ENBM035

Employing Adversarial Machine Learning and Computer Audition for Smartphone-Based Real-Time Arrhythmia Classification in Heart Sounds

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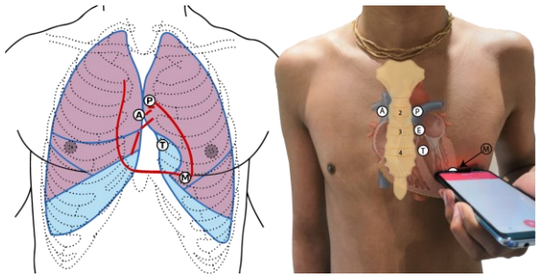
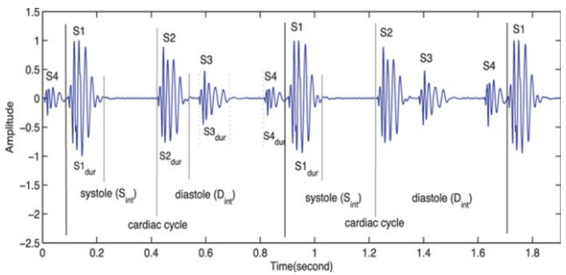
Problem

An estimated three **million cases of arrhythmia occur** in the United States yearly (Mayo Clinic), and current detection methods have **limited performance/aplication** in pathologies and lack real-time classification capabilities.

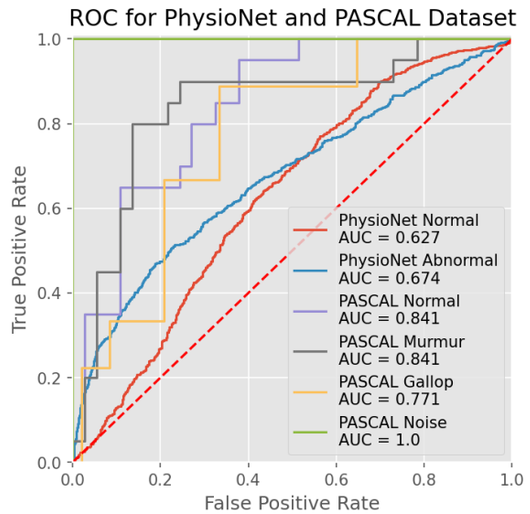


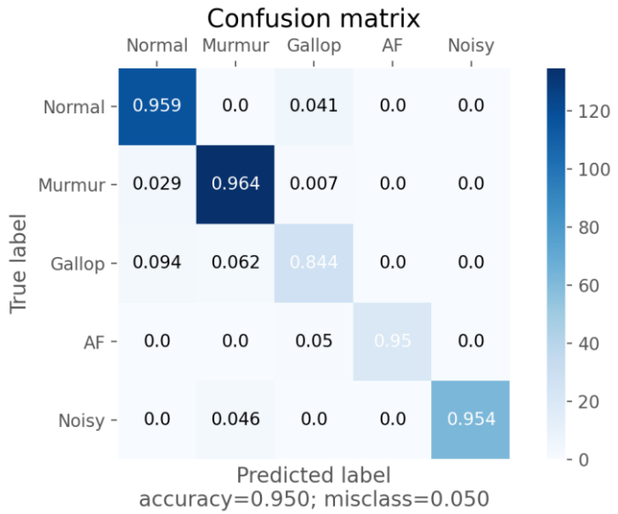
Motivation

Create a **fast and accurate** model capable of detecting Cardiovascular modalities, specifically a **variety arrhythmias** in heart sound recordings (PCGs) without the need for specialized equipment.

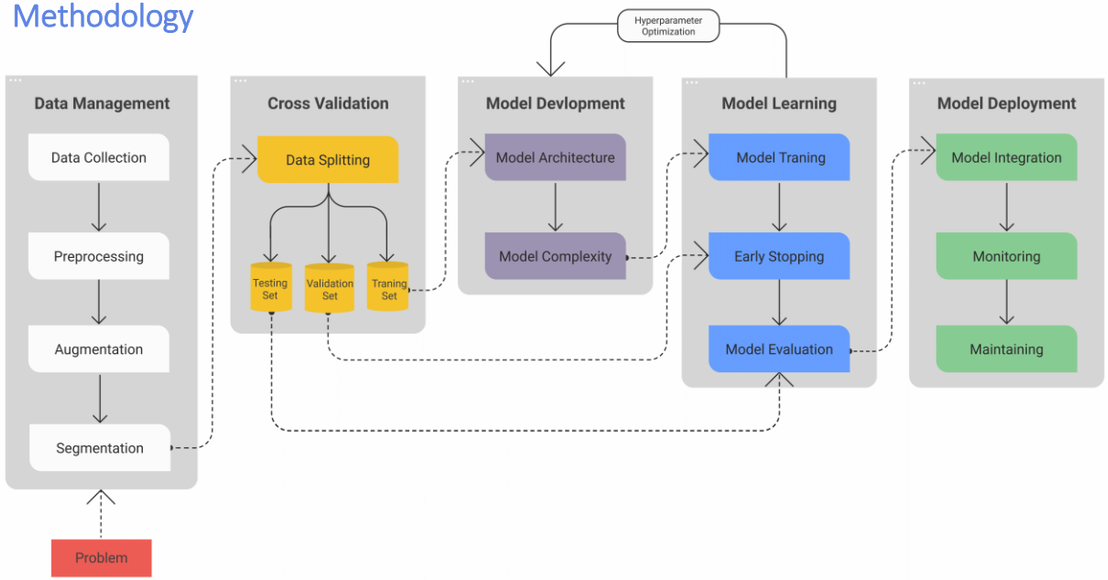


Results





Methodology



Interpretation & Conclusions

The object of this study was to create a fast and accurate end-to-end heart sound arrhythmia detection system, capable of detecting abnormalities in real-time without specialized equipment. We proposed a Generative Adversarial Network (GAN), composed of a Convolution Transformer Generator and a Transformer Discriminator to detect abnormal heart sounds in a recording. The results from model testing and evaluation, along with results from the t-test revealed the proposed method reached better performance than the previous state-of-the-art methods. The introduction of heart sounds analysis with ECGs allowed for increased arrhythmia labels for classification and in a time-efficient manner. Furthermore, the proposed method showed real-world deployment capabilities for autonomous heart sound abnormality detection with recordings collected from a phone microphone.