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No. of hidden neurons: 20

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Epoch 0:

Training Accuracy: 11.323333333333334

Test Accuracy: 11.39

Epoch 1:

Training Accuracy: 90.12666666666667

Test Accuracy: 90.84

Epoch 2:

Training Accuracy: 92.72833333333334

Test Accuracy: 91.57

Epoch 3:

Training Accuracy: 93.215

Test Accuracy: 91.86999999999999

Epoch 4:

Training Accuracy: 93.51833333333333

Test Accuracy: 92.30000000000001

Epoch 5:

Training Accuracy: 93.86666666666666

Test Accuracy: 92.04

Epoch 6:

Training Accuracy: 94.025

Test Accuracy: 91.96

Epoch 7:

Training Accuracy: 94.20333333333333

Test Accuracy: 92.60000000000001

Epoch 8:

Training Accuracy: 94.27666666666667

Test Accuracy: 92.65

Epoch 9:

Training Accuracy: 94.54166666666667

Test Accuracy: 92.28

Epoch 10:

Training Accuracy: 94.56833333333333

Test Accuracy: 92.71000000000001

Epoch 11:

Training Accuracy: 94.63000000000001

Test Accuracy: 92.95

Epoch 12:

Training Accuracy: 94.74166666666667

Test Accuracy: 92.88

Epoch 13:

Training Accuracy: 94.86666666666666

Test Accuracy: 93.13

Epoch 14:

Training Accuracy: 94.895

Test Accuracy: 93.27

Epoch 15:

Training Accuracy: 94.95666666666666

Test Accuracy: 93.25

Epoch 16:

Training Accuracy: 95.04166666666667

Test Accuracy: 93.4

Epoch 17:

Training Accuracy: 95.085

Test Accuracy: 93.36

Epoch 18:

Training Accuracy: 95.15166666666667

Test Accuracy: 93.55

Epoch 19:

Training Accuracy: 95.19333333333333

Test Accuracy: 93.33

Epoch 20:

Training Accuracy: 95.27166666666666

Test Accuracy: 93.38

Epoch 21:

Training Accuracy: 95.23666666666666

Test Accuracy: 93.24

Epoch 22:

Training Accuracy: 95.295

Test Accuracy: 93.31

Epoch 23:

Training Accuracy: 95.31500000000001

Test Accuracy: 93.36

Epoch 24:

Training Accuracy: 95.41

Test Accuracy: 93.36

Epoch 25:

Training Accuracy: 95.39166666666667

Test Accuracy: 93.49

Epoch 26:

Training Accuracy: 95.46166666666667

Test Accuracy: 93.46

Epoch 27:

Training Accuracy: 95.48166666666667

Test Accuracy: 93.52000000000001

Epoch 28:

Training Accuracy: 95.52333333333334

Test Accuracy: 93.66

Epoch 29:

Training Accuracy: 95.54

Test Accuracy: 93.58

Epoch 30:

Training Accuracy: 95.58833333333332

Test Accuracy: 93.30000000000001

Epoch 31:

Training Accuracy: 95.61833333333334

Test Accuracy: 93.46

Epoch 32:

Training Accuracy: 95.62333333333333

Test Accuracy: 93.47

Epoch 33:

Training Accuracy: 95.66666666666667

Test Accuracy: 93.35

Epoch 34:

Training Accuracy: 95.71499999999999

Test Accuracy: 93.30000000000001

Epoch 35:

Training Accuracy: 95.73833333333333

Test Accuracy: 93.58

Epoch 36:

Training Accuracy: 95.72666666666667

Test Accuracy: 93.33

Epoch 37:

Training Accuracy: 95.685

Test Accuracy: 93.36

Epoch 38:

Training Accuracy: 95.72833333333334

Test Accuracy: 93.36

Epoch 39:

Training Accuracy: 95.80666666666666

Test Accuracy: 93.61

Epoch 40:

Training Accuracy: 95.76666666666667

Test Accuracy: 93.4

Epoch 41:

Training Accuracy: 95.80666666666666

Test Accuracy: 93.43

Epoch 42:

Training Accuracy: 95.84166666666667

Test Accuracy: 93.37

Epoch 43:

Training Accuracy: 95.85000000000001

Test Accuracy: 93.44

Epoch 44:

