**PROJECT RESULTS:**

Consists of:-

1. Accuracy
2. Stepwise Loss
3. CNN error at the end
4. Improvement between start and end

**Dataset:**

number of training examples = 12000

number of test examples = 1199

X\_train shape: (12000, 2500)

Y\_train shape: (1, 12000)

X\_test shape: (1199, 2500)

Y\_test shape: (1, 1199)

X\_train shape: (12000, 50, 50, 1)

X\_test shape: (1199, 50, 50, 1)

**RESULT(AS FOUND IN OUTPUT):**

Train on 12000 samples, validate on 1199 samples:

Epoch 1/1

64/12000 [..............................] - ETA: 2:08 - loss: 2.8435 - acc: 0.0781

128/12000 [..............................] - ETA: 1:33 - loss: 3.1224 - acc: 0.0859

192/12000 [..............................] - ETA: 1:22 - loss: 2.9768 - acc: 0.1094

256/12000 [..............................] - ETA: 1:21 - loss: 2.9987 - acc: 0.1016

320/12000 [..............................] - ETA: 1:17 - loss: 2.9997 - acc: 0.0938

384/12000 [..............................] - ETA: 1:15 - loss: 2.9613 - acc: 0.0964

448/12000 [>.............................] - ETA: 1:14 - loss: 2.9330 - acc: 0.0982

512/12000 [>.............................] - ETA: 1:12 - loss: 2.9019 - acc: 0.1016

576/12000 [>.............................] - ETA: 1:11 - loss: 2.8997 - acc: 0.0990

640/12000 [>.............................] - ETA: 1:10 - loss: 2.8735 - acc: 0.1031

704/12000 [>.............................] - ETA: 1:09 - loss: 2.8553 - acc: 0.1065

768/12000 [>.............................] - ETA: 1:08 - loss: 2.8261 - acc: 0.1081

832/12000 [=>............................] - ETA: 1:07 - loss: 2.8196 - acc: 0.1070

896/12000 [=>............................] - ETA: 1:06 - loss: 2.8068 - acc: 0.1016

960/12000 [=>............................] - ETA: 1:06 - loss: 2.7876 - acc: 0.1000

1024/12000 [=>............................] - ETA: 1:05 - loss: 2.7672 - acc: 0.1006

1088/12000 [=>............................] - ETA: 1:04 - loss: 2.7521 - acc: 0.1002

1152/12000 [=>............................] - ETA: 1:04 - loss: 2.7358 - acc: 0.1024

1216/12000 [==>...........................] - ETA: 1:03 - loss: 2.7149 - acc: 0.1069

1280/12000 [==>...........................] - ETA: 1:02 - loss: 2.7006 - acc: 0.1078

1344/12000 [==>...........................] - ETA: 1:02 - loss: 2.6867 - acc: 0.1101

1408/12000 [==>...........................] - ETA: 1:01 - loss: 2.6692 - acc: 0.1115

1472/12000 [==>...........................] - ETA: 1:01 - loss: 2.6512 - acc: 0.1168

1536/12000 [==>...........................] - ETA: 1:00 - loss: 2.6321 - acc: 0.1217

1600/12000 [===>..........................] - ETA: 1:00 - loss: 2.6168 - acc: 0.1263

1664/12000 [===>..........................] - ETA: 59s - loss: 2.5975 - acc: 0.1322

1728/12000 [===>..........................] - ETA: 59s - loss: 2.5813 - acc: 0.1360

1792/12000 [===>..........................] - ETA: 58s - loss: 2.5605 - acc: 0.1434

1856/12000 [===>..........................] - ETA: 58s - loss: 2.5421 - acc: 0.1514

1920/12000 [===>..........................] - ETA: 57s - loss: 2.5177 - acc: 0.1630

1984/12000 [===>..........................] - ETA: 57s - loss: 2.4937 - acc: 0.1729

2048/12000 [====>.........................] - ETA: 57s - loss: 2.4735 - acc: 0.1807

2112/12000 [====>.........................] - ETA: 56s - loss: 2.4491 - acc: 0.1894

2176/12000 [====>.........................] - ETA: 56s - loss: 2.4247 - acc: 0.2013

2240/12000 [====>.........................] - ETA: 55s - loss: 2.3998 - acc: 0.2107

2304/12000 [====>.........................] - ETA: 55s - loss: 2.3734 - acc: 0.2222

2368/12000 [====>.........................] - ETA: 55s - loss: 2.3515 - acc: 0.2335

2432/12000 [=====>........................] - ETA: 55s - loss: 2.3252 - acc: 0.2447

2496/12000 [=====>........................] - ETA: 54s - loss: 2.2988 - acc: 0.2540

2560/12000 [=====>........................] - ETA: 54s - loss: 2.2740 - acc: 0.2625

2624/12000 [=====>........................] - ETA: 54s - loss: 2.2487 - acc: 0.2725

2688/12000 [=====>........................] - ETA: 53s - loss: 2.2226 - acc: 0.2809

2752/12000 [=====>........................] - ETA: 53s - loss: 2.1956 - acc: 0.2914

2816/12000 [======>.......................] - ETA: 52s - loss: 2.1656 - acc: 0.3040

2880/12000 [======>.......................] - ETA: 52s - loss: 2.1432 - acc: 0.3115

2944/12000 [======>.......................] - ETA: 51s - loss: 2.1152 - acc: 0.3207

3008/12000 [======>.......................] - ETA: 51s - loss: 2.0867 - acc: 0.3324

3072/12000 [======>.......................] - ETA: 51s - loss: 2.0588 - acc: 0.3421

3136/12000 [======>.......................] - ETA: 50s - loss: 2.0303 - acc: 0.3533

3200/12000 [=======>......................] - ETA: 50s - loss: 2.0008 - acc: 0.3628

3264/12000 [=======>......................] - ETA: 50s - loss: 1.9733 - acc: 0.3732

3328/12000 [=======>......................] - ETA: 49s - loss: 1.9459 - acc: 0.3819

3392/12000 [=======>......................] - ETA: 49s - loss: 1.9160 - acc: 0.3933

3456/12000 [=======>......................] - ETA: 48s - loss: 1.8876 - acc: 0.4034

3520/12000 [=======>......................] - ETA: 48s - loss: 1.8616 - acc: 0.4131

3584/12000 [=======>......................] - ETA: 48s - loss: 1.8351 - acc: 0.4216

3648/12000 [========>.....................] - ETA: 47s - loss: 1.8107 - acc: 0.4285

3712/12000 [========>.....................] - ETA: 47s - loss: 1.7849 - acc: 0.4364

3776/12000 [========>.....................] - ETA: 46s - loss: 1.7586 - acc: 0.4452

3840/12000 [========>.....................] - ETA: 46s - loss: 1.7359 - acc: 0.4526

3904/12000 [========>.....................] - ETA: 46s - loss: 1.7121 - acc: 0.4606

3968/12000 [========>.....................] - ETA: 45s - loss: 1.6871 - acc: 0.4688

4032/12000 [=========>....................] - ETA: 45s - loss: 1.6654 - acc: 0.4759

4096/12000 [=========>....................] - ETA: 44s - loss: 1.6419 - acc: 0.4841

4160/12000 [=========>....................] - ETA: 44s - loss: 1.6198 - acc: 0.4911

4224/12000 [=========>....................] - ETA: 44s - loss: 1.5994 - acc: 0.4979

4288/12000 [=========>....................] - ETA: 43s - loss: 1.5788 - acc: 0.5049

4352/12000 [=========>....................] - ETA: 43s - loss: 1.5583 - acc: 0.5113

4416/12000 [==========>...................] - ETA: 42s - loss: 1.5390 - acc: 0.5177

4480/12000 [==========>...................] - ETA: 42s - loss: 1.5209 - acc: 0.5234

4544/12000 [==========>...................] - ETA: 42s - loss: 1.5012 - acc: 0.5299

4608/12000 [==========>...................] - ETA: 41s - loss: 1.4823 - acc: 0.5356

4672/12000 [==========>...................] - ETA: 41s - loss: 1.4642 - acc: 0.5415

4736/12000 [==========>...................] - ETA: 41s - loss: 1.4458 - acc: 0.5475

4800/12000 [===========>..................] - ETA: 40s - loss: 1.4285 - acc: 0.5531

4864/12000 [===========>..................] - ETA: 40s - loss: 1.4114 - acc: 0.5586

4928/12000 [===========>..................] - ETA: 39s - loss: 1.3947 - acc: 0.5639

4992/12000 [===========>..................] - ETA: 39s - loss: 1.3788 - acc: 0.5689

5056/12000 [===========>..................] - ETA: 39s - loss: 1.3619 - acc: 0.5744

5120/12000 [===========>..................] - ETA: 38s - loss: 1.3458 - acc: 0.5795

5184/12000 [===========>..................] - ETA: 38s - loss: 1.3304 - acc: 0.5845

5248/12000 [============>.................] - ETA: 37s - loss: 1.3149 - acc: 0.5896

5312/12000 [============>.................] - ETA: 37s - loss: 1.3012 - acc: 0.5941

5376/12000 [============>.................] - ETA: 37s - loss: 1.2869 - acc: 0.5986

5440/12000 [============>.................] - ETA: 36s - loss: 1.2722 - acc: 0.6033

5504/12000 [============>.................] - ETA: 36s - loss: 1.2594 - acc: 0.6074

5568/12000 [============>.................] - ETA: 36s - loss: 1.2456 - acc: 0.6119

5632/12000 [=============>................] - ETA: 35s - loss: 1.2330 - acc: 0.6161

5696/12000 [=============>................] - ETA: 35s - loss: 1.2195 - acc: 0.6204

5760/12000 [=============>................] - ETA: 35s - loss: 1.2065 - acc: 0.6247

5824/12000 [=============>................] - ETA: 34s - loss: 1.1942 - acc: 0.6284

5888/12000 [=============>................] - ETA: 34s - loss: 1.1821 - acc: 0.6323

5952/12000 [=============>................] - ETA: 33s - loss: 1.1699 - acc: 0.6361

6016/12000 [==============>...............] - ETA: 33s - loss: 1.1580 - acc: 0.6398

6080/12000 [==============>...............] - ETA: 33s - loss: 1.1466 - acc: 0.6433

6144/12000 [==============>...............] - ETA: 32s - loss: 1.1362 - acc: 0.6466

6208/12000 [==============>...............] - ETA: 32s - loss: 1.1249 - acc: 0.6501

6272/12000 [==============>...............] - ETA: 32s - loss: 1.1140 - acc: 0.6535

6336/12000 [==============>...............] - ETA: 31s - loss: 1.1033 - acc: 0.6569

6400/12000 [===============>..............] - ETA: 31s - loss: 1.0930 - acc: 0.6600

6464/12000 [===============>..............] - ETA: 31s - loss: 1.0834 - acc: 0.6629

6528/12000 [===============>..............] - ETA: 30s - loss: 1.0731 - acc: 0.6662

6592/12000 [===============>..............] - ETA: 30s - loss: 1.0635 - acc: 0.6693

6656/12000 [===============>..............] - ETA: 29s - loss: 1.0541 - acc: 0.6722

6720/12000 [===============>..............] - ETA: 29s - loss: 1.0448 - acc: 0.6750

6784/12000 [===============>..............] - ETA: 29s - loss: 1.0360 - acc: 0.6778

6848/12000 [================>.............] - ETA: 28s - loss: 1.0269 - acc: 0.6808

6912/12000 [================>.............] - ETA: 28s - loss: 1.0184 - acc: 0.6834

6976/12000 [================>.............] - ETA: 28s - loss: 1.0094 - acc: 0.6864

7040/12000 [================>.............] - ETA: 27s - loss: 1.0006 - acc: 0.6892

7104/12000 [================>.............] - ETA: 27s - loss: 0.9920 - acc: 0.6920

7168/12000 [================>.............] - ETA: 27s - loss: 0.9835 - acc: 0.6946

7232/12000 [=================>............] - ETA: 26s - loss: 0.9750 - acc: 0.6973

7296/12000 [=================>............] - ETA: 26s - loss: 0.9668 - acc: 0.6998

7360/12000 [=================>............] - ETA: 25s - loss: 0.9590 - acc: 0.7022

