```
 1  "C:\Program Files\Anaconda3\python.exe" C:/Users/anant/OneDrive/Documents/Niveditha/PSU/
    Spring2018/ML/ProgrammingAssignments/neuralNet/neuralNetworkFinal.py
 2  Epoch Number: 0
 3  Training Accuracy:  8.42
 4  Test Accuracy:  8.35
 5  Epoch Number: 1
 6  Training Accuracy:  90.22833333333334
 7  Test Accuracy:  90.8
 8  Epoch Number: 2
 9  Training Accuracy:  92.94666666666667
10  Test Accuracy:  92.27
11  Epoch Number: 3
12  Training Accuracy:  93.465
13  Test Accuracy:  92.44
14  Epoch Number: 4
15  Training Accuracy:  93.82166666666667
16  Test Accuracy:  93.25
17  Epoch Number: 5
18  Training Accuracy:  94.11833333333334
19  Test Accuracy:  93.36
20  Epoch Number: 6
21  Training Accuracy:  94.26166666666667
22  Test Accuracy:  93.67999999999999
23  Epoch Number: 7
24  Training Accuracy:  94.51666666666667
25  Test Accuracy:  93.35
26  Epoch Number: 8
27  Training Accuracy:  94.64333333333333
28  Test Accuracy:  93.61
29  Epoch Number: 9
30  Training Accuracy:  94.80833333333332
31  Test Accuracy:  93.95
32  Epoch Number: 10
33  Training Accuracy:  94.78166666666667
34  Test Accuracy:  93.45
35  Epoch Number: 11
36  Training Accuracy:  94.83833333333334
37  Test Accuracy:  93.36
38  Epoch Number: 12
39  Training Accuracy:  94.965
40  Test Accuracy:  93.45
41  Epoch Number: 13
42  Training Accuracy:  94.975
43  Test Accuracy:  93.56
44  Epoch Number: 14
45  Training Accuracy:  95.12333333333333
46  Test Accuracy:  93.78999999999999
47  Epoch Number: 15
48  Training Accuracy:  95.12
49  Test Accuracy:  93.84
50  Epoch Number: 16
51  Training Accuracy:  95.19999999999999
52  Test Accuracy:  93.72
53  Epoch Number: 17
54  Training Accuracy:  95.16833333333334
55  Test Accuracy:  93.35
56  Epoch Number: 18
57  Training Accuracy:  95.34333333333333
58  Test Accuracy:  93.89
59  Epoch Number: 19
60  Training Accuracy:  95.36
61  Test Accuracy:  93.57
62  Epoch Number: 20
```

```
63 Training Accuracy:  95.42333333333333
64 Test Accuracy:  93.82000000000001
65 Epoch Number: 21
66 Training Accuracy:  95.38499999999999
67 Test Accuracy:  93.55
68 Epoch Number: 22
69 Training Accuracy:  95.405
70 Test Accuracy:  93.72
71 Epoch Number: 23
72 Training Accuracy:  95.47333333333333
73 Test Accuracy:  93.58999999999999
74 Epoch Number: 24
75 Training Accuracy:  95.53333333333333
76 Test Accuracy:  93.73
77 Epoch Number: 25
78 Training Accuracy:  95.49
79 Test Accuracy:  93.91000000000001
80 Epoch Number: 26
81 Training Accuracy:  95.58833333333332
82 Test Accuracy:  93.72
83 Epoch Number: 27
84 Training Accuracy:  95.64166666666667
85 Test Accuracy:  93.61
86 Epoch Number: 28
87 Training Accuracy:  95.6
88 Test Accuracy:  93.67999999999999
89 Epoch Number: 29
90 Training Accuracy:  95.65
91 Test Accuracy:  93.74
92 Epoch Number: 30
93 Training Accuracy:  95.67
94 Test Accuracy:  93.65
95 Epoch Number: 31
96 Training Accuracy:  95.68833333333333
97 Test Accuracy:  93.66
98 Epoch Number: 32
99 Training Accuracy:  95.71666666666667
100 Test Accuracy:  93.60000000000001
101 Epoch Number: 33
102 Training Accuracy:  95.77333333333333
103 Test Accuracy:  93.66
104 Epoch Number: 34
105 Training Accuracy:  95.815
106 Test Accuracy:  93.69
107 Epoch Number: 35
108 Training Accuracy:  95.83500000000001
109 Test Accuracy:  93.67
110 Epoch Number: 36
111 Training Accuracy:  95.84833333333333
112 Test Accuracy:  93.64
113 Epoch Number: 37
114 Training Accuracy:  95.88
115 Test Accuracy:  93.8
116 Epoch Number: 38
117 Training Accuracy:  95.87166666666667
118 Test Accuracy:  93.76
119 Epoch Number: 39
120 Training Accuracy:  95.94500000000001
121 Test Accuracy:  93.76
122 Epoch Number: 40
123 Training Accuracy:  95.895
124 Test Accuracy:  93.78999999999999
125 Epoch Number: 41
```

```
126 Training Accuracy:  95.91333333333333
127 Test Accuracy:  93.43
128 Epoch Number: 42
129 Training Accuracy:  95.93333333333334
130 Test Accuracy:  93.69
131 Epoch Number: 43
132 Training Accuracy:  95.92833333333334
133 Test Accuracy:  93.39
134 Epoch Number: 44
135 Training Accuracy:  96.02000000000001
136 Test Accuracy:  93.69
137 Epoch Number: 45
138 Training Accuracy:  95.97166666666666
139 Test Accuracy:  93.47999999999999
140 Epoch Number: 46
141 Training Accuracy:  96.01333333333332
142 Test Accuracy:  93.71000000000001
143 Epoch Number: 47
144 Training Accuracy:  96.00999999999999
145 Test Accuracy:  93.63
146 Epoch Number: 48
147 Training Accuracy:  96.04
148 Test Accuracy:  93.55
149 Epoch Number: 49
150 Training Accuracy:  96.07166666666667
151 Test Accuracy:  93.74
152 [[ 964    0    0    1    0    3    2    4    6    0]
153  [   0 1115    3    4    0    1    3    0    8    1]
154  [   4    1  943    8    5    0   12   11   45    3]
155  [   3    0    8  936    2   31    1    7   17    5]
156  [   1    1    3    2  894    0   13    1    8   59]
157  [   5    1    1   13    1  818   12    3   30    8]
158  [  16    3    6    0    5   11  899    1   17    0]
159  [   3    3   12   11    4    2    1  943   13   36]
160  [  10    2    2   10    3   11   13    6  908    9]
161  [   4    8    0    9    9    7    1    6   11  954]]
162 Epoch Number: 0
163 Training Accuracy:  10.441666666666666
164 Test Accuracy:  10.280000000000001
165 Epoch Number: 1
166 Training Accuracy:  92.685
167 Test Accuracy:  94.39
168 Epoch Number: 2
169 Training Accuracy:  95.83333333333334
170 Test Accuracy:  95.36
171 Epoch Number: 3
172 Training Accuracy:  96.455
173 Test Accuracy:  95.47
174 Epoch Number: 4
175 Training Accuracy:  96.81333333333333
176 Test Accuracy:  95.38
177 Epoch Number: 5
178 Training Accuracy:  97.07000000000001
179 Test Accuracy:  95.66
180 Epoch Number: 6
181 Training Accuracy:  97.27333333333334
182 Test Accuracy:  95.7
183 Epoch Number: 7
184 Training Accuracy:  97.47333333333333
185 Test Accuracy:  95.65
186 Epoch Number: 8
187 Training Accuracy:  97.57166666666667
188 Test Accuracy:  95.87
```

```
189 Epoch Number: 9
190 Training Accuracy:  97.725
191 Test Accuracy:  95.84
192 Epoch Number: 10
