Neural Net Report

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Question 5: Learning With Restarts

1. **testPenData**:
   - Max accuracy: 0.9116638078902229
   - Average accuracy: 0.9069182389937108
   - Standard deviation: 0.0028792860633537064
2. **testCarData**:
   - Max accuracy: 0.995
   - Average accuracy: 0.9890000000000001
   - Standard deviation: 0.0037416573867739447

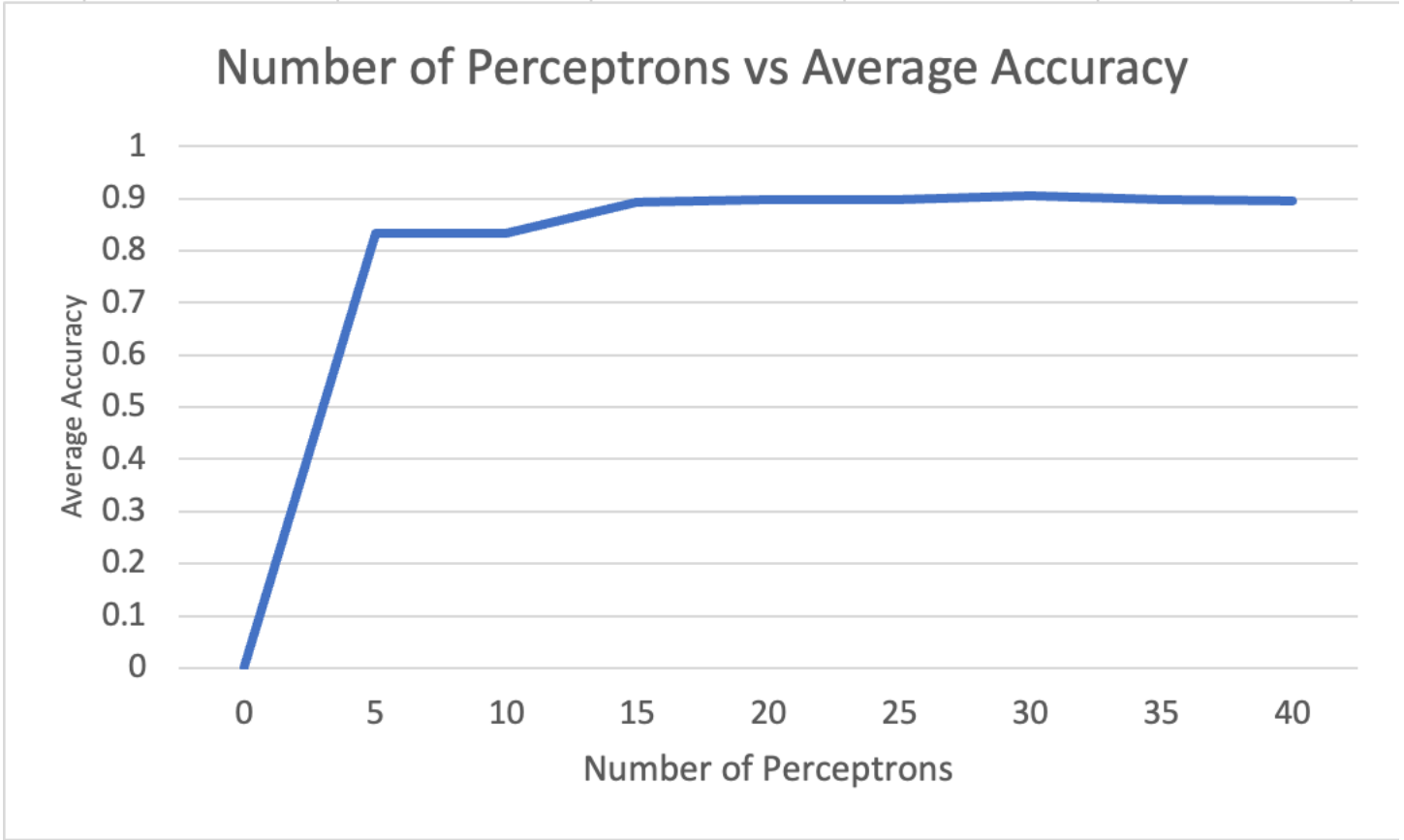
Question 6: Varying the Hidden Layers

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	0.8461978273299028	0.9010863350485993	0.9065180102915952	0.9045168667810177	0.9093767867352773	0.906232132647227	0.9045168667810177	0.9056603773584906
Avg Accuracy	0	0.8331046312178387	0.8331046312178387	0.8926815323041739	0.8986277873070326	0.898399085191538	0.9041166380789022	0.8986277873070326	0.8955403087478558
Standard Deviation	0	0.0169112031436464 7	0.0169112031436464 7	0.0065380411018514 87	0.0074867201586917 105	0.0054888507718696 49	0.0017304455060516 543	0.0059352495242360 03	0.0078157086711066 09

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: Some trends that I noticed were that there was a huge spike in average accuracy from 0 to 5 perceptrons but after that, there was very little improvement in average accuracy.

