Assignment-2
CS671 - Deep Learning

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1 LINE DATASET

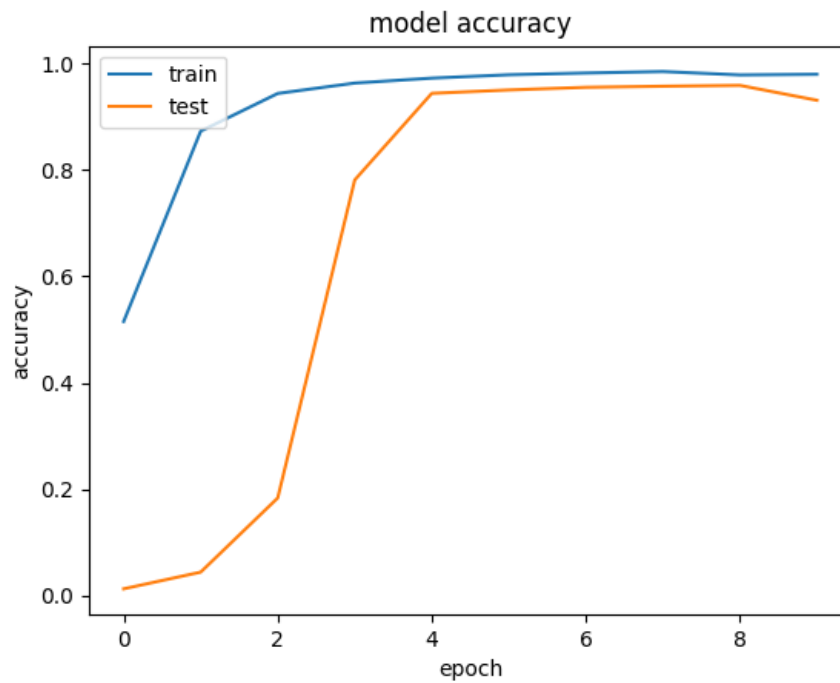## 1.1 Learning Curves

1.1.1 Accuracy vs no. of iterations

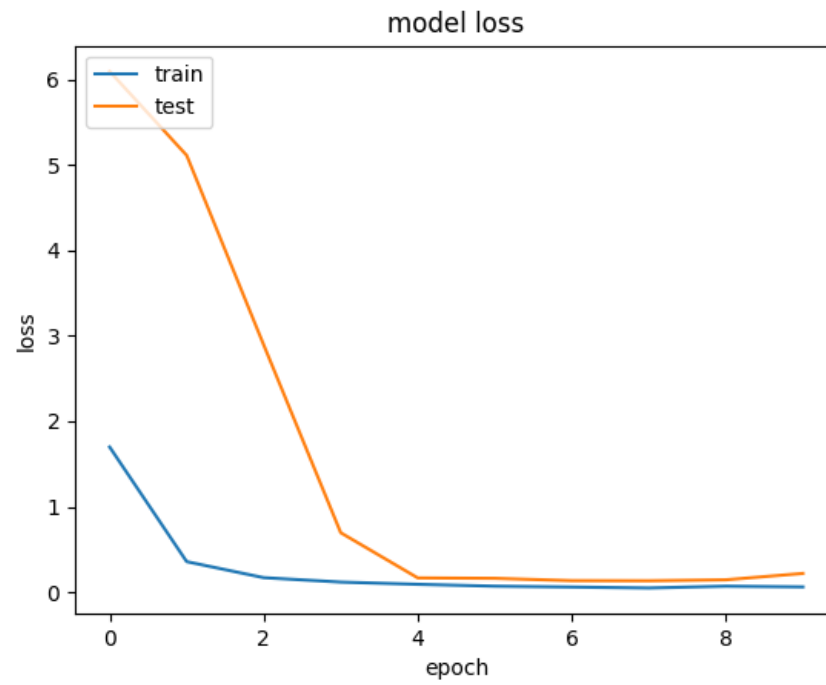Figure 1: Accuracy curve

1.1.2 Loss vs. no. of iterations

Figure 2: Loss vs no. of iterations

1.2 Classification Report

cls_report classes	precision	recall	F-scores	support
0	0.85	0.97	0.91	408
1	0.98	0.99	0.99	392
2	0.99	0.90	0.94	411
3	0.91	0.92	0.91	389
4	0.99	0.94	0.97	391
5	0.94	0.92	0.93	381
6	1.00	0.99	1.00	411
7	0.99	0.98	0.99	385
8	0.96	0.90	0.93	413
9	0.99	0.99	0.99	395
10	1.00	0.98	0.99	387
11	0.99	0.97	0.98	396
12	0.98	0.71	0.83	392
13	0.98	0.99	0.99	387
14	0.90	0.98	0.94	389
15	0.89	0.85	0.87	383
16	0.96	0.97	0.97	398
17	0.99	0.95	0.97	391
18	1.00	0.99	0.99	374
19	0.99	1.00	1.00	386
20	1.00	0.96	0.98	406
21	0.99	1.00	0.99	408
22	0.94	0.99	0.96	385
23	0.75	0.98	0.85	396
24	0.99	0.99	0.99	403
25	0.95	0.73	0.83	397
26	0.97	1.00	0.99	383
27	0.93	0.98	0.96	389
28	0.90	0.66	0.76	383
29	0.99	0.99	0.99	413
30	0.97	0.93	0.95	404
31	0.82	0.78	0.80	406
32	1.00	0.97	0.98	426
33	0.98	0.97	0.98	434
34	0.99	1.00	0.99	412
35	0.99	0.98	0.99	406
36	0.96	0.99	0.97	425
37	0.98	1.00	0.99	402
38	1.00	0.95	0.98	427
39	0.98	0.99	0.99	400

cls_report classes	precision	recall	F-scores	support
40	0.99	0.75	0.85	389
