

## PRINTOUTS

Question 1(b).

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accuracy: 0.7818

precision: 0.761270801815

recall: 0.5032

Question 1(c).

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accuracy: 0.8178

precision: 0.77241047825

recall: 0.6428

Question 1(d).

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accuracy: 0.822

precision: 0.755819060167

recall: 0.6884

Question 1(e).

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accuracy: 0.821666666667

precision: 0.759312960071

recall: 0.6808

Question 3(a).

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validation accuracy of trained net 1: 0.9369

validation accuracy of trained net 2: 0.9249

validation accuracy of trained net 3: 0.9261

validation accuracy of trained net 4: 0.9256  
validation accuracy of trained net 5: 0.9264  
validation accuracy of trained net 6: 0.9289  
validation accuracy of trained net 7: 0.9301  
validation accuracy of trained net 8: 0.9292  
validation accuracy of trained net 9: 0.9287  
validation accuracy of trained net 10: 0.9331

maximum validation accuracy: 0.9369  
test accuracy: 0.9425  
cross entropy: 271.741386392  
learning rate used: 1.0

Question 3(b).

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validation accuracy of trained net 1: 0.7972  
validation accuracy of trained net 2: 0.7992  
validation accuracy of trained net 3: 0.8012  
validation accuracy of trained net 4: 0.797  
validation accuracy of trained net 5: 0.7894  
validation accuracy of trained net 6: 0.7995  
validation accuracy of trained net 7: 0.8001  
validation accuracy of trained net 8: 0.8009  
validation accuracy of trained net 9: 0.795  
validation accuracy of trained net 10: 0.7955

maximum validation accuracy: 0.8012  
test accuracy: 0.8108  
cross entropy: 8104.27189644  
learning rate used: 1.0

Question 3(c).

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training accuracy (after 50 iterations): 0.9339

test accuracy (after 50 iterations): 0.9177

cross entropy (after 50 iterations): 2309.19289926

training accuracy (after 200 iterations): 0.9841

test accuracy (after 200 iterations): 0.9385

cross entropy (after 200 iterations): 775.079204549

Question 3(d).

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validation accuracy of trained net 1: 0.7081

validation accuracy of trained net 2: 0.6589

validation accuracy of trained net 3: 0.6926

validation accuracy of trained net 4: 0.7134

validation accuracy of trained net 5: 0.6832

validation accuracy of trained net 6: 0.6654

validation accuracy of trained net 7: 0.6122

validation accuracy of trained net 8: 0.645

validation accuracy of trained net 9: 0.679

validation accuracy of trained net 10: 0.7394

maximum validation accuracy: 0.7394

test accuracy: 0.7545

cross entropy: 7831.50794389

learning rate used: 1.0

Question 3(e).

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validation accuracy of trained net 1: 0.837  
validation accuracy of trained net 2: 0.8291  
validation accuracy of trained net 3: 0.8273  
validation accuracy of trained net 4: 0.8257  
validation accuracy of trained net 5: 0.8206  
validation accuracy of trained net 6: 0.8358  
validation accuracy of trained net 7: 0.8199  
validation accuracy of trained net 8: 0.8461  
validation accuracy of trained net 9: 0.8154  
validation accuracy of trained net 10: 0.8418

maximum validation accuracy: 0.8461  
test accuracy: 0.8615  
cross entropy: 4721.85609366  
learning rate used: 1.0

Question 3(f).

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test accuracy after epoch #1 is : 0.8676  
test accuracy after epoch #10 is : 0.8917  
test accuracy after epoch #20 is : 0.9068  
test accuracy after epoch #30 is : 0.913  
test accuracy after epoch #40 is : 0.918  
test accuracy after epoch #50 is : 0.9221  
test accuracy after epoch #60 is : 0.9226  
test accuracy after epoch #70 is : 0.9184  
test accuracy after epoch #80 is : 0.9223  
test accuracy after epoch #90 is : 0.9238  
test accuracy after epoch #100 is : 0.9258

final train accuracy: 0.929816666667

final test accuracy: 0.9258

final cross entropy: 2481.34892728

Question 3(g).

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test accuracy after epoch #1 is : 0.1867

test accuracy after epoch #10 is : 0.4271

test accuracy after epoch #20 is : 0.5909

test accuracy after epoch #30 is : 0.7218

test accuracy after epoch #40 is : 0.7098

test accuracy after epoch #50 is : 0.753

test accuracy after epoch #60 is : 0.7729

test accuracy after epoch #70 is : 0.7869

test accuracy after epoch #80 is : 0.8009

test accuracy after epoch #90 is : 0.8171

test accuracy after epoch #100 is : 0.8348

final train accuracy: 0.830766666667

final test accuracy: 0.8348

final cross entropy: 5809.24916712