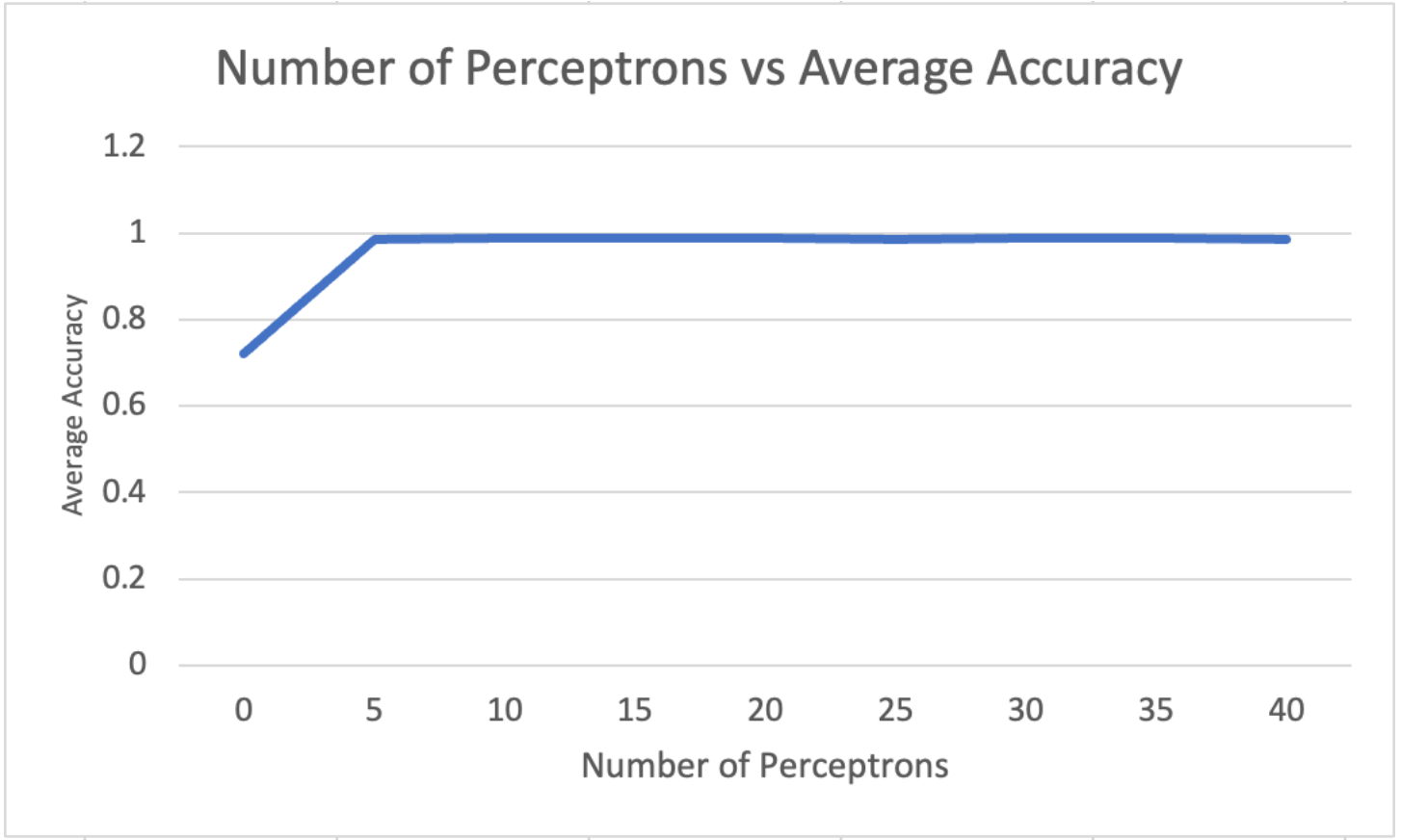
Question 6: Varying the Hidden Layers

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	0.72	0.995	0.995	0.99	0.995	0.99	0.995	0.99	0.985
Avg Accuracy	0.72	0.984	0.9879999999999999	0.9869999999999999	0.9880000000000001	0.985	0.9880000000000001	0.9879999999999999	0.985
Standard Deviation	0	0.01019803902718558	0.00509901951359279	0.00244948974278318	0.00509901951359279	0.00774596692414842	0.00400000000000036	0.00244948974278318	0

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: Some trends I noticed were that the biggest spike in average accuracy was from 0 to 5 perceptrons, but again there was very little noticeable change in average accuracy after that. At some points, the accuracy actually started to drop down a little bit.

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		
		5 perceptrons	10 perceptrons	20 perceptrons
Max Accuracy	0.5	0.75	0.5	1
Avg Accuracy	0.1	0.45	0.4	0.5
Standard Deviation	0.2	0.2915475947422 6505	0.1224744871391 589	0.2738612787525 8304

Question 7 (extra credit): Learning XOR

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

Answer: At 0 perceptrons, the average accuracy is 10%, the max accuracy is 50%, and the standard deviation is 0.2. These were all very clean numbers.

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: As the number of perceptrons increased, so too did the average accuracy. The accuracy does eventually reach 100%. But when the learning rate is increased, the number of perceptrons actually reduces.

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: