week_1_solution_13

March 15, 2018

```
In [2]: import mnist_loader
        import numpy as np
        import pandas as pd

        training_data, validation_data, test_data = mnist_loader.load_data_wrapper()
        print("Training data, validation data and test data loaded.")
```

Training data, validation data and test data loaded.

```
In [3]: print("13. Repeat 12 for a deep network with two hidden layers, with 30 neuron in each
```

13. Repeat 12 for a deep network with two hidden layers, with 30 neuron in each.

```
In [5]: import network2
        net2_all_train = network2.Network([784, 30, 30, 10], cost=network2.CrossEntropyCost)
        net2_all_train.large_weight_initializer()

        epochs = 400

        evaluation_cost_all_train, evaluation_accuracy_all_train, training_cost_all_train, trai
            training_data,
            epochs,
            10,
            0.5,
            evaluation_data=test_data,
            lmbda=5.0,
            monitor_evaluation_cost=True,
            monitor_evaluation_accuracy=True,
            monitor_training_cost=True,
            monitor_training_accuracy=True
        )
```

Epoch 0 training complete
Cost on training data: 1.32221800774
Accuracy on training data: 45769 / 50000
Cost on evaluation data: 4.49026165537

```
Accuracy on evaluation data: 9188 / 10000

Epoch 1 training complete
Cost on training data: 0.95114024397
Accuracy on training data: 46678 / 50000
Cost on evaluation data: 3.10866726151
Accuracy on evaluation data: 9331 / 10000

Epoch 2 training complete
Cost on training data: 0.703653926467
Accuracy on training data: 47586 / 50000
Cost on evaluation data: 2.28468588117
Accuracy on evaluation data: 9419 / 10000

Epoch 3 training complete
Cost on training data: 0.610544002164
Accuracy on training data: 47559 / 50000
Cost on evaluation data: 1.82264665944
Accuracy on evaluation data: 9432 / 10000

Epoch 4 training complete
Cost on training data: 0.529902280075
Accuracy on training data: 47791 / 50000
Cost on evaluation data: 1.53200522981
Accuracy on evaluation data: 9485 / 10000

Epoch 5 training complete
Cost on training data: 0.461520124785
Accuracy on training data: 48112 / 50000
Cost on evaluation data: 1.35085443574
Accuracy on evaluation data: 9524 / 10000

Epoch 6 training complete
Cost on training data: 0.481431462824
Accuracy on training data: 47845 / 50000
Cost on evaluation data: 1.30574861403
Accuracy on evaluation data: 9465 / 10000

Epoch 7 training complete
Cost on training data: 0.439734948895
Accuracy on training data: 48006 / 50000
Cost on evaluation data: 1.21605575003
Accuracy on evaluation data: 9530 / 10000

Epoch 8 training complete
Cost on training data: 0.409268592373
Accuracy on training data: 48313 / 50000
Cost on evaluation data: 1.1562868553
```

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Accuracy on evaluation data: 9580 / 10000

Epoch 9 training complete
Cost on training data: 0.403858467397
Accuracy on training data: 48273 / 50000
Cost on evaluation data: 1.14835804175
Accuracy on evaluation data: 9572 / 10000

Epoch 10 training complete
Cost on training data: 0.38217714905
Accuracy on training data: 48397 / 50000
Cost on evaluation data: 1.11778456491
Accuracy on evaluation data: 9591 / 10000

Epoch 11 training complete
Cost on training data: 0.409327844266
Accuracy on training data: 48154 / 50000
Cost on evaluation data: 1.13916499873
Accuracy on evaluation data: 9554 / 10000

Epoch 12 training complete
Cost on training data: 0.472786960778
Accuracy on training data: 47604 / 50000
Cost on evaluation data: 1.20841199341
Accuracy on evaluation data: 9441 / 10000

Epoch 13 training complete
Cost on training data: 0.387396410092
Accuracy on training data: 48355 / 50000
Cost on evaluation data: 1.10685326394
Accuracy on evaluation data: 9579 / 10000

Epoch 14 training complete
Cost on training data: 0.386721681747
Accuracy on training data: 48363 / 50000
Cost on evaluation data: 1.10895746946
Accuracy on evaluation data: 9599 / 10000

Epoch 15 training complete
Cost on training data: 0.394075652408
Accuracy on training data: 48277 / 50000
Cost on evaluation data: 1.12888150918
Accuracy on evaluation data: 9549 / 10000

Epoch 16 training complete
Cost on training data: 0.40687553358
Accuracy on training data: 48179 / 50000
Cost on evaluation data: 1.12162263624
```

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Accuracy on evaluation data: 9556 / 10000

Epoch 17 training complete
Cost on training data: 0.436259761092
Accuracy on training data: 47836 / 50000
Cost on evaluation data: 1.15325904146
Accuracy on evaluation data: 9482 / 10000

Epoch 18 training complete
Cost on training data: 0.387562144153
Accuracy on training data: 48378 / 50000
Cost on evaluation data: 1.0942802406
Accuracy on evaluation data: 9603 / 10000

Epoch 19 training complete
Cost on training data: 0.412090911431
Accuracy on training data: 48077 / 50000
Cost on evaluation data: 1.12871344784
Accuracy on evaluation data: 9523 / 10000

Epoch 20 training complete
Cost on training data: 0.383678819839
Accuracy on training data: 48358 / 50000
Cost on evaluation data: 1.10361305092
Accuracy on evaluation data: 9588 / 10000

Epoch 21 training complete
Cost on training data: 0.394725239772
Accuracy on training data: 48280 / 50000
Cost on evaluation data: 1.13166915245
Accuracy on evaluation data: 9530 / 10000

Epoch 22 training complete
Cost on training data: 0.423056953406
Accuracy on training data: 48060 / 50000
Cost on evaluation data: 1.13742744109
Accuracy on evaluation data: 9529 / 10000

Epoch 23 training complete
Cost on training data: 0.410488076481
Accuracy on training data: 48136 / 50000
Cost on evaluation data: 1.12746287213
Accuracy on evaluation data: 9568 / 10000

Epoch 24 training complete
Cost on training data: 0.373272529725
Accuracy on training data: 48413 / 50000
Cost on evaluation data: 1.10227899786
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Accuracy on evaluation data: 9584 / 10000

Epoch 25 training complete
Cost on training data: 0.382706343173
Accuracy on training data: 48386 / 50000
Cost on evaluation data: 1.11600266313
Accuracy on evaluation data: 9570 / 10000

Epoch 26 training complete
Cost on training data: 0.405077823548
Accuracy on training data: 48283 / 50000
Cost on evaluation data: 1.13396682567
Accuracy on evaluation data: 9541 / 10000

Epoch 27 training complete
Cost on training data: 0.405952138076
Accuracy on training data: 48149 / 50000
Cost on evaluation data: 1.13308089301
Accuracy on evaluation data: 9548 / 10000

Epoch 28 training complete
Cost on training data: 0.366280661975
Accuracy on training data: 48578 / 50000
Cost on evaluation data: 1.10125767989
Accuracy on evaluation data: 9596 / 10000

Epoch 29 training complete
Cost on training data: 0.359640637601
Accuracy on training data: 48635 / 50000
Cost on evaluation data: 1.08728241182
Accuracy on evaluation data: 9629 / 10000

Epoch 30 training complete
Cost on training data: 0.401439450098
Accuracy on training data: 48193 / 50000
Cost on evaluation data: 1.11431956843
Accuracy on evaluation data: 9554 / 10000

Epoch 31 training complete
Cost on training data: 0.375875954392
Accuracy on training data: 48400 / 50000
Cost on evaluation data: 1.09803654772
Accuracy on evaluation data: 9579 / 10000

Epoch 32 training complete
Cost on training data: 0.358196332801
Accuracy on training data: 48508 / 50000
Cost on evaluation data: 1.08472907102
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Accuracy on evaluation data: 9621 / 10000

Epoch 33 training complete
Cost on training data: 0.426370251522
Accuracy on training data: 47945 / 50000
Cost on evaluation data: 1.14375706048
Accuracy on evaluation data: 9492 / 10000

Epoch 34 training complete
Cost on training data: 0.377138575253
Accuracy on training data: 48478 / 50000
Cost on evaluation data: 1.11054183391
Accuracy on evaluation data: 9583 / 10000

Epoch 35 training complete
Cost on training data: 0.403388538801
Accuracy on training data: 48132 / 50000
Cost on evaluation data: 1.13002218766
Accuracy on evaluation data: 9529 / 10000

Epoch 36 training complete
Cost on training data: 0.36668063314
Accuracy on training data: 48520 / 50000
Cost on evaluation data: 1.09968456765
Accuracy on evaluation data: 9582 / 10000

Epoch 37 training complete
Cost on training data: 0.371988392202
Accuracy on training data: 48473 / 50000
Cost on evaluation data: 1.084824155
Accuracy on evaluation data: 9626 / 10000

Epoch 38 training complete
Cost on training data: 0.376786783032
Accuracy on training data: 48420 / 50000
Cost on evaluation data: 1.09829617323
Accuracy on evaluation data: 9587 / 10000

Epoch 39 training complete
Cost on training data: 0.397979390229
Accuracy on training data: 48252 / 50000
Cost on evaluation data: 1.12924793785
Accuracy on evaluation data: 9539 / 10000

Epoch 40 training complete
Cost on training data: 0.386638274406
Accuracy on training data: 48370 / 50000
Cost on evaluation data: 1.11046921796
```

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Accuracy on evaluation data: 9598 / 10000

Epoch 41 training complete
Cost on training data: 0.380669539547
Accuracy on training data: 48376 / 50000
Cost on evaluation data: 1.10321878245
Accuracy on evaluation data: 9610 / 10000

Epoch 42 training complete
Cost on training data: 0.384395205827
Accuracy on training data: 48408 / 50000
Cost on evaluation data: 1.11568198347
Accuracy on evaluation data: 9586 / 10000

Epoch 43 training complete
Cost on training data: 0.381334340332
Accuracy on training data: 48370 / 50000
Cost on evaluation data: 1.10913298865
Accuracy on evaluation data: 9599 / 10000

Epoch 44 training complete
Cost on training data: 0.386648420156
Accuracy on training data: 48322 / 50000
Cost on evaluation data: 1.11486601125
Accuracy on evaluation data: 9577 / 10000

Epoch 45 training complete
Cost on training data: 0.368285500224
Accuracy on training data: 48481 / 50000
Cost on evaluation data: 1.0974279752
Accuracy on evaluation data: 9622 / 10000

