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# Detection of Atrial Fibrillation Using Wearables via Attentional Two-Stream Heterogeneous Networks

**Authors :** Huawei Bai, Jianguo Yao, Fellow, IEEE

**Abstract :** Atrial fibrillation (AF) is the most common form of heart arrhythmia and is closely associated with mortality and morbidity in heart failure, stroke, and coronary artery disease. The development of single spot optical sensors enables widespread photoplethysmography (PPG) screening, especially for AF, since it represents a more convenient and noninvasive approach. To our knowledge, most existing studies based on public and unbalanced datasets can barely handle the multiple noises sources in the real world and, also, lack interpretability. In this paper, we construct a large- scale PPG dataset using measurements collected from PPG wrist- watch devices worn by volunteers and propose an attention-based two-stream heterogeneous neural network (TSHNN). The first stream is a hybrid neural network consisting of a three-layer one-dimensional convolutional neural network (1D-CNN) and two-layer attention- based bidirectional long short-term memory (Bi-LSTM) network to learn representations from temporally sampled signals. The second stream extracts latent representations from the PPG time-frequency spectrogram using a five-layer CNN. The outputs from both streams are fed into a fusion layer for the outcome. Visualization of the attention weights learned demonstrates the effectiveness of the attention mechanism against noise. The experimental results show that the TSHNN outperforms all the competitive baseline approaches and with 98.09% accuracy, achieves state-of-the-art performance.

**Keywords :** PPG wearables, atrial fibrillation, feature fusion, attention mechanism, hyber network
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