Baby steps in the path of modifying the role of cardiologists for interpreting EKG for AMI

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10. Baby Steps in the Path of Modifying the Role of Cardiologists for Interpreting EKG for AMI

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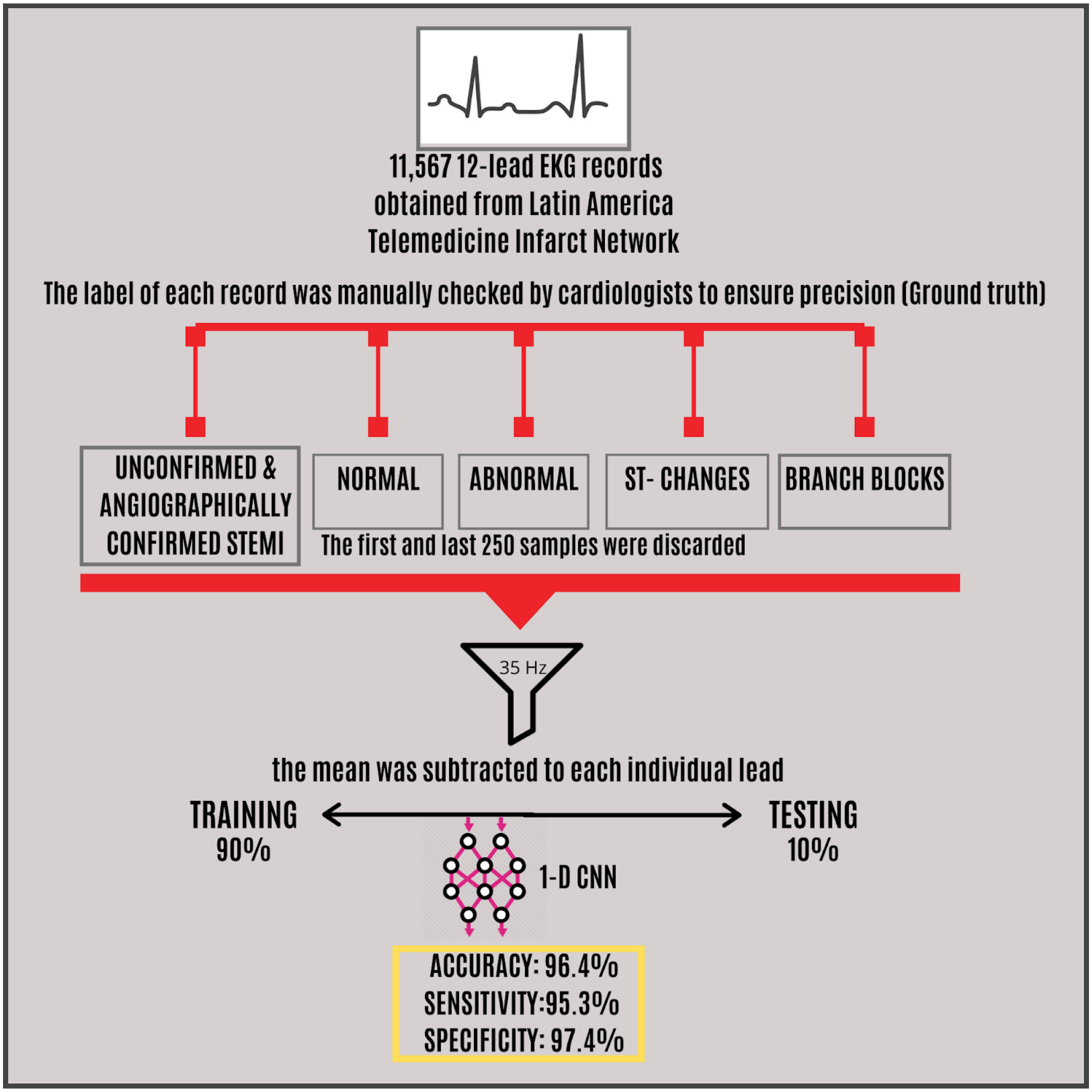
Background: EKG interpretation is slowly transitioning to a physician-free, Artificial Intelligence (AI)-driven endeavor. Our continued efforts to innovate follow a carefully laid stepwise approach, as follows: 1) Create an AI algorithm that accurately identifies STEMI against non-STEMI using a 12-lead EKG; 2) Challenging said algorithm by including different EKG diagnosis to the previous experiment, and now 3) To further validate the accuracy and reliability of our algorithm while also improving performance in a prehospital and hospital settings.

Purpose: To provide an accurate, reliable, and cost-effective tool for STEMI detection with the potential to redirect human resources into other clinically relevant tasks and save the need for human resources.

Methods: *Database:* EKG records obtained from Latin America Telemedicine Infarct Network (Mexico, Colombia, Argentina, and Brazil) from April 2014 to December 2019. *Dataset:* A total of 11,567 12-lead EKG records of 10-seconds length with sampling frequency of 500[Hz], including the following balanced classes: unconfirmed and angiographically confirmed STEMI, branch blocks, non-specific ST-T abnormalities, normal and abnormal (200+ CPT codes, excluding the ones included in other classes). The label of each record was manually checked by cardiologists to ensure precision (Ground truth). *Pre-processing:* The first and last 250 samples were discarded as they may contain a standardization pulse. An order 5 digital low pass filter with a 35 Hz cut-off was applied. For each record, the mean was subtracted to each individual lead. *Classification:* The determined classes were STEMI (STEMI in different locations of the myocardium – anterior, inferior and lateral); Not-STEMI (A combination of randomly sampled normal, branch blocks, non-specific ST-T abnormalities and abnormal records – 25% of each subclass). *Training & Testing:* A 1-D Convolutional Neural Network was trained and tested with a dataset proportion of 90/10; respectively. The last dense layer outputs a probability for each record of being STEMI or Not-STEMI. Additional testing was performed with a subset of the original dataset of angiographically confirmed STEMI.

Results: See Figure Attached – **Preliminary STEMI Dataset** Accuracy: 96.4%; Sensitivity: 95.3%; Specificity: 97.4% – **Confirmed STEMI Dataset:** Accuracy: 97.6%; Sensitivity: 98.1%; Specificity: 97.2%

Conclusions: Our results remain consistent with our previous experience. By further increasing the amount and complexity of the data, the performance of the model improves. Future implementations of this technology in clinical settings look promising, not only in performing swift screening and diagnostic steps but also partaking in complex STEMI management triage.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