Layer API

A Simple Neural Network

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Group 21

Datasets

1.MNIST

Variations Tried:

(A)Batch Size=128

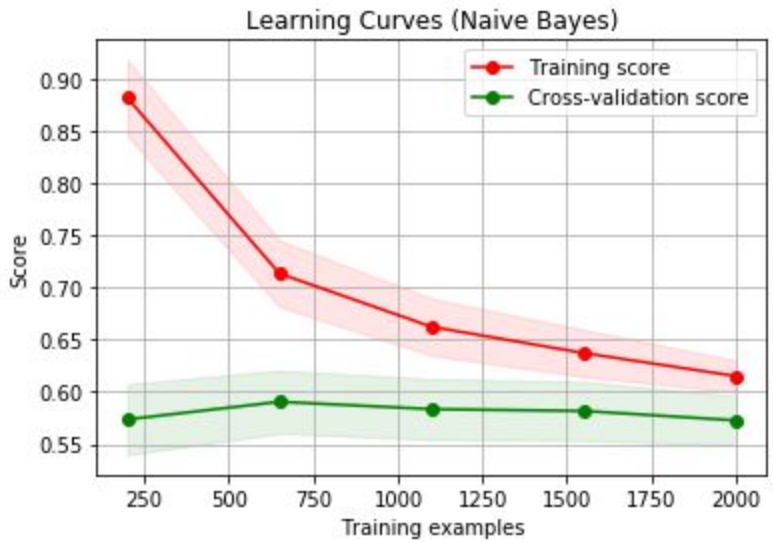
Epochs=6

(B)Batch Size=64

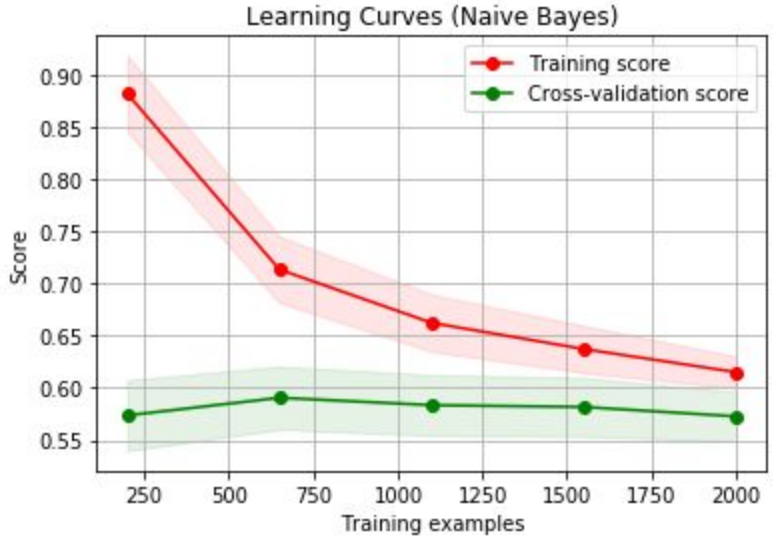
Epochs=10

Learning Curve:

(A)



(B)



F-Scores:

(A) 0.918113891506489

(B) 0.9224656926620597

Confusion Matrices:

(A)

```
[[ 962    0    1    2    0    4    7    1    3    0]
 [   0 1107    2    3    1    2    4    2   14    0]
 [  10    7  913   17    7    1   16   11   43    7]
 [   3    0   23  900    1   31    2   16   25    9]
 [   2    2    5    1  905    0   13    2    9   43]
 [  10    1    5   39    9  757   14   10   39    8]
 [  17    3    5    0    9   11  907    1    5    0]
 [   3    8   26    5    7    0    0  937    2   40]
 [  10    6    9   20   10   24   11   14  859   11]
 [  15    8    2   11   37    3    0   26    9  898]]
```

(B)

```
[[ 963    0    1    1    0    4    6    3    1    1]
 [   0 1109    3    2    0    1    4    2   14    0]
 [  10    8  917   22    5    3   13    9   39    6]
 [   3    0   15  913    1   30    2   14   24    8]
 [   1    3    6    0  907    0   11    3    9   42]
 [   8    2    4   31   11  775   11   10   32    8]
 [  12    3    7    1    8   13  910    2    2    0]
 [   2    7   22    7    9    0    0  945    3   33]
 [   9    7    7   23    9   28    8   12  864    7]
 [  11    6    1   10   22    5    0   22    9  923]]
```

Inferences:

(A)

Epochs 0 | Loss = 0.77030116 | Accuracy = 0.84375

Epochs 1 | Loss = 0.44989762 | Accuracy = 0.875

Epochs 2 | Loss = 0.37722096 | Accuracy = 0.90625

Epochs 3 | Loss = 0.34927392 | Accuracy = 0.9166667

Epochs 4 | Loss = 0.33363935 | Accuracy = 0.9375

Epochs 5 | Loss = 0.32288277 | Accuracy = 0.9479167

Accuracy on test set: 0.9182

(B)

Epochs 0 | Loss = 0.3214841 | Accuracy = 0.9375

Epochs 1 | Loss = 0.18205723 | Accuracy = 0.96875

Epochs 2 | Loss = 0.14709452 | Accuracy = 0.96875

Epochs 3 | Loss = 0.13118085 | Accuracy = 0.96875

Epochs 4 | Loss = 0.12192336 | Accuracy = 0.96875

Epochs 5 | Loss = 0.11570815 | Accuracy = 0.96875

Epochs 6 | Loss = 0.1111283 | Accuracy = 0.96875

Epochs 7 | Loss = 0.10754906 | Accuracy = 0.96875

Epochs 8 | Loss = 0.10465056 | Accuracy = 0.96875

Epochs 9 | Loss = 0.102252275 | Accuracy = 0.96875

Accuracy on test set: 0.9226

2.Line Dataset

Variations Tried:

