Neural Net Report

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Question 5: Learning With Restarts

1. **testPenData**:
   - Max accuracy: 0.907375
   - Average accuracy: 0.904459
   - Standard deviation: 0.0023671
2. **testCarData**:
   - Max accuracy: 0.985346
   - Average accuracy: 0.9742773
   - Standard deviation: 0.007348

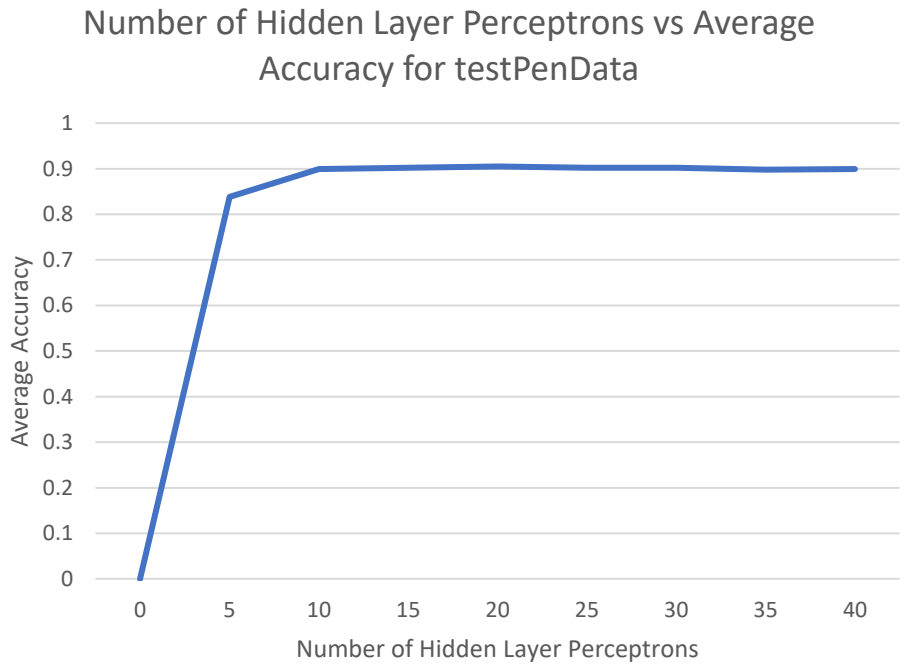
Question 6: Varying the Hidden Layers

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	0.8512	0.9185	0.9045	0.9093	0.9073	0.9059	0.9048	0.9051
Avg Accuracy	0.0	0.8381	0.8991	0.9021	0.9046	0.9022	0.9021	0.8981	0.8996
Standard Deviation	0.0	0.0084	0.0125	0.0018	0.0032	0.0083	0.0024	0.0069	0.0051

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: In the case of the testPenData, the enhancement in average accuracy for neural networks exhibits a substantial decline beyond 5 hidden layer perceptrons. There is minimal observable variance in average accuracy among networks with 10-40 perceptrons. Notably, the neural network failed to operate when with 0 perceptrons.

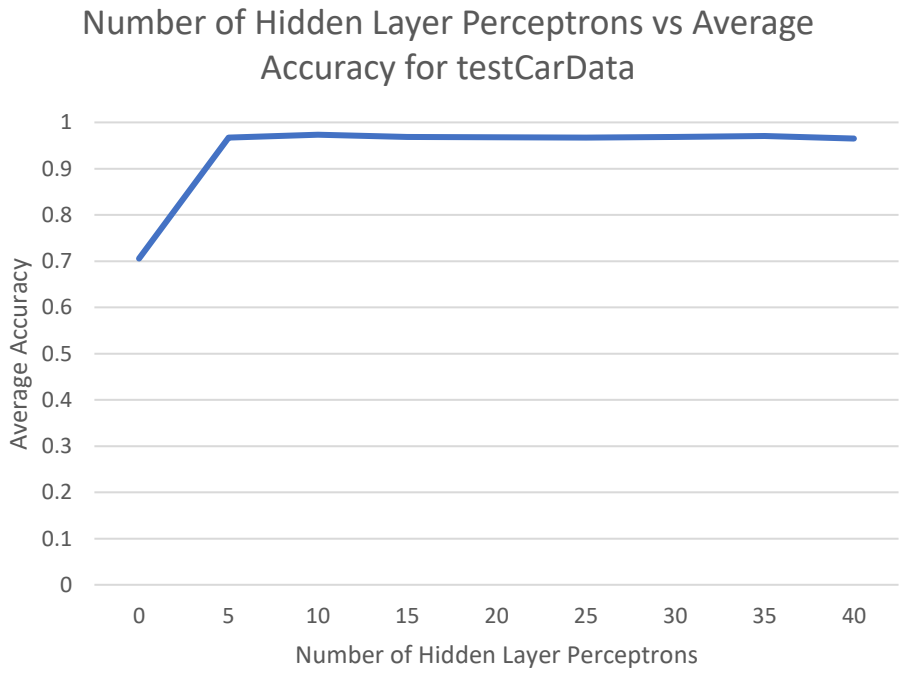
Question 6: Varying the Hidden Layers

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	0.7054	0.9852	0.9759	0.9861	0.9758	0.9732	0.9611	0.9757	0.9606
Avg Accuracy	0.7054	0.9671	0.9732	0.9687	0.9679	0.9675	0.9684	0.9709	0.9650
Standard Deviation	0.0	0.0120	0.0044	0.0067	0.0040	0.0024	0.0016	0.0020	0.0063

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: In the evaluation of testCarData, the improvement in average accuracy for neural networks shows a decreasing impact beyond 5 hidden layer perceptrons. There is minimal noticeable distinction in average accuracy across networks employing 5-40 perceptrons and the average accuracy exhibited a slight downward trend with an increase in the number of perceptrons. Lastly, with 0 hidden layer perceptrons, the network still achieved a 70% accuracy rate.

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: