AI Image Recognition Honors Project Program Deliverables

**Features**:

* The program will utilize the MNIST dataset from TensorFlow. This includes the 60,000-training data set and the 10,000-testing dataset of the 28x28 pixel numbers.
* The program will utilize batch training in which multiple drawings will be forward and backward propagated through the network. (This will provide better fitting to all the numbers since the network will adjust the fit to the whole batch).
* The program will show the training process through each EPOCH (iteration of training and testing) reporting the EPOCH number, accuracy of the network based on the test, loss based on the loss activation function, and the current learning rate in that EPOCH. At the end of a variable number of EPOCHs, the program will plot some of the drawings that it guessed correctly and incorrectly (this will be handled using MATPLOTLIB).
* Once all learning EPOCHs have been completed, the program will again show some drawings that it guessed correctly and incorrectly (again, using matplotlib) with the appropriate statistics (i.e.: accuracy vs epoch number, loss vs epoch number, and learning rate vs epoch number).
* The individual weights and biases of the network can be imported into the program and exported from the program, so it does not have to be trained each time the program runs.
* Once the weights and biases are loaded into the program or the neural network finished the learning epochs, the user will have a GUI pop-up with a window for drawing a digit on a 28x28 pixel canvas with a clear button and a predict button. Once the predict button is clicked, it will give the output of the neural network (the neuron with the highest percentage will be the guess).

**Deliverables**:

1. Forward Propagation
2. Backward Propagation
3. MNIST Loading from TensorFlow
4. Matplotlib Graphing for MNIST Numbers
5. Matplotlib Graphing for Accuracy, Loss, Learning Rate, and EPOCH number
6. EPOCH Training with a variable number of EPOCHs per training
7. After each EPOCH, a variable number of MNIST testing set numbers (not to exceed the 10,000-testing dataset) will be forwarded through the network
8. Console Output of EPOCH training process (including the Accuracy, Loss, Learning Rate, and EPOCH number)
9. After a variable interval of EPOCHs, show a Matplotlib plot of 2 correct and 2 incorrect guesses from the current EPOCH testing sequence
10. Batch Training with a variable number of drawings per batch
11. GUI Drawing Utility with a clear canvas and predict button