

Mobile app for the digitalization and deep learning-based classification of ECG printing records

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The interpretation of electrocardiograms (ECG) plays an important role in the understanding of cardiovascular diseases, being increasingly used not only for diagnosis but also for monitoring those illnesses. Nowadays, 75% of deaths related to cardiovascular diseases are in low and middle-income countries, where there is no access to a cardiologist with full expertise. In these environments, the primary care centres and emergency units need new ECG interpretation techniques that enable a rapid and simple diagnosis. This simplicity and rapidity could be provided by mobile phone applications, extensively present in daily life healthcare, where ECG classification algorithms, based on Artificial Intelligence techniques, could be embedded. However, the development of these algorithms is hampered by the non-digitalization of the ECG, still common in healthcare environments. In this work, we present a method for ECG digitalization and classification based on AI-algorithms embedded in an Android mobile application, whose methodology is shown in Figure 1. The Android-based application is used to capture the printed ECG with the camera, to be processed to extract the digitalised signal with a Python digitalization algorithm embedded in Android Studio framework. Afterwards, the extracted ECG is introduced into a Deep Learning algorithm, also embedded in the mobile application framework and pre-trained on the PhysioNet/CinC 2020 Challenge database, composed of 12-lead ECG recording of 6877 patients with 9 cardiomyopathy categories. The deep learning algorithm was based on a residual neural network with 4 convolutional blocks, 3 convolutional layers overlapped with a batch normalization layer and an activation layer. The proposed methodology was tested on a set of 50 printed ECG, achieving an accuracy around 80%. These preliminary results pave the way for improved ECG interpretation in clinical environments such as in emergency units.

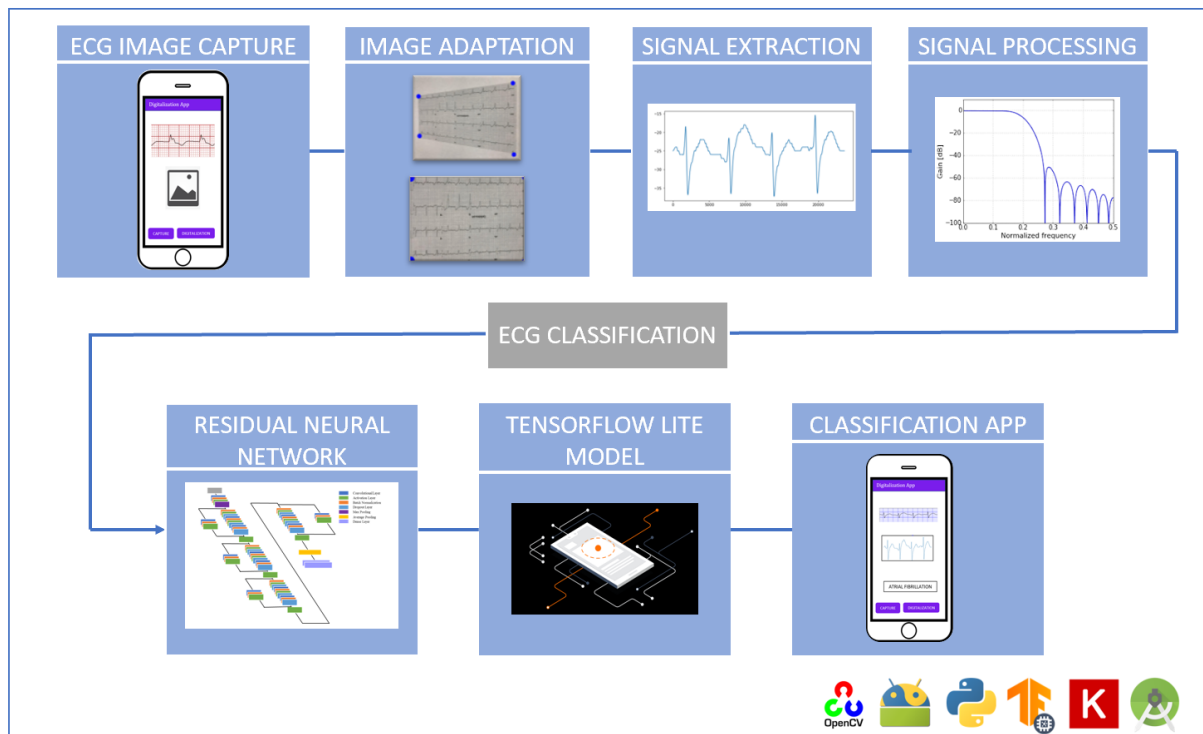


Figure 1: Scheme of the developed methodology.