

```
#####  
MultinomialNB()
```

```
Training Accuracy scores  
[0.5180699 0.5189597 0.51816557 0.51816557 0.51796704]  
Mean Training Accuracy  
51.82655576691182
```

```
Training Precision scores  
[0.5180699 0.5189597 0.51816557 0.51816557 0.51796704]  
Mean Training Precision  
0.5182655576691182
```

```
Training Recall scores[0.5180699 0.5189597 0.51816557 0.51816557 0.51796704]  
Mean Training Recall0.5182655576691182
```

```
Training F1 scores[0.5180699 0.5189597 0.51816557 0.51816557 0.51796704]  
Mean Training F1 Score0.5182655576691182
```

```
Validation Accuracy scores[0.51904762 0.51548848 0.51866561 0.51866561  
0.51945989]  
Mean Validation Accuracy51.82654412042815
```

```
Validation Precision scores[0.51904762 0.51548848 0.51866561 0.51866561  
0.51945989]  
Mean Validation Precision0.5182654412042815
```

```
Validation Recall scores[0.51904762 0.51548848 0.51866561 0.51866561 0.51945989]  
Mean Validation Recall0.5182654412042815
```

```
Validation F1 scores[0.51904762 0.51548848 0.51866561 0.51866561 0.51945989]  
Mean Validation F1 Score0.5182654412042815
```

```
#####  
GaussianNB()
```

```
Training Accuracy scores  
[0.30142971 0.30732579 0.30017868 0.295811 0.29878896]  
Mean Training Accuracy  
30.07068266708801
```

```
Training Precision scores  
[0.30142971 0.30732579 0.30017868 0.295811 0.29878896]  
Mean Training Precision  
0.3007068266708801
```

```
Training Recall scores[0.30142971 0.30732579 0.30017868 0.295811 0.29878896]  
Mean Training Recall0.3007068266708801
```

```
Training F1 scores[0.30142971 0.30732579 0.30017868 0.295811 0.29878896]  
Mean Training F1 Score0.3007068266708801
```

```
Validation Accuracy scores[0.29444444 0.28991263 0.27243844 0.27720413
```

0.29308975]
Mean Validation Accuracy28.541788015179602

Validation Precision scores[0.29444444 0.28991263 0.27243844 0.27720413
0.29308975]
Mean Validation Precision0.28541788015179603

Validation Recall scores[0.29444444 0.28991263 0.27243844 0.27720413 0.29308975]
Mean Validation Recall0.28541788015179603

Validation F1 scores[0.29444444 0.28991263 0.27243844 0.27720413 0.29308975]
Mean Validation F1 Score0.28541788015179603

BernoulliNB()

Training Accuracy scores
[0.51588562 0.51598174 0.51618027 0.51538614 0.51479055]
Mean Training Accuracy
51.56448634355175

Training Precision scores
[0.51588562 0.51598174 0.51618027 0.51538614 0.51479055]
Mean Training Precision
0.5156448634355175

Training Recall scores[0.51588562 0.51598174 0.51618027 0.51538614 0.51479055]
Mean Training Recall0.5156448634355175

Training F1 scores[0.51588562 0.51598174 0.51618027 0.51538614 0.51479055]
Mean Training F1 Score0.5156448634355175

Validation Accuracy scores[0.51111111 0.51310564 0.50913423 0.51151708
0.51707705]
Mean Validation Accuracy51.23890212690849

Validation Precision scores[0.51111111 0.51310564 0.50913423 0.51151708
0.51707705]
Mean Validation Precision0.5123890212690849

Validation Recall scores[0.51111111 0.51310564 0.50913423 0.51151708 0.51707705]
Mean Validation Recall0.5123890212690849

Validation F1 scores[0.51111111 0.51310564 0.50913423 0.51151708 0.51707705]
Mean Validation F1 Score0.5123890212690849

ComplementNB()

Training Accuracy scores
[0.66759333 0.67242406 0.67262259 0.67103435 0.67679174]
Mean Training Accuracy

67.20932139498925

Training Precision scores

[0.66759333 0.67242406 0.67262259 0.67103435 0.67679174]

Mean Training Precision

0.6720932139498924

Training Recall scores[0.66759333 0.67242406 0.67262259 0.67103435 0.67679174]

Mean Training Recall0.6720932139498924

Training F1 scores[0.66759333 0.67242406 0.67262259 0.67103435 0.67679174]

Mean Training F1 Score0.6720932139498924

Validation Accuracy scores[0.67936508 0.67593328 0.66004766 0.66084194
0.65210485]

Mean Validation Accuracy66.56585599556212

Validation Precision scores[0.67936508 0.67593328 0.66004766 0.66084194
0.65210485]

Mean Validation Precision0.6656585599556212

Validation Recall scores[0.67936508 0.67593328 0.66004766 0.66084194 0.65210485]

Mean Validation Recall0.6656585599556212

Validation F1 scores[0.67936508 0.67593328 0.66004766 0.66084194 0.65210485]

Mean Validation F1 Score0.6656585599556212

#####

RandomForestClassifier(n_jobs=10, random_state=0)

Training Accuracy scores

[1. 1. 1. 1. 1.]

Mean Training Accuracy

100.0

Training Precision scores

[1. 1. 1. 1. 1.]

Mean Training Precision

1.0

Training Recall scores[1. 1. 1. 1. 1.]

Mean Training Recall1.0

Training F1 scores[1. 1. 1. 1. 1.]

Mean Training F1 Score1.0

Validation Accuracy scores[0.84126984 0.85702939 0.85544083 0.84193805
0.84352661]

Mean Validation Accuracy84.78409420426894

Validation Precision scores[0.84126984 0.85702939 0.85544083 0.84193805
0.84352661]

Mean Validation Precision0.8478409420426894

Validation Recall scores[0.84126984 0.85702939 0.85544083 0.84193805 0.84352661]
Mean Validation Recall0.8478409420426894

Validation F1 scores[0.84126984 0.85702939 0.85544083 0.84193805 0.84352661]
Mean Validation F1 Score0.8478409420426894

DecisionTreeClassifier()

Training Accuracy scores
[1. 1. 1. 1. 1.]
Mean Training Accuracy
100.0

Training Precision scores
[1. 1. 1. 1. 1.]
Mean Training Precision
1.0

Training Recall scores[1. 1. 1. 1. 1.]
Mean Training Recall1.0

Training F1 scores[1. 1. 1. 1. 1.]
Mean Training F1 Score1.0

Validation Accuracy scores[0.81269841 0.82764098 0.79507546 0.80063542
0.79666402]
Mean Validation Accuracy80.65428596643847

Validation Precision scores[0.81269841 0.82764098 0.79507546 0.80063542
0.79666402]
Mean Validation Precision0.8065428596643847

Validation Recall scores[0.81269841 0.82764098 0.79507546 0.80063542 0.79666402]
Mean Validation Recall0.8065428596643847

Validation F1 scores