

Generating New Arabic Letters-Rawashin Design Using GAN

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Introduction

The abilities of machines are not limited. Consequently, the revolution of AI models and Generative Adversarial Networks (GAN) keeps producing promising results.

Rawashin is a window design built from wood that is well-known in the Hijaz area in western of Saudi Arabia. A distinctive heritage style where most of the houses are decorated with them.

This paper attempts to experiment the ability of GAN to generate different building interfaces combining the Rawashin with Arabic calligraphers.

We aim to highlighting the Saudi heritage in the Hijaz region. combine the originality of the past, the modernity of the present, and touches of the future.

Arts By GAN

Photographic Faces From the Sketch [1]

GAN and Skip connection layers.



Chinese Seal Carving Art Creation [2]

Conditional GAN.



Creative Arts Generation [3]

GAN with style classification loss and a style ambiguity loss.



Anime Characters Creation [4]

DRAGAN Deep Regret Analytic Generative Adversarial Networks.

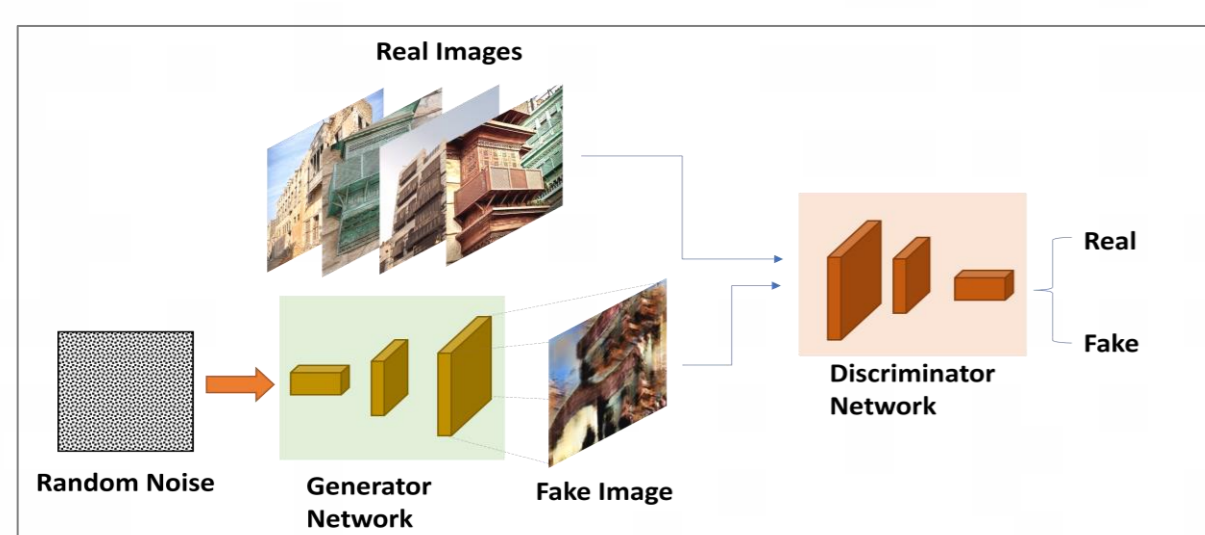


GAN Networks

1. Vanilla GAN

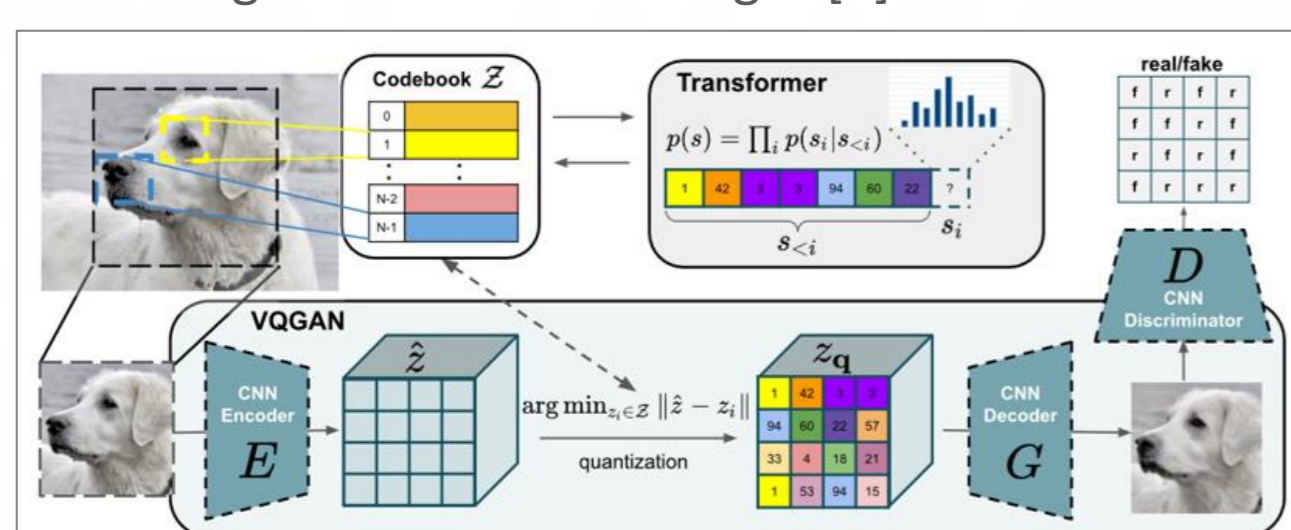
A. Generator network: responsible to generate fake images aided by a random noise.

B. Discriminator network: takes two inputs real and fake images, then discriminate if the generated images are real or fake.



2. VQ GAN

Vector Quantized GAN. Transformer-based powerful tool to generate high-resolution art images [5]



Dataset



Implementation

TABLE I: Vanilla GAN parameters fine tuning

Parameter	Best Value	Experimented Values
Seed Size	100	256, 128
Batch Size	32	16, 64
Learning Rate	1.5e-4	1.5e-5, 1.5e-2
Optimization Methods	Adam	SGD

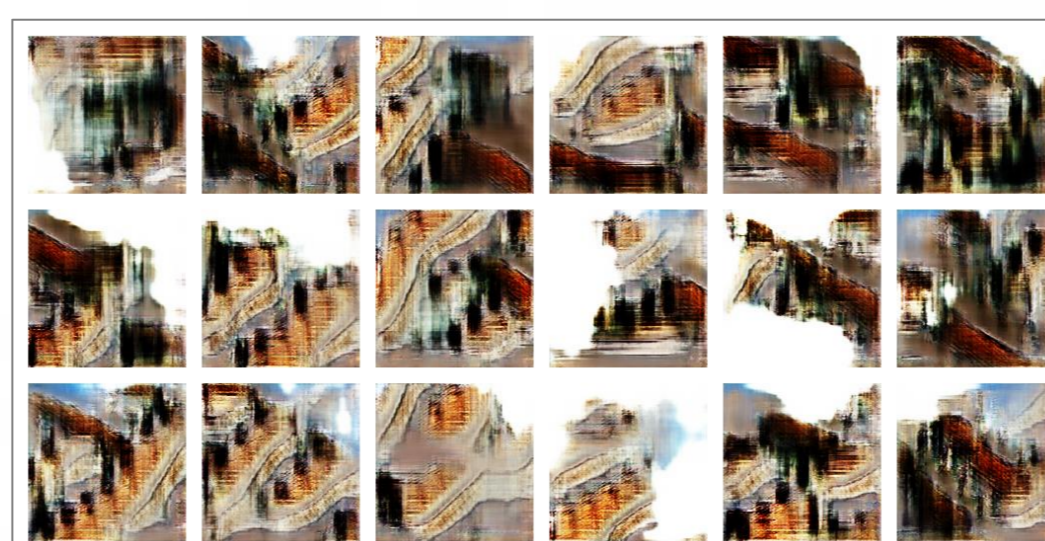
VQ GAN Parameters

- I. Initial images
- II. Supportive text
- III. Building, Letters, حروف عربية، ط، ع، ه

