

Backpropagation Report

CS_30

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Results

Activation Function	Train Accuracy	Test Accuracy	LR	Epochs	#Layers	#HiddenNodes
Sigmoid	100%	100%	0.01	5000	2	3, 4
Tanh	100%	100%	0.01	5000	1	5

Backpropagation

Choose Dataset Processing

Hyper-Parameters

Features: gender body_mass beak_length beak_depth fin_length

Classes: 3

Enter Learning Rate (eta): 0.01

Enter Number of Epochs (m): 5000

Layers 2

☒ Add Bias

Choose Activation:

☒ Sigmoid ☐ Tanh

neurons/hidden layer (if layers > 1 : type sperated by space) 3 4

Train Predict

Process Data->Original test Shape: (60, 5)

Train Accuracy: 100.0%

Test Accuracy: 100.0%

Backpropagation

Choose Dataset Processing

Hyper-Parameters

Features: gender body_mass beak_length beak_depth fin_length

Classes: 3

Enter Learning Rate (eta): 0.01

Enter Number of Epochs (m): 5000

Layers 1

☒ Add Bias

Choose Activation:

☐ Sigmoid ☒ Tanh

neurons/hidden layer (if layers > 1 : type sperated by space) 5

Train Predict

main x

Train Accuracy: 100.0%

Test Accuracy: 100.0%

Conclusion

Weight initialization is very important for training deep neural networks. In this study, we found that using `"0.6 * np.random.randn(self.hidden_size[0], self.input_size)"` instead of 0.01 for initializing weights improved the model's performance. Smaller weights can cause gradients to become too small during backpropagation, making it hard for the model to learn.

Using larger initial weights helps keep the gradients from shrinking, making training faster and improving accuracy. This shows that choosing the right weight initialization can make training more stable and effective.