# Neural Net Report

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# Question 5: Learning With Restarts

1. **testPenData**:
   - Max accuracy: 0.9077
   - Average accuracy: 0.9050
   - Standard deviation: 0.0026
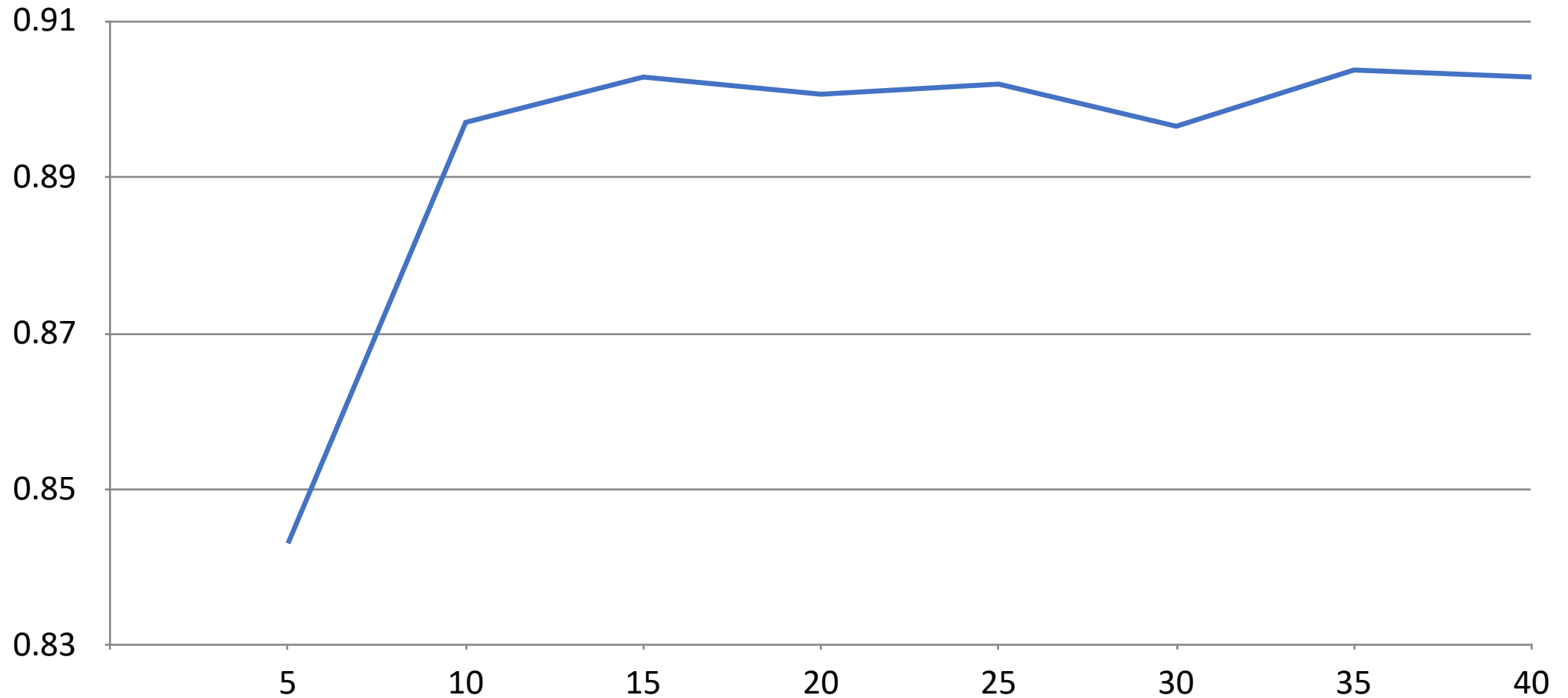
2. **testCarData**:
   - Max accuracy: 0.9900
   - Average accuracy: 0.9800
   - Standard deviation: 0.0083

# 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 | 0.8556 | 0.9348 | 0.9039 | 0.9079 | 0.9085 | 0.9059 | 0.9045 | 0.9054 |
| Avg Accuracy | 0 | 0.8431 | 0.8970 | 0.9028 | 0.9006 | 0.9019 | 0.8965 | 0.9037 | 0.9028 |
| Standard Deviation | 0 | 0.0073 | 0.0199 | 0.0009 | 0.0058 | 0.0072 | 0.0075 | 0.0009 | 0.0024 |

