

# DENOISING OF MEDICAL IMAGES: A GAN-BASED APPROACH FOR MULTI-TYPE NOISE AND MODALITIES



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## Abstract:

Many medical images taken from various medical imaging techniques suffer from noise, either due to external factors or because of the device used to take them or when transmitting data. Thus, the specialist must diagnose the patient, which may lead to an incorrect diagnosis due to this noise. Therefore, the mechanisms of noise removal from medical images are important in these cases. Generative adversarial networks: a generator and discriminator were used with the addition of a refinement network to become three convolutional neural networks. A set of medical images was used, like MRI, X-ray, US, CT, and OCT. Each type of such data consists of noise data and clean data. The goal of the proposed model is to remove noise from real medical images; The proposed model handles different imaging modalities as well as multiple noise types by introducing an additional refinement network to the GAN architecture and employing a combination of diverse loss functions. The proposed model achieved good results using the best evaluation measures that measure similarity, namely PSNR=34.49, SSIM=0.911, MSE= 0.00079, and RMSE= 0.02207 as well as the quality of the visual results of the resulting images. Although the results are promising, the study relies on images with artificial noise, and clinical validation is left for future work. Nevertheless, the proposed model successfully removed noise from low-dose CT images, despite the fact that the noise was real rather than artificially generated.

**Keywords:** Deep Learning, GAN, DCGAN, Medical Image, Denoising

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