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ALGORITHM FOR CALCULATING THE DISTANCE BETWEEN THE ELECTRODES ON X-RAY IMAGES

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We propose a method for the segmentation of implanted electrodes and electrodes tips location in X-ray images of the human torso.

The detection of artificial objects in medical images is an important problem with a wide area of applications. For example, it is required for the assessment of electrodes position in X-ray images. This may be suitable for post-surgery checks such as analysis of electrode status after implantation of artificial pacemakers and devices of cardiac resynchronization therapy.

In our work, we propose a method for the detection of electrodes and electrodes tips in X-ray images of the human torso. Our solution is based on a convolutional neural network with U-Net architecture [1]. We trained this neural network in 30 X-ray images and validated it in 13 images of our original dataset. The neural network correctly reconstructs electrode shadows in X-ray images. Maximal difference between predicted and the real position of electrode tips was not more than 5 mm.

Also, we analyzed the effect of hyperparameters and augmentation approaches on the performance of the neural network. Optimal learning rate equal to 0.001. Changes in image brightness are the most effective augmentation method to improve neural network performance in our set of x-ray images.

We suppose that our solution may find application in clinical practice.

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