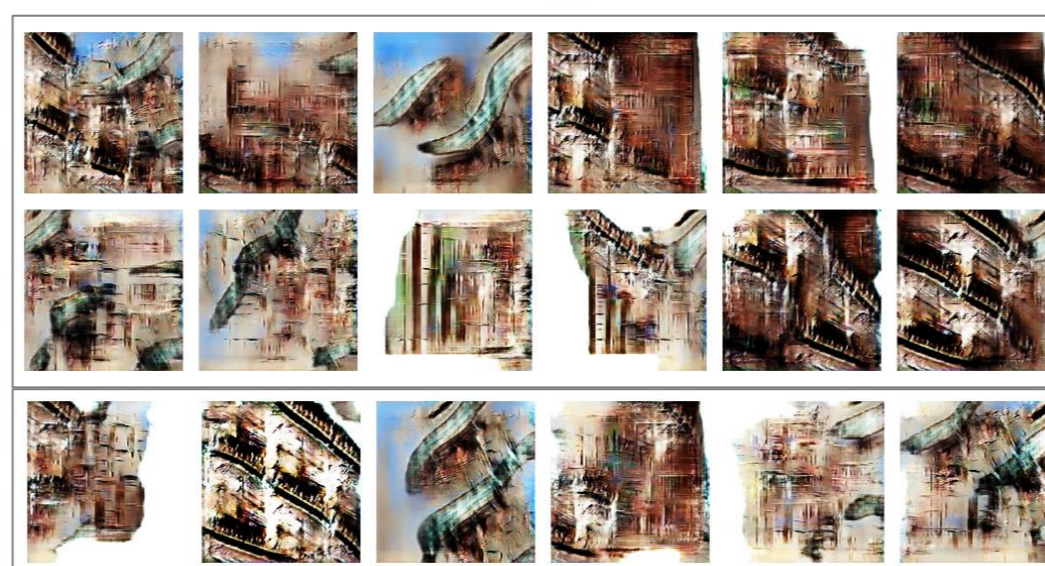


Results

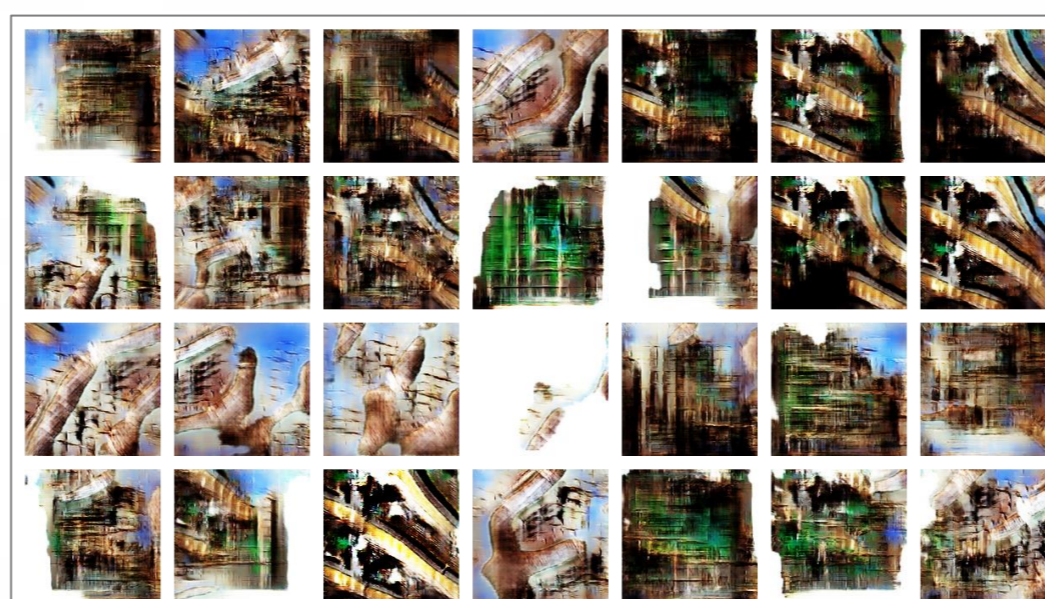
Vanilla GAN



Epoch 193



Epoch 478



Epoch 673

VQ GAN



Experiment 1



Experiment 2



Experiment 3



All result video

Discussion

The evaluation is based on human judgment only, to ensure whether the generated works are useful or not.

- Vanilla GAN

Vanilla GAN outcomes were not suitable to create a new designs of Rawashin, as it is a basic model. Another reason is number of trained image is small.

- VQ GAN

This network provides satisfying results due to the powerful of the GAN transformer-based models, and the various high quality trained on images. Also, it was able to combine Arabic calligraphy with Rawashin to re-design the building interface.

Conclusion

This paper experiments the ability of two types of GAN to generate a new form of Rawashin combined with Arabic calligraphy. As a feature work, other types of GAN such as DC-GAN and hybrid GAN are recommended to enhance the basic GAN performance. Transformer-based GAN models also are recommended for high-resolution images.

References

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