**Module 4: Option #1**

Lance I. Evans

Colorado State University Global

CSC580-1: Applying Machine Learning and Neural Networks - Capstone

Dr. Brian Holbert

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The training loss decreases steadily from epoch 1 to epoch 10, which is a good sign. This means that the model is learning from the training dataset and the gradient descent optimization is working properly. However, the validation loss does not show the same behavior. It decreases initially, then starts to fluctuate and increase towards the end of the training (epochs 7-10). This indicates that the model may be overfitting on the training data, i.e., it’s getting very good at predicting the training data but not generalizing well to new, unseen data. The increasing validation loss and decreasing training loss implies a divergence between the two, which is a clear indication of overfitting.

The accuracy on the training set increases slightly from 0.9593 to 0.9781 across the epochs. This indicates that the model is learning and improving its predictions on the training data. The validation accuracy, however, does not show a significant increase. It fluctuates slightly but doesn’t show a consistent improvement. The highest validation accuracy achieved is 0.9630 at the 2nd and 6th epochs, but it doesn’t improve further. This behavior, along with the pattern observed in the loss, again suggests that the model might be overfitting on the training data.

Overfitting can be tackled in multiple ways. We could use regularization techniques like L1, L2 or dropout in the model. We could decrease the complexity of the model by reducing the number of layers or the number of units in the hidden layers. We could stop the training early, for instance, after the 7th epoch where the validation loss seems to start fluctuating and increasing. Another option would be to gather more data, or use data augmentation techniques, if possible, more data can help improve the model’s ability to generalize.

Lastly, the accuracy figures are pretty high (over 0.95). I could be that the dataset is imbalanced, with one class significantly outnumbering the other. In such a case, accuracy may not be the best metric to evaluate the model. It could be beneficial to look at precision, recall, or the F1-score instead.