CS5002 Senior Design Self Assessment:

Daniel Hackney - 4/18/22

Part A:

On this project, I contributed effort to the initial research surrounding GANs and Tensorflow – namely, finding an existing GAN for the MNIST dataset that we could reference as we built our own. I spent a lot of time working with the staff at the Ohio Supercomputer (OSC) to try to get our GAN running on their GPUs. I also found out how to get our GAN running on my local GPU, which proved to be our preferred method of testing as we developed new features for our project. I added the code that tracked and plotted our loss functions for the generator and discriminator neural networks composing our GAN. I feel that I have not only applied, but also built upon the skills I identified in my initial assessment from last Fall as I was beginning this project. I utilized a lot of what I learned in my previous machine learning course, including the basics of neural networks and the use of Python's matplotlib library to plot loss functions. As expected, I also needed to utilize and expand upon my knowledge of data structures for the image processing portions of this project, as much of it involved working with higher-dimensional matrices.

I learned a lot more about Python machine learning libraries than I thought I would – mostly TensorFlow accompanied with Keras and matplotlib. I spent a lot of time digging through their documentation and code examples to learn more about their specialized data structures and functions that proved useful in the creation of our GAN. I learned a lot about parallel computing, which was also one of the skills I expected to utilize from the class on it that I took last semester. I utilized cudnn to train our GAN using my local GPU, as well as my CPU initially. Getting this to work was a major accomplishment, along with getting our first set of 28x28 black and white cat faces to generate. Another smaller, but still meaningful success was getting the GAN to accept a local dataset of images and convert them to a data type that was compatible with the GANs latent space. We faced several obstacles throughout our project including the image translations within our generator, getting RGB images instead of just monochrome, and getting our GPUs to run our code.

Part B:

Ultimately, our group managed to develop and train a generative adversarial network that can generate original images of RGB, 128x128 pixel, cat faces. As each epoch is completed, it saves the image of the currently generated image batch. It also compiles a plot of the competing neural networks' loss functions as each epoch is completed. At the end of training it will output and save the plot of these functions as well as a gif containing all the generated images as the GAN was training so that you can easily visualize the learning. We learned that group work doesn't always have to be something to dread so long as everyone does their fair share. We also

learned that it helps to divide up the tasks ahead of time so that everyone can home in on what they are interested in most.

Since we were only a team of two, communication was easy and effective. We made sure that we knew what the other person was working on at all times so that we wouldn't step on any toes. Our version control using GitHub was also effective for us, as we were able to merge code changes the other team member made as new ones were pushed onto it. The only issues we had involved not being able to test easily, as my teammate was unable to get his local GPU to effectively train our GAN – leaving it up to me to perform all the testing. I do believe my teammate and I contributed equal amounts of effort towards this project as a whole. Both of us made significant strides towards the end product, and we met several times to help each other along the way.