ANOMALY DETECTION USING TRANSFORMER BASED GANS

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MOTIVATION / INTRODUCTION

- Anomaly detection in images is a challenging problem due to the diverse anomalies and the complex patterns they exhibit. The project presents an intellectually stimulating challenge, enticing those driven by curiosity and the desire to solve complex puzzles.
- he opportunity to explore cutting-edge technology like TransGAN in anomaly detection offers a chance to contribute to the frontier of research and innovation. Being among the first to apply such advanced methodologies can lead to groundbreaking discoveries and recognition within the scientific community.
- The potential real-world applications of effective anomaly detection are vast and impactful. From ensuring product quality in manufacturing to detecting abnormalities in medical scans, the project offers the opportunity to make a tangible difference in various domains, ultimately improving safety, efficiency, and reliability.

OBJECTIVES

• Evaluate TransGAN's efficacy in detecting anomalies within image datasets, comparing its performance against traditional methods.

• Develop and implement novel anomaly detection methodologies using TransGAN-generated images, focusing on enhancing accuracy and robustness.

• Optimize anomaly detection algorithms to achieve high accuracy and efficiency while ensuring scalability and resource efficiency.

• Assess the potential real-world applications of TransGAN-based anomaly detection across industries, analyzing its effectiveness in practical scenarios.

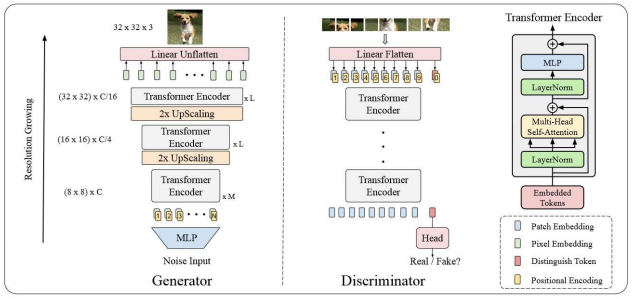
SCOPE OF THE PROJECT

The scope of this project is to leverage TransGAN for anomaly detection in image datasets, focusing on developing innovative methodologies, optimizing performance, and evaluating real-world applicability. Through meticulous analysis and documentation, it seeks to contribute to advancing anomaly detection research.

METHODOLOGY

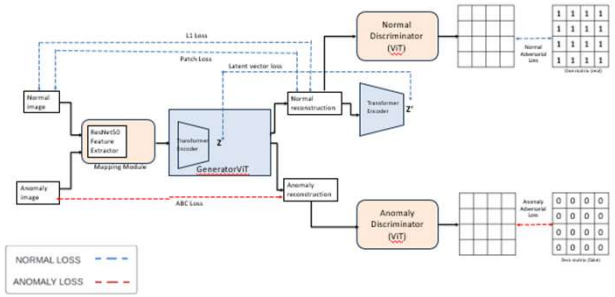
We use two different approaches for two datasets using the same model. For MVTec-AD dataset we use latent space mapping. While for CIFAR-10 we employ usage of two discriminators and different losses for anomaly classification.

ARCHITECTURE



We use this transGAN architecture for both the datasets as explained before. We train the dataset on this model to generate realistic images. Now for MVTec-AD we use this trained model on test images and use reconstruction and discriminator loss to classify anomalous and normal images.

In case of CIFAR-10 dataset we make use of the given system flow where we use two discriminator and a combination of multiple losses to classify an image as anomalous or normal.



RESULTS

Algorithm	Result	
Latent Space Mapping (Accuracy)	Good Images	Anomalous Images
	0.897	0.6
2Discrimator approach (AUROC)	0.79	

CONCLUSION

In summary, this project achieved notable results in anomaly detection using TransGAN. With an accuracy of 89.7% for normal images and 60% for anomalous images in MVTec-AD, and an average AUROC score of 0.74 in CIFAR-10, it demonstrates the effectiveness of TransGAN-based methodologies. These findings signify promising prospects for TransGAN in anomaly detection applications.

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