ECG CHANNEL RECONSTRUCTION WITH CONVOLUTIONAL NEURAL NETWORKS

BASTIAN AUER

Jugend forscht Germany / Helmholtz-Zentrum Dresden Rossendorf

In my work, I have tried to minimize the electrodes needed for an ECG to allow faster treatment for the patient.

Abstract

The most frequent cause of death in Germany is cardiovascular disease, with around 338,000 deaths per year. Here, especially in emergency medicine, the utmost urgency is required to save a patient's life. In order to be able to make a diagnosis as quickly as possible on the spot, a diagnostic ECG consisting of 10 ECG electrodes is required, which produce a total of 12 leads that are used for diagnosis. However, setting up such an ECG can be very time-consuming and also stressful for the patient, since 6 of the 10 electrodes have to be specifically attached to intercostal spaces. This requires a very precise and time-consuming method of working: if the electrodes are misplaced by only a few millimeters, the entire ECG may be distorted. Often it is also not possible to attach all 10 electrodes to the patient due to the circumstances.

To solve this problem, neural networks can be used for data reconstruction. These reconstruct the signals of the six missing electrodes from the signals of four easily attached ECG electrodes to write a complete diagnostic ECG. In addition, the trained model filters out motion disturbances, which makes it possible to write a disturbance-free and perfectly readable ECG even in turbulent situations.