Epoch 46 training complete
Cost on training data: 0.371561599382
Accuracy on training data: 48496 / 50000
Cost on evaluation data: 1.10364705298
Accuracy on evaluation data: 9583 / 10000

Epoch 47 training complete
Cost on training data: 0.382891055303
Accuracy on training data: 48435 / 50000
Cost on evaluation data: 1.10250833701
Accuracy on evaluation data: 9608 / 10000

Epoch 48 training complete
Cost on training data: 0.346832480003
Accuracy on training data: 48648 / 50000
Cost on evaluation data: 1.07328304995
```

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Accuracy on evaluation data: 9628 / 10000

Epoch 49 training complete
Cost on training data: 0.39411639961
Accuracy on training data: 48232 / 50000
Cost on evaluation data: 1.11542798791
Accuracy on evaluation data: 9556 / 10000

Epoch 50 training complete
Cost on training data: 0.40228665181
Accuracy on training data: 48149 / 50000
Cost on evaluation data: 1.1248923583
Accuracy on evaluation data: 9555 / 10000

Epoch 51 training complete
Cost on training data: 0.393436943284
Accuracy on training data: 48272 / 50000
Cost on evaluation data: 1.11235889655
Accuracy on evaluation data: 9564 / 10000

Epoch 52 training complete
Cost on training data: 0.380163247693
Accuracy on training data: 48437 / 50000
Cost on evaluation data: 1.08959030951
Accuracy on evaluation data: 9596 / 10000

Epoch 53 training complete
Cost on training data: 0.356742082208
Accuracy on training data: 48614 / 50000
Cost on evaluation data: 1.07567438553
Accuracy on evaluation data: 9655 / 10000

Epoch 54 training complete
Cost on training data: 0.462746011689
Accuracy on training data: 47583 / 50000
Cost on evaluation data: 1.17777996189
Accuracy on evaluation data: 9430 / 10000

Epoch 55 training complete
Cost on training data: 0.35611931148
Accuracy on training data: 48681 / 50000
Cost on evaluation data: 1.08321679964
Accuracy on evaluation data: 9628 / 10000

Epoch 56 training complete
Cost on training data: 0.376373400727
Accuracy on training data: 48365 / 50000
Cost on evaluation data: 1.10646659817
```

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Accuracy on evaluation data: 9595 / 10000

Epoch 57 training complete
Cost on training data: 0.356483658989
Accuracy on training data: 48600 / 50000
Cost on evaluation data: 1.06957309982
Accuracy on evaluation data: 9635 / 10000

Epoch 58 training complete
Cost on training data: 0.352021007669
Accuracy on training data: 48681 / 50000
Cost on evaluation data: 1.07197855716
Accuracy on evaluation data: 9623 / 10000

Epoch 59 training complete
Cost on training data: 0.359460629489
Accuracy on training data: 48593 / 50000
Cost on evaluation data: 1.07693309276
Accuracy on evaluation data: 9617 / 10000

Epoch 60 training complete
Cost on training data: 0.338315778275
Accuracy on training data: 48769 / 50000
Cost on evaluation data: 1.06574752832
Accuracy on evaluation data: 9659 / 10000

Epoch 61 training complete
Cost on training data: 0.356922487464
Accuracy on training data: 48626 / 50000
Cost on evaluation data: 1.08264637044
Accuracy on evaluation data: 9623 / 10000

Epoch 62 training complete
Cost on training data: 0.379646983118
Accuracy on training data: 48448 / 50000
Cost on evaluation data: 1.10328569889
Accuracy on evaluation data: 9594 / 10000

Epoch 63 training complete
Cost on training data: 0.347814835184
Accuracy on training data: 48692 / 50000
Cost on evaluation data: 1.0681374148
Accuracy on evaluation data: 9629 / 10000

Epoch 64 training complete
Cost on training data: 0.402477159927
Accuracy on training data: 48224 / 50000
Cost on evaluation data: 1.11967112131
```

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Accuracy on evaluation data: 9551 / 10000

Epoch 65 training complete
Cost on training data: 0.346012010292
Accuracy on training data: 48669 / 50000
Cost on evaluation data: 1.07527967129
Accuracy on evaluation data: 9623 / 10000

Epoch 66 training complete
Cost on training data: 0.352500562295
Accuracy on training data: 48600 / 50000
Cost on evaluation data: 1.08400406392
Accuracy on evaluation data: 9595 / 10000

Epoch 67 training complete
Cost on training data: 0.360389428112
Accuracy on training data: 48575 / 50000
Cost on evaluation data: 1.08045340143
Accuracy on evaluation data: 9633 / 10000

Epoch 68 training complete
Cost on training data: 0.364614490374
Accuracy on training data: 48521 / 50000
Cost on evaluation data: 1.09652493964
Accuracy on evaluation data: 9588 / 10000

Epoch 69 training complete
Cost on training data: 0.357680927996
Accuracy on training data: 48543 / 50000
Cost on evaluation data: 1.09479855631
Accuracy on evaluation data: 9622 / 10000

Epoch 70 training complete
Cost on training data: 0.356450812479
Accuracy on training data: 48596 / 50000
Cost on evaluation data: 1.08721162695
Accuracy on evaluation data: 9596 / 10000

Epoch 71 training complete
Cost on training data: 0.347739170063
Accuracy on training data: 48654 / 50000
Cost on evaluation data: 1.07390724313
Accuracy on evaluation data: 9625 / 10000

Epoch 72 training complete
Cost on training data: 0.361942187696
Accuracy on training data: 48570 / 50000
Cost on evaluation data: 1.08881821418
```

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Accuracy on evaluation data: 9602 / 10000

Epoch 73 training complete
Cost on training data: 0.353325079435
Accuracy on training data: 48564 / 50000
Cost on evaluation data: 1.07242074061
Accuracy on evaluation data: 9618 / 10000

Epoch 74 training complete
Cost on training data: 0.402355072725
Accuracy on training data: 48226 / 50000
Cost on evaluation data: 1.11007145819
Accuracy on evaluation data: 9564 / 10000

Epoch 75 training complete
Cost on training data: 0.36342417651
Accuracy on training data: 48539 / 50000
Cost on evaluation data: 1.08137889871
Accuracy on evaluation data: 9604 / 10000

Epoch 76 training complete
Cost on training data: 0.354566200396
Accuracy on training data: 48592 / 50000
Cost on evaluation data: 1.06818972786
Accuracy on evaluation data: 9626 / 10000

Epoch 77 training complete
Cost on training data: 0.348644751825
Accuracy on training data: 48705 / 50000
Cost on evaluation data: 1.07836137946
Accuracy on evaluation data: 9638 / 10000

Epoch 78 training complete
Cost on training data: 0.359057785949
Accuracy on training data: 48568 / 50000
Cost on evaluation data: 1.08890876334
Accuracy on evaluation data: 9637 / 10000

Epoch 79 training complete
Cost on training data: 0.32894145905
Accuracy on training data: 48805 / 50000
Cost on evaluation data: 1.05502595549
Accuracy on evaluation data: 9671 / 10000

Epoch 80 training complete
Cost on training data: 0.398648890237
Accuracy on training data: 48202 / 50000
Cost on evaluation data: 1.12754946509
```

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Accuracy on evaluation data: 9549 / 10000

Epoch 81 training complete
Cost on training data: 0.3349877906
Accuracy on training data: 48829 / 50000
Cost on evaluation data: 1.0666817923
Accuracy on evaluation data: 9649 / 10000

Epoch 82 training complete
Cost on training data: 0.367021002742
Accuracy on training data: 48446 / 50000
Cost on evaluation data: 1.09216901375
Accuracy on evaluation data: 9595 / 10000

Epoch 83 training complete
Cost on training data: 0.367241448918
Accuracy on training data: 48492 / 50000
Cost on evaluation data: 1.08278262043
Accuracy on evaluation data: 9607 / 10000

Epoch 84 training complete
Cost on training data: 0.364453515438
Accuracy on training data: 48509 / 50000
Cost on evaluation data: 1.08690233463
Accuracy on evaluation data: 9591 / 10000

Epoch 85 training complete
Cost on training data: 0.499847462635
Accuracy on training data: 47267 / 50000
Cost on evaluation data: 1.21460788279
Accuracy on evaluation data: 9392 / 10000

Epoch 86 training complete
Cost on training data: 0.361864268697
Accuracy on training data: 48531 / 50000
Cost on evaluation data: 1.09350265938
Accuracy on evaluation data: 9609 / 10000

Epoch 87 training complete
Cost on training data: 0.364153844539
Accuracy on training data: 48523 / 50000
Cost on evaluation data: 1.07751697957
Accuracy on evaluation data: 9620 / 10000

Epoch 88 training complete
Cost on training data: 0.35141914992
Accuracy on training data: 48614 / 50000
Cost on evaluation data: 1.07003494107
```

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Accuracy on evaluation data: 9616 / 10000

Epoch 89 training complete
Cost on training data: 0.345776313742
Accuracy on training data: 48672 / 50000
Cost on evaluation data: 1.0771157448
Accuracy on evaluation data: 9615 / 10000

Epoch 90 training complete
Cost on training data: 0.383884015025
Accuracy on training data: 48298 / 50000
Cost on evaluation data: 1.09178623636
Accuracy on evaluation data: 9586 / 10000

Epoch 91 training complete
Cost on training data: 0.397958441292
Accuracy on training data: 48173 / 50000
Cost on evaluation data: 1.12174774282
Accuracy on evaluation data: 9524 / 10000

Epoch 92 training complete
Cost on training data: 0.328581380981
Accuracy on training data: 48817 / 50000
Cost on evaluation data: 1.0441089489
Accuracy on evaluation data: 9670 / 10000

Epoch 93 training complete
Cost on training data: 0.357597141739
Accuracy on training data: 48563 / 50000
Cost on evaluation data: 1.08107061698
Accuracy on evaluation data: 9610 / 10000

Epoch 94 training complete
Cost on training data: 0.3375306095
Accuracy on training data: 48785 / 50000
Cost on evaluation data: 1.06852085051
Accuracy on evaluation data: 9639 / 10000

Epoch 95 training complete
Cost on training data: 0.396901593805
Accuracy on training data: 48249 / 50000
Cost on evaluation data: 1.1246351378
Accuracy on evaluation data: 9539 / 10000