Training Accuracy: 95.90166666666666

Test Accuracy: 93.32000000000001

Epoch 45:

Training Accuracy: 95.86

Test Accuracy: 93.58999999999999

Epoch 46:

Training Accuracy: 95.89999999999999

Test Accuracy: 93.28

Epoch 47:

Training Accuracy: 95.94833333333334

Test Accuracy: 93.23

Epoch 48:

Training Accuracy: 95.94666666666667

Test Accuracy: 93.47

Epoch 49:

Training Accuracy: 95.93833333333333

Test Accuracy: 93.37

Epoch 50:

Training Accuracy: 95.99

Test Accuracy: 93.55

Confusion matrix on test data after training:

```

[[ 955    0    0    1    1    7    6    3    6    1]
 [   0 1114    2    2    0    1    3    3    8    2]
 [   4    7  950    6    6    3    8    8   33    7]
 [   4    0   12  955    2   12    0    9   11    5]
 [   1    2    2    3  911    0   11    1    6   45]
 [   4    1    5   38    3  795   10    5   16   15]
 [  11    3    5    2    3   10  909    1   13    1]
 [   1    7   18   22    6    2    0  927    8   37]
 [   8    8    1   10    9   13    8    5  899   13]
 [   3    6    1   11   19    4    1    4   20  940]]

```

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No. of hidden neurons: 50

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Epoch 0:

Training Accuracy: 11.615

Test Accuracy: 11.72

Epoch 1:

Training Accuracy: 93.14333333333333

Test Accuracy: 94.66

Epoch 2:

Training Accuracy: 95.94500000000001

Test Accuracy: 95.33

Epoch 3:

Training Accuracy: 96.47833333333334

Test Accuracy: 95.76

Epoch 4:

Training Accuracy: 96.82666666666667

Test Accuracy: 96.0

Epoch 5:

Training Accuracy: 97.10499999999999

Test Accuracy: 95.82000000000001

Epoch 6:

Training Accuracy: 97.29333333333334

Test Accuracy: 95.99

Epoch 7:  
Training Accuracy: 97.44666666666667  
Test Accuracy: 95.93

Epoch 8:  
Training Accuracy: 97.51833333333333  
Test Accuracy: 95.73

Epoch 9:  
Training Accuracy: 97.62666666666667  
Test Accuracy: 95.93

Epoch 10:  
Training Accuracy: 97.68666666666667  
Test Accuracy: 95.76

Epoch 11:  
Training Accuracy: 97.78666666666666  
Test Accuracy: 95.95

Epoch 12:  
Training Accuracy: 97.87166666666667  
Test Accuracy: 95.65

Epoch 13:  
Training Accuracy: 97.95333333333333  
Test Accuracy: 96.1

Epoch 14:  
Training Accuracy: 98.02833333333332  
Test Accuracy: 95.78999999999999

Epoch 15:  
Training Accuracy: 98.07333333333334  
Test Accuracy: 96.04

Epoch 16:  
Training Accuracy: 98.12333333333333  
Test Accuracy: 95.89999999999999

Epoch 17:  
Training Accuracy: 98.16166666666668  
Test Accuracy: 95.84

Epoch 18:  
Training Accuracy: 98.22333333333333  
Test Accuracy: 95.89

Epoch 19:

Training Accuracy: 98.25333333333333  
Test Accuracy: 95.84

Epoch 20:  
Training Accuracy: 98.26  
Test Accuracy: 95.78999999999999

Epoch 21:  
Training Accuracy: 98.25833333333334  
Test Accuracy: 95.77

Epoch 22:  
Training Accuracy: 98.33333333333333  
Test Accuracy: 95.83

Epoch 23:  
Training Accuracy: 98.36  
Test Accuracy: 95.86

Epoch 24:  
Training Accuracy: 98.36666666666667  
Test Accuracy: 95.89

Epoch 25:  
Training Accuracy: 98.39333333333333  
Test Accuracy: 95.93

Epoch 26:  
Training Accuracy: 98.45333333333333  
Test Accuracy: 95.88

Epoch 27:  
Training Accuracy: 98.44500000000001  
Test Accuracy: 95.88

Epoch 28:  
Training Accuracy: 98.47166666666666  
Test Accuracy: 95.8

Epoch 29:  
Training Accuracy: 98.48666666666666  
Test Accuracy: 95.83

Epoch 30:  
Training Accuracy: 98.52666666666666  
Test Accuracy: 95.82000000000001

