

Project 4 Analysis

By: Abhinav Tirath

A. Q5 Analysis

Metrics	Pen Data	Car Data
Accuracy	0.9021154	0.8328532
Standard Deviation	0.006915931	0.007208124
Max Accuracy	0.908233	0.84555

Figure 1. Table that displays the accuracy, standard deviation, and maximum accuracy for the default parameters with the pen and car data.

Here, we see that both the average accuracy and maximum accuracy of the pen data are greater than those of the car data. This is likely because the training set for the pen data was much larger and allowed the neural network to learn the mapping of the input to output much better. The tradeoff, however, was that the neural network spent much longer on the pen data than the car data. Moreover, we observe that the standard deviation is very low for both datasets. This signifies that the local minima that our neural networks found are quite similar in performance to one another.

B. Q6 Analysis

a. Pen Data

Nodes in
Hidden Layer

Metrics	0	5	10	15	20	25	30	35	40
Accuracy	0	0.846140 652	0.8874 21384	0.8967 40995	0.9065 1801	0.9110 92053	0.9020 58319	0.8996 56947	0.8951 4008
Standard Deviation	0	0.006164 36	0.0101 17646	0.0055 79816	0.0049 01781	0.0214 55684	0.0027 69327	0.0073 6877	0.0065 62496
Max Accuracy	0	0.853916 524	0.9025 15723	0.9019 43968	0.9139 50829	0.9522 58433	0.9065 1801	0.9056 60377	0.9022 29846

Figure 2. Table that displays the accuracy, standard deviation, and maximum accuracy for the by varying the number of nodes in the hidden layer for the pen data.

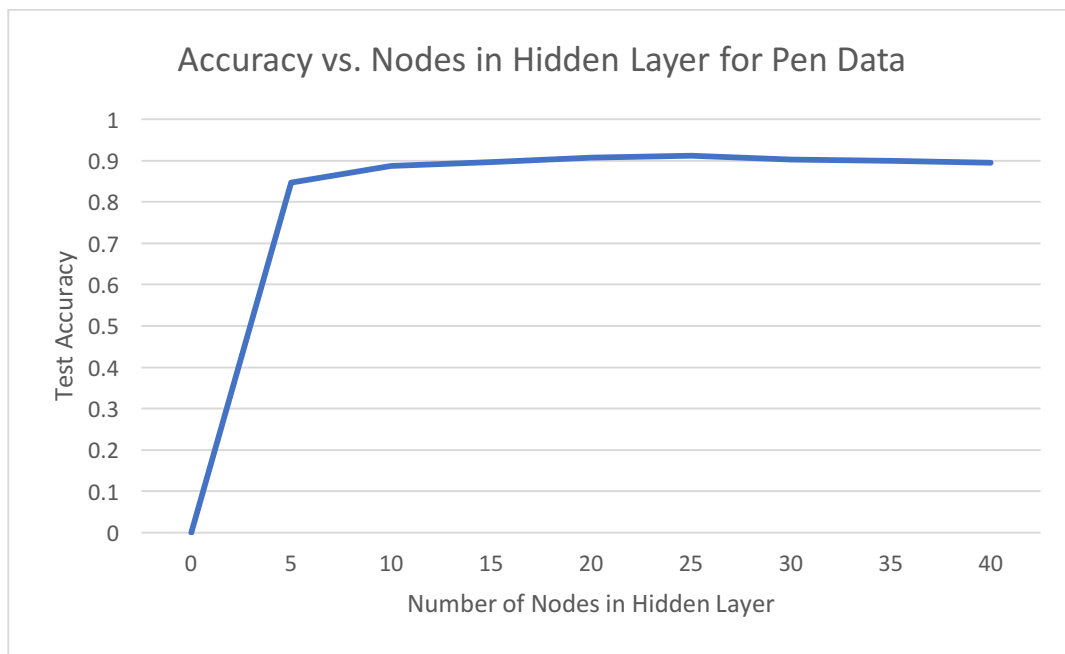


Figure 3. Displays the accuracy vs. the number of nodes in the hidden layer for the pen data.

