

# Neural Net Report

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# Question 5: Learning With Restarts

## 1. testPenData:

- Max accuracy: 0.9065180102915952
- Average accuracy: 0.9000571755288738
- Standard deviation: 0.006188706290559077

## 2. testCarData:

- Max accuracy: 0.985
- Average accuracy: 0.982
- Standard deviation: 0.00400000000000000036

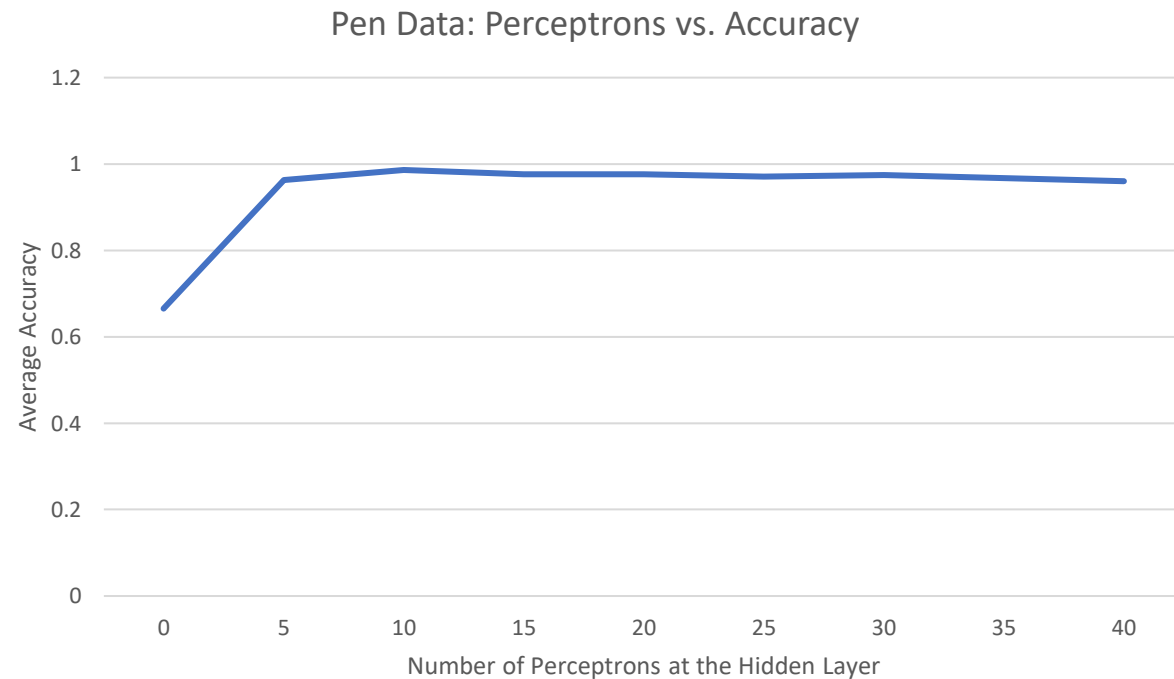
# Question 6: Varying the Hidden Layers

Statistic table for **testPenData** – report the max, average, and standard deviation at various amount of perceptrons.

	Number of Perceptrons at the Hidden Layer								
	0	5	10	15	20	25	30	35	40
Max Accuracy	0	0.8510 577472 841624	0.8896 512292 738707	0.9079 473985 134362	0.9085 191538 021726	0.9128 073184 676958	0.9088 050314 465409	0.9045 168667 810177	0.9056 603773 584906
Avg Accuracy	0	0.8352 773013 150372	0.8852 487135 506003	0.8993 138936 535162	0.9054 316752 429961	0.9022 870211 549456	0.9036 020583 190394	0.9004 574042 309892	0.9012 578616 3522
Standard Deviation	0	0.0113 308569 949139 07	0.0049 502254 595570 92	0.0068 022060 948955 65	0.0018 026166 690033 579	0.0077 248350 322550 77	0.0050 605995 685211 86	0.0053 799711 817942 79	0.0065 754344 050257 73

# Question 6: Varying the Hidden Layers

Create a learning curve for **testPenData** where the number of hidden layer perceptrons is the independent variable and the average accuracy is the dependent variable.



## Question 6: Varying the Hidden Layers

For **testPenData**, discuss any notable trends you saw related to increasing the size of the hidden layers in your neural net.

### **Answer:**

Increasing the size of the hidden layer increased the average accuracy of the neural networks output. The trend followed a logarithmic relationship, and the average accuracy plateaued around 10 perceptrons.

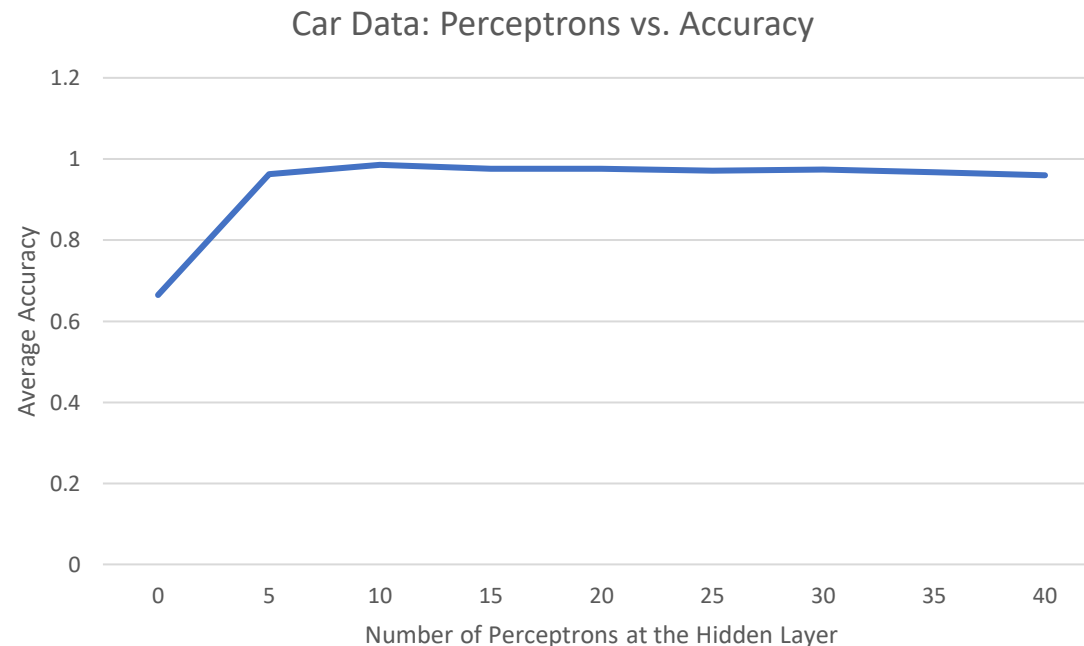
# Question 6: Varying the Hidden Layers

Statistic table for **testCarData** – report the max, average, and standard deviation at various amount of perceptrons.

	Number of Perceptrons at the Hidden Layer								
	0	5	10	15	20	25	30	35	40
Max Accuracy	0.665	0.97	0.995	0.98	0.985	0.985	0.995	0.98	0.975
Avg Accuracy	0.665	0.9629 999999 999999	0.986	0.976	0.976	0.9710 000000 000001	0.974	0.967	0.96
Standard Deviation	0.0	0.0067 823299 831252 74	0.0066 332495 807108 05	0.0037 416573 867739 447	0.0073 484692 283495 41	0.0096 953597 148326 66	0.0120 000000 000000 1	0.0116 619037 896906 11	0.0109 544511 501033 31

# Question 6: Varying the Hidden Layers

Create a learning curve for **testCarData** where the number of hidden layer perceptrons is the independent variable and the average accuracy is the dependent variable.



## Question 6: Varying the Hidden Layers

For **testCarData**, discuss any notable trends you saw related to increasing the size of the hidden layers in your neural net.

**Answer:** Once again, increasing the number of perceptrons increased the average accuracy. However this data was quick to plateau and also dropped a bit in accuracy as the number of perceptrons increased. Overall the neural net output data had a higher accuracy than the pen data.



# Question 7 (extra credit): Learning XOR

Report the max accuracy, average accuracy, and standard deviation of the neural net that you have trained with 1) no hidden layer, and 2) a hidden layer with various amount of perceptrons (at least 3 different amounts)

	No Hidden Layer	Hidden Layer		
		___ perceptrons	___ perceptrons	___ perceptrons
Max Accuracy				
Avg Accuracy				
Standard Deviation				

## Question 7 (extra credit): Learning XOR

Report the behavior of the trained neural net **without a hidden layer**.

Answer:

## Question 7 (extra credit): Learning XOR

Report the behavior of the trained neural net **with a hidden layer**. Are the results what you expected? Explain your observation.

Answer:

## Question 8 (extra credit): Novel Dataset

List the name and the source of the dataset that you've chosen.

- Name: \_\_\_\_\_
- Source (e.g., URLs): \_\_\_\_\_
- Briefly describe the dataset: \_\_\_\_\_

## Question 8 (extra credit): Run Stats

- Max accuracy: \_\_\_\_\_
- Average accuracy: \_\_\_\_\_
- Standard deviation: \_\_\_\_\_

## Question 8 (extra credit): Novel Dataset

Describe how to run the code that you've set up to train the selected dataset.

Answer: