# Detecting Atrial Fibrillation From Single Lead ECGs in Sinus Rhythm: a Comparative Analysis

Myrte Barthels*, Henri Gruwez, Thomas De Cooman, Noëlla Pierlet, David Duncker, Pieter Vandervoort

Hasselt University
Hasselt, Belgium

**Introduction** Atrial fibrillation (AF) is a progressive cardiac arrhythmia with high risk of stroke and mortality. Up to 30% of patients are undiagnosed due to its paroxysmal nature and the low accessibility of gold standard 12-lead ECG measurements. Wearable single lead ECG technology has become widely available and holds much potential. Previous work has demonstrated the ability to detect underlying AF from a sinus rhythm (SR) 10 s 12-lead ECG. This study aims to evaluate the feasibility of AF prediction utilizing 10-second single lead ECG recordings.

Lead by lead performance

| Lead | AUC | 95% CI |
|---|---|---|
| I | 0.83 | 0.82-0.84 |
| II | 0.83 | 0.82-0.84 |
| II | 0.81 | 0.80-0.82 |
| AvR | 0.84 | 0.83-0.85 |
| AvL | 0.80 | 0.79-0.81 |
| AvF | 0.82 | 0.82-0.83 |
| V1 | 0.81 | 0.80-0.82 |
| V2 | 0.81 | 0.80-0.82 |
| V3 | 0.82 | 0.81-0.83 |
| V4 | 0.82 | 0.81-0.83 |
| V5 | 0.82 | 0.81-0.83 |
| V6 | 0.82 | 0.81-0.83 |

**Methods** A convolutional neural network (CNN) was trained to identify AF from 10s single lead ECG. For patients without AF, all ECGs in SR were included. For patients with AF, all ECGs in SR starting 31 days before the first AF event were included. We trained 12 different CNN's for each lead separately (I, II, III, AvR, AvL, AvF, V1-V6) and compared all outcomes to rank lead importance in the prediction of AF. Performance was compared against a CNN trained on 12-lead ECG outcomes.

**Results** We included 498 888 ECGs from 143 498 adult patients. The best performance was found in lead I, II and AvR with respective AUCs of 0.83 (95% CI 0.82-0.84), 0.83 (95% CI 0.82-0.84) and 0.84 (95% CI 0.83-0.85). The least performing lead was AvL with an AUC of 0.80 (95% CI 0.79-0.81). The 12-lead ECG model achieved an AUC of 0.87 (95% CI 0.86-0.87).

**Conclusion** Despite a diminished performance compared to a 12-lead ECG model, single lead SR ECG models remain robust at AF identification using CNNs and offer a versatile approach for predicting AF in a broader context.