Epoch 96 training complete
Cost on training data: 0.388190835977
Accuracy on training data: 48251 / 50000
Cost on evaluation data: 1.11835792243
```

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Accuracy on evaluation data: 9570 / 10000

Epoch 97 training complete
Cost on training data: 0.347742679028
Accuracy on training data: 48673 / 50000
Cost on evaluation data: 1.06496776536
Accuracy on evaluation data: 9662 / 10000

Epoch 98 training complete
Cost on training data: 0.342025485347
Accuracy on training data: 48722 / 50000
Cost on evaluation data: 1.05911572494
Accuracy on evaluation data: 9652 / 10000

Epoch 99 training complete
Cost on training data: 0.335643723619
Accuracy on training data: 48751 / 50000
Cost on evaluation data: 1.04723820478
Accuracy on evaluation data: 9667 / 10000

Epoch 100 training complete
Cost on training data: 0.371776916031
Accuracy on training data: 48490 / 50000
Cost on evaluation data: 1.10705153334
Accuracy on evaluation data: 9594 / 10000

Epoch 101 training complete
Cost on training data: 0.379030521243
Accuracy on training data: 48403 / 50000
Cost on evaluation data: 1.10095684639
Accuracy on evaluation data: 9562 / 10000

Epoch 102 training complete
Cost on training data: 0.366847109798
Accuracy on training data: 48526 / 50000
Cost on evaluation data: 1.08986516017
Accuracy on evaluation data: 9607 / 10000

Epoch 103 training complete
Cost on training data: 0.350265479065
Accuracy on training data: 48670 / 50000
Cost on evaluation data: 1.07128595791
Accuracy on evaluation data: 9618 / 10000

Epoch 104 training complete
Cost on training data: 0.333405323217
Accuracy on training data: 48827 / 50000
Cost on evaluation data: 1.0501729331
```

```
Accuracy on evaluation data: 9666 / 10000

Epoch 105 training complete
Cost on training data: 0.372042510736
Accuracy on training data: 48377 / 50000
Cost on evaluation data: 1.08890989672
Accuracy on evaluation data: 9578 / 10000

Epoch 106 training complete
Cost on training data: 0.358804939831
Accuracy on training data: 48595 / 50000
Cost on evaluation data: 1.08335652507
Accuracy on evaluation data: 9609 / 10000

Epoch 107 training complete
Cost on training data: 0.363740425521
Accuracy on training data: 48551 / 50000
Cost on evaluation data: 1.08800031137
Accuracy on evaluation data: 9603 / 10000

Epoch 108 training complete
Cost on training data: 0.345523149567
Accuracy on training data: 48689 / 50000
Cost on evaluation data: 1.06429883491
Accuracy on evaluation data: 9664 / 10000

Epoch 109 training complete
Cost on training data: 0.423421567387
Accuracy on training data: 48049 / 50000
Cost on evaluation data: 1.1343067759
Accuracy on evaluation data: 9536 / 10000

Epoch 110 training complete
Cost on training data: 0.376684724345
Accuracy on training data: 48406 / 50000
Cost on evaluation data: 1.09873129778
Accuracy on evaluation data: 9598 / 10000

Epoch 111 training complete
Cost on training data: 0.345742728515
Accuracy on training data: 48653 / 50000
Cost on evaluation data: 1.06435026323
Accuracy on evaluation data: 9636 / 10000

Epoch 112 training complete
Cost on training data: 0.345671842773
Accuracy on training data: 48649 / 50000
Cost on evaluation data: 1.05624727881
```

```
Accuracy on evaluation data: 9664 / 10000

Epoch 113 training complete
Cost on training data: 0.342327072884
Accuracy on training data: 48672 / 50000
Cost on evaluation data: 1.06381527908
Accuracy on evaluation data: 9631 / 10000

Epoch 114 training complete
Cost on training data: 0.366129687783
Accuracy on training data: 48488 / 50000
Cost on evaluation data: 1.09494344729
Accuracy on evaluation data: 9603 / 10000

Epoch 115 training complete
Cost on training data: 0.35176089823
Accuracy on training data: 48659 / 50000
Cost on evaluation data: 1.072043895
Accuracy on evaluation data: 9632 / 10000

Epoch 116 training complete
Cost on training data: 0.374068045265
Accuracy on training data: 48468 / 50000
Cost on evaluation data: 1.10320072999
Accuracy on evaluation data: 9586 / 10000

Epoch 117 training complete
Cost on training data: 0.432802365245
Accuracy on training data: 47864 / 50000
Cost on evaluation data: 1.14863806056
Accuracy on evaluation data: 9498 / 10000

Epoch 118 training complete
Cost on training data: 0.390282912965
Accuracy on training data: 48267 / 50000
Cost on evaluation data: 1.11432194928
Accuracy on evaluation data: 9544 / 10000

Epoch 119 training complete
Cost on training data: 0.349751497502
Accuracy on training data: 48623 / 50000
Cost on evaluation data: 1.06279840418
Accuracy on evaluation data: 9632 / 10000

Epoch 120 training complete
Cost on training data: 0.341197707053
Accuracy on training data: 48761 / 50000
Cost on evaluation data: 1.04924367739
```

```
Accuracy on evaluation data: 9659 / 10000

Epoch 121 training complete
Cost on training data: 0.360393226852
Accuracy on training data: 48559 / 50000
Cost on evaluation data: 1.07670701405
Accuracy on evaluation data: 9623 / 10000

Epoch 122 training complete
Cost on training data: 0.362391015772
Accuracy on training data: 48583 / 50000
Cost on evaluation data: 1.06998853515
Accuracy on evaluation data: 9627 / 10000

Epoch 123 training complete
Cost on training data: 0.37525078652
Accuracy on training data: 48459 / 50000
Cost on evaluation data: 1.08477751209
Accuracy on evaluation data: 9608 / 10000

Epoch 124 training complete
Cost on training data: 0.368672133292
Accuracy on training data: 48439 / 50000
Cost on evaluation data: 1.09419253946
Accuracy on evaluation data: 9592 / 10000

Epoch 125 training complete
Cost on training data: 0.367732190049
Accuracy on training data: 48476 / 50000
Cost on evaluation data: 1.09022290817
Accuracy on evaluation data: 9598 / 10000

Epoch 126 training complete
Cost on training data: 0.333336799778
Accuracy on training data: 48778 / 50000
Cost on evaluation data: 1.05525711492
Accuracy on evaluation data: 9656 / 10000

Epoch 127 training complete
Cost on training data: 0.347516034254
Accuracy on training data: 48657 / 50000
Cost on evaluation data: 1.07362058065
Accuracy on evaluation data: 9657 / 10000

Epoch 128 training complete
Cost on training data: 0.398336898236
Accuracy on training data: 48274 / 50000
Cost on evaluation data: 1.12000697814
```

```
Accuracy on evaluation data: 9569 / 10000

Epoch 129 training complete
Cost on training data: 0.366207054031
Accuracy on training data: 48508 / 50000
Cost on evaluation data: 1.09099942208
Accuracy on evaluation data: 9621 / 10000

Epoch 130 training complete
Cost on training data: 0.379190319668
Accuracy on training data: 48343 / 50000
Cost on evaluation data: 1.117797446
Accuracy on evaluation data: 9564 / 10000

Epoch 131 training complete
Cost on training data: 0.374599335868
Accuracy on training data: 48464 / 50000
Cost on evaluation data: 1.09428309443
Accuracy on evaluation data: 9604 / 10000

Epoch 132 training complete
Cost on training data: 0.344419862114
Accuracy on training data: 48721 / 50000
Cost on evaluation data: 1.0734257639
Accuracy on evaluation data: 9632 / 10000

Epoch 133 training complete
Cost on training data: 0.353353018841
Accuracy on training data: 48654 / 50000
Cost on evaluation data: 1.08039349205
Accuracy on evaluation data: 9613 / 10000

Epoch 134 training complete
Cost on training data: 0.333466123844
Accuracy on training data: 48772 / 50000
Cost on evaluation data: 1.05781493424
Accuracy on evaluation data: 9644 / 10000

Epoch 135 training complete
Cost on training data: 0.358620177758
Accuracy on training data: 48509 / 50000
Cost on evaluation data: 1.07502901367
Accuracy on evaluation data: 9624 / 10000

Epoch 136 training complete
Cost on training data: 0.352369879073
Accuracy on training data: 48673 / 50000
Cost on evaluation data: 1.07452231831
```

```
Accuracy on evaluation data: 9624 / 10000

Epoch 137 training complete
Cost on training data: 0.345518901295
Accuracy on training data: 48674 / 50000
Cost on evaluation data: 1.06974858453
Accuracy on evaluation data: 9622 / 10000

Epoch 138 training complete
Cost on training data: 0.360105963724
Accuracy on training data: 48534 / 50000
Cost on evaluation data: 1.08814392539
Accuracy on evaluation data: 9582 / 10000

Epoch 139 training complete
Cost on training data: 0.353295529284
Accuracy on training data: 48615 / 50000
Cost on evaluation data: 1.07002788392
Accuracy on evaluation data: 9615 / 10000

Epoch 140 training complete
Cost on training data: 0.341501762811
Accuracy on training data: 48760 / 50000
Cost on evaluation data: 1.06314960098
Accuracy on evaluation data: 9643 / 10000

Epoch 141 training complete
Cost on training data: 0.330944773363
Accuracy on training data: 48789 / 50000
Cost on evaluation data: 1.04797682294
Accuracy on evaluation data: 9669 / 10000

Epoch 142 training complete
Cost on training data: 0.343544232849
Accuracy on training data: 48709 / 50000
Cost on evaluation data: 1.06848026799
Accuracy on evaluation data: 9634 / 10000

Epoch 143 training complete
Cost on training data: 0.339738883567
Accuracy on training data: 48756 / 50000
Cost on evaluation data: 1.06960936328
Accuracy on evaluation data: 9638 / 10000

Epoch 144 training complete
Cost on training data: 0.394869461089
Accuracy on training data: 48244 / 50000
Cost on evaluation data: 1.12827970833
```

```
Accuracy on evaluation data: 9580 / 10000

Epoch 145 training complete
Cost on training data: 0.490773903905
Accuracy on training data: 47376 / 50000
Cost on evaluation data: 1.20511984835
Accuracy on evaluation data: 9383 / 10000

Epoch 146 training complete
Cost on training data: 0.350144153456
Accuracy on training data: 48650 / 50000
Cost on evaluation data: 1.07592126477
Accuracy on evaluation data: 9655 / 10000

Epoch 147 training complete
Cost on training data: 0.348351618503
Accuracy on training data: 48614 / 50000
Cost on evaluation data: 1.06984197377
Accuracy on evaluation data: 9624 / 10000

Epoch 148 training complete
Cost on training data: 0.405426741551
Accuracy on training data: 48152 / 50000
Cost on evaluation data: 1.13588393552
Accuracy on evaluation data: 9560 / 10000

Epoch 149 training complete
Cost on training data: 0.352744115133
Accuracy on training data: 48591 / 50000
Cost on evaluation data: 1.06096480112
Accuracy on evaluation data: 9657 / 10000

Epoch 150 training complete
Cost on training data: 0.365338281448
Accuracy on training data: 48502 / 50000
Cost on evaluation data: 1.08442424391
Accuracy on evaluation data: 9620 / 10000

Epoch 151 training complete
Cost on training data: 0.389857680198
Accuracy on training data: 48362 / 50000
Cost on evaluation data: 1.10388649535
Accuracy on evaluation data: 9583 / 10000

Epoch 152 training complete
Cost on training data: 0.427245129299
Accuracy on training data: 47917 / 50000
Cost on evaluation data: 1.1602127127
```

```
Accuracy on evaluation data: 9476 / 10000

Epoch 153 training complete
Cost on training data: 0.338238581072
Accuracy on training data: 48709 / 50000
Cost on evaluation data: 1.06209876488
Accuracy on evaluation data: 9653 / 10000

Epoch 154 training complete
Cost on training data: 0.336411821456
Accuracy on training data: 48770 / 50000
Cost on evaluation data: 1.06564019869
Accuracy on evaluation data: 9652 / 10000

Epoch 155 training complete
Cost on training data: 0.324275206779
Accuracy on training data: 48888 / 50000
Cost on evaluation data: 1.06303256533
Accuracy on evaluation data: 9660 / 10000

Epoch 156 training complete
Cost on training data: 0.342991625981
Accuracy on training data: 48746 / 50000
Cost on evaluation data: 1.06730720335
Accuracy on evaluation data: 9655 / 10000

Epoch 157 training complete
Cost on training data: 0.346992238101
Accuracy on training data: 48656 / 50000
Cost on evaluation data: 1.07777979174
Accuracy on evaluation data: 9628 / 10000

Epoch 158 training complete
Cost on training data: 0.353696251098
Accuracy on training data: 48638 / 50000
Cost on evaluation data: 1.09503769634
Accuracy on evaluation data: 9607 / 10000

Epoch 159 training complete
Cost on training data: 0.377940973901
Accuracy on training data: 48391 / 50000
Cost on evaluation data: 1.09782240298
Accuracy on evaluation data: 9591 / 10000

Epoch 160 training complete
Cost on training data: 0.341993815963
Accuracy on training data: 48729 / 50000
Cost on evaluation data: 1.06513808398
```

```
Accuracy on evaluation data: 9655 / 10000

Epoch 161 training complete
Cost on training data: 0.397492860721
Accuracy on training data: 48201 / 50000
Cost on evaluation data: 1.11933967895
Accuracy on evaluation data: 9553 / 10000

Epoch 162 training complete
Cost on training data: 0.353517967289
Accuracy on training data: 48567 / 50000
Cost on evaluation data: 1.07701270987
Accuracy on evaluation data: 9613 / 10000

Epoch 163 training complete
Cost on training data: 0.37256071726
Accuracy on training data: 48478 / 50000
Cost on evaluation data: 1.1015318597
Accuracy on evaluation data: 9576 / 10000

Epoch 164 training complete
Cost on training data: 0.349997703191
Accuracy on training data: 48614 / 50000
Cost on evaluation data: 1.07057278065
Accuracy on evaluation data: 9616 / 10000

Epoch 165 training complete
Cost on training data: 0.337719320824
Accuracy on training data: 48766 / 50000
Cost on evaluation data: 1.06087744731
Accuracy on evaluation data: 9639 / 10000

Epoch 166 training complete
Cost on training data: 0.372670088269
Accuracy on training data: 48429 / 50000
Cost on evaluation data: 1.09808224958
Accuracy on evaluation data: 9583 / 10000

Epoch 167 training complete
Cost on training data: 0.349466398542
Accuracy on training data: 48610 / 50000
Cost on evaluation data: 1.08722392984
Accuracy on evaluation data: 9616 / 10000

Epoch 168 training complete
Cost on training data: 0.367742604462
Accuracy on training data: 48519 / 50000
Cost on evaluation data: 1.09105084641
```

```
Accuracy on evaluation data: 9614 / 10000

Epoch 169 training complete
Cost on training data: 0.380369060157
Accuracy on training data: 48381 / 50000
Cost on evaluation data: 1.10561930529
Accuracy on evaluation data: 9592 / 10000

Epoch 170 training complete
Cost on training data: 0.345670268876
Accuracy on training data: 48710 / 50000
Cost on evaluation data: 1.07368763249
Accuracy on evaluation data: 9647 / 10000

Epoch 171 training complete
Cost on training data: 0.335116712287
Accuracy on training data: 48771 / 50000
Cost on evaluation data: 1.05742909833
Accuracy on evaluation data: 9677 / 10000

Epoch 172 training complete
Cost on training data: 0.344532470445
Accuracy on training data: 48713 / 50000
Cost on evaluation data: 1.06797800741
Accuracy on evaluation data: 9658 / 10000

Epoch 173 training complete
Cost on training data: 0.37455825366
Accuracy on training data: 48424 / 50000
Cost on evaluation data: 1.08203990672
Accuracy on evaluation data: 9609 / 10000

Epoch 174 training complete
Cost on training data: 0.348552819066
Accuracy on training data: 48657 / 50000
Cost on evaluation data: 1.07138833587
Accuracy on evaluation data: 9647 / 10000

Epoch 175 training complete
Cost on training data: 0.354316903362
Accuracy on training data: 48640 / 50000
Cost on evaluation data: 1.07869463597
Accuracy on evaluation data: 9622 / 10000

Epoch 176 training complete
Cost on training data: 0.356185333453
Accuracy on training data: 48618 / 50000
Cost on evaluation data: 1.07186929418
```

```
Accuracy on evaluation data: 9631 / 10000

Epoch 177 training complete
Cost on training data: 0.358716413823
Accuracy on training data: 48503 / 50000
Cost on evaluation data: 1.08091047657
Accuracy on evaluation data: 9628 / 10000

Epoch 178 training complete
Cost on training data: 0.333656394579
Accuracy on training data: 48781 / 50000
Cost on evaluation data: 1.06181057553
Accuracy on evaluation data: 9662 / 10000

Epoch 179 training complete
Cost on training data: 0.357396390513
Accuracy on training data: 48581 / 50000
Cost on evaluation data: 1.09534252024
Accuracy on evaluation data: 9617 / 10000

Epoch 180 training complete
Cost on training data: 0.408581825577
Accuracy on training data: 48113 / 50000
Cost on evaluation data: 1.13231406152
Accuracy on evaluation data: 9524 / 10000

Epoch 181 training complete
Cost on training data: 0.364589377998
Accuracy on training data: 48489 / 50000
Cost on evaluation data: 1.08950178214
Accuracy on evaluation data: 9585 / 10000

Epoch 182 training complete
Cost on training data: 0.343456933859
Accuracy on training data: 48711 / 50000
Cost on evaluation data: 1.071655013
Accuracy on evaluation data: 9643 / 10000

Epoch 183 training complete
Cost on training data: 0.364869036459
Accuracy on training data: 48480 / 50000
Cost on evaluation data: 1.094805206
Accuracy on evaluation data: 9585 / 10000

Epoch 184 training complete
Cost on training data: 0.379061225847
Accuracy on training data: 48387 / 50000
Cost on evaluation data: 1.11699233721
```