41	0.97	0.99	0.98	424
42	0.74	1.00	0.85	398
43	0.95	0.91	0.93	419
44	0.99	1.00	0.99	394
45	1.00	0.81	0.89	421
46	0.99	0.95	0.97	417
47	0.97	0.93	0.95	398
48	0.91	1.00	0.95	384
49	1.00	0.99	0.99	398
50	1.00	0.99	0.99	397
51	0.99	0.98	0.99	401
52	0.92	0.99	0.95	392
53	0.81	0.98	0.89	422
54	0.99	0.94	0.96	425
55	0.99	0.95	0.97	376
56	0.81	0.72	0.76	393
57	0.98	1.00	0.99	391
58	0.85	0.94	0.89	418
59	0.95	1.00	0.97	376
60	0.98	0.98	0.98	400
61	1.00	0.99	0.99	402
62	0.78	0.81	0.79	425
63	0.95	1.00	0.97	395
64	0.93	0.92	0.92	403
65	0.99	0.98	0.99	401
66	1.00	1.00	1.00	402
67	0.99	0.87	0.92	394
68	0.94	1.00	0.97	411
69	0.98	1.00	0.99	426
70	0.99	0.83	0.90	369
71	0.98	0.96	0.97	419
72	0.77	0.95	0.85	405
73	1.00	0.99	0.99	393
74	0.96	0.93	0.95	381
75	0.81	0.82	0.82	422
76	0.93	0.98	0.95	405
77	0.99	0.87	0.93	391
78	0.94	0.93	0.93	411
79	0.83	1.00	0.91	401
80	0.70	0.72	0.71	411
81	0.98	0.93	0.95	404
82	0.98	0.99	0.99	375
83	0.99	0.99	0.99	382
84	0.88	0.95	0.91	395

cls_report classes	precision	recall	F-scores	support
85	0.94	0.98	0.96	391
86	0.92	0.92	0.92	400
87	0.99	0.88	0.93	396
88	0.97	0.95	0.96	423
89	0.97	0.99	0.98	386
90	0.89	1.00	0.94	417
91	0.99	0.98	0.98	390
92	0.96	0.98	0.97	400
93	0.98	1.00	0.99	395
94	0.95	0.98	0.97	382
95	0.99	0.99	0.99	400
micro avg	0.94	0.94	0.94	3840
macro avg	0.95	0.94	0.94	38400
weighted avg	0.95	0.94	0.94	38400

