

Hand Digit Recognizer

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1.

Output Snapshot:

```
QtOctave [Empty] - [Octave Terminal]
Additional information about Octave is available at http://www.octave.org.
Please contribute if you find this software useful.
For more information, visit http://www.octave.org/get-involved.html
Read http://www.octave.org/bugs.html to learn how to submit bug reports.
For information about changes from previous versions, type 'news'.
>>> cd '/home/siddharth/Downloads/IIIT/SEM2/SMIA/Assignments/Assignment3'
source ("graph.m")
>>>totalimages = 10000
>>> cd '/home/siddharth/Downloads/IIIT/SEM2/SMIA/Assignments/Assignment3'
source ("test.m")
>>>Time to read input:
0.31122
input readed
Confusion Matrix:
  970    1     0     0     1     3     2     1     1     1
    1 1118     4     1     0     0     2     2     7     0
    8     1 1006     2     1     1     3     5     5     0
    0     0     3   987     1     7     0     4     4     4
    1     3     4     0   943     2     6     3     3    17
    3     0     0     4     1   871     7     1     3     2
    6     3     1     2     4     9   930     1     2     0
    2     7     8     6     2     1     1   992     2     7
    3     1     4     6     1     7     2     1   946     3
    2     4     1     5     9     5     0     4     7   972
Accuracy: 96.350000
Error Rate: 3.650000
Precision: 0.973393
Recall: 0.973268
Specificity: 0.996703
Total Time:
7.9233
>>>
Command line>>
```

Output Snapshot with noise:

```
QtOctave [Empty] - [Octave Terminal]
Octave was configured for "x86_64-unknown-linux-gnu".
Additional information about Octave is available at http://www.octave.org.
Please contribute if you find this software useful.
For more information, visit http://www.octave.org/get-involved.html
Read http://www.octave.org/bugs.html to learn how to submit bug reports.
For information about changes from previous versions, type 'news'.
>>> cd '/home/siddharth/Downloads/IIIT/SEM2/SMIA/Assignments/Assignment3'
source ("test.m")
>>>Time to read input:
0.31845
input readed
Confusion Matrix:
  959     1     2     1     1     8     3     3     2     0
    0 1108     3     1     0    17     1     0     5     0
    3     3 1004     5     2     3     1     8     2     1
    0     0     4   978     1    15     0     7     2     3
    1     2     5     0   935    13     6     4     1    15
    2     0     0     2     1   880     4     1     1     1
    5     2     1     1     4    43    901     1     0     0
    1     9     8     3     0     6     0   997     0     4
    4     3     3     5     2    33     3     6   912     3
    2     5     0     7     9    23     1    13     2   947
Accuracy: 95.210000
Error Rate: 4.790000
Precision: 0.961990
Recall: 0.962784
Specificity: 0.995319
Total Time:
8.2806
>>>
Command line>>
```

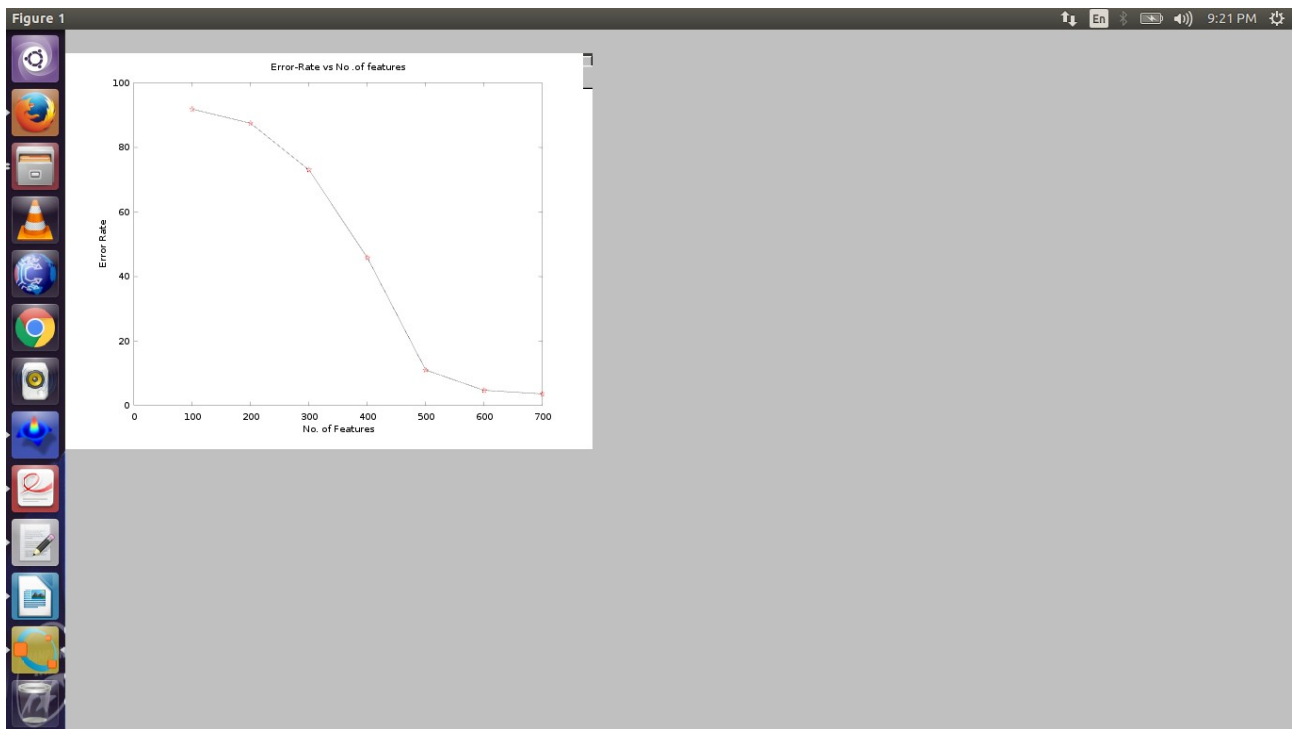


Figure3:Graph For Error Rate vs No. Of Features

1.No. Of features vs Error Rate

Number Of Features	Error Rate
100	91.86
200	87.49
300	73.04
400	45.84
500	11.02
600	4.73
700	3.62

Q2.

1-NN gives better accuracy than BPNN on this dataset. This is because dataset is well formulated with no noise and missing values. On dataset with more noise BPNN will give more accuracy.

Time to train BPNN is less than 1-NN.

classifier	preprocessing	accuracy	Error rate	precision	recall	specificity
Neural NW	none	95.35	2.65	0.9734	0.9732	0.9967
1NN	none	96.33	4.67	0.9534	0.9530	0.9878
5-fold	none	94.12	5.88	0.9434	0.9329	0.9666
Neural NW	adding noise weight decay,	95.21	3.79	0.9619	0.9627	0.9953
		75.32	24.68	0.7442	0.7633	0.9191
1NN	adding noise,	92.92	7.08	0.9022	0.9111	0.9242
5-fold	adding noise weight decay,	94.31	5.69	0.9655	0.9627	0.9753
		70.11	29.89	0.7042	0.7133	0.8991