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Accuracy on evaluation data: 9582 / 10000

Epoch 185 training complete
Cost on training data: 0.364483576219
Accuracy on training data: 48526 / 50000
Cost on evaluation data: 1.09438181864
Accuracy on evaluation data: 9594 / 10000

Epoch 186 training complete
Cost on training data: 0.370700969376
Accuracy on training data: 48462 / 50000
Cost on evaluation data: 1.08558442153
Accuracy on evaluation data: 9604 / 10000

Epoch 187 training complete
Cost on training data: 0.3474855364
Accuracy on training data: 48660 / 50000
Cost on evaluation data: 1.07771696022
Accuracy on evaluation data: 9635 / 10000

Epoch 188 training complete
Cost on training data: 0.389763232265
Accuracy on training data: 48212 / 50000
Cost on evaluation data: 1.10591607669
Accuracy on evaluation data: 9579 / 10000

Epoch 189 training complete
Cost on training data: 0.372551781928
Accuracy on training data: 48464 / 50000
Cost on evaluation data: 1.09779119147
Accuracy on evaluation data: 9593 / 10000

Epoch 190 training complete
Cost on training data: 0.349455037792
Accuracy on training data: 48667 / 50000
Cost on evaluation data: 1.07477883423
Accuracy on evaluation data: 9644 / 10000

Epoch 191 training complete
Cost on training data: 0.379895347378
Accuracy on training data: 48390 / 50000
Cost on evaluation data: 1.11549573988
Accuracy on evaluation data: 9577 / 10000

Epoch 192 training complete
Cost on training data: 0.388557877987
Accuracy on training data: 48358 / 50000
Cost on evaluation data: 1.11728754701
```

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Accuracy on evaluation data: 9603 / 10000

Epoch 193 training complete
Cost on training data: 0.379986629679
Accuracy on training data: 48427 / 50000
Cost on evaluation data: 1.10369884901
Accuracy on evaluation data: 9595 / 10000

Epoch 194 training complete
Cost on training data: 0.41566292029
Accuracy on training data: 48033 / 50000
Cost on evaluation data: 1.149596164
Accuracy on evaluation data: 9531 / 10000

Epoch 195 training complete
Cost on training data: 0.350243979848
Accuracy on training data: 48664 / 50000
Cost on evaluation data: 1.07663951035
Accuracy on evaluation data: 9625 / 10000

Epoch 196 training complete
Cost on training data: 0.336790141482
Accuracy on training data: 48714 / 50000
Cost on evaluation data: 1.06035065291
Accuracy on evaluation data: 9652 / 10000

Epoch 197 training complete
Cost on training data: 0.366697174222
Accuracy on training data: 48528 / 50000
Cost on evaluation data: 1.0946152546
Accuracy on evaluation data: 9620 / 10000

Epoch 198 training complete
Cost on training data: 0.365559533067
Accuracy on training data: 48556 / 50000
Cost on evaluation data: 1.10438115187
Accuracy on evaluation data: 9574 / 10000

Epoch 199 training complete
Cost on training data: 0.377656346047
Accuracy on training data: 48408 / 50000
Cost on evaluation data: 1.1018904178
Accuracy on evaluation data: 9587 / 10000

Epoch 200 training complete
Cost on training data: 0.332562231191
Accuracy on training data: 48804 / 50000
Cost on evaluation data: 1.05806483963
```

```
Accuracy on evaluation data: 9665 / 10000

Epoch 201 training complete
Cost on training data: 0.360001319204
Accuracy on training data: 48608 / 50000
Cost on evaluation data: 1.09545130895
Accuracy on evaluation data: 9580 / 10000

Epoch 202 training complete
Cost on training data: 0.349128288971
Accuracy on training data: 48583 / 50000
Cost on evaluation data: 1.06272787352
Accuracy on evaluation data: 9649 / 10000

Epoch 203 training complete
Cost on training data: 0.336913837865
Accuracy on training data: 48768 / 50000
Cost on evaluation data: 1.05726456536
Accuracy on evaluation data: 9657 / 10000

Epoch 204 training complete
Cost on training data: 0.387269070116
Accuracy on training data: 48264 / 50000
Cost on evaluation data: 1.10896177134
Accuracy on evaluation data: 9563 / 10000

Epoch 205 training complete
Cost on training data: 0.413616215157
Accuracy on training data: 48078 / 50000
Cost on evaluation data: 1.1195109893
Accuracy on evaluation data: 9570 / 10000

Epoch 206 training complete
Cost on training data: 0.397894455176
Accuracy on training data: 48241 / 50000
Cost on evaluation data: 1.12412498496
Accuracy on evaluation data: 9546 / 10000

Epoch 207 training complete
Cost on training data: 0.352709734539
Accuracy on training data: 48596 / 50000
Cost on evaluation data: 1.06464188026
Accuracy on evaluation data: 9639 / 10000

Epoch 208 training complete
Cost on training data: 0.346060112252
Accuracy on training data: 48663 / 50000
Cost on evaluation data: 1.06367787576
```

```
Accuracy on evaluation data: 9649 / 10000

Epoch 209 training complete
Cost on training data: 0.359527664459
Accuracy on training data: 48552 / 50000
Cost on evaluation data: 1.07158817004
Accuracy on evaluation data: 9637 / 10000

Epoch 210 training complete
Cost on training data: 0.337040912702
Accuracy on training data: 48732 / 50000
Cost on evaluation data: 1.05553884976
Accuracy on evaluation data: 9657 / 10000

Epoch 211 training complete
Cost on training data: 0.360443392299
Accuracy on training data: 48605 / 50000
Cost on evaluation data: 1.08784166289
Accuracy on evaluation data: 9607 / 10000

Epoch 212 training complete
Cost on training data: 0.352864520529
Accuracy on training data: 48580 / 50000
Cost on evaluation data: 1.07491957279
Accuracy on evaluation data: 9628 / 10000

Epoch 213 training complete
Cost on training data: 0.345594998672
Accuracy on training data: 48671 / 50000
Cost on evaluation data: 1.08046942883
Accuracy on evaluation data: 9641 / 10000

Epoch 214 training complete
Cost on training data: 0.357989135055
Accuracy on training data: 48559 / 50000
Cost on evaluation data: 1.08116633447
Accuracy on evaluation data: 9623 / 10000

Epoch 215 training complete
Cost on training data: 0.34758702905
Accuracy on training data: 48661 / 50000
Cost on evaluation data: 1.07375644015
Accuracy on evaluation data: 9650 / 10000

Epoch 216 training complete
Cost on training data: 0.381744508615
Accuracy on training data: 48371 / 50000
Cost on evaluation data: 1.10631031927
```

```
Accuracy on evaluation data: 9593 / 10000

Epoch 217 training complete
Cost on training data: 0.369033548899
Accuracy on training data: 48443 / 50000
Cost on evaluation data: 1.10063889259
Accuracy on evaluation data: 9597 / 10000

Epoch 218 training complete
Cost on training data: 0.403879729363
Accuracy on training data: 48137 / 50000
Cost on evaluation data: 1.13831475541
Accuracy on evaluation data: 9518 / 10000

Epoch 219 training complete
Cost on training data: 0.382221478391
Accuracy on training data: 48393 / 50000
Cost on evaluation data: 1.11361478851
Accuracy on evaluation data: 9565 / 10000

Epoch 220 training complete
Cost on training data: 0.370794460715
Accuracy on training data: 48467 / 50000
Cost on evaluation data: 1.10209694939
Accuracy on evaluation data: 9620 / 10000

Epoch 221 training complete
Cost on training data: 0.36914409223
Accuracy on training data: 48405 / 50000
Cost on evaluation data: 1.102572911
Accuracy on evaluation data: 9575 / 10000

Epoch 222 training complete
Cost on training data: 0.353663705664
Accuracy on training data: 48611 / 50000
Cost on evaluation data: 1.08329313486
Accuracy on evaluation data: 9646 / 10000

Epoch 223 training complete
Cost on training data: 0.351274627275
Accuracy on training data: 48689 / 50000
Cost on evaluation data: 1.07576597516
Accuracy on evaluation data: 9660 / 10000

Epoch 224 training complete
Cost on training data: 0.331781509099
Accuracy on training data: 48788 / 50000
Cost on evaluation data: 1.05233448121
```

```
Accuracy on evaluation data: 9663 / 10000

Epoch 225 training complete
Cost on training data: 0.345815018963
Accuracy on training data: 48673 / 50000
Cost on evaluation data: 1.07212538723
Accuracy on evaluation data: 9631 / 10000

Epoch 226 training complete
Cost on training data: 0.33554405057
Accuracy on training data: 48777 / 50000
Cost on evaluation data: 1.05215916802
Accuracy on evaluation data: 9689 / 10000

Epoch 227 training complete
Cost on training data: 0.371399412386
Accuracy on training data: 48486 / 50000
Cost on evaluation data: 1.1050445835
Accuracy on evaluation data: 9576 / 10000

Epoch 228 training complete
Cost on training data: 0.355460531387
Accuracy on training data: 48568 / 50000
Cost on evaluation data: 1.07531205804
Accuracy on evaluation data: 9629 / 10000

Epoch 229 training complete
Cost on training data: 0.335234091239
Accuracy on training data: 48755 / 50000
Cost on evaluation data: 1.06662844131
Accuracy on evaluation data: 9663 / 10000

Epoch 230 training complete
Cost on training data: 0.360872290117
Accuracy on training data: 48587 / 50000
Cost on evaluation data: 1.08595573754
Accuracy on evaluation data: 9630 / 10000

Epoch 231 training complete
Cost on training data: 0.320120069476
Accuracy on training data: 48920 / 50000
Cost on evaluation data: 1.04383021505
Accuracy on evaluation data: 9691 / 10000

Epoch 232 training complete
Cost on training data: 0.384379342916
Accuracy on training data: 48308 / 50000
Cost on evaluation data: 1.11482108597
```

```
Accuracy on evaluation data: 9574 / 10000

Epoch 233 training complete
Cost on training data: 0.388052093324
Accuracy on training data: 48336 / 50000
Cost on evaluation data: 1.11231621909
Accuracy on evaluation data: 9598 / 10000

Epoch 234 training complete
Cost on training data: 0.350877244791
Accuracy on training data: 48668 / 50000
Cost on evaluation data: 1.08695993321
Accuracy on evaluation data: 9624 / 10000

Epoch 235 training complete
Cost on training data: 0.356079616128
Accuracy on training data: 48579 / 50000
Cost on evaluation data: 1.07086766293
Accuracy on evaluation data: 9628 / 10000

Epoch 236 training complete
Cost on training data: 0.385254412063
Accuracy on training data: 48346 / 50000
Cost on evaluation data: 1.10215076765
Accuracy on evaluation data: 9588 / 10000

Epoch 237 training complete
Cost on training data: 0.361553189473
Accuracy on training data: 48575 / 50000
Cost on evaluation data: 1.08466168688
Accuracy on evaluation data: 9633 / 10000

Epoch 238 training complete
Cost on training data: 0.387617138232
Accuracy on training data: 48327 / 50000
Cost on evaluation data: 1.11024605024
Accuracy on evaluation data: 9591 / 10000

Epoch 239 training complete
Cost on training data: 0.350876105942
Accuracy on training data: 48630 / 50000
Cost on evaluation data: 1.06409477482
Accuracy on evaluation data: 9648 / 10000

Epoch 240 training complete
Cost on training data: 0.371448934218
Accuracy on training data: 48478 / 50000
Cost on evaluation data: 1.0921195442
```

```
Accuracy on evaluation data: 9649 / 10000

Epoch 241 training complete
Cost on training data: 0.367606277684
Accuracy on training data: 48490 / 50000
Cost on evaluation data: 1.08940839353
Accuracy on evaluation data: 9632 / 10000

Epoch 242 training complete
Cost on training data: 0.393492396158
Accuracy on training data: 48183 / 50000
Cost on evaluation data: 1.1241897566
Accuracy on evaluation data: 9568 / 10000

Epoch 243 training complete
Cost on training data: 0.36349021557
Accuracy on training data: 48553 / 50000
Cost on evaluation data: 1.0869747123
Accuracy on evaluation data: 9610 / 10000

Epoch 244 training complete
Cost on training data: 0.35484739665
Accuracy on training data: 48587 / 50000
Cost on evaluation data: 1.07629716698
Accuracy on evaluation data: 9631 / 10000

Epoch 245 training complete
Cost on training data: 0.374814742934
Accuracy on training data: 48373 / 50000
Cost on evaluation data: 1.0932139331
Accuracy on evaluation data: 9598 / 10000

Epoch 246 training complete
Cost on training data: 0.36888276912
Accuracy on training data: 48440 / 50000
Cost on evaluation data: 1.08967857073
Accuracy on evaluation data: 9592 / 10000

Epoch 247 training complete
Cost on training data: 0.36020655462
Accuracy on training data: 48567 / 50000
Cost on evaluation data: 1.07809604781
Accuracy on evaluation data: 9629 / 10000

Epoch 248 training complete
Cost on training data: 0.370613595029
Accuracy on training data: 48458 / 50000
Cost on evaluation data: 1.09481115052
```

```
Accuracy on evaluation data: 9600 / 10000

Epoch 249 training complete
Cost on training data: 0.354217648006
Accuracy on training data: 48651 / 50000
Cost on evaluation data: 1.0827472882
Accuracy on evaluation data: 9620 / 10000

Epoch 250 training complete
Cost on training data: 0.379385018339
Accuracy on training data: 48401 / 50000
Cost on evaluation data: 1.10814659125
Accuracy on evaluation data: 9597 / 10000

Epoch 251 training complete
Cost on training data: 0.387708869525
Accuracy on training data: 48283 / 50000
Cost on evaluation data: 1.10728097961
Accuracy on evaluation data: 9556 / 10000

Epoch 252 training complete
Cost on training data: 0.383734434964
Accuracy on training data: 48348 / 50000
Cost on evaluation data: 1.11173141644
Accuracy on evaluation data: 9560 / 10000

Epoch 253 training complete
Cost on training data: 0.38358671788
Accuracy on training data: 48407 / 50000
Cost on evaluation data: 1.0863266131
Accuracy on evaluation data: 9621 / 10000

Epoch 254 training complete
Cost on training data: 0.366537385168
Accuracy on training data: 48533 / 50000
Cost on evaluation data: 1.08975440067
Accuracy on evaluation data: 9629 / 10000

Epoch 255 training complete
Cost on training data: 0.36747345403
Accuracy on training data: 48485 / 50000
Cost on evaluation data: 1.09491857597
Accuracy on evaluation data: 9604 / 10000

Epoch 256 training complete
Cost on training data: 0.343870634615
Accuracy on training data: 48709 / 50000
Cost on evaluation data: 1.07157113041
```

```
Accuracy on evaluation data: 9644 / 10000

Epoch 257 training complete
Cost on training data: 0.342520862214
Accuracy on training data: 48721 / 50000
Cost on evaluation data: 1.07532132228
Accuracy on evaluation data: 9643 / 10000

Epoch 258 training complete
Cost on training data: 0.349870388147
Accuracy on training data: 48613 / 50000
Cost on evaluation data: 1.07886143848
Accuracy on evaluation data: 9628 / 10000

Epoch 259 training complete
Cost on training data: 0.360784459052
Accuracy on training data: 48606 / 50000
Cost on evaluation data: 1.09785988669
Accuracy on evaluation data: 9607 / 10000

Epoch 260 training complete
Cost on training data: 0.340404010104
Accuracy on training data: 48710 / 50000
Cost on evaluation data: 1.07257775648
Accuracy on evaluation data: 9628 / 10000

Epoch 261 training complete
Cost on training data: 0.369703479397
Accuracy on training data: 48535 / 50000
Cost on evaluation data: 1.10041471412
Accuracy on evaluation data: 9613 / 10000

Epoch 262 training complete
Cost on training data: 0.389323395026
Accuracy on training data: 48274 / 50000
Cost on evaluation data: 1.11337291417
Accuracy on evaluation data: 9567 / 10000

Epoch 263 training complete
Cost on training data: 0.369476394677
Accuracy on training data: 48456 / 50000
Cost on evaluation data: 1.09635238639
Accuracy on evaluation data: 9585 / 10000

Epoch 264 training complete
Cost on training data: 0.359569756105
Accuracy on training data: 48552 / 50000
Cost on evaluation data: 1.08420902133
```

```
Accuracy on evaluation data: 9614 / 10000

Epoch 265 training complete
Cost on training data: 0.343861291746
Accuracy on training data: 48671 / 50000
Cost on evaluation data: 1.06489896519
Accuracy on evaluation data: 9657 / 10000

Epoch 266 training complete
Cost on training data: 0.355101178141
Accuracy on training data: 48604 / 50000
Cost on evaluation data: 1.08296564702
Accuracy on evaluation data: 9614 / 10000

Epoch 267 training complete
Cost on training data: 0.346742243546
Accuracy on training data: 48657 / 50000
Cost on evaluation data: 1.07281886276
Accuracy on evaluation data: 9633 / 10000

Epoch 268 training complete
Cost on training data: 0.348950419541
Accuracy on training data: 48645 / 50000
Cost on evaluation data: 1.08708537916
Accuracy on evaluation data: 9609 / 10000

Epoch 269 training complete
Cost on training data: 0.372979824165
Accuracy on training data: 48420 / 50000
Cost on evaluation data: 1.10110170092
Accuracy on evaluation data: 9583 / 10000

Epoch 270 training complete
Cost on training data: 0.356060708872
Accuracy on training data: 48608 / 50000
Cost on evaluation data: 1.0812464878
Accuracy on evaluation data: 9627 / 10000

Epoch 271 training complete
Cost on training data: 0.354691111137
Accuracy on training data: 48583 / 50000
Cost on evaluation data: 1.08147931455
Accuracy on evaluation data: 9612 / 10000

Epoch 272 training complete
Cost on training data: 0.371351945595
Accuracy on training data: 48465 / 50000
Cost on evaluation data: 1.09540674664
```

```
Accuracy on evaluation data: 9580 / 10000

Epoch 273 training complete
Cost on training data: 0.365972904522
Accuracy on training data: 48478 / 50000
Cost on evaluation data: 1.09488098465
Accuracy on evaluation data: 9591 / 10000

Epoch 274 training complete
Cost on training data: 0.334815863088
Accuracy on training data: 48861 / 50000
Cost on evaluation data: 1.05973498983
Accuracy on evaluation data: 9689 / 10000

Epoch 275 training complete
Cost on training data: 0.387460955252
Accuracy on training data: 48315 / 50000
Cost on evaluation data: 1.1043972348
Accuracy on evaluation data: 9589 / 10000

Epoch 276 training complete
Cost on training data: 0.394573941832
Accuracy on training data: 48281 / 50000
Cost on evaluation data: 1.1152000307
Accuracy on evaluation data: 9590 / 10000

Epoch 277 training complete
Cost on training data: 0.388827769685
Accuracy on training data: 48318 / 50000
Cost on evaluation data: 1.10839168794
Accuracy on evaluation data: 9593 / 10000

Epoch 278 training complete
Cost on training data: 0.341274039536
Accuracy on training data: 48693 / 50000
Cost on evaluation data: 1.06980739596
Accuracy on evaluation data: 9648 / 10000

Epoch 279 training complete
Cost on training data: 0.342948102956
Accuracy on training data: 48732 / 50000
Cost on evaluation data: 1.07520680347
Accuracy on evaluation data: 9640 / 10000

Epoch 280 training complete
Cost on training data: 0.339709628539
Accuracy on training data: 48758 / 50000
Cost on evaluation data: 1.06233640575
```

```
Accuracy on evaluation data: 9666 / 10000

Epoch 281 training complete
Cost on training data: 0.438503171853
Accuracy on training data: 47900 / 50000
Cost on evaluation data: 1.16905905611
Accuracy on evaluation data: 9505 / 10000

Epoch 282 training complete
Cost on training data: 0.338605576103
Accuracy on training data: 48774 / 50000
Cost on evaluation data: 1.06467447126
Accuracy on evaluation data: 9647 / 10000

Epoch 283 training complete
Cost on training data: 0.342132354306
Accuracy on training data: 48679 / 50000
Cost on evaluation data: 1.05968083562
Accuracy on evaluation data: 9663 / 10000

Epoch 284 training complete
Cost on training data: 0.34538383456
Accuracy on training data: 48696 / 50000
Cost on evaluation data: 1.0848962905
Accuracy on evaluation data: 9629 / 10000

Epoch 285 training complete
Cost on training data: 0.3421450113
Accuracy on training data: 48693 / 50000
Cost on evaluation data: 1.08191858304
Accuracy on evaluation data: 9625 / 10000

Epoch 286 training complete
Cost on training data: 0.390462449148
Accuracy on training data: 48251 / 50000
Cost on evaluation data: 1.1199920422
Accuracy on evaluation data: 9541 / 10000

Epoch 287 training complete
Cost on training data: 0.335546365929
Accuracy on training data: 48740 / 50000
Cost on evaluation data: 1.06445417834
Accuracy on evaluation data: 9635 / 10000

Epoch 288 training complete
Cost on training data: 0.405249246602
Accuracy on training data: 48141 / 50000
Cost on evaluation data: 1.12865857839
```

```
Accuracy on evaluation data: 9528 / 10000

Epoch 289 training complete
Cost on training data: 0.386702610448
Accuracy on training data: 48333 / 50000
Cost on evaluation data: 1.10450569677
Accuracy on evaluation data: 9553 / 10000

Epoch 290 training complete
Cost on training data: 0.386520437268
Accuracy on training data: 48354 / 50000
Cost on evaluation data: 1.11223037134
Accuracy on evaluation data: 9623 / 10000

Epoch 291 training complete
Cost on training data: 0.372633213924
Accuracy on training data: 48478 / 50000
Cost on evaluation data: 1.09923943506
Accuracy on evaluation data: 9608 / 10000

Epoch 292 training complete
Cost on training data: 0.336270609223
Accuracy on training data: 48790 / 50000
Cost on evaluation data: 1.06462862297
Accuracy on evaluation data: 9636 / 10000

Epoch 293 training complete
Cost on training data: 0.336453276273
Accuracy on training data: 48799 / 50000
Cost on evaluation data: 1.06119627797
Accuracy on evaluation data: 9666 / 10000

Epoch 294 training complete
Cost on training data: 0.335372288091
Accuracy on training data: 48802 / 50000
Cost on evaluation data: 1.06864287032
Accuracy on evaluation data: 9646 / 10000

Epoch 295 training complete
Cost on training data: 0.396423284896
Accuracy on training data: 48228 / 50000
Cost on evaluation data: 1.12987961005
Accuracy on evaluation data: 9532 / 10000

Epoch 296 training complete
Cost on training data: 0.359868419032
Accuracy on training data: 48601 / 50000
Cost on evaluation data: 1.09137040399
```

```
Accuracy on evaluation data: 9620 / 10000

Epoch 297 training complete
Cost on training data: 0.34037907012
Accuracy on training data: 48777 / 50000
Cost on evaluation data: 1.06109388073
Accuracy on evaluation data: 9659 / 10000

Epoch 298 training complete
Cost on training data: 0.352894456019
Accuracy on training data: 48686 / 50000
Cost on evaluation data: 1.08318392343
Accuracy on evaluation data: 9636 / 10000

Epoch 299 training complete
Cost on training data: 0.3481901494
Accuracy on training data: 48725 / 50000
Cost on evaluation data: 1.07592605222
Accuracy on evaluation data: 9653 / 10000

Epoch 300 training complete
Cost on training data: 0.360327134351
Accuracy on training data: 48574 / 50000
Cost on evaluation data: 1.08217177879
Accuracy on evaluation data: 9649 / 10000

Epoch 301 training complete
Cost on training data: 0.375698431221
Accuracy on training data: 48484 / 50000
Cost on evaluation data: 1.10051046598
Accuracy on evaluation data: 9612 / 10000

Epoch 302 training complete
Cost on training data: 0.350340635892
Accuracy on training data: 48694 / 50000
Cost on evaluation data: 1.0875162689
Accuracy on evaluation data: 9604 / 10000

Epoch 303 training complete
Cost on training data: 0.411304295133
Accuracy on training data: 48109 / 50000
Cost on evaluation data: 1.14582057342
Accuracy on evaluation data: 9531 / 10000

Epoch 304 training complete
Cost on training data: 0.362227898715
Accuracy on training data: 48570 / 50000
Cost on evaluation data: 1.0949322979
```

```
Accuracy on evaluation data: 9609 / 10000

Epoch 305 training complete
Cost on training data: 0.338803887113
Accuracy on training data: 48751 / 50000
Cost on evaluation data: 1.06814248044
Accuracy on evaluation data: 9647 / 10000

Epoch 306 training complete
Cost on training data: 0.361362487264
Accuracy on training data: 48562 / 50000
Cost on evaluation data: 1.09515400895
Accuracy on evaluation data: 9614 / 10000

Epoch 307 training complete
Cost on training data: 0.379872215577
Accuracy on training data: 48393 / 50000
Cost on evaluation data: 1.11095186031
Accuracy on evaluation data: 9589 / 10000

Epoch 308 training complete
Cost on training data: 0.354454601442
Accuracy on training data: 48650 / 50000
Cost on evaluation data: 1.09349275256
Accuracy on evaluation data: 9621 / 10000

Epoch 309 training complete
Cost on training data: 0.360173428482
Accuracy on training data: 48580 / 50000
Cost on evaluation data: 1.0945912586
Accuracy on evaluation data: 9624 / 10000

Epoch 310 training complete
Cost on training data: 0.373805107091
Accuracy on training data: 48449 / 50000
Cost on evaluation data: 1.10930992294
Accuracy on evaluation data: 9577 / 10000

Epoch 311 training complete
Cost on training data: 0.394066954012
Accuracy on training data: 48233 / 50000
Cost on evaluation data: 1.12478516011
Accuracy on evaluation data: 9551 / 10000

Epoch 312 training complete
Cost on training data: 0.380906621104
Accuracy on training data: 48343 / 50000
Cost on evaluation data: 1.11360851777
```

Accuracy on evaluation data: 9568 / 10000

Epoch 313 training complete
Cost on training data: 0.369494817317
Accuracy on training data: 48489 / 50000
Cost on evaluation data: 1.10610138255
Accuracy on evaluation data: 9569 / 10000

Epoch 314 training complete
Cost on training data: 0.343126585962
Accuracy on training data: 48748 / 50000
Cost on evaluation data: 1.06874051703
Accuracy on evaluation data: 9645 / 10000

Epoch 315 training complete
Cost on training data: 0.360193040223
Accuracy on training data: 48589 / 50000
Cost on evaluation data: 1.08657501412
Accuracy on evaluation data: 9621 / 10000

Epoch 316 training complete
Cost on training data: 0.348260813428
Accuracy on training data: 48697 / 50000
Cost on evaluation data: 1.07675455677
Accuracy on evaluation data: 9642 / 10000

Epoch 317 training complete
Cost on training data: 0.363585420318
Accuracy on training data: 48517 / 50000
Cost on evaluation data: 1.1069050984
Accuracy on evaluation data: 9579 / 10000

Epoch 318 training complete
Cost on training data: 0.348566853843
Accuracy on training data: 48662 / 50000
Cost on evaluation data: 1.08429456522
Accuracy on evaluation data: 9631 / 10000

Epoch 319 training complete
Cost on training data: 0.330248759376
Accuracy on training data: 48792 / 50000
Cost on evaluation data: 1.04602179662
Accuracy on evaluation data: 9660 / 10000

