# UNSUPERVISED SKETCH TO ARTWORK SYNTHESIS

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# Abstract

Machine learning is a subtype of artificial intelligence (AI) that allows machines to replicate some human behaviors without the need of particular programming. Machine learning simply takes what the algorithms have learned and applies it to the supplied data sample. Furthermore, machine learning drives a lot of automation in multi-domain and industry-specific jobs. Over the years machine learning scientists and researchers have tried to mimic the functionality of the human brain, which is made of millions of neurons. As a result, machine learning and deep learning have emerged as two of the most researched fields in the artificial intelligence arena.

In the field of deep learning, generative adversarial networks or GANs are a generative modeling which has achieved huge success recently. Generative Adversarial Networks understand and learn the distribution of a specific sample of information and produce new samples of distribution, those are similar to the initial sample. The basic GAN architecture is composed of two neural networks known as the generator and the discriminator. GANs have been involved in various deep learning tasks, such as data generation, neural style translation and super-resolution images. GAN is still a growing research area and under explored in some domains mainly because of the advanced concepts behind it and the requirement of previous knowledge in order to challenge its true potential.

Sketch to Art synthesis can be regarded as such recent advancement of the generative models. It was found that the game between the generator and the discriminator can be applied to develop an image based on a grayscale sketch. The aim is to transform freehand sketches by amateur artists into artworks that represent the artistic representation of the sketches that meant to represent. In this dissertation, we are aiming to provide a thorough overview of existing generative adversarial networks. We then present the limitations of existing techniques for translating sketches to art. To overcome those limitations, we propose an art synthesis technique utilizing unpaired drawing data. We measure our performance compared to existing work and finally conclude with suggestions for further research.

**Keywords:** Sketch to Art; Sketch to Image Synthesis; Image-to-Image Translation; Generative Adversarial Networks; Deep Learning