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Enhancing Brain Tumor Detection Using GANs Based Techniques

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ABSTRACT

This research introduces an innovative, non-invasive approach for brain tumor detection that minimizes reliance on gadolinium-based contrast agents. By harnessing the power of advanced generative models, including various Generative Adversarial Networks (WGAN, DCGAN) and cutting-edge diffusion models, the study synthesizes high-quality, contrast-enhanced MRI images without the associated risks of traditional contrast media. These artificially enhanced images are then rigorously analyzed using a robust Convolutional Neural Network (CNN) to accurately detect and classify brain tumors. The comparative evaluation not only highlights the superior diagnostic quality of images generated by each model but also demonstrates the potential of integrating synthetic image generation with deep learning for improved detection accuracy. Ultimately, this research paves the way for safer, more cost-effective, and efficient diagnostic tools, thereby enhancing early detection capabilities and streamlining clinical workflows for brain tumor diagnosis.

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