

Short Story assignment Proposal Assignment

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Title:

CardioGAN: Attentive Generative Adversarial Network with Dual Discriminators for Synthesis of ECG from PPG.

Abstract:

One of the popular and most effective medical techniques we have to monitor the cardiac activity of a heart is through Electrocardiogram i.e. ECG. It is an electrical methodology that captures many elemental information about a heart other than the heart rate. For example: the P-wave indicates the sinus rhythm . It is hence a most useful technique when compared with other optical techniques like Photoplethysmogram(PPG) which can measure just the blood volume changes under the skin. However PPG is considered as a close alternative to ECG.

There are many industry standard wearable devices that can record and capture the PPG information because of their low-cost and simple application.

However a drawback is that PPG suffers from inaccurate heart rate estimation and is dependent on many factors like skin tone, skin texture, signal crossovers, etc.

There has hence been a vast amount of research that is being carried out to bring ECG to everyday wearable devices for continuous monitoring of heart health but in vain.

To address this unavailability of a continuous ECG monitoring system for every day use, a solution is being proposed in this paper that can take PPG signals as input and generate ECG. This is called CardioGAN. It takes a cycleGAN approach but with multiple discriminators, allowing the network to be trained in an unpaired manner. Unlike the cycleGAN, CardioGAN is attenuation based with many discriminators unlike cycleGAN which has just two. The output of the proposed network is essentially an ECG signal corresponding closely to the real ECG outputs. Then the heart rate estimation is performed using the trained model and compared with the ground truth.