3.1:

NN

CE: Train 0.38740 Validation 0.95633 Test 0.86177

Acc: Train 0.85625 Validation 0.73747 Test 0.74026

CNN

CE: Train 0.43665 Validation 0.63323 Test 0.63202

Acc: Train 0.83847 Validation 0.79236 Test 0.76883

3.2:

Eps: 0.001, 0.01, 0.1, 0.5, 1.0

**0.001**

CE: Train 0.98334 Validation 1.01839 Test 1.03876

Acc: Train 0.63900 Validation 0.63007 Test 0.60000

**0.005**

CE: Train 0.49237 Validation 0.97814 Test 0.90445

Acc: Train 0.81239 Validation 0.72554 Test 0.71688

**0.01**

CE: Train 0.38740 Validation 0.95633 Test 0.86177

Acc: Train 0.85625 Validation 0.73747 Test 0.74026

**0.05**

CE: Train 0.56579 Validation 1.30734 Test 1.10953

Acc: Train 0.79816 Validation 0.65871 Test 0.68052

**0.1**

CE: Train 0.85699 Validation 1.14380 Test 1.12948

Acc: Train 0.72525 Validation 0.68496 Test 0.63896

**~~0.5~~**

~~CE: Train 1.86108 Validation 1.85905 Test 1.83899~~

~~Acc: Train 0.28542 Validation 0.27924 Test 0.31688~~

**1.0**

CE: Train 1.86245 Validation 1.86104 Test 1.84036

Acc: Train 0.28542 Validation 0.27924 Test 0.31688

**0.001**

CE: Train 1.84815 Validation 1.85101 Test 1.82782

Acc: Train 0.28542 Validation 0.27924 Test 0.31688

**0.01**

CE: Train 1.10297 Validation 1.10436 Test 1.11776

Acc: Train 0.61352 Validation 0.59905 Test 0.61039

**0.05**

CE: Train 0.82335 Validation 0.87704 Test 0.90520

Acc: Train 0.70332 Validation 0.69928 Test 0.68571

**0.1**

CE: Train 0.43665 Validation 0.63323 Test 0.63202

Acc: Train 0.83847 Validation 0.79236 Test 0.76883

**~~0.5~~**

~~CE: Train 1.86165 Validation 1.85870 Test 1.84225~~

~~Acc: Train 0.28542 Validation 0.27924 Test 0.31688~~

**1.0**

CE: Train 1.86420 Validation 1.86102 Test 1.84769

Acc: Train 0.28542 Validation 0.27924 Test 0.31688

Momentum: 0.3, 0.6, 0.9

**0.0**

CE: Train 0.38740 Validation 0.95633 Test 0.86177

Acc: Train 0.85625 Validation 0.73747 Test 0.74026

**0.3**

CE: Train 0.27271 Validation 1.14016 Test 0.95320

Acc: Train 0.89893 Validation 0.72076 Test 0.74545

**0.6**

CE: Train 0.29303 Validation 0.97333 Test 0.96477

Acc: Train 0.89597 Validation 0.72554 Test 0.70130

**0.9**

CE: Train 0.00323 Validation 2.35975 Test 1.99778

Acc: Train 1.00000 Validation 0.74224 Test 0.77922

**0.0**

CE: Train 0.43665 Validation 0.63323 Test 0.63202

Acc: Train 0.83847 Validation 0.79236 Test 0.76883

**0.3**

CE: Train 0.35368 Validation 0.69299 Test 0.59336

Acc: Train 0.87759 Validation 0.76850 Test 0.76883

**0.6**

CE: Train 0.21042 Validation 0.80755 Test 0.71512

Acc: Train 0.92620 Validation 0.77088 Test 0.75584

**0.9**

CE: Train 1.86147 Validation 1.85794 Test 1.83964

Acc: Train 0.28542 Validation 0.27924 Test 0.31688

Mini-batch size: 1, 10, 100, 500, 1000

**1:**

CE: Train 0.95778 Validation 2.61369 Test 2.18502

Acc: Train 0.78660 Validation 0.68019 Test 0.70130

**10:**

CE: Train 0.00180 Validation 2.37357 Test 1.90406

Acc: Train 1.0000 Validation 0.74702 Test 0.77662

**100:**

CE: Train 0.38740 Validation 0.95633 Test 0.86177

Acc: Train 0.85625 Validation 0.73747 Test 0.74026

**500:**

CE: Train 0.77602 Validation 0.88781 Test 0.91100

Acc: Train 0.71903 Validation 0.63007 Test 0.66234

**1000:**

CE: Train 1.12063 Validation 1.13375 Test 1.15588

Acc: Train 0.60344 Validation 0.58950 Test 0.56364

**1:**

CE: Train 1.88155 Validation 1.88067 Test 1.87092

Acc: Train 0.28542 Validation 0.27924 Test 0.31688

**10:**

CE: Train 1.25564 Validation 1.71583 Test 1.39351

Acc: Train 0.54801 Validation 0.46778 Test 0.50390

**100:**

CE: Train 0.43665 Validation 0.63323 Test 0.63202

Acc: Train 0.83847 Validation 0.79236 Test 0.76883

**500:**

CE: Train 1.11511 Validation 1.07845 Test 1.15663

Acc: Train 0.63545 Validation 0.61098 Test 0.61818

**1000:**

CE: Train 3.02981 Validation 2.84858 Test 3.13769

Acc: Train 0.32513 Validation 0.33413 Test 0.32727

**3.3:**

2,50,100

Epochs 250, default learning rates.

