

Image Recognition and Anomaly Detection Powered by GANs: A Systematic Review

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Abstract : Generative Adversarial Networks (GANs) have emerged as powerful tools in the fields of image recognition and anomaly detection due to their ability to model complex data distributions and generate realistic images. This systematic review explores recent advancements and applications of GANs in both image recognition and anomaly detection tasks. We discuss various GAN architectures, such as DCGAN, CycleGAN, and StyleGAN, which have been tailored to improve accuracy, robustness, and efficiency in visual data analysis. In image recognition, GANs have been used to enhance data augmentation, improve classification models, and generate high-quality synthetic images. In anomaly detection, GANs have proven effective in identifying rare and subtle abnormalities across various domains, including medical imaging, cybersecurity, and industrial inspection. The review also highlights the challenges and limitations associated with GAN-based methods, such as instability during training and mode collapse, and suggests future research directions to overcome these issues. Through this review, we aim to provide researchers with a comprehensive understanding of the capabilities and potential of GANs in transforming image recognition and anomaly detection practices.

Keywords : generative adversarial networks, image recognition, anomaly detection, DCGAN, CycleGAN, StyleGAN, data augmentation

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