(A)

Batch Size=500

Epochs=6

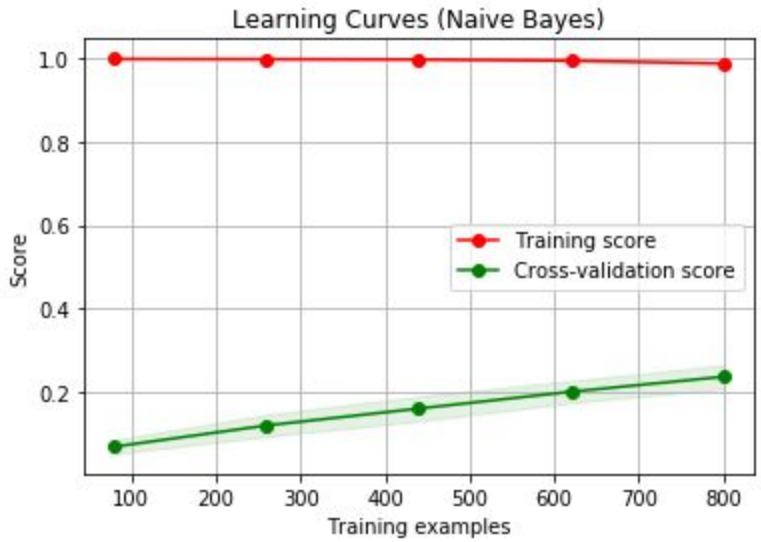
(B)

Batch Size=64

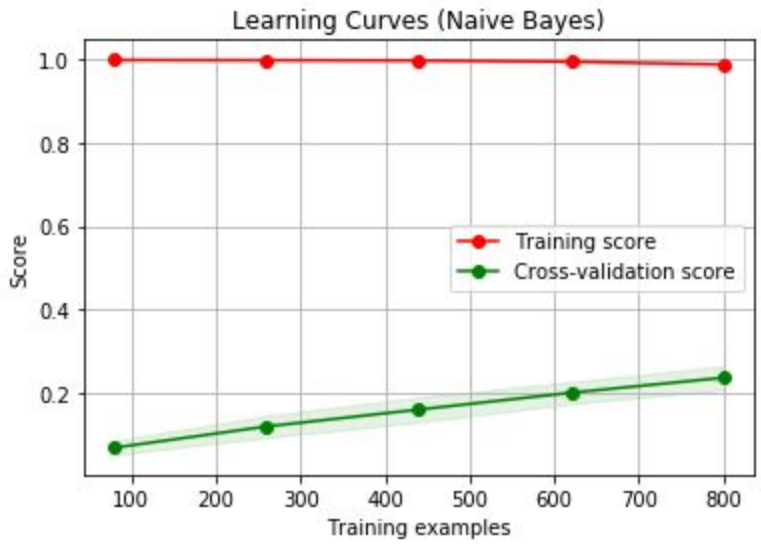
Epochs=10

Learning Curve:

(A)



(B)



F-Scores:

(A)0.8868805429437695

(B)0.9674465704824545

Confusion Matrices:

(A)

```
[[ 744    0    0 ...    0    0    0]
[   0 1000    0 ...    0    0    0]
[   0    0 1000 ...    0    0    0]
...
[   0    0    0 ...  981    0    0]
[   0    0    0 ...    0  497    0]
[   0    0    0 ...    0    0 1000]]
```

(B)

```
[[ 838    0    0 ...    0    0    0]
[   0 1000    0 ...    0    0    0]
[   0    0 1000 ...    0    0    0]
...
[   0    0    0 ... 1000    0    0]
[   0    0    0 ...    0  928    0]
[   0    0    0 ...    0    0 1000]]
```

Inferences:

(A)

Epochs 0 | Loss = 2.1575205 | Accuracy = 0.464

Epochs 1 | Loss = 1.3952588 | Accuracy = 0.664

Epochs 2 | Loss = 1.0151566 | Accuracy = 0.766

Epochs 3 | Loss = 0.79073566 | Accuracy = 0.824

Epochs 4 | Loss = 0.64377654 | Accuracy = 0.844

Epochs 5 | Loss = 0.5404488 | Accuracy = 0.87

Accuracy on test set: 0.8885

(B)

Epochs 0 | Loss = 1.6279122 | Accuracy = 0.616

Epochs 1 | Loss = 0.9860647 | Accuracy = 0.764

Epochs 2 | Loss = 0.69602275 | Accuracy = 0.852

Epochs 3 | Loss = 0.5305631 | Accuracy = 0.88

Epochs 4 | Loss = 0.42273867 | Accuracy = 0.896

Epochs 5 | Loss = 0.34601194 | Accuracy = 0.908

Epochs 6 | Loss = 0.28772643 | Accuracy = 0.92

Epochs 7 | Loss = 0.24141482 | Accuracy = 0.936

Epochs 8 | Loss = 0.20356707 | Accuracy = 0.956

Epochs 9 | Loss = 0.17214395 | Accuracy = 0.968

Accuracy on test set: 0.96767706