XPGAN: A Novel Patch-Based Generative Adversarial Network Framework for Super-Resolution of X-Ray Images

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High-resolution X-rays require greater radiation dosages compared to lower-resolution X-rays. However, lower-resolution low-dose X-rays often lack the pathological detail and clarity required for diagnosis and examination. This research presents a patch-based generative adversarial network to recover lost image detail from X-ray images of lower-resolution and reconstruct high-fidelity super-resolution X-ray images. The generated X-ray images showed a structural similarity of 0.85 to the source X-ray images. It was observed that this model outperforms interpolation techniques in reconstructing image detail and shows promise in recovering edges in degraded images. It also allows for memory efficient computation without sacrificing image fidelity. The network was trained and tested for X-ray images which were smoothed and downsampled by a factor of 4. This corresponds to reduction in radiation dose by a factor of 16.

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