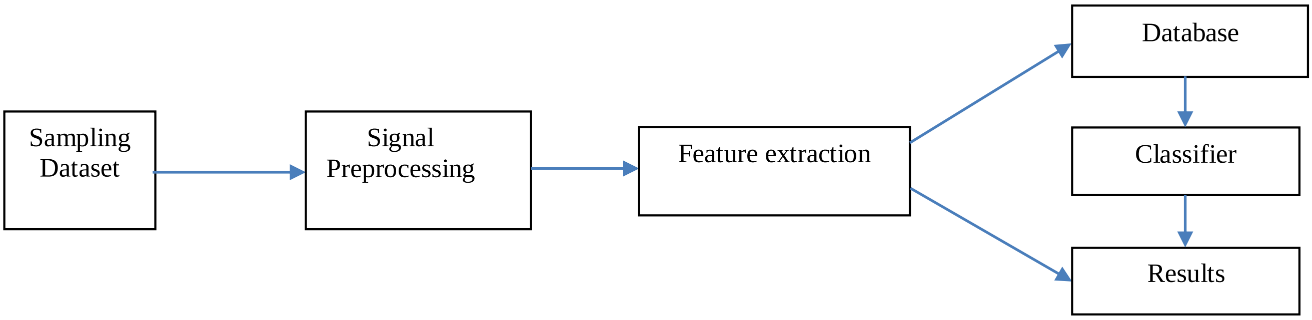
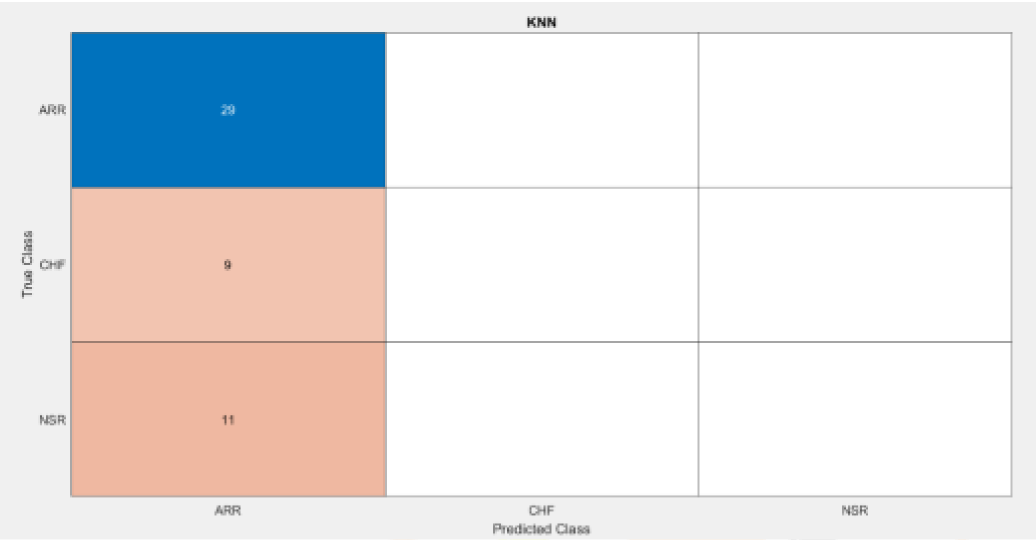


