Hyperparameters and Loss Data Report, by Grant Henry – January 20th, 2025

In this report, I investigated how altering hyperparameters in my machine-learning model affected its average loss in training and testing. My model is used to predict solar radiation values, based on the following inputs: UNIXTime, temperature, pressure, humidity, wind direction, speed, time of sunrise, time of sunset, the date, and the time of day. This is the link to its GitHub page: https://github.com/Grant734/NASA-Dataset-Solar-Radiation-Prediction/blob/main/SolarRadiationProject.py.

All tests were conducted with 15 epochs, and the training set involved 26148 data points. The independent variables I tested were learning rate, batch size, activation function, and number of neural layers. The dependent variables were average training and testing loss. When not specifically testing an individual independent variable, its default number went as follows: learning rate was 0.001, batch size was 32, the activation function was 'relu,' and the number of neural layers was 3. The graphs of each test are found below.

Figure 1: Testing Learning Rates

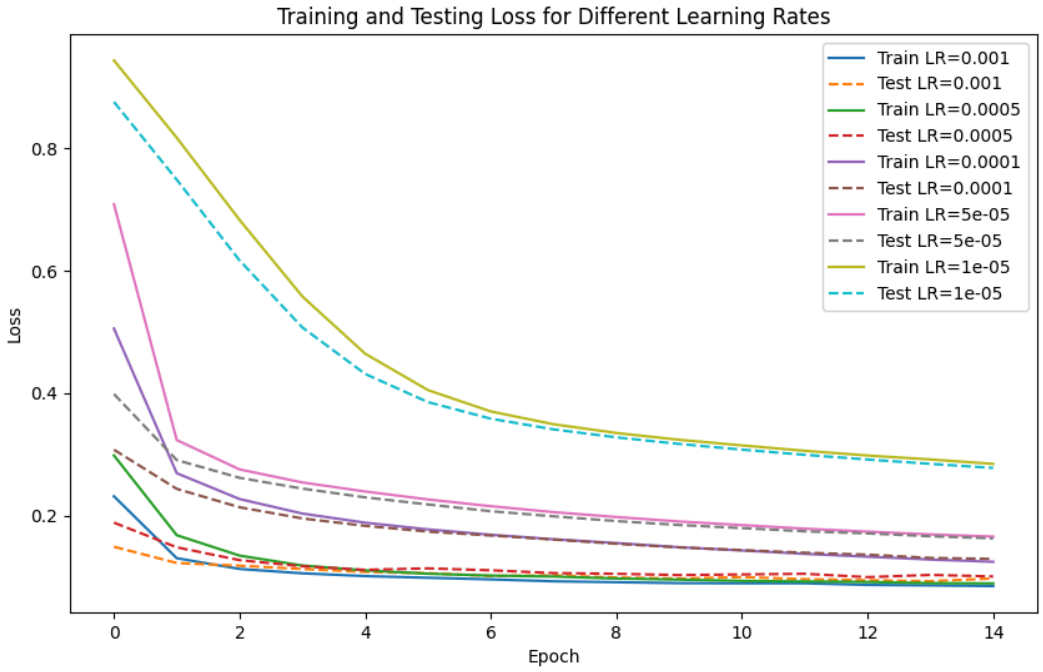


Figure 2: Testing Batch Sizes

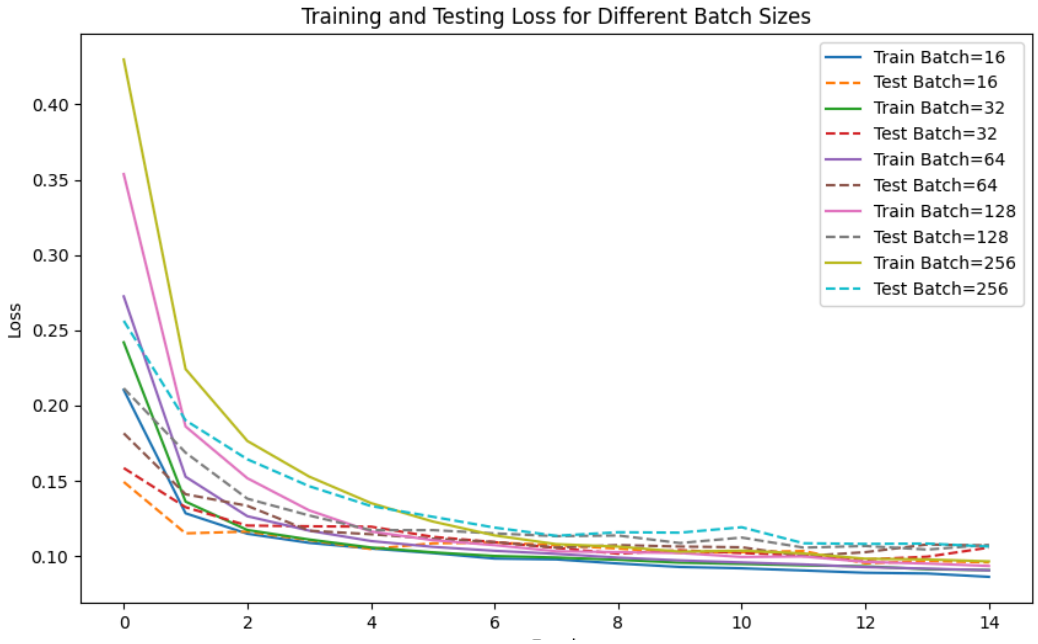


Figure 3: Testing Activation Functions

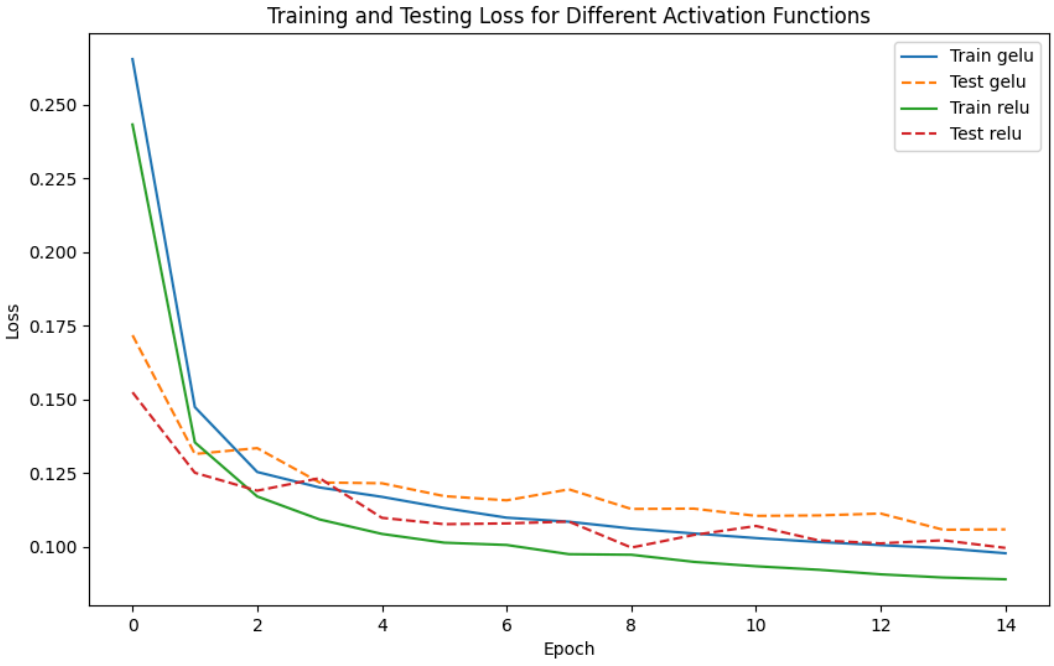
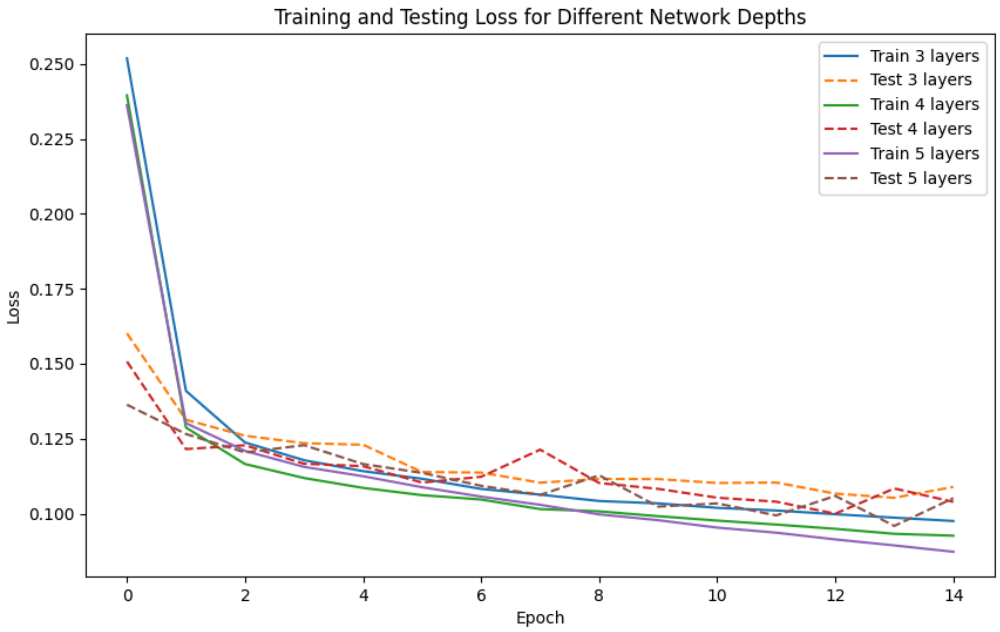


Figure 4: Testing number of Neural Layers



Conclusion:

Based on the data of what hyperparameters minimized testing loss, it is reasonable to assume that a model with a learning rate of 0.001, batch size 16, a relu activation function, and 5 neural layers might produce the best results. My final model used these hyperparameters but worked best with 8 epochs. Here is the graph of the results with these parameters, still using 15 epochs.

Figure 8: Final Model