Neural Networking System for Detecting and Analyzing Heart Pathologies

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Cardiovascular system diseases are leading causes of mortality worldwide and in all age groups. Moreover, specialists believe that in 90% of cases, cardiovascular diseases can be cured if diagnosis is timely and accurate. The most information about heart's function and its condition is provided by an electrocardiogram (ECG) is still quite difficult to interpret manually, which leads to risks of errors. Therefore we suggested an algorithm that would be able to analyse ECG in detail with machine learning and dual neural network. Designed software consists of two modules of neural networks. The first one is designed to analyze the electrocardiogram and identify what kind of disease it is. It consists of 10 basic 3-layer classifiers that work simultaneously and the result is based on 10 outputs. The second network detects the part of the heart where the pathological impulse starts. It is LSTM-recurrent neural network determined to analyse the data about the most important signals so-called R-teeth. The train database consists of 468*3 files from the PhysioNet.org resource. The cross-validation was also implemented. The system is implemented in Python 3.6.4 using libraries for high-level Keras labeled networks with Teano. In addition, the wfdb library is used for input data. The developed software shows promising results: the accuracy of the first software module is 85%, while the accuracy of the second one is about 60%. Undoubtedly, the system still has many ways for improvement. It should be noted that working with files *.dat, *.hea and *.xyz, this program can be used by patients at home and serve as application for ECG device. Thus, the diagnosis interpretation will be provided immediately after ECG with supervision of a cardiologist.

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