Fabricating Images of Cats with a Deep Convolutional Generative Adversarial Network (DC-GAN)

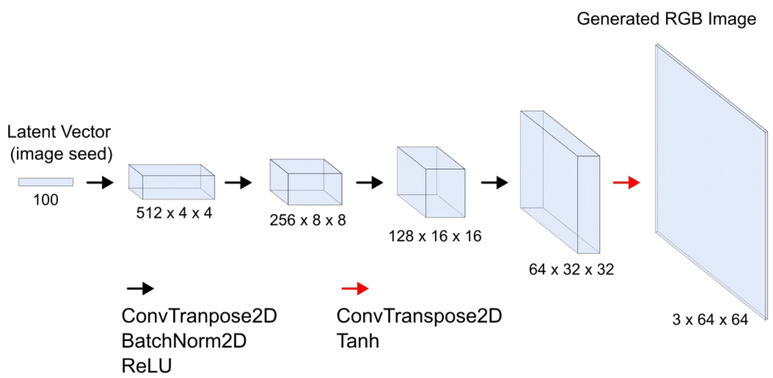
Jacob Vietorisz and Sean Yamamoto
CS1430, Computer Vision
Department of Computer Science, Brown University, Providence, RI

We implement a deep convolutional generative adversarial network (DC-GAN) to produce fake images of cats. Unlike traditional GAN architectures, which use pooling layers, DC-GANs use transpose convolutions to up-sample in the generator and strided convolutions to down-sample in the discriminator. We demonstrate that even with small and diverse training data sets (< 15k images) we produce convincing images of cats. The success of our network relies on reproducing a small number of distinctive feline features, such as ears, eyes, and noses, and fur patterns.

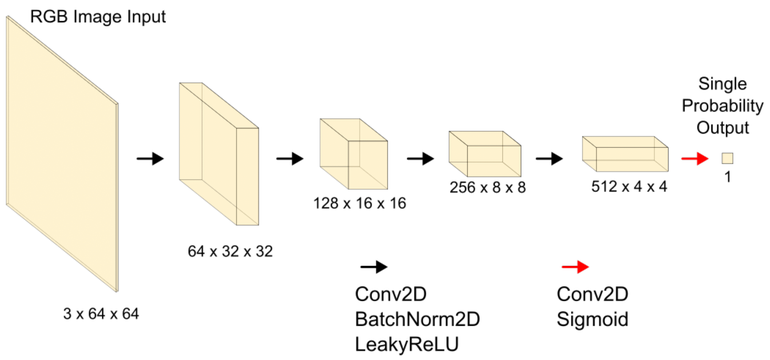
What is a GAN?

A GAN consists of two networks: a Generator, which produces fake images from random seed vectors (latent vectors), and a Discriminator, which is a binary classier that takes in an image and makes a prediction of whether it is real or fake. These networks have random initial weights and are trained against each other. The architectures and an example training cycle are shown below.

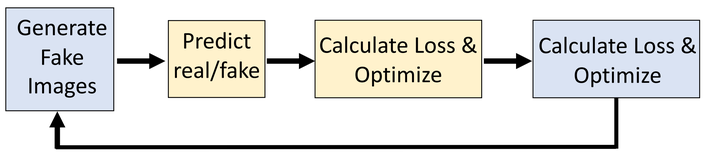
Generator Network Architecture



Discriminator Network Architecture



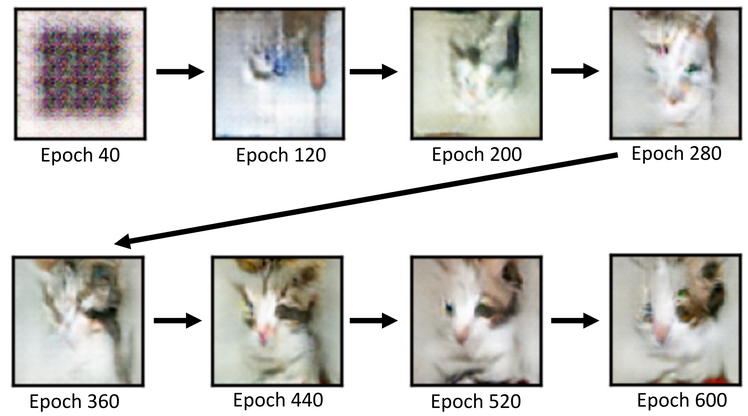
The GAN Training cycle



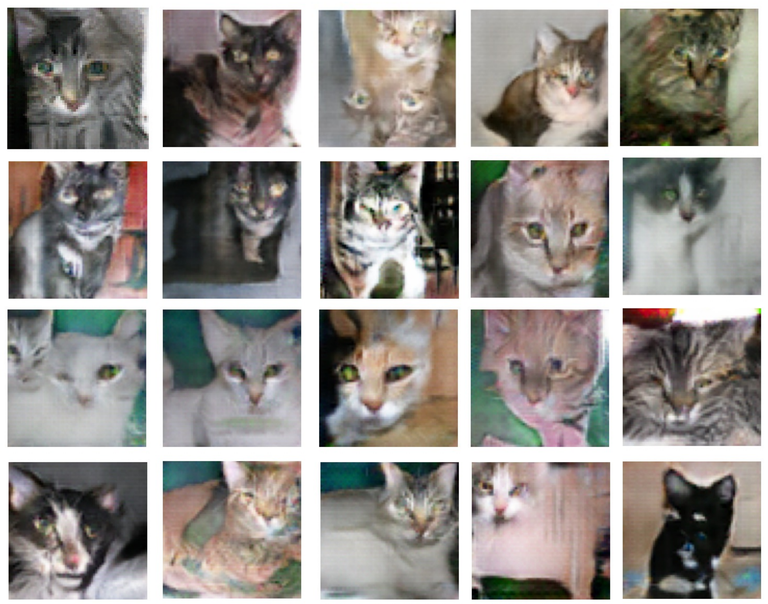
Our generated images

We trained our model using 12.5k images of cats from the dataset 'dogs vs cats.' We overcame the limited size of our dataset by implementing random crops and horizontal flips of the real images and by training for 1200 epochs.

Visualizing training with constant latent vectors



Results at 1200 epochs



Can you tell the difference between real and fake cats?

Our discriminator can