CSC421: Programming Assignment 4

Due on Thrusday, Mar 29, 2019

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Part 1

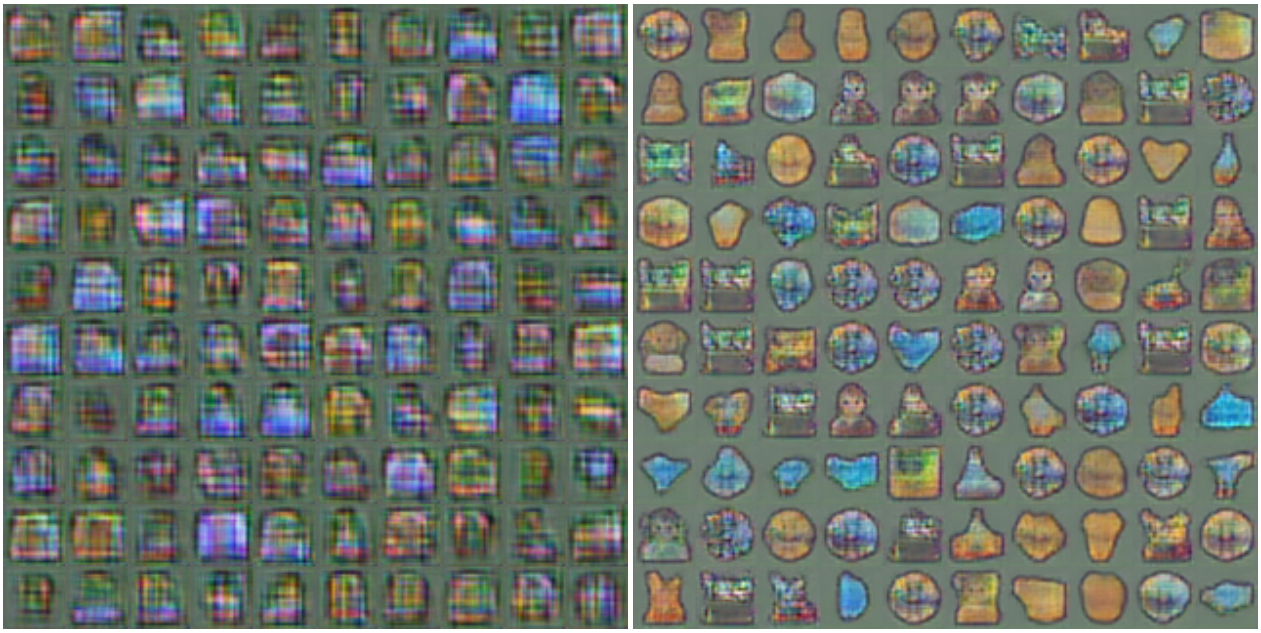
Deep Convolutional GAN

1.
Let input width = W, output width = 0.5W:
Using the formula from csc411:

$$0.5W = \frac{W - F + 2P}{S} + 1 = \frac{W - 5 + 2P}{2} + 1 = 0.5W - 2.5 + P + 1,\ P = 1.5 \approx 2$$

The zero padding should be 2.

2.
The following samples are from iteration 200 and iteration 4000. The quality for both images are not very ideal. An human can easily identify this emojis as generated since they have serious artifacts. However, the quality does improve a lot through the training process. Compare to the one from iteration 200, where all the generated emojis look like some random pixels, the one from iteration 4000 have some emojis that are recognizable such as a face or a human. Both the shape and the color of the emojis improved a lot.



(a) Iteration 200 (b) Iteration 4000

Part 2

CycleGAN

1.

(a) X to Y (b) Y to X

Figure 2: Iteration 200

(a) X to Y (b) Y to X

Figure 3: Iteration 10000

2.

The most noticible difference is the colour of the generated images. In one of the random seeds I tried, the green and red channel in the generated images seems to be switched. And the other random seeds also result in slightly differently colored generated images. The reason is that with different random seeds, the neural net is trained to different local min. Since the color of the content of an emoji (except the black edge for windows emojis) doesn't really affect how the discriminator decide whether it is a generated or original emoji, and since the difference in color can be reverted when translating the emoji back as long as the contrast information is preserved, neural networks with different initial weights will generate differently colored emojis.

