Abstract: Utility-preserving Measure for Patient Privacy

Deep Learning-based Anonymization of Chest Radiographs

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Robust and reliable anonymization of chest radiographs constitutes an essential step before publishing large datasets of such for research purposes. The conventional anonymization process is carried out by obscuring personal information in the images with black boxes and removing or replacing meta-information. However, such simple measures retain biometric information in the chest radiographs, allowing patients to be re-identified by a linkage attack. Therefore, there is an urgent need to obfuscate the biometric information appearing in the images. We propose the first deep learning-based approach (PriCheXy-Net) to targetedly anonymize chest radiographs while maintaining data utility for diagnostic and machine learning purposes. Our model architecture is a composition of three independent neural networks that, when collectively used, allow for learning a deformation field that is able to impede patient re-identification. Quantitative results on the ChestX-ray14 dataset show a reduction of patient re-identification from 81.8 % to 57.7 % (AUC) after re-training with little impact on the abnormality classification performance. This indicates the ability to preserve underlying abnormality patterns while increasing patient privacy. Lastly, we compare our proposed anonymization approach with two other obfuscation-based methods (Privacy-Net, DP-Pix) and demonstrate the superiority of our method towards resolving the privacy-utility trade-off for chest radiographs. This work has previously been published at MICCAI 2023 [1]. Code is available at https://github.com/kaipackhaeuser/PriCheXy-Net.

References

1. Packhäuser K, Gündel S, Thamm F, Denzinger F, Maier A. Deep learning-based anonymization of chest radiographs: a utility-preserving measure for patient privacy. Proc MICCAI. 2023:262–72.

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