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Counteraction to algorithms affecting the performance of machine learning algorithms recognizing electrocardiograms

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Nikolai Oskin Healthcare is becoming the target of hacker attacks. According to a recent report from the SANS Institute, 94% of healthcare organizations are vulnerable to hacking. The object of such actions are both medical devices and medical infrastructure. The shift from stand-alone medical devices to integrated hardware, networks, and software is forcing a rethinking of the medical device concept. The purpose of this study was to study the theoretical and practical aspects of information security in relation to recognition systems for biomedical signals. We used electrocardiograms from the PTB-XL database. Recognition algorithms such as convolutional neural network, ExtraTreesClassifier, decision tree, GradientBoosting, principal component method, XGBoost, naive Bayes, LightGBM, Bagging, CatBoost, AdaBoost, logistic regression, support vector machine were considered. The risk assessment from the malicious impact of attacks based on adversarial examples (zero order optimization, projected gradient descent, database reconstruction, hopskipjump, fast gradient sign, Carlini and Wagner method with infinite norm) and back door triggers was carried out. The effectiveness of countermeasures (protective distillation, filtration, weaning, pruning) was evaluated. It was found that the efficiency of the considered electrocardiogram recognition algorithms varies from 78 to 100%. Hacker attacks can reduce the efficiency of classification algorithms from 34 to 100%. The effectiveness of counteraction varies from 54 to 100%. The threat of hacker attacks on medical services is real and needs to be further explored. Keywords: Attacks based on adversarial examp

Biography

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