3.
Using 4 as the random seed. For lambda_cycle = 0.015, same as the above in Q1.
When lambda_cycle = 0:

(4).png (4).png

(a) X to Y (b) Y to X

Figure 4: Iteration 200

(4).png (4).png

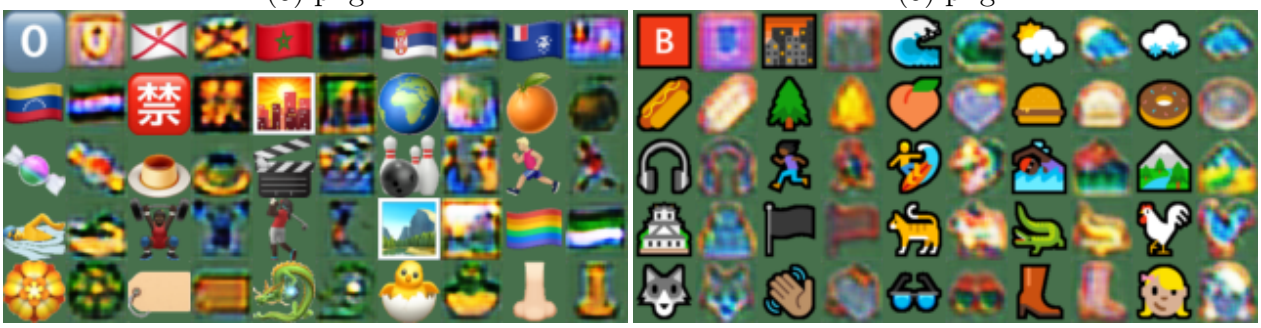
(a) X to Y (b) Y to X

Figure 5: Iteration 10000

These samples from a CycleGAN neural net trained without the cycle-consistency loss are very different from the previous results.. With lambda_cycle = 0, the generated emojis doen't preserve the shape and color of the original emoji well because the NN is not penalized for not being able to translate the emojis back to the original.

When lambda_cycle = 0.1:

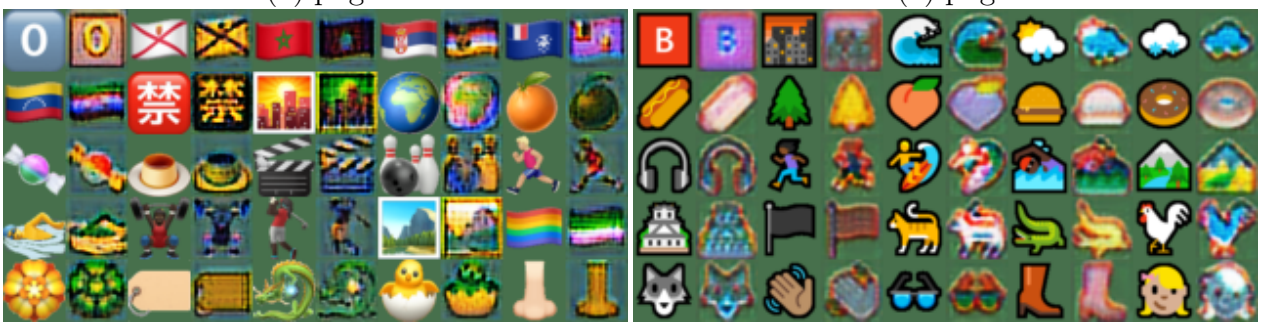
(5).png (5).png



(a) X to Y (b) Y to X

Figure 6: Iteration 200

(5).png (5).png



(a) X to Y (b) Y to X

Figure 7: Iteration 10000

When lambda_cycle = 0.1, the shape of the generated emojis are almost identical to the original emoji, while the color are very different. The reason is that with a large lambda_cycle, the NN is penalized hard for failing to translate the emojis back to the original and therefore, it choose to prioritize this function more. To do so, preserving the shape is very important. As a comparison, as explained in Q2, the color of generated emoji doesn't really matter as long as the color mapping information is captured in the weights.