193 Training Accuracy:  97.81166666666667
194 Test Accuracy:  95.86
195 Epoch Number: 11
196 Training Accuracy:  97.88
197 Test Accuracy:  95.85000000000001
198 Epoch Number: 12
199 Training Accuracy:  97.98833333333333
200 Test Accuracy:  95.81
201 Epoch Number: 13
202 Training Accuracy:  98.03166666666667
203 Test Accuracy:  95.73
204 Epoch Number: 14
205 Training Accuracy:  98.11
206 Test Accuracy:  95.8
207 Epoch Number: 15
208 Training Accuracy:  98.15833333333333
209 Test Accuracy:  95.73
210 Epoch Number: 16
211 Training Accuracy:  98.16333333333334
212 Test Accuracy:  95.92
213 Epoch Number: 17
214 Training Accuracy:  98.235
215 Test Accuracy:  95.77
216 Epoch Number: 18
217 Training Accuracy:  98.27666666666667
218 Test Accuracy:  95.93
219 Epoch Number: 19
220 Training Accuracy:  98.29
221 Test Accuracy:  95.97
222 Epoch Number: 20
223 Training Accuracy:  98.33666666666666
224 Test Accuracy:  95.94
225 Epoch Number: 21
226 Training Accuracy:  98.4
227 Test Accuracy:  95.87
228 Epoch Number: 22
229 Training Accuracy:  98.39666666666666
230 Test Accuracy:  95.81
231 Epoch Number: 23
232 Training Accuracy:  98.46000000000001
233 Test Accuracy:  95.89999999999999
234 Epoch Number: 24
235 Training Accuracy:  98.465
236 Test Accuracy:  95.85000000000001
237 Epoch Number: 25
238 Training Accuracy:  98.48166666666667
239 Test Accuracy:  95.83
240 Epoch Number: 26
241 Training Accuracy:  98.51666666666667
242 Test Accuracy:  95.73
243 Epoch Number: 27
244 Training Accuracy:  98.53166666666667
245 Test Accuracy:  95.78
246 Epoch Number: 28
247 Training Accuracy:  98.54833333333333
248 Test Accuracy:  95.83
249 Epoch Number: 29
250 Training Accuracy:  98.54833333333333
251 Test Accuracy:  95.89
```

```
252 Epoch Number: 30
253 Training Accuracy:  98.59
254 Test Accuracy:  95.88
255 Epoch Number: 31
256 Training Accuracy:  98.585
257 Test Accuracy:  95.89
258 Epoch Number: 32
259 Training Accuracy:  98.595
260 Test Accuracy:  95.83
261 Epoch Number: 33
262 Training Accuracy:  98.63666666666666
263 Test Accuracy:  95.93
264 Epoch Number: 34
265 Training Accuracy:  98.63499999999999
266 Test Accuracy:  95.84
267 Epoch Number: 35
268 Training Accuracy:  98.63
269 Test Accuracy:  95.83
270 Epoch Number: 36
271 Training Accuracy:  98.66
272 Test Accuracy:  95.92
273 Epoch Number: 37
274 Training Accuracy:  98.67666666666666
275 Test Accuracy:  95.91
276 Epoch Number: 38
277 Training Accuracy:  98.685
278 Test Accuracy:  95.88
279 Epoch Number: 39
280 Training Accuracy:  98.68333333333334
281 Test Accuracy:  95.93
282 Epoch Number: 40
283 Training Accuracy:  98.67166666666667
284 Test Accuracy:  95.85000000000001
285 Epoch Number: 41
286 Training Accuracy:  98.68333333333334
287 Test Accuracy:  95.86
288 Epoch Number: 42
289 Training Accuracy:  98.71
290 Test Accuracy:  95.89999999999999
291 Epoch Number: 43
292 Training Accuracy:  98.71666666666667
293 Test Accuracy:  95.96000000000001
294 Epoch Number: 44
295 Training Accuracy:  98.71
