CS5600 HW03

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Problem 3

Table 1: Training ANNs with 1 Hidden Layer on MNIST; mini batch = 10, num epochs=10

eta/HLS	10	25	50
$\eta = 0.5$	90.41%	92.23%	84.18%
$\eta = 0.25$	88.57%	91.78%	83.15%
$\eta = 0.125$	85.56%	89.33%	81.01%

Table 2: Training ANNs with 2 Hidden Layers on MNIST; h1=10; mini batch = 10, num epochs=10

eta/HLS	10	25	50
$\eta = 0.5$	91.03%	91.10%	91.01%
$\eta = 0.25$	87.78%	88.61%	89.89%
$\eta = 0.125$	82.86%	86.34%	86.60%

Table 3: Training ANNs with 2 Hidden Layers on MNIST; h1=25; mini batch = 10, num epochs=10

eta/HLS	10	25	50
$\eta = 0.5$	92.08%	92.77 %	93.09 %
$\eta = 0.25$	89.73 %	91.35 %	91.66 %
$\eta = 0.125$	84.15 %	88.33 %	82.50 %

Table 4: Training ANNs with 2 Hidden Layers on MNIST; h1=50; mini batch = 10, num epochs=10

eta/HLS	10	25	50
$\eta = 0.5$	92.68%	93.08 %	84.10%
$\eta = 0.25$	91.11 %	91.88 %	91.98 %
$\eta = 0.125$	86.54 %	89.05 %	90.04 %

Discussion   On the network with 1 hidden layer, the accuracy decreased as the number of neurons increased. As the learning rate got faster, the accuracy also decreased. The networks with 2 hidden layers generally had a decrease in accuracy as the learning rate got faster. An interesting observation is that on the 10x50x50x10 network, the accuracy was the worst when $\eta = 0.5$. This kind of broke the trend a bit. Generally, as the number of neurons increased and the learning rate increased or got faster, the accuracy of the network decreased.