Epoch 31:  
Training Accuracy: 98.52833333333334  
Test Accuracy: 95.88

Epoch 32:  
Training Accuracy: 98.56166666666667  
Test Accuracy: 95.82000000000001

Epoch 33:  
Training Accuracy: 98.56166666666667  
Test Accuracy: 95.69

Epoch 34:  
Training Accuracy: 98.57833333333333  
Test Accuracy: 95.88

Epoch 35:  
Training Accuracy: 98.58333333333333  
Test Accuracy: 95.78

Epoch 36:  
Training Accuracy: 98.62833333333333  
Test Accuracy: 95.89999999999999

Epoch 37:  
Training Accuracy: 98.63333333333333  
Test Accuracy: 95.81

Epoch 38:  
Training Accuracy: 98.64500000000001  
Test Accuracy: 95.84

Epoch 39:  
Training Accuracy: 98.63  
Test Accuracy: 95.7

Epoch 40:  
Training Accuracy: 98.63166666666666  
Test Accuracy: 95.87

Epoch 41:  
Training Accuracy: 98.66333333333334  
Test Accuracy: 95.71

Epoch 42:  
Training Accuracy: 98.65833333333333  
Test Accuracy: 95.74000000000001

Epoch 43:  
Training Accuracy: 98.68666666666667  
Test Accuracy: 95.73

Epoch 44:



Training Accuracy: 98.69

Test Accuracy: 95.76

Epoch 45:

Training Accuracy: 98.68833333333333

Test Accuracy: 95.78

Epoch 46:

Training Accuracy: 98.70166666666667

Test Accuracy: 95.73

Epoch 47:

Training Accuracy: 98.69833333333334

Test Accuracy: 95.86

Epoch 48:

Training Accuracy: 98.70166666666667

Test Accuracy: 95.73

Epoch 49:

Training Accuracy: 98.73666666666666

Test Accuracy: 95.75

Epoch 50:

Training Accuracy: 98.72333333333333

Test Accuracy: 95.67

Confusion matrix on test data after training:

```
[[ 960    0    5    2    1    2    1    2    7    0]
 [   0 1115    5    4    1    1    1    1    6    1]
 [   7    5  981   11    3    0    3   10    9    3]
 [   2    0    8  966    1   10    1    5    9    8]
 [   0    1    4    0  932    0    7    1    2   35]
 [   4    2    1   14    1  839    8    2   11   10]
 [   7    3    8    0    1   12  916    0   11    0]
 [   0    4   12    5    3    0    0  977    6   21]
 [   6    2    4    8    5    8    2    5  924   10]
 [   3    3    2   12   10    6    0    8    8  957]]
```

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No. of hidden neurons: 100

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Epoch 0:

Training Accuracy: 10.383333333333333

Test Accuracy: 10.35

Epoch 1:

Training Accuracy: 93.545

Test Accuracy: 95.3

Epoch 2:

Training Accuracy: 96.6

Test Accuracy: 96.26

Epoch 3:

Training Accuracy: 97.385

Test Accuracy: 96.44

Epoch 4:

Training Accuracy: 97.815

Test Accuracy: 96.50999999999999

Epoch 5:

Training Accuracy: 98.165

Test Accuracy: 96.76

Epoch 6:

Training Accuracy: 98.38833333333334

Test Accuracy: 96.88

Epoch 7:

Training Accuracy: 98.555

Test Accuracy: 96.97

Epoch 8:

Training Accuracy: 98.675

Test Accuracy: 96.98

Epoch 9:

Training Accuracy: 98.815

Test Accuracy: 96.96000000000001

Epoch 10:

Training Accuracy: 98.92833333333333

Test Accuracy: 96.89

Epoch 11:

Training Accuracy: 99.00166666666667

Test Accuracy: 96.95

Epoch 12:

Training Accuracy: 99.075

Test Accuracy: 97.00999999999999

Epoch 13:

Training Accuracy: 99.13

Test Accuracy: 97.0

Epoch 14:

