Changes in the normal rhythm of a human heart may result in different cardiac arrhythmias, which may be immediately causes irreparable damage to the heart sustained over long periods of time. The ability to automatically identify arrhythmias from ECG recordings is important for clinical diagnosis and treatment. In this paper we proposed an Artificial Neural Network (ANN) based cardiac arrhythmia disease diagnosis system using standard 12 lead ECG signal recordings data. In this study, we are mainly interested in classifying disease in normal and abnormal classes. We have used UCI ECG signal data to train and test three different ANN models. In arrhythmia analysis, it is unavoidable that some attribute values of a person would be missing. Therefore we have replaced these missing attributes by closest column value of the concern class. ANN models are trained by static backpropagation algorithm with momentum learning rule to diagnose cardiac arrhythmia. The classification performance is evaluated using measures such as mean squared error (MSE), classification specificity, sensitivity, accuracy, receiver operating characteristics (ROC) and area under curve (AUC). Out of three different ANN models Multilayer perceptron ANN model have given very attractive classification results in terms of classification accuracy and sensitivity of 86.67% and 93.75%.
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respectively while Modular ANN have given 93.1% classification specificity

References

- Dale Dubin, MD, "Rapid Interpretation of EKGs", USA, ISBN: 9780912912066 2001
- Shivajirao Jadhav, Sanjay Nalbalwar and Ashok Ghatol, "Artificial Neural Network Based Cardiac Arrhythmia Classification Using ECG Signal Data", in Proc. Int. Conference on Electronics and Information Engineering, Kyoto Japan, Volume: 1, 10. 1109/ICEIE. 2010. 5559887, Pages: V1-228 - 231
- Shivajirao Jadhav, Sanjay Nalbalwar and Ashok Ghatol, "ECG Arrhythmia Classification using Modular Neural Network Model", in Proc. 2010 IEEE EMBS Conference on Biomedical Engineering & Sciences, IECBES. 2010. 5742200, Kuala Lumpur, Malaysia, Pages: 62-66
- Shivajirao Jadhav, Sanjay Nalbalwar and Ashok Ghatol, "Generalized Feedforward Neural Network based Cardiac Arrhythmia Classification from ECG Signal Data", 2010 6th International Conference on Advanced Information Management and Service (IMS) with ICMIA 2010, Seoul South Korea, Pages: 351-356
- Sang-Hong Lee, Jung-Kwon Uhm, and Joon S. Lim, "Extracting Input Features and Fuzzy Rules for Detecting ECG Arrhythmia Based on NEWFM", International Conference on Intelligent and Advanced Systems, Division of Software, Kyungwon University, Korea
- Alaa M. Elsayad, "Classification of ECG arrhythmia Using Learning Vector Quantization Neural Networks", (978-1-4244-5844-8/09/$26. 00 ©2009 IEEE )Manuscript received July 30, 2009: revised 1 October 2010
- Jose Principe, Neil Euliano, Curt Lefebvre, Neural And Adaptive System, 2000 Jon Willey and Sons, Inc., New York
Thomas J. Downey, Donald J. Meyer, Rumi Kato Price, Using the Receiver Operating Characteristic to assess the performance of Neural Classifiers, IEEE 1999, 3642-3646


Index Terms

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