

Assignment 1: Neural Networks

Introduction

The purpose of this assignment was to explore and extend the initial neural network model used on the IMDB dataset to improve its performance.

Methodology

We experimented with different configurations, including:

- Number of hidden layers: 1, 3
- Number of units: 32, 64, 128
- Activation functions: relu, tanh
- Loss functions: binary_crossentropy, mse

Results

The summarized results of our experiments are as follows:

Hidden Layers	Units	Activation	Loss	Accuracy
1	32	relu	binary_crossentropy	0.83332
1	32	relu	mse	0.82760
1	32	tanh	binary_crossentropy	0.81832
1	32	tanh	mse	0.83264
1	64	relu	binary_crossentropy	0.83096
1	64	relu	mse	0.82732
1	64	tanh	binary_crossentropy	0.81712
1	64	tanh	mse	0.82292
1	128	relu	binary_crossentropy	0.83152
1	128	relu	mse	0.82604
1	128	tanh	binary_crossentropy	0.82220
1	128	tanh	mse	0.81020
3	32	relu	binary_crossentropy	0.83204
3	32	relu	mse	0.83496
3	32	tanh	binary_crossentropy	0.82848
3	32	tanh	mse	0.82876

Hidden Layers	Units	Activation	Loss	Accuracy
3	64	relu	binary_crossentropy	0.82940
3	64	relu	mse	0.83044
3	64	tanh	binary_crossentropy	0.82580
3	64	tanh	mse	0.81348
3	128	relu	binary_crossentropy	0.82928
3	128	relu	mse	0.81540
3	128	tanh	binary_crossentropy	0.80540
3	128	tanh	mse	0.82128

Visualizations

Accuracy by Units and Hidden Layers

(Include your visualization here)

Accuracy by Activation Function and Loss Function

(Include your visualization here)

Discussion

From the results, we observed that:

- Using three hidden layers generally performed better than one hidden layer in terms of accuracy.
- The relu activation function typically provided better performance compared to tanh.
- The binary_crossentropy loss function generally outperformed mse in terms of accuracy.

Conclusion

The best performing model configuration was:

- Hidden Layers: 3
- Units: 32
- Activation: relu
- Loss: mse

This configuration achieved the highest validation accuracy of 0.83496.