

Enriching artificial intelligence ST-elevation myocardial infarction (STEMI) detection algorithms with differential diagnoses

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Background: STEMI outcomes, although improved with systems of care, are hampered by delayed presentation and prevaricates of a 12-lead ECG. We report an artificial intelligence (AI) guided, single lead EKG algorithm for a self-administered tool to reliably detect STEMI and trigger ambulance dispatch.

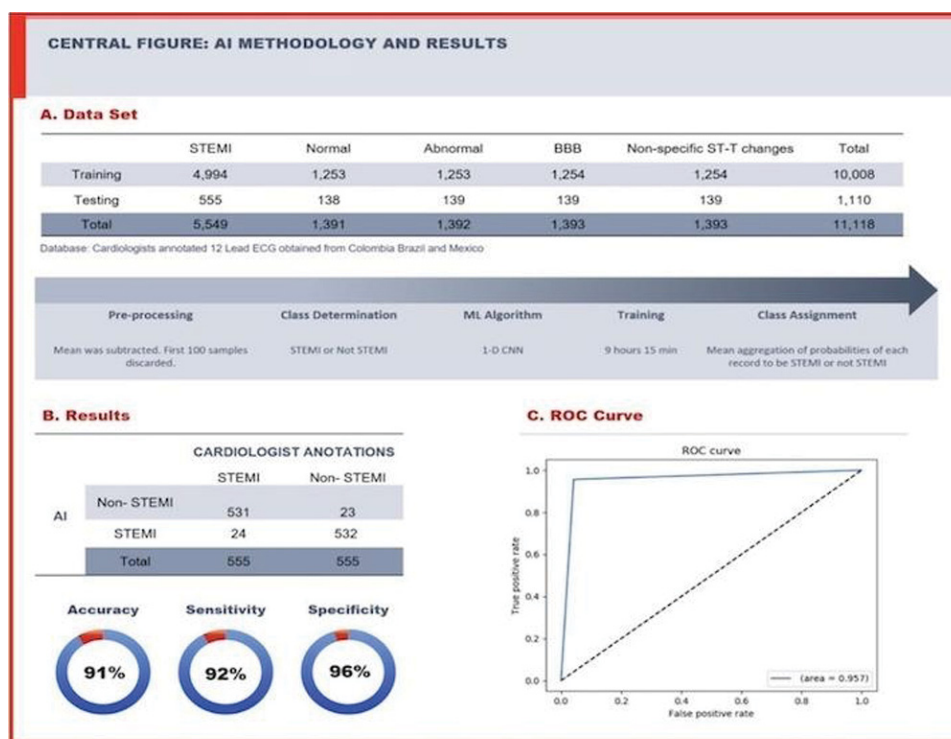
Purpose: To provide a reliable and improved AI-guided Single Lead EKG methodology.

Methods: From our cardiologist-annotated repository, we assigned a dataset of 11,118 classified ECG. Ontology organized 5 groups apportioned for an interclass balance among commoner STEMI differential diagnoses. This anonymous, pre-classified data included 5,549 STEMI, 1,391 normal, 1,393 Bundle Branch Block, 1,393 non-specific ST-T changes and 1,392 miscellaneous. Each ECG was fragmented into individual 1-lead

strips. Algorithm: 1-D Convolutional Neural Networks. Gender and age were included before the last dense layer. Training and Testing: Preset 90% dataset (10,008 ECG) train, 10% test (1,110 ECG). Statistical Analysis and ROC curves: Digitized dataset, 500 samples/second, 10s duration, total 5,000 samples per lead. Statistical mean for each lead was calculated and subtracted from the original lead. Statistical values and ROC curves were assessed.

Results: Most Accurate: Lead V2 – 91%; Most Sensitive: Lead I – 92% Most Specific: Lead III – 96%. Best AUC: Lead V2 – 91%.

Conclusions: Incorporating subtypes of STEMI differential diagnosis enriches the single lead AI algorithm. Validating the derived algorithm with our entire database of 18 million ECG will further strengthen the results.



STEMI: ST-Elevation Myocardial Infarction; BBB: Bundle Branch Block; AI: Artificial Intelligence; CNN: Convolutional Neural Networks; ECG: Electrocardiogram