Fig 1: Block diagram of Proposed Method

RESULTS AND DISCUSSION

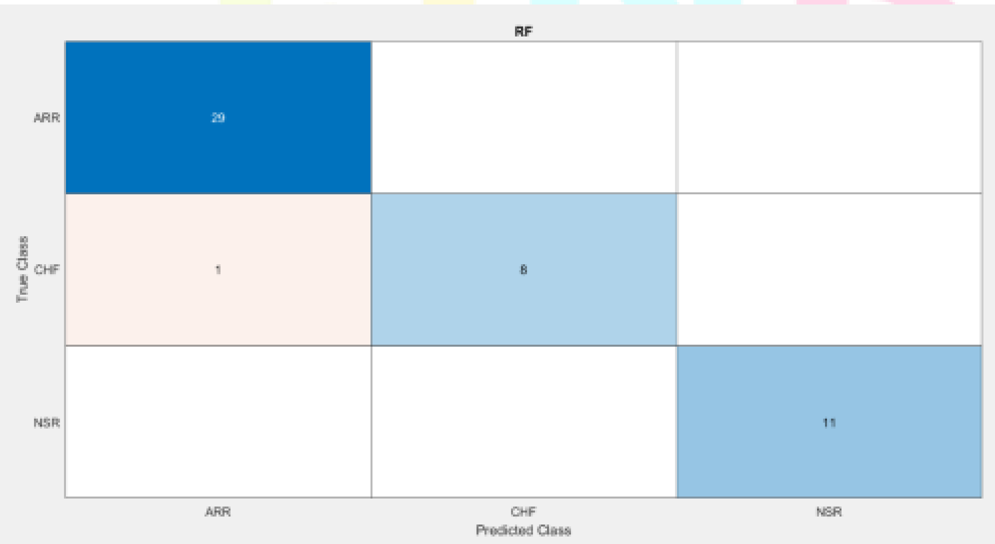


KNN classifier

testAccuracy =

59.1837

	Precision	Recall	F1_Score
ARR	59.184	100	74.359
CHF	NaN	0	NaN
NSR	NaN	0	NaN



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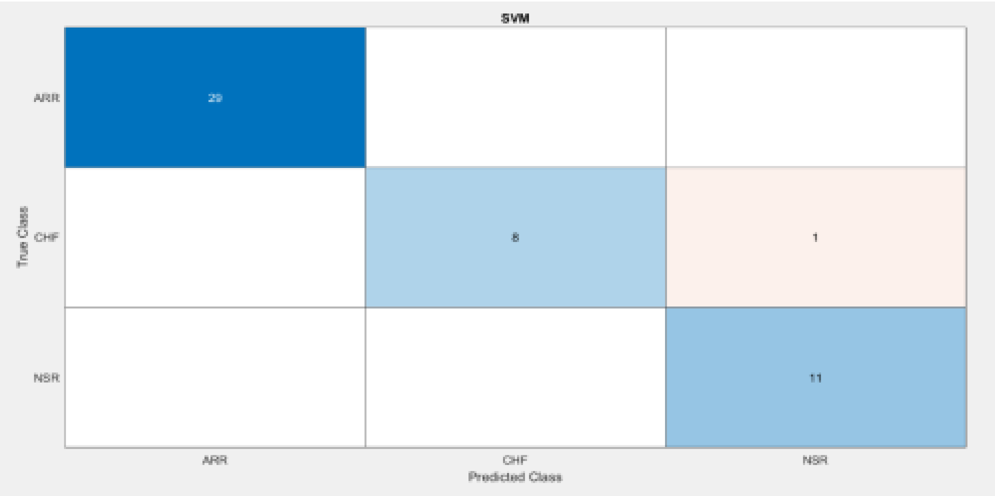
Random Forest classifier

testAccuracy =

   97.9592
```

	Precision	Recall	F1_Score
ARR	96.667	100	98.305
CHF	100	88.889	94.118
NSR	100	100	100

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SVM classifier

testAccuracy =

   97.9592
```

	Precision	Recall	F1_Score
ARR	100	100	100
CHF	100	88.889	94.118
NSR	91.667	100	95.652

CONCLUSION

Characterising the ECG signal is important for analysing and preventing cardiovascular infections, making it an important research topic for the period when prescription and PC innovation are combined. In this research, Continuous wavelet change channel banks are used to obtain ECG signals of improved quality. For the automated classification of ECG recordings, an approach combining traditional signal analysis and machine learning methods has been developed. ECG recordings are categorised into many classes using MATLAB and a variety of methods, including beat detection, wave point detection on beat detection, quality evaluation of the detection, beat averaging, beat classification, rhythm classification, and many others. Numerous features from the time and frequency domains, among others, have been extracted and used as the classifier's input features.

REFERENCES

[1] A.K. Sawhney, A Course in Electrical and Electronic Measurements and Instrumentation, Dhanpat Rai & Co., 2009, pp. 1130–1132.

[2] "Detection of ecg characteristic points using wavelet transforms," IEEE Transactions on Biomedical Engineering, vol. 42, no. 1, 1995, pp. 21–28.

[3] Chapter 1 on pages 1–9 of Charles Kitchen and Lew Counts' A Designer's Guide to Instrumentation Amplifiers, 3rd edition, published by Analogue Devices Inc. in 2006.