2 MNIST DATASET
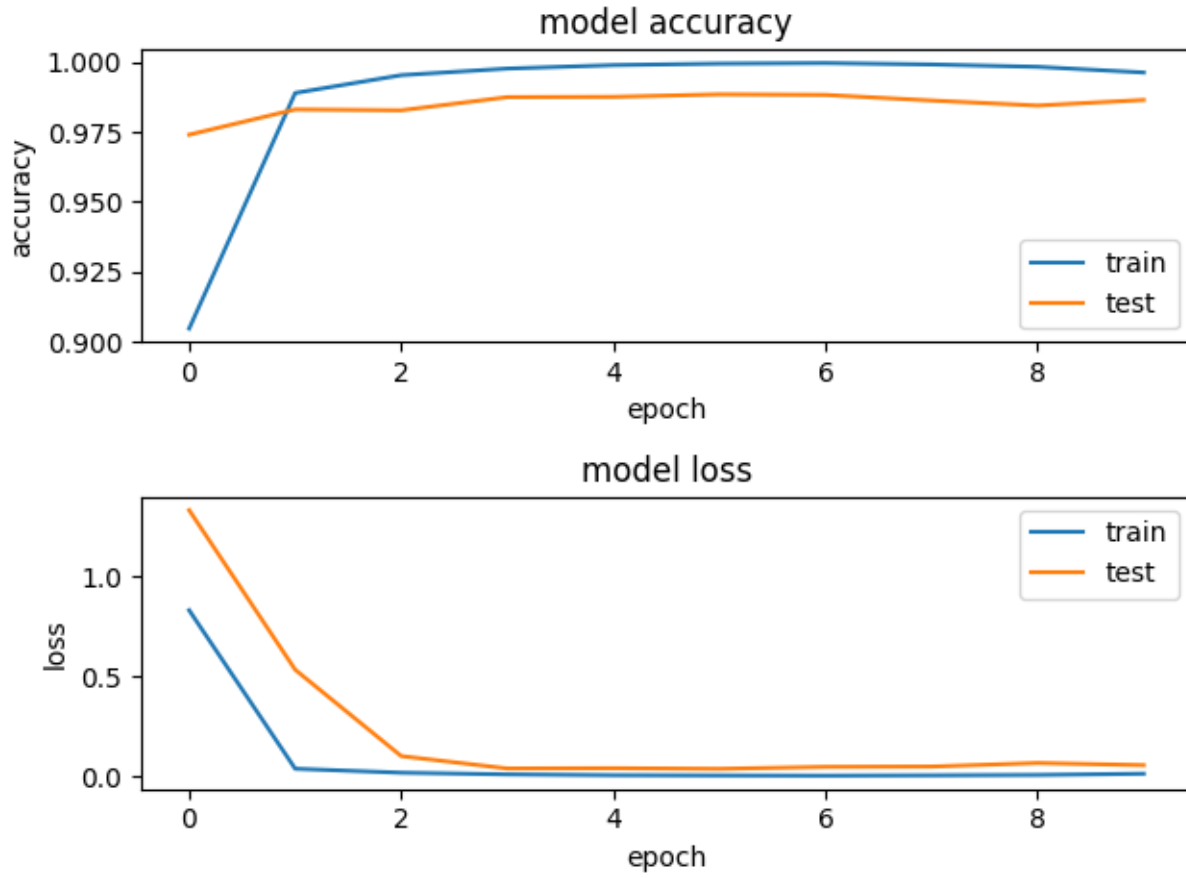
2.1 Learning Curves

Figure 3: Accuracy and loss curves
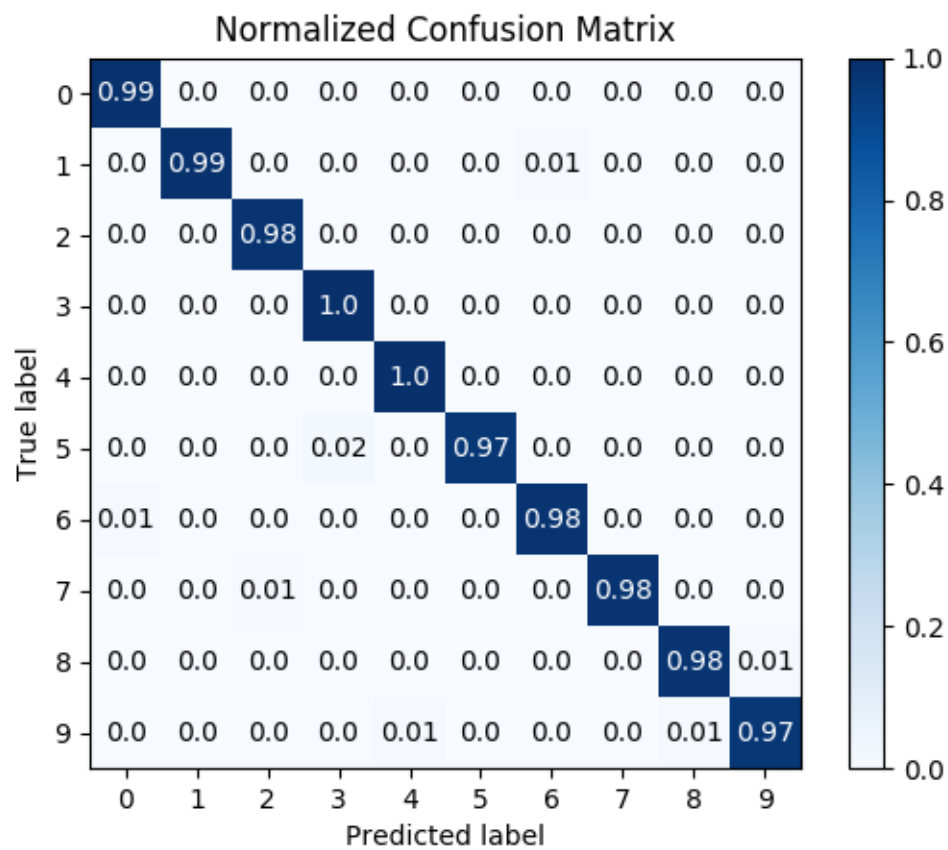
2.2 Confusion matrix

Figure 4: Normalized Confusion Matrix for Mnist dataset

2.3   Classification report

cls_report classes	precision	recall	F-scores	support
0	0.99	0.99	0.99	980
1	0.99	0.99	0.99	1135
2	0.99	0.99	0.99	1032
3	0.99	0.99	0.99	1010
4	0.99	0.99	0.99	982
5	0.99	0.99	0.99	892
6	0.99	0.99	0.99	958
7	0.99	0.99	0.99	1028
8	0.98	0.99	0.99	974
9	0.99	0.98	0.99	1009
micro avg	0.99	0.99	0.99	10000
macro avg	0.99	0.99	0.99	10000
weighted avg	0.99	0.99	0.99	10000

2.4   Variation tried:-

1.) The size of the filters that is used is 5×5.

2.) Strided Convolution instead of max-pooling with a stride of 2.

3.) 3 convolutional layers used.

4.) Dropouts with parameter 0.2 is used.

2.4.1   Inferences

By using the Network Architecture stated above, the test accuracy goes up to 99.12 percent.