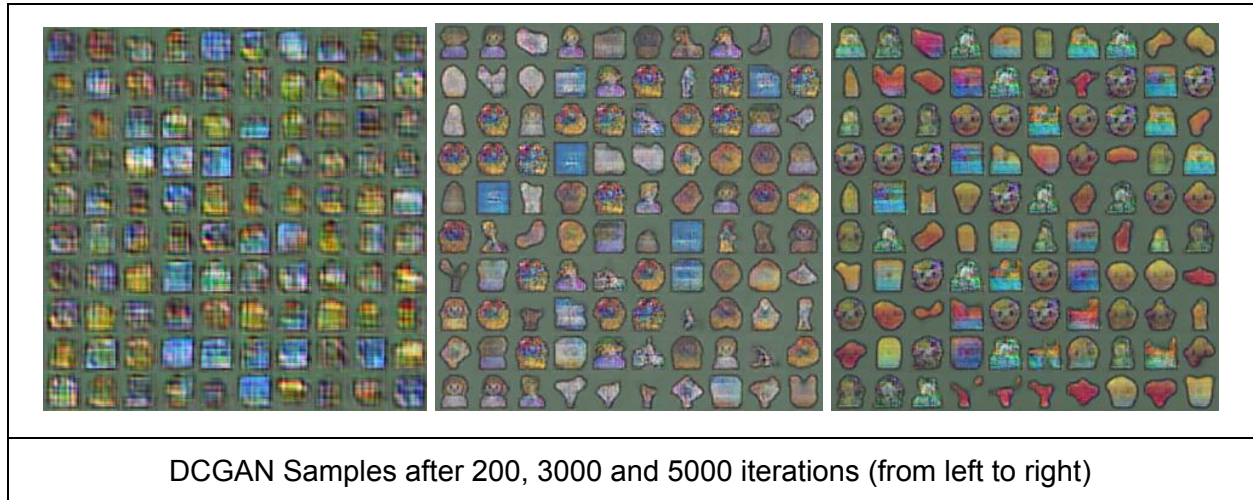


Part 1

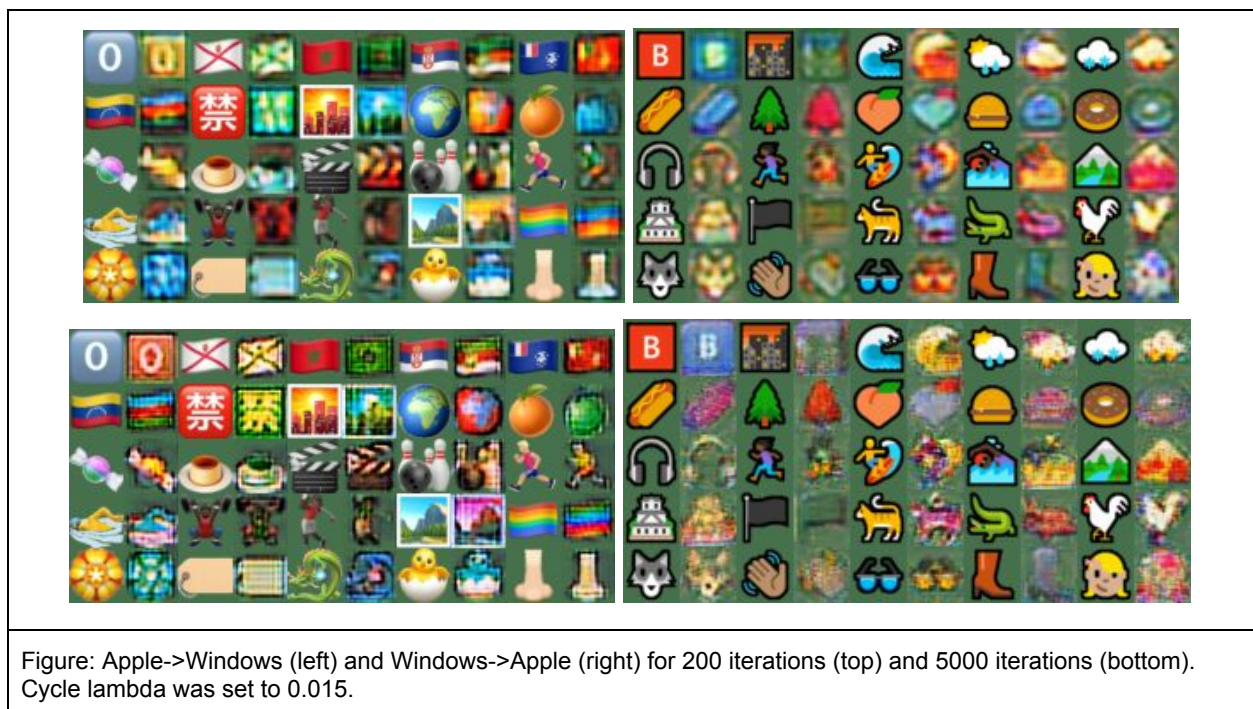
1. The general equation describing the input dimension and output dimension of a convolution is given by $W_2 = \frac{W_1 - F}{s} + 1$, where W_1 is the input dimension, F is the filter size, s is the stride, and W_2 is the output dimension. Let p be the amount of padding.
 $W_1/2 = \frac{W_1 + 2p - F}{s} + 1$. Setting $F = 5$, $s = 2$, then $p = 3/2$.



As seen, the generated samples improve by taking on more familiar shapes of emoticons and then eventually adding details and more vivid coloring.

Part 2

1.



2. Below are samples of the GAN with the same settings, only using different seeds.



Interestingly, the colors changed with a different seed. The reason is because a new seed shuffles the images. The gradient is a stochastic gradient and so the neural nets probably entered a different local minimum.

3. Below are samples of the cycle gan with lambda set to 0, 0.03, 0.05, 1.



Figure: Apple->Windows (left) and Windows->Apple (right) for 200 iterations (top) and 5000 iterations (bottom), with a different seed set. The cycle lambda was set to 0.



Figure: Apple->Windows (left) and Windows->Apple (right) for 200 iterations (top) and 5000 iterations (bottom), with a different seed set. The cycle lambda was set to 0.03



When lambda was 0, the translations are incoherent but vaguely familiar to the input. The reason is because the generators only aimed to fool the discriminator. As expected, as the cycle lambda increased, the neural net focused on the reconstruction loss and the fakes become sharper and closer to the original image. As lambda further increased, the generators only

focused on reconstructions. The best way to reconstruct would be for the generator to simply output the original image. The translations are thus much more similar to the original image and maintain its qualities, but also one would've *expected* qualitatively have a worse style transfer (similar color palette, shape, etc). As cycle lambda increases further, the results do not change. One hypothesis is that the generators only focus on reconstruction and subsequently saturate their capacity.

Why, if cycle lambda is very high, does the translation change the color? One hypothesis is that early during training the weights get shifted toward a local minimum that transfers from style.