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Enhancing Medical Image Fusion and Diagnostic Accuracy Using Vision Transformers: A Novel Approach Leveraging Generative Adversarial Networks

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Abstract **–** Developed by Ian Goodfellow, Generative Adversarial Networks, GANs in short, are a great advance in machine learning. They have shown exceptional precision and accuracy results in classification methods across a wide range of applications, including computer vision. This paper presents a novel method for medical image fusion that leverages the potential of Vision Transformers, enhancing diagnostic accuracy. Our method, which addresses the growing demand for advanced analytic tools in medical image analysis, combines the informative features from different imaging modalities - specifically X-rays and MRI - into a comprehensive, interpretable format. Our method uses a ViT-based architecture capable of handling images with varying resolutions to produce fused pictures that preserve both the texture and thermal radiation from the source images. The experiments conducted show a significant improvement in the preservation of detailed information. This could be crucial for medical diagnostic applications. Our approach encourages the integration of artificial intelligence into healthcare, setting up the future of medical imaging. Our experiments reveal that the quality of the merged images has improved significantly. Quantified by entropy, mean gradient, and structural similarity index, the results show a dynamic shift of EN and MG as the number image pairs changes. These advances could have a significant impact on medical diagnostic applications. They also highlight the potential benefits of AI integration.

Keywords – Medical Image Fusion, Diagnostic Accuracy, Vision Transformers, Generative Adversarial Networks, Artificial Intelligence, Healthcare, Advanced Analytic Tools, Image Analysis, Multi-modal Imaging, Machine Learning.