# An Active Role for Machine Learning in the Diagnosis of Atrial Fibrillation

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Atrial Fibrillation (AF) is a cardiac disease affecting over three million Americans with a prevalence of 1% (above 6% in the elderly). AF is an irregular heartbeat that can lead to blood clots, stroke, heart failure and death. Annually, AF is responsible for over 750,000 hospitalizations and 130,000 deaths in the U.S. Accurate and early diagnosis is key. However, the disease is significantly under-diagnosed. Monitoring devices can acquire large amounts of real-time ECG images but evaluating this big data remains a challenge. Diagnostic accuracy with current technologies is high but false positive rates are between 27-90%. There is a growing need for automated image analysis. This study aims to create a supervised machine learning algorithm that will reliably identify AF, reduce the false positive rate and reduce the time to diagnosis. 5,761 pre-classified ECG images were collected, augmented and classified as either AF or NOT for binary analysis. The optimal model was found using seven Convolution Neural Networks, four dense layers and nine epochs. Testing the final model on the validation images resulted in sensitivity of 94.7%, specificity of 95.1% and a false positive rate of 4.9%. With a consecutive-image trigger, the false positive rates are dramatically reduced (< one per 10 years). This algorithm can potentially achieve similar accuracy, a significantly lower false positive rate and faster time to diagnosis than the reported algorithms used today. Clinical testing is needed.

**Awards Won:**