7424/12000 [=================>............] - ETA: 25s - loss: 0.9510 - acc: 0.7046

7488/12000 [=================>............] - ETA: 25s - loss: 0.9432 - acc: 0.7071

7552/12000 [=================>............] - ETA: 24s - loss: 0.9353 - acc: 0.7096

7616/12000 [==================>...........] - ETA: 24s - loss: 0.9277 - acc: 0.7121

7680/12000 [==================>...........] - ETA: 24s - loss: 0.9202 - acc: 0.7145

7744/12000 [==================>...........] - ETA: 23s - loss: 0.9128 - acc: 0.7168

7808/12000 [==================>...........] - ETA: 23s - loss: 0.9055 - acc: 0.7191

7872/12000 [==================>...........] - ETA: 23s - loss: 0.8987 - acc: 0.7212

7936/12000 [==================>...........] - ETA: 22s - loss: 0.8916 - acc: 0.7234

8000/12000 [===================>..........] - ETA: 22s - loss: 0.8848 - acc: 0.7256

8064/12000 [===================>..........] - ETA: 21s - loss: 0.8781 - acc: 0.7277

8128/12000 [===================>..........] - ETA: 21s - loss: 0.8715 - acc: 0.7297

8192/12000 [===================>..........] - ETA: 21s - loss: 0.8647 - acc: 0.7318

8256/12000 [===================>..........] - ETA: 20s - loss: 0.8583 - acc: 0.7338

8320/12000 [===================>..........] - ETA: 20s - loss: 0.8526 - acc: 0.7356

8384/12000 [===================>..........] - ETA: 20s - loss: 0.8462 - acc: 0.7376

8448/12000 [====================>.........] - ETA: 19s - loss: 0.8400 - acc: 0.7396

8512/12000 [====================>.........] - ETA: 19s - loss: 0.8338 - acc: 0.7415

8576/12000 [====================>.........] - ETA: 19s - loss: 0.8278 - acc: 0.7434

8640/12000 [====================>.........] - ETA: 18s - loss: 0.8226 - acc: 0.7449

8704/12000 [====================>.........] - ETA: 18s - loss: 0.8167 - acc: 0.7467

8768/12000 [====================>.........] - ETA: 18s - loss: 0.8109 - acc: 0.7485

8832/12000 [=====================>........] - ETA: 17s - loss: 0.8052 - acc: 0.7503

8896/12000 [=====================>........] - ETA: 17s - loss: 0.7997 - acc: 0.7520

8960/12000 [=====================>........] - ETA: 16s - loss: 0.7947 - acc: 0.7536

9024/12000 [=====================>........] - ETA: 16s - loss: 0.7893 - acc: 0.7552

9088/12000 [=====================>........] - ETA: 16s - loss: 0.7841 - acc: 0.7568

9152/12000 [=====================>........] - ETA: 15s - loss: 0.7787 - acc: 0.7585

9216/12000 [======================>.......] - ETA: 15s - loss: 0.7735 - acc: 0.7601

9280/12000 [======================>.......] - ETA: 15s - loss: 0.7684 - acc: 0.7616

9344/12000 [======================>.......] - ETA: 14s - loss: 0.7633 - acc: 0.7633

9408/12000 [======================>.......] - ETA: 14s - loss: 0.7582 - acc: 0.7649

9472/12000 [======================>.......] - ETA: 14s - loss: 0.7532 - acc: 0.7665

9536/12000 [======================>.......] - ETA: 13s - loss: 0.7483 - acc: 0.7680

9600/12000 [=======================>......] - ETA: 13s - loss: 0.7434 - acc: 0.7696

9664/12000 [=======================>......] - ETA: 13s - loss: 0.7386 - acc: 0.7711

9728/12000 [=======================>......] - ETA: 12s - loss: 0.7340 - acc: 0.7726

9792/12000 [=======================>......] - ETA: 12s - loss: 0.7294 - acc: 0.7740

9856/12000 [=======================>......] - ETA: 11s - loss: 0.7248 - acc: 0.7755

9920/12000 [=======================>......] - ETA: 11s - loss: 0.7202 - acc: 0.7769

9984/12000 [=======================>......] - ETA: 11s - loss: 0.7157 - acc: 0.7783

