Question 5)

Car Data:

Max Accuracy = .985

Average Accuracy = .975

Standard Deviation = 0.007905694150420955

Pen Data:

Max Accuracy = 0.907662

Average Accuracy = 0.9040024

Standard Deviation = 0.004198681793134571

Question 6)

Pen Data

|  |  |  |  |
| --- | --- | --- | --- |
| Number of Perceptrons | Max Accuracy | Average Accuracy | Standard Deviation |
| 0 | 0 | 0 | 0 |
| 5 | 0.8459119496855346 | 0.8329331046312178 | 0.009631319240363902 |
| 10 | 0.8962264150943396 | 0.8838765008576329 | 0.008563741476821606 |
| 15 | 0.9048027444253859 | 0.8974842767295599 | 0.008548841025301597 |
| 20 | 0.906232132647227 | 0.8992567181246425 | 0.007062045812072973 |
| 25 | 0.907661520869068 | 0.9026300743281876 | 0.0048602562692632014 |
| 30 | 0.906232132647227 | 0.9045168667810177 | 0.0018526988846220107 |
| 35 | 0.906232132647227 | 0.9040022870211549 | 0.003369962728025452 |
| 40 | 0.9082332761578045 | 0.9021726700971984 | 0.007148999131932111 |

Car Data

|  |  |  |  |
| --- | --- | --- | --- |
| Number of Perceptrons | Max Accuracy | Average Accuracy | Standard Deviation |
| 0 | 0.645 | 0.645 | 0 |
| 5 | 0.96 | 0.9570000000000001 | 0.0040000000000000036 |
| 10 | 0.98 | 0.9720000000000001 | 0.00509901951359279 |
| 15 | 0.955 | 0.952 | 0.0040000000000000036 |
| 20 | 0.97 | 0.96 | 0.00836660026534076 |
| 25 | 0.965 | 0.959 | 0.0037416573867739447 |
| 30 | 0.965 | 0.961 | 0.0037416573867739447 |
| 35 | 0.96 | 0.953 | 0.0040000000000000036 |
| 40 | 0.965 | 0.954 | 0.0040000000000000036 |

Generally, increasing the size of the hidden layer helps at lower numbers of perceptrons, but then plateaus as we add more. For the pen data, we plateau around 15 perceptrons. For the car data, we plateau around 5 perceptrons. Adding more layers at this point is not necessary and only increases complexity and training time while not making our accuracy any better.