Question 6: Varying the Hidden Layers

# 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:**

**There is a maximum cap for the effectiveness of increasing the hidden layers and after a while (as fast as 15) the difference was not very noticeable.**
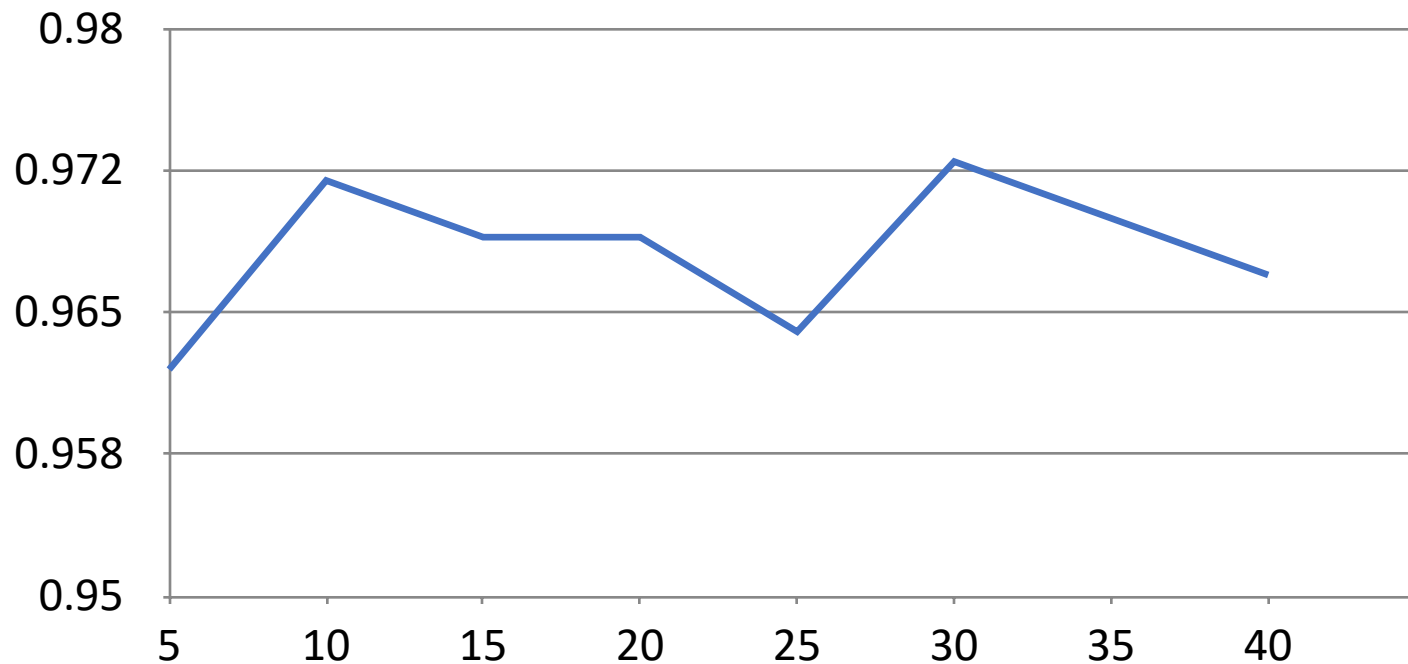
# Question 6: Varying the Hidden Layers

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 | 0.6550 | 0.9750 | 0.9800 | 0.9750 | 0.9750 | 0.9700 | 0.9750 | 0.9800 | 0.9750 |
| Avg Accuracy | 0.6550 | 0.9620 | 0.9720 | 0.9690 | 0.9690 | 0.9640 | 0.9730 | 0.9700 | 0.9670 |
| Standard Deviation | 0.0000 | 0.0093 | 0.0051 | 0.0049 | 0.0058 | 0.0049 | 0.0040 | 0.0083 | 0.0051 |

# 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:**

**The seems to be no strong correlation between the two. The averages shift too radically in both directions over the span of sizes to see any real trend.**

# 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: