MNSIT RESULTS

Unless otherwise specified in brackets, the parameters for this experiment are -
batch_size = 20
nkerns = [32,64] (Number of kernels in layer1,layer2)
learning_rate = 0.01
verbose=True
activation=relu (Rectified linear unit)
fullyconnected=20 -> Num. of hidden units in the fully connected layer(dropout/dropconnect)
p=0.5 (Probability of choosing an element of the mask in the dropout/dropconnect layer as 1)
Learning rate decay - 0.5
Momentum - 0.9
The feature extraction is by either a 2 layer CNN(nkerns[0],nkerns[1]) or a 2 layer MLP(number of hidden units=50 in each layer)

1. CNN
Best validation score of 0.990000 % obtained at iteration 290000, with test performance 1.060000 %
The training process for function test_lenet ran for 30.65m

2. CNN+Dropout
Best validation score of 5.450000 % obtained at iteration 317500, with test performance 5.860000 %
The training process for function test_dropout ran for 25.18m

3. CNN+Dropconnect
Best validation score of 1.000000 % obtained at iteration 287500, with test performance 0.960000 %
The training process for function test_dropconnect ran for 201.02m

4. Crop+CNN
The training process for function test_lenet_crop ran for 35.82m
Best validation score of 10.950000 % obtained at iteration 367250, with test performance 20.700000 %

5. Crop+CNN+Dropout
Best validation score of 7.620000 % obtained at iteration 610000, with test performance 7.140000 %
The training process for function test_dropout_crop ran for 46.37m

6. Crop+CNN+Dropconnect
Best validation score of 9.490000 % obtained at iteration 730000, with test performance 15.250000 %
The training process for function test_dropconnect_crop ran for 457.66m

7. Crop+Scale+Rotation+CNN
Best validation score of 1.270000 % obtained at iteration 350000, with test performance 1.470000 %
The training process for function test_lenet_cropscalrot ran for 26.70m

8. Crop+Scale+Rotation+CNN+Dropout

Best validation score of 9.910000 % obtained at iteration 383500, with test performance 5.560000 %
The training process for function test_dropout_cropscalrot ran for 32.68m

9. Crop+Scale+Rotation+CNN+Dropconnect

Best validation score of 1.470000 % obtained at iteration 243750, with test performance 4.780000 %
The training process for function test_dropconnect_cropscalrot ran for 246.78m

10 CNN+Dropconnect(fullyconnectedlayer=150)
At the end of 18 epochs, below are the results
epoch 18, minibatch 2500/2500, validation error 1.470000 %
epoch 18, minibatch 2500/2500, test error of best model 1.200000 %

11.CNN+Dropconnect(fullyconnectedlayer=350)
At the end of 18 epochs, below were the results
epoch 18, minibatch 2500/2500, validation error 1.320000 %
epoch 18, minibatch 2500/2500, test error of best model 1.270000 %

12.CNN+Dropconnect(p=0.1)
Best validation score of 1.130000 % obtained at iteration 292500, with test performance 1.020000 %
The training process for function test_dropconnect ran for 216.55m

13.CNN+Dropconnect(p=0.8)
The training process for function test_dropconnect ran for 197.09m
Best validation score of 1.040000 % obtained at iteration 277500, with test performance
1.030000 %

14.MLP+Dropconnect(activation=tanh)
Best validation score of 3.970000 % obtained at iteration 430000, with test performance 4.400000 %
The training process for function test_mlp ran for 343.60m

15.MLP+Dropconnect(activation=sigmoid)
Best validation score of 3.830000 % obtained at iteration 200000, with test performance 3.900000 %

The training process for function test_mlp ran for 240.10m

16.MLP+Dropconnect(relu)
The training process for function test_mlp ran for 226.00m
Best validation score of 2.640000 % obtained at iteration 380000, with test performance 2.950000 %

17.CNN+Dropout(fullyconnected=150)
The training process for function test_dropout ran for 25.27m
Best validation score of 0.990000 % obtained at iteration 265000, with test performance 1.040000 %

18.CNN+Dropout(p=0.1)
The training process for function test_dropout ran for 23.86m
Best validation score of 64.720000 % obtained at iteration 207500, with test performance 65.820000 %

19.CNN+Dropout(p=0.8)
Best validation score of 1.230000 % obtained at iteration 252500, with test performance 1.450000 %
The training process for function test_dropout ran for 24.22m

20.CNN+Dropout(fullyconnected=350)
The training process for function test_dropout ran for 31.75m
Best validation score of 0.840000 % obtained at iteration 225000, with test performance 0.890000 %

21.CNN+Dropout(activation=tanh)
The training process for function test_dropout ran for 24.17m
Best validation score of 2.060000 % obtained at iteration 247500, with test performance 2.410000 %

22.CNN+Dropout(activation=sigmoid)
Best validation score of 13.360000 % obtained at iteration 247500, with test performance 14.030000 %
The training process for function test_dropout ran for 18.92m

23.CNN(activation=tanh)
The training process for function test_lenet ran for 26.43m

Best validation score of 1.060000 % obtained at iteration 275000, with test performance 0.970000 %

24.CNN(activation=sigmoid)
Best validation score of 1.130000 % obtained at iteration 462500, with test performance 1.090000 %
The training process for function test_lenet ran for 41.67m

DropConnect:
Error vs HiddenLayers:
20 -> 0.96
150 -> 1.2
350 -> 1.27

DropOut:
Error vs HiddenLayers:
20 -> 5.86
150 -> 1.04
350 -> 0.89

DropConnect:
Error vs p:
0.1 -> 1.02
0.5 -> 0.96
0.8 -> 1.03

DropOut:
0.1 -> 65.82
0.5 -> 5.86
0.8 -> 1.45