2,32

CE: Train 0.84712 Validation 1.08366 Test 1.11583

Acc: Train 0.69265 Validation 0.63246 Test 0.60260

50,32

CE: Train 0.22881 Validation 1.32803 Test 1.29762

Acc: Train 0.91049 Validation 0.74702 Test 0.70130

100,32

CE: Train 0.18360 Validation 1.30536 Test 1.11899

Acc: Train 0.93094 Validation 0.75895 Test 0.74545

16,2

CE: Train 0.82891 Validation 1.10209 Test 1.07401

Acc: Train 0.69769 Validation 0.62768 Test 0.60260

16,50

CE: Train 0.34499 Validation 1.02241 Test 0.94215

Acc: Train 0.86426 Validation 0.72315 Test 0.73506

16,100

CE: Train 0.23790 Validation 1.04204 Test 1.04273

Acc: Train 0.91286 Validation 0.73747 Test 0.71429

**CNN**

2-16

CE: Train 1.86186 Validation 1.85961 Test 1.84004

Acc: Train 0.28542 Validation 0.27924 Test 0.31688

15-16

CE: Train 0.73828 Validation 0.85413 Test 0.80747

Acc: Train 0.74748 Validation 0.70883 Test 0.71429

30-16

CE: Train 1.86226 Validation 1.85867 Test 1.84428

Acc: Train 0.28542 Validation 0.27924 Test 0.31688

8-2

CE: Train 1.86147 Validation 1.85794 Test 1.83964

Acc: Train 0.28542 Validation 0.27924 Test 0.31688

8-15

CE: Train 1.86147 Validation 1.85794 Test 1.83964

Acc: Train 0.28542 Validation 0.27924 Test 0.31688

8-30

CE: Train 0.93646 Validation 1.26483 Test 1.19042

Acc: Train 0.68791 Validation 0.60621 Test 0.61818

3.4

NN:

Input 2304

Outputs 7

16, 32

2304\*16+16+16\*32+32+32\*7+7 = 37655

CNN

numChannel 1

numOutput 7

numFilter1 = 8

numFilter2 = 16

filtersize =5

5x5x1x8+8+5x5x8x16+16+16x64x7+7 = 10599

Change NN to 5 and 5

NN

CE: Train 0.84129 Validation 1.10018 Test 1.07887

Acc: Train 0.68346 Validation 0.62768 Test 0.60779

CNN

CE: Train 0.41933 Validation 0.64808 Test 0.66129

Acc: Train 0.84618 Validation 0.78759 Test 0.74805

CNN:

4.2:

**randConst: 1**

Iter 1 logLikelihood -389563.37143

Iter 2 logLikelihood 4869174.51947

Iter 3 logLikelihood 5840651.53433

Iter 4 logLikelihood 6065743.93889

Iter 5 logLikelihood 6252181.86132

Iter 6 logLikelihood 6323678.96411

Iter 7 logLikelihood 6349247.45486

Iter 8 logLikelihood 6362503.87340

Iter 9 logLikelihood 6367031.91710

Iter 10 logLikelihood 6370454.02535

probabilities of clusters:

[[ 0.0480172 ]

[ 0.15731185]

[ 0.20355158]

[ 0.10050798]

[ 0.1641975 ]

[ 0.19332084]

[ 0.13309304]]

**randConst: 0.5**

Iter 1 logLikelihood -5977778.05858

Iter 2 logLikelihood 5365371.15879

Iter 3 logLikelihood 5885115.14167

Iter 4 logLikelihood 6046761.86429

Iter 5 logLikelihood 6112315.15133

Iter 6 logLikelihood 6143603.06972

Iter 7 logLikelihood 6163342.39442

Iter 8 logLikelihood 6180082.38384

Iter 9 logLikelihood 6190682.45160

Iter 10 logLikelihood 6200398.07419

probabilities of clusters:

[[ 0.23403804]

[ 0.29572614]

[ 0.11623679]

[ 0.04900158]

[ 0.19862918]

[ 0.10607188]

[ 0.00029638]]

**randCost 1.5:**

Iter 1 logLikelihood 714304.97655

Iter 2 logLikelihood 5219819.26170

Iter 3 logLikelihood 5996070.74278

Iter 4 logLikelihood 6166225.07638

Iter 5 logLikelihood 6224038.78909

Iter 6 logLikelihood 6246992.19185

Iter 7 logLikelihood 6262949.59616

Iter 8 logLikelihood 6277293.58249

Iter 9 logLikelihood 6285011.07855

Iter 10 logLikelihood 6289160.80219

probabilities of clusters:

[[ 0.07557852]

[ 0.04773834]

[ 0.21564725]

[ 0.27101569]

[ 0.0675629 ]

[ 0.08535864]

[ 0.23709867]]