Epoch 320 training complete
Cost on training data: 0.383782911136
Accuracy on training data: 48401 / 50000
Cost on evaluation data: 1.11028669393

```
Accuracy on evaluation data: 9584 / 10000

Epoch 321 training complete
Cost on training data: 0.357371661087
Accuracy on training data: 48595 / 50000
Cost on evaluation data: 1.07160980966
Accuracy on evaluation data: 9629 / 10000

Epoch 322 training complete
Cost on training data: 0.357659732661
Accuracy on training data: 48570 / 50000
Cost on evaluation data: 1.0898415206
Accuracy on evaluation data: 9601 / 10000

Epoch 323 training complete
Cost on training data: 0.34146165883
Accuracy on training data: 48761 / 50000
Cost on evaluation data: 1.06765265038
Accuracy on evaluation data: 9640 / 10000

Epoch 324 training complete
Cost on training data: 0.375773473892
Accuracy on training data: 48410 / 50000
Cost on evaluation data: 1.09043026958
Accuracy on evaluation data: 9600 / 10000

Epoch 325 training complete
Cost on training data: 0.358737401619
Accuracy on training data: 48577 / 50000
Cost on evaluation data: 1.0862536655
Accuracy on evaluation data: 9620 / 10000

Epoch 326 training complete
Cost on training data: 0.345348105564
Accuracy on training data: 48675 / 50000
Cost on evaluation data: 1.06920215463
Accuracy on evaluation data: 9638 / 10000

Epoch 327 training complete
Cost on training data: 0.36068567808
Accuracy on training data: 48538 / 50000
Cost on evaluation data: 1.09343282625
Accuracy on evaluation data: 9603 / 10000

Epoch 328 training complete
Cost on training data: 0.363184523924
Accuracy on training data: 48533 / 50000
Cost on evaluation data: 1.08973093159
```

```
Accuracy on evaluation data: 9616 / 10000

Epoch 329 training complete
Cost on training data: 0.398687047758
Accuracy on training data: 48244 / 50000
Cost on evaluation data: 1.11147754516
Accuracy on evaluation data: 9584 / 10000

Epoch 330 training complete
Cost on training data: 0.385050344133
Accuracy on training data: 48321 / 50000
Cost on evaluation data: 1.10910025773
Accuracy on evaluation data: 9587 / 10000

Epoch 331 training complete
Cost on training data: 0.348289860794
Accuracy on training data: 48665 / 50000
Cost on evaluation data: 1.08637878776
Accuracy on evaluation data: 9623 / 10000

Epoch 332 training complete
Cost on training data: 0.350667937926
Accuracy on training data: 48652 / 50000
Cost on evaluation data: 1.08434939435
Accuracy on evaluation data: 9620 / 10000

Epoch 333 training complete
Cost on training data: 0.386523398978
Accuracy on training data: 48377 / 50000
Cost on evaluation data: 1.10705452798
Accuracy on evaluation data: 9586 / 10000

Epoch 334 training complete
Cost on training data: 0.357373384253
Accuracy on training data: 48630 / 50000
Cost on evaluation data: 1.08548553427
Accuracy on evaluation data: 9615 / 10000

Epoch 335 training complete
Cost on training data: 0.332762509197
Accuracy on training data: 48817 / 50000
Cost on evaluation data: 1.06356797893
Accuracy on evaluation data: 9659 / 10000

Epoch 336 training complete
Cost on training data: 0.349679807524
Accuracy on training data: 48645 / 50000
Cost on evaluation data: 1.07020761648
```

```
Accuracy on evaluation data: 9654 / 10000

Epoch 337 training complete
Cost on training data: 0.395504904231
Accuracy on training data: 48298 / 50000
Cost on evaluation data: 1.12194554068
Accuracy on evaluation data: 9583 / 10000

Epoch 338 training complete
Cost on training data: 0.358853349881
Accuracy on training data: 48597 / 50000
Cost on evaluation data: 1.09715718164
Accuracy on evaluation data: 9600 / 10000

Epoch 339 training complete
Cost on training data: 0.349926791855
Accuracy on training data: 48663 / 50000
Cost on evaluation data: 1.08201574207
Accuracy on evaluation data: 9628 / 10000

Epoch 340 training complete
Cost on training data: 0.353188231703
Accuracy on training data: 48594 / 50000
Cost on evaluation data: 1.08632888143
Accuracy on evaluation data: 9623 / 10000

Epoch 341 training complete
Cost on training data: 0.38938952477
Accuracy on training data: 48329 / 50000
Cost on evaluation data: 1.11526185059
Accuracy on evaluation data: 9567 / 10000

Epoch 342 training complete
Cost on training data: 0.377462701037
Accuracy on training data: 48431 / 50000
Cost on evaluation data: 1.10795406801
Accuracy on evaluation data: 9601 / 10000

Epoch 343 training complete
Cost on training data: 0.365977324355
Accuracy on training data: 48491 / 50000
Cost on evaluation data: 1.10160712006
Accuracy on evaluation data: 9577 / 10000

Epoch 344 training complete
Cost on training data: 0.336085065692
Accuracy on training data: 48767 / 50000
Cost on evaluation data: 1.06534265226
```

```
Accuracy on evaluation data: 9662 / 10000

Epoch 345 training complete
Cost on training data: 0.409969454603
Accuracy on training data: 48155 / 50000
Cost on evaluation data: 1.14731162887
Accuracy on evaluation data: 9514 / 10000

Epoch 346 training complete
Cost on training data: 0.339094214986
Accuracy on training data: 48714 / 50000
Cost on evaluation data: 1.07188289468
Accuracy on evaluation data: 9637 / 10000

Epoch 347 training complete
Cost on training data: 0.350088893861
Accuracy on training data: 48673 / 50000
Cost on evaluation data: 1.0868734699
Accuracy on evaluation data: 9622 / 10000

Epoch 348 training complete
Cost on training data: 0.41329833114
Accuracy on training data: 48226 / 50000
Cost on evaluation data: 1.13016837769
Accuracy on evaluation data: 9556 / 10000

Epoch 349 training complete
Cost on training data: 0.349011592464
Accuracy on training data: 48663 / 50000
Cost on evaluation data: 1.08634984731
Accuracy on evaluation data: 9626 / 10000

Epoch 350 training complete
Cost on training data: 0.369741031731
Accuracy on training data: 48455 / 50000
Cost on evaluation data: 1.09634989417
Accuracy on evaluation data: 9595 / 10000

Epoch 351 training complete
Cost on training data: 0.363959736166
Accuracy on training data: 48529 / 50000
Cost on evaluation data: 1.09314380665
Accuracy on evaluation data: 9611 / 10000

Epoch 352 training complete
Cost on training data: 0.368784782312
Accuracy on training data: 48550 / 50000
Cost on evaluation data: 1.10404577056
```

```
Accuracy on evaluation data: 9610 / 10000

Epoch 353 training complete
Cost on training data: 0.357225761251
Accuracy on training data: 48593 / 50000
Cost on evaluation data: 1.095191491
Accuracy on evaluation data: 9614 / 10000

Epoch 354 training complete
Cost on training data: 0.335580264157
Accuracy on training data: 48814 / 50000
Cost on evaluation data: 1.0629784718
Accuracy on evaluation data: 9670 / 10000

Epoch 355 training complete
Cost on training data: 0.417403465603
Accuracy on training data: 48055 / 50000
Cost on evaluation data: 1.15684096938
Accuracy on evaluation data: 9528 / 10000

Epoch 356 training complete
Cost on training data: 0.361288011775
Accuracy on training data: 48556 / 50000
Cost on evaluation data: 1.10097082294
Accuracy on evaluation data: 9593 / 10000

Epoch 357 training complete
Cost on training data: 0.388149987193
Accuracy on training data: 48354 / 50000
Cost on evaluation data: 1.11952856278
Accuracy on evaluation data: 9565 / 10000

Epoch 358 training complete
Cost on training data: 0.349460917928
Accuracy on training data: 48673 / 50000
Cost on evaluation data: 1.08906766628
Accuracy on evaluation data: 9629 / 10000

Epoch 359 training complete
Cost on training data: 0.338673047848
Accuracy on training data: 48750 / 50000
Cost on evaluation data: 1.06332000523
Accuracy on evaluation data: 9658 / 10000

Epoch 360 training complete
Cost on training data: 0.360318614292
Accuracy on training data: 48513 / 50000
Cost on evaluation data: 1.09691771517
```

```
Accuracy on evaluation data: 9591 / 10000

Epoch 361 training complete
Cost on training data: 0.364823425027
Accuracy on training data: 48555 / 50000
Cost on evaluation data: 1.10171912656
Accuracy on evaluation data: 9617 / 10000

Epoch 362 training complete
Cost on training data: 0.366087674219
Accuracy on training data: 48502 / 50000
Cost on evaluation data: 1.10372574134
Accuracy on evaluation data: 9578 / 10000

Epoch 363 training complete
Cost on training data: 0.38418437382
Accuracy on training data: 48341 / 50000
Cost on evaluation data: 1.10784617731
Accuracy on evaluation data: 9589 / 10000

Epoch 364 training complete
Cost on training data: 0.344754448465
Accuracy on training data: 48719 / 50000
Cost on evaluation data: 1.08407786993
Accuracy on evaluation data: 9634 / 10000

Epoch 365 training complete
Cost on training data: 0.34609368992
Accuracy on training data: 48689 / 50000
Cost on evaluation data: 1.06667208471
Accuracy on evaluation data: 9662 / 10000

Epoch 366 training complete
Cost on training data: 0.3418698954
Accuracy on training data: 48706 / 50000
Cost on evaluation data: 1.08307306202
Accuracy on evaluation data: 9625 / 10000

Epoch 367 training complete
Cost on training data: 0.368586619782
Accuracy on training data: 48456 / 50000
Cost on evaluation data: 1.09845752407
Accuracy on evaluation data: 9605 / 10000

Epoch 368 training complete
Cost on training data: 0.341695164829
Accuracy on training data: 48680 / 50000
Cost on evaluation data: 1.07143048082
```

```
Accuracy on evaluation data: 9646 / 10000

Epoch 369 training complete
Cost on training data: 0.39526755904
Accuracy on training data: 48235 / 50000
Cost on evaluation data: 1.13556613251
Accuracy on evaluation data: 9540 / 10000

Epoch 370 training complete
Cost on training data: 0.38401885474
Accuracy on training data: 48401 / 50000
Cost on evaluation data: 1.10464843612
Accuracy on evaluation data: 9582 / 10000

Epoch 371 training complete
Cost on training data: 0.353827869188
Accuracy on training data: 48590 / 50000
Cost on evaluation data: 1.06268224728
Accuracy on evaluation data: 9650 / 10000

Epoch 372 training complete
Cost on training data: 0.362510601775
Accuracy on training data: 48540 / 50000
Cost on evaluation data: 1.09229487094
Accuracy on evaluation data: 9613 / 10000

Epoch 373 training complete
Cost on training data: 0.343651999902
Accuracy on training data: 48706 / 50000
Cost on evaluation data: 1.07275359266
Accuracy on evaluation data: 9647 / 10000

Epoch 374 training complete
Cost on training data: 0.408844963312
Accuracy on training data: 48183 / 50000
Cost on evaluation data: 1.13951789436
Accuracy on evaluation data: 9531 / 10000

Epoch 375 training complete
Cost on training data: 0.352901159648
Accuracy on training data: 48617 / 50000
Cost on evaluation data: 1.07867470719
Accuracy on evaluation data: 9617 / 10000

Epoch 376 training complete
Cost on training data: 0.378953346118
Accuracy on training data: 48412 / 50000
Cost on evaluation data: 1.09970923919
```

```
Accuracy on evaluation data: 9601 / 10000

Epoch 377 training complete
Cost on training data: 0.336118526632
Accuracy on training data: 48797 / 50000
Cost on evaluation data: 1.06481505827
Accuracy on evaluation data: 9651 / 10000

Epoch 378 training complete
Cost on training data: 0.374707318505
Accuracy on training data: 48459 / 50000
Cost on evaluation data: 1.10165178401
Accuracy on evaluation data: 9597 / 10000

Epoch 379 training complete
Cost on training data: 0.364646037044
Accuracy on training data: 48510 / 50000
Cost on evaluation data: 1.08782054286
Accuracy on evaluation data: 9624 / 10000

Epoch 380 training complete
Cost on training data: 0.348159609616
Accuracy on training data: 48647 / 50000
Cost on evaluation data: 1.07472685616
Accuracy on evaluation data: 9618 / 10000

Epoch 381 training complete
Cost on training data: 0.355254966635
Accuracy on training data: 48632 / 50000
Cost on evaluation data: 1.07146838168
Accuracy on evaluation data: 9621 / 10000

Epoch 382 training complete
Cost on training data: 0.333063667602
Accuracy on training data: 48800 / 50000
Cost on evaluation data: 1.06269719724
Accuracy on evaluation data: 9644 / 10000

Epoch 383 training complete
Cost on training data: 0.342146544843
Accuracy on training data: 48691 / 50000
Cost on evaluation data: 1.06503172574
Accuracy on evaluation data: 9670 / 10000

Epoch 384 training complete
Cost on training data: 0.354845694002
Accuracy on training data: 48594 / 50000
Cost on evaluation data: 1.08549745215
```

```
Accuracy on evaluation data: 9626 / 10000

Epoch 385 training complete
Cost on training data: 0.352718165896
Accuracy on training data: 48605 / 50000
Cost on evaluation data: 1.08766088087
Accuracy on evaluation data: 9600 / 10000

Epoch 386 training complete
Cost on training data: 0.362902196413
Accuracy on training data: 48557 / 50000
Cost on evaluation data: 1.09168191577
Accuracy on evaluation data: 9608 / 10000

Epoch 387 training complete
Cost on training data: 0.384765009775
Accuracy on training data: 48347 / 50000
Cost on evaluation data: 1.10562825135
Accuracy on evaluation data: 9587 / 10000

Epoch 388 training complete
Cost on training data: 0.36743987023
Accuracy on training data: 48543 / 50000
Cost on evaluation data: 1.0939727365
Accuracy on evaluation data: 9616 / 10000

Epoch 389 training complete
Cost on training data: 0.384149185768
Accuracy on training data: 48387 / 50000
Cost on evaluation data: 1.11482732023
Accuracy on evaluation data: 9567 / 10000

Epoch 390 training complete
Cost on training data: 0.370269617102
Accuracy on training data: 48499 / 50000
Cost on evaluation data: 1.10828055727
Accuracy on evaluation data: 9592 / 10000

Epoch 391 training complete
Cost on training data: 0.351669882985
Accuracy on training data: 48668 / 50000
Cost on evaluation data: 1.09093148334
Accuracy on evaluation data: 9624 / 10000

Epoch 392 training complete
Cost on training data: 0.344255024699
Accuracy on training data: 48674 / 50000
Cost on evaluation data: 1.07318276734
```

```
Accuracy on evaluation data: 9653 / 10000

Epoch 393 training complete
Cost on training data: 0.348395485364
Accuracy on training data: 48651 / 50000
Cost on evaluation data: 1.07546304839
Accuracy on evaluation data: 9638 / 10000

Epoch 394 training complete
Cost on training data: 0.427304898925
Accuracy on training data: 47917 / 50000
Cost on evaluation data: 1.14838394828
Accuracy on evaluation data: 9495 / 10000

Epoch 395 training complete
Cost on training data: 0.342646866426
Accuracy on training data: 48722 / 50000
Cost on evaluation data: 1.08225990802
Accuracy on evaluation data: 9612 / 10000

Epoch 396 training complete
Cost on training data: 0.352607513756
Accuracy on training data: 48633 / 50000
Cost on evaluation data: 1.0832840042
Accuracy on evaluation data: 9634 / 10000

Epoch 397 training complete
Cost on training data: 0.348843682658
Accuracy on training data: 48666 / 50000
Cost on evaluation data: 1.06684858141
Accuracy on evaluation data: 9656 / 10000

Epoch 398 training complete
Cost on training data: 0.351048409009
Accuracy on training data: 48652 / 50000
Cost on evaluation data: 1.08109793796
Accuracy on evaluation data: 9638 / 10000

Epoch 399 training complete
Cost on training data: 0.410649134412
Accuracy on training data: 48094 / 50000
Cost on evaluation data: 1.14460120848
Accuracy on evaluation data: 9535 / 10000
```