# Performance Analysis of Neural Network Configurations and Optimizer.

Arrabachala sisira

Student id : 811244505

Sarrabac@kent.edu

Introduction:

In our comprehensive analysis, we scrutinized the performance of a neural network model trained for 20 epochs with a batch size of 512. The focus was on evaluating validation loss under different configurations and loss functions, as well as exploring the impact of optimizers.

Loss Function Comparisons:

1. Nodes=16, 3 Layers, BCE vs MSE with tanh:

- MSE: Started at 0.17, decreased to 0.12.

- BCE: Started at 0.4, fluctuated, and increased to 0.58.

2. Nodes=32, 3 Layers, BCE vs MSE with ReLU:

- MSE: Started at 0.15, decreased to around 0.13.

- BCE: Started at 0.5, fluctuated, and decreased to approximately 0.4.

3. Nodes=32, 3 Layers, BCE vs MSE with tanh:

- MSE: Started at 0.24, decreased to 0.1.

- BCE: Started at 0.4, decreased, then increased to 0.6.

4. Nodes=64, 3 Layers, ReLU with regularization:

- MSE: Started at 0.2, fluctuated, and decreased to 0.13.

- BCE: Started at 0.5, fluctuated, and increased to 0.7.

5. Nodes=64, 3 Layers, tanh with regularization:

- MSE: Started at 0.2, fluctuated, and decreased to around 0.1.

- BCE: Started at 0.5, fluctuated, and remained steady.

Validation and Training Accuracy:

- 16 Nodes, tanh: Validation 87%, Training 94%.

- 32 Nodes, tanh: Validation 87%, Training 95%.

- 64 Nodes, tanh: Validation 87%, Training 95%. Discrepancy suggests data-related issues; sampling might address this concern.

Test Accuracy:

- 64 Nodes, tanh: Test accuracy 88%, Loss 16.32.

- 64 Nodes, ReLU: Test accuracy 86%, Loss 21.25.

Optimizer Comparisons:

- Adam: Test accuracy 88%.

- RMSprop: Test accuracy 86%.

Conclusion:

The neural network with 64 hidden nodes, three layers, L2 regularization, and dropout consistently demonstrated superior performance in terms of validation and test accuracy while maintaining simplicity. The Adam optimizer outperformed RMSprop in this configuration. Further investigation into data-related issues is recommended to address discrepancies between training and validation accuracies.