ISEF Sample Abstract & Certification

Generative Adversarial Networks for PCG Arrhythmia Detection

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With the rapid growth of computational power and complex algorithms, we propose a novel approach to detect arrhythmias in Phonocardiograms (PCGs). Typically, Electrocardiograms are used to diagnose arrhythmias, requiring medical-grade equipment to accurately recognize cardiac illnesses. PCGs provide ease of access to everyone who has a device capable of recording audio, allowing medical professionals to treat arrhythmias in the developmental stages. The new design comprises two subsystems; one is based on the relationship between Electrocardiograms (ECGs) and PCGs, and the other between PCGs and arrhythmias. The association between ECGs and PCGs is amended to translate from one space to another, where ECGs become dimensionally reduced, then reconstructed into a PCG signal. The second subsystem uses a Generative Adversarial Networks (GAN), in which both arbitrary PCG signals are generated, and preexisting ECG datasets are recreated into PCG signals (using subsystem one). These signals are fed into a classifier that detects if an arrhythmia is present. This proposed system's advantage is that PCG data is more readily available than ECG data; hence, more heart diagnostics can be made.

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