296 Test Accuracy:  95.99
297 Epoch Number: 45
298 Training Accuracy:  98.73166666666665
299 Test Accuracy:  95.93
300 Epoch Number: 46
301 Training Accuracy:  98.74666666666667
302 Test Accuracy:  95.93
303 Epoch Number: 47
304 Training Accuracy:  98.73666666666666
305 Test Accuracy:  95.93
306 Epoch Number: 48
307 Training Accuracy:  98.75666666666667
308 Test Accuracy:  95.85000000000001
309 Epoch Number: 49
310 Training Accuracy:  98.77
311 Test Accuracy:  96.0
312 [[ 960    0    1    2    1    0    4    2    7    3]
313  [   0 1118    1    1    1    1    3    2    7    1]
314  [   6    2  984    9    4    0    1    7   16    3]
```

```
315    [    1    0    4  966    0   14    0    4   14    7]
316    [    1    1    4    1  937    0    7    2    3   26]
317    [    4    2    1    9    2  844    9    3    9    9]
318    [   10    3    5    1    1    7  925    0    6    0]
319    [    2    3   12    4    4    1    0  971   10   21]
320    [    7    1    2    3    7    5    7    5  930    7]
321    [    5    5    0    8    8    1    1    6   10  965]]
```
322 Epoch Number: 0
323 Training Accuracy: 10.751666666666667
324 Test Accuracy: 10.84
325 Epoch Number: 1
326 Training Accuracy: 93.53
327 Test Accuracy: 95.6
328 Epoch Number: 2
329 Training Accuracy: 96.72166666666666
330 Test Accuracy: 96.06
331 Epoch Number: 3
332 Training Accuracy: 97.39833333333333
333 Test Accuracy: 96.45
334 Epoch Number: 4
335 Training Accuracy: 97.84333333333333
336 Test Accuracy: 96.69
337 Epoch Number: 5
338 Training Accuracy: 98.14500000000001
339 Test Accuracy: 96.57
340 Epoch Number: 6
341 Training Accuracy: 98.35833333333333
342 Test Accuracy: 96.75
343 Epoch Number: 7
344 Training Accuracy: 98.51666666666667
345 Test Accuracy: 96.89
346 Epoch Number: 8
347 Training Accuracy: 98.66333333333334
348 Test Accuracy: 96.88
349 Epoch Number: 9
350 Training Accuracy: 98.77833333333334
351 Test Accuracy: 96.75
352 Epoch Number: 10
353 Training Accuracy: 98.88
354 Test Accuracy: 96.89
355 Epoch Number: 11
356 Training Accuracy: 98.95833333333334
357 Test Accuracy: 97.00999999999999
358 Epoch Number: 12
359 Training Accuracy: 99.02833333333334
360 Test Accuracy: 96.92
361 Epoch Number: 13
362 Training Accuracy: 99.105
363 Test Accuracy: 96.81
364 Epoch Number: 14
365 Training Accuracy: 99.125
366 Test Accuracy: 96.78
367 Epoch Number: 15
368 Training Accuracy: 99.18166666666667
369 Test Accuracy: 96.77
370 Epoch Number: 16
371 Training Accuracy: 99.22833333333332
372 Test Accuracy: 96.82
373 Epoch Number: 17
374 Training Accuracy: 99.265
375 Test Accuracy: 96.87
376 Epoch Number: 18
377 Training Accuracy: 99.29166666666667

```
378 Test Accuracy:  96.81
379 Epoch Number: 19
380 Training Accuracy:  99.32
381 Test Accuracy:  96.74000000000001
382 Epoch Number: 20
383 Training Accuracy:  99.345
384 Test Accuracy:  96.71
385 Epoch Number: 21
386 Training Accuracy:  99.34333333333333
387 Test Accuracy:  96.78
388 Epoch Number: 22
389 Training Accuracy:  99.37333333333333