Training Accuracy: 99.18166666666667

Test Accuracy: 96.98

Epoch 15:

Training Accuracy: 99.19333333333333

Test Accuracy: 96.94

Epoch 16:

Training Accuracy: 99.24833333333333

Test Accuracy: 96.94

Epoch 17:

Training Accuracy: 99.30333333333333

Test Accuracy: 96.94

Epoch 18:

Training Accuracy: 99.33333333333333

Test Accuracy: 96.83

Epoch 19:

Training Accuracy: 99.36166666666666

Test Accuracy: 96.87

Epoch 20:

Training Accuracy: 99.38166666666667

Test Accuracy: 96.83

Epoch 21:

Training Accuracy: 99.395

Test Accuracy: 96.89999999999999

Epoch 22:

Training Accuracy: 99.41

Test Accuracy: 96.91

Epoch 23:

Training Accuracy: 99.43833333333333

Test Accuracy: 96.92

Epoch 24:

Training Accuracy: 99.44666666666667

Test Accuracy: 96.95

Epoch 25:

Training Accuracy: 99.46166666666667

Test Accuracy: 96.87

Epoch 26:

Training Accuracy: 99.47666666666667

Test Accuracy: 96.97

Epoch 27:  
Training Accuracy: 99.49333333333334  
Test Accuracy: 96.94

Epoch 28:  
Training Accuracy: 99.5  
Test Accuracy: 96.96000000000001

Epoch 29:  
Training Accuracy: 99.51  
Test Accuracy: 96.89

Epoch 30:  
Training Accuracy: 99.51166666666667  
Test Accuracy: 96.87

Epoch 31:  
Training Accuracy: 99.52666666666666  
Test Accuracy: 96.81

Epoch 32:  
Training Accuracy: 99.52333333333333  
Test Accuracy: 96.76

Epoch 33:  
Training Accuracy: 99.54166666666666  
Test Accuracy: 96.78

Epoch 34:  
Training Accuracy: 99.54499999999999  
Test Accuracy: 96.77

Epoch 35:  
Training Accuracy: 99.55333333333334  
Test Accuracy: 96.69

Epoch 36:  
Training Accuracy: 99.56833333333334  
Test Accuracy: 96.69

Epoch 37:  
Training Accuracy: 99.56666666666666  
Test Accuracy: 96.61

Epoch 38:  
Training Accuracy: 99.58166666666666  
Test Accuracy: 96.57

Epoch 39:  
Training Accuracy: 99.59833333333333

Test Accuracy: 96.57

Epoch 40:

Training Accuracy: 99.60166666666666

Test Accuracy: 96.57

Epoch 41:

Training Accuracy: 99.59833333333333

Test Accuracy: 96.54

Epoch 42:

Training Accuracy: 99.61

Test Accuracy: 96.49

Epoch 43:

Training Accuracy: 99.62166666666667

Test Accuracy: 96.52

Epoch 44:

Training Accuracy: 99.61666666666666

Test Accuracy: 96.56

Epoch 45:

Training Accuracy: 99.63166666666666

Test Accuracy: 96.59

Epoch 46:

Training Accuracy: 99.64

Test Accuracy: 96.58

Epoch 47:

Training Accuracy: 99.64333333333333

Test Accuracy: 96.6

Epoch 48:

Training Accuracy: 99.64166666666667

Test Accuracy: 96.61

Epoch 49:

Training Accuracy: 99.65

Test Accuracy: 96.56

Epoch 50:

Training Accuracy: 99.64833333333334

Test Accuracy: 96.54

Confusion matrix on test data after training:

[[	970	1	1	1	1	0	1	1	4	0]
[	0	1127	2	1	0	2	1	0	2	0]
[	5	2	986	8	0	1	2	2	23	3]

File - unknown

```
[ 3 0 3 977 0 11 0 5 10 1]
[ 0 1 2 0 950 0 6 1 2 20]
[ 2 0 2 16 1 846 5 1 13 6]
[ 4 3 2 0 4 12 924 0 9 0]
[ 2 3 11 2 4 0 0 969 13 24]
[ 6 1 2 2 3 7 4 3 939 7]
[ 6 4 0 7 11 3 0 2 10 966]]
```

Process finished with exit code 0