

Transfer Learning-Based Super-Resolution for High-Precision Medical Imaging

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Abstract: *High-resolution medical images are critical for preserving intricate anatomical details essential for accurate diagnosis, effective surgical planning, and creating precise digital twins. However, acquiring such images often requires expensive equipment, specialized personnel, considerable time, and significant financial investment. This research addresses these challenges by proposing an AI-driven specialized super-resolution (SR) framework tailored for medical imaging. Our approach leverages transfer learning by fine-tuning high-performing general-domain SR models (BSRGAN, DPSR, HAT, RealESRGAN, and SwinIR) using approximately 190,000 images from KISTI's Digital Korean dataset. On average, the fine-tuned SR models exhibited a 3.28% improvement in PSNR and a 0.6% increase in SSIM compared to their zero-shot counterparts, underscoring the effectiveness of transfer learning in enhancing both image quality and structural fidelity for medical applications.*

Keywords: Super-resolution, transfer learning, digital Korean, medical imaging, human digital twin.