390 Test Accuracy:  96.67
391 Epoch Number: 23
392 Training Accuracy:  99.39166666666667
393 Test Accuracy:  96.61
394 Epoch Number: 24
395 Training Accuracy:  99.40166666666667
396 Test Accuracy:  96.58
397 Epoch Number: 25
398 Training Accuracy:  99.42666666666666
399 Test Accuracy:  96.56
400 Epoch Number: 26
401 Training Accuracy:  99.44
402 Test Accuracy:  96.55
403 Epoch Number: 27
404 Training Accuracy:  99.455
405 Test Accuracy:  96.57
406 Epoch Number: 28
407 Training Accuracy:  99.455
408 Test Accuracy:  96.55
409 Epoch Number: 29
410 Training Accuracy:  99.48166666666667
411 Test Accuracy:  96.56
412 Epoch Number: 30
413 Training Accuracy:  99.485
414 Test Accuracy:  96.58
415 Epoch Number: 31
416 Training Accuracy:  99.49833333333333
417 Test Accuracy:  96.64
418 Epoch Number: 32
419 Training Accuracy:  99.50666666666666
420 Test Accuracy:  96.56
421 Epoch Number: 33
422 Training Accuracy:  99.515
423 Test Accuracy:  96.53
424 Epoch Number: 34
425 Training Accuracy:  99.52
426 Test Accuracy:  96.48
427 Epoch Number: 35
428 Training Accuracy:  99.52499999999999
429 Test Accuracy:  96.55
430 Epoch Number: 36
431 Training Accuracy:  99.52499999999999
432 Test Accuracy:  96.50999999999999
433 Epoch Number: 37
434 Training Accuracy:  99.54499999999999
435 Test Accuracy:  96.46000000000001
436 Epoch Number: 38
437 Training Accuracy:  99.54833333333333
438 Test Accuracy:  96.45
439 Epoch Number: 39
440 Training Accuracy:  99.555
```

```
441 Test Accuracy:  96.49
442 Epoch Number: 40
443 Training Accuracy:  99.555
444 Test Accuracy:  96.49
445 Epoch Number: 41
446 Training Accuracy:  99.56
447 Test Accuracy:  96.44
448 Epoch Number: 42
449 Training Accuracy:  99.565
450 Test Accuracy:  96.49
451 Epoch Number: 43
452 Training Accuracy:  99.57166666666667
453 Test Accuracy:  96.49
454 Epoch Number: 44
455 Training Accuracy:  99.575
456 Test Accuracy:  96.46000000000001
457 Epoch Number: 45
458 Training Accuracy:  99.575
459 Test Accuracy:  96.49
460 Epoch Number: 46
461 Training Accuracy:  99.575
462 Test Accuracy:  96.53
463 Epoch Number: 47
464 Training Accuracy:  99.575
465 Test Accuracy:  96.50999999999999
466 Epoch Number: 48
467 Training Accuracy:  99.57666666666667
468 Test Accuracy:  96.54
469 Epoch Number: 49
470 Training Accuracy:  99.58500000000001
471 Test Accuracy:  96.48
472 [[ 967    1    0    0    0    2    3    2    0    5]
473  [   0 1123    1    3    1    1    1    1    4    0]
474  [   5    1  982    8    2    1    3    9   19    2]
475  [   1    0    4  978    0    8    2    6   11    0]
476  [   2    0    1    1  936    0    7    1    1   33]
477  [   4    1    1   11    1  845    9    1   13    6]
478  [   6    3    1    0    2    8  931    0    6    1]
479  [   1    5   12    5    3    1    0  981    9   11]
480  [   7    2    2    2    4    1    4    3  944    5]
481  [   4    5    0   10   11    2    1    5   10  961]]
482 Total Time taken for the experiment:  0:59:22.300994
483
484 Process finished with exit code 0
485
```