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Performance of GAN-based augmentation for deep learning COVID-19 image classification

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One of the biggest challenges in the deep learning application to the medical imaging domain is the availability of training data. A promising avenue to mitigate this problem is the usage of Generative Adversarial Networks (GAN) to generate images to increase the size of training data sets. A GAN is a class of unsupervised learning methods in which two networks (generator and discriminator) are joined by a feedback loop to compete with each other. In this process the generator gradually learns how to better deceive the discriminator, on the other hand, the discriminator gets constantly better at detecting synthetic images.

We will present the results of the transfer learning-based classification of COVID-19 chest X-ray images. The performance of several deep convolutional neural network models is compared. Data augmentation is a typical methodology used in machine learning when confronted with limited data set. We study the impact on the detection performance of classical image augmentations i.e. rotations, cropping, and brightness changes. Furthermore, we compare classical image augmentation with GAN-based augmentation. A StyleGAN2-ADA model of Generative Adversarial Networks is trained on the limited COVID-19 chest X-ray image set.
After assessing the quality of generated images they are used to increase the training data set, and to improve the balance between classes.

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