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Improving Chest X-Ray Disease Detection with Enhanced Data Augmentation Using Novel Approach of Diverse Conditional Wasserstein Generative Adversarial Networks

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Abstract : Chest X-rays are instrumental in the detection and monitoring of a wide array of diseases, including viral infections such as COVID-19, tuberculosis, pneumonia, lung cancer, and various cardiac and pulmonary conditions. To enhance the accuracy of diagnosis, artificial intelligence (AI) algorithms, particularly deep learning models like Convolutional Neural Networks (CNNs), are employed. However, these deep learning models demand a substantial and varied dataset to attain optimal precision. Generative Adversarial Networks (GANs) can be employed to create new data, thereby supplementing the existing dataset and enhancing the accuracy of deep learning models. Nevertheless, GANs have their limitations, such as issues related to stability, convergence, and the ability to distinguish between authentic and fabricated data. In order to overcome these challenges and advance the detection and classification of CXR normal and abnormal images, this study introduces a distinctive technique known as DCWGAN (Diverse Conditional Wasserstein GAN) for generating synthetic chest X-ray (CXR) images. The study evaluates the effectiveness of this Idiosyncratic DCWGAN technique using the ResNet50 model and compares its results with those obtained using the traditional GAN approach. The findings reveal that the ResNet50 model trained on the DCWGAN-generated dataset outperformed the model trained on the classic GAN-generated dataset. Specifically, the ResNet50 model utilizing DCWGAN synthetic images achieved impressive performance metrics with an accuracy of 0.961, precision of 0.955, recall of 0.970, and F1-Measure of 0.963. These results indicate the promising potential for the early detection of diseases in CXR images using this Inimitable approach.

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