10048/12000 [========================>.....] - ETA: 10s - loss: 0.7113 - acc: 0.7798

10112/12000 [========================>.....] - ETA: 10s - loss: 0.7069 - acc: 0.7812

10176/12000 [========================>.....] - ETA: 10s - loss: 0.7025 - acc: 0.7825

10240/12000 [========================>.....] - ETA: 9s - loss: 0.6982 - acc: 0.7839

10304/12000 [========================>.....] - ETA: 9s - loss: 0.6940 - acc: 0.7852

10368/12000 [========================>.....] - ETA: 9s - loss: 0.6899 - acc: 0.7865

10432/12000 [=========================>....] - ETA: 8s - loss: 0.6857 - acc: 0.7878

10496/12000 [=========================>....] - ETA: 8s - loss: 0.6816 - acc: 0.7891

10560/12000 [=========================>....] - ETA: 8s - loss: 0.6775 - acc: 0.7903

10624/12000 [=========================>....] - ETA: 7s - loss: 0.6735 - acc: 0.7916

10688/12000 [=========================>....] - ETA: 7s - loss: 0.6695 - acc: 0.7929

10752/12000 [=========================>....] - ETA: 6s - loss: 0.6657 - acc: 0.7941

10816/12000 [==========================>...] - ETA: 6s - loss: 0.6618 - acc: 0.7953

10880/12000 [==========================>...] - ETA: 6s - loss: 0.6579 - acc: 0.7965

10944/12000 [==========================>...] - ETA: 5s - loss: 0.6541 - acc: 0.7977

11008/12000 [==========================>...] - ETA: 5s - loss: 0.6504 - acc: 0.7989

11072/12000 [==========================>...] - ETA: 5s - loss: 0.6468 - acc: 0.8000

11136/12000 [==========================>...] - ETA: 4s - loss: 0.6433 - acc: 0.8011

11200/12000 [===========================>..] - ETA: 4s - loss: 0.6397 - acc: 0.8022

11264/12000 [===========================>..] - ETA: 4s - loss: 0.6362 - acc: 0.8033

11328/12000 [===========================>..] - ETA: 3s - loss: 0.6327 - acc: 0.8043

11392/12000 [===========================>..] - ETA: 3s - loss: 0.6294 - acc: 0.8053

11456/12000 [===========================>..] - ETA: 3s - loss: 0.6260 - acc: 0.8064

11520/12000 [===========================>..] - ETA: 2s - loss: 0.6226 - acc: 0.8075

11584/12000 [===========================>..] - ETA: 2s - loss: 0.6192 - acc: 0.8085

11648/12000 [============================>.] - ETA: 1s - loss: 0.6159 - acc: 0.8096

11712/12000 [============================>.] - ETA: 1s - loss: 0.6126 - acc: 0.8106

11776/12000 [============================>.] - ETA: 1s - loss: 0.6097 - acc: 0.8114

11840/12000 [============================>.] - ETA: 0s - loss: 0.6065 - acc: 0.8124

11904/12000 [============================>.] - ETA: 0s - loss: 0.6033 - acc: 0.8134

11968/12000 [============================>.] - ETA: 0s - loss: 0.6001 - acc: 0.8144

12000/12000 [==============================] - 70s 6ms/step - loss: 0.5986 - acc: 0.8149 - val\_loss: 0.0097 - val\_acc: 0.9975

Epoch 00001: val\_acc improved from -inf to 0.99750

CNN Error: 0.25%

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Layer (type) Output Shape Param #

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conv2d\_1 (Conv2D) (None, 46, 46, 32) 832

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max\_pooling2d\_1 (MaxPooling2 (None, 23, 23, 32) 0

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conv2d\_2 (Conv2D) (None, 19, 19, 64) 51264

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max\_pooling2d\_2 (MaxPooling2 (None, 4, 4, 64) 0

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flatten\_1 (Flatten) (None, 1024) 0

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dense\_1 (Dense) (None, 1024) 1049600

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dropout\_1 (Dropout) (None, 1024) 0

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dense\_2 (Dense) (None, 12) 12300

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Total params: 1,113,996

Trainable params: 1,113,996

Non-trainable params: 0