b. Car Data

Nodes in
Hidden Layer

Metrics	0	5	10	15	20	25	30	35	40
Accuracy	0.703	0.8577	0.8477	0.8558	0.8435	0.8455	0.8439	0.8507	0.8345
Standard Deviation	0	0.0114	0.0159	0.0118	0.0119	0.0159	0.0068	0.0098	0.0140
Max Accuracy	0.703	0.8769	0.8789	0.8717	0.8612	0.8638	0.8520	0.8671	0.8520
	53403	22513	74869	90052	86387	49738	79058	8534	54974
		75109	58928	12057	7483	77167	08799	7331	20518
		63351	26702	27749	56545	74346	94241	46597	94241

Figure 4. Table that displays the accuracy, standard deviation, and maximum accuracy for the by varying the number of nodes in the hidden layer for the car data.

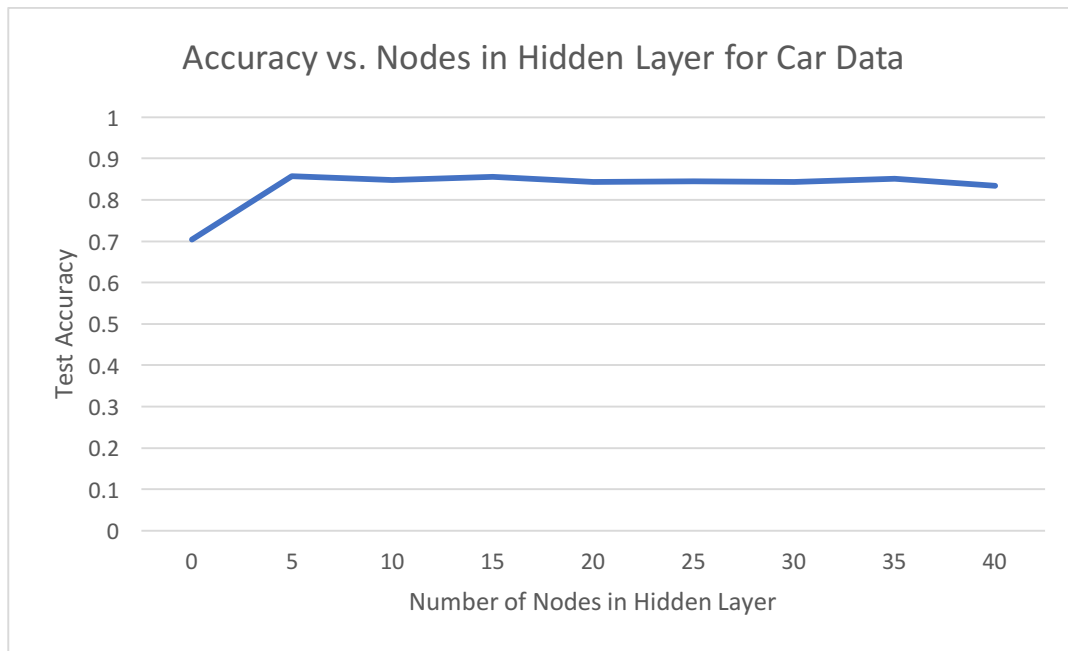


Figure 5. Displays the accuracy vs. the number of nodes in the hidden layer for the car data.

One thing that we notice immediately is that the average accuracy is 0 with 0 hidden nodes for the pen data. Clearly, without any hidden nodes, the neural network is unable to map the inputs to the large amount of outputs (10) well. However, since the car data has only binary output, the neural network with 0 hidden nodes for the car data performs much better. We also note that the standard deviation for both datasets with 0 hidden nodes is 0, signifying there is no

variation in output when you have 0 hidden nodes. Furthermore, from Figures 3 and 5, we see that the pen data converges with just 10 hidden nodes, and the pen data does the same with just 5 hidden nodes. After these points, the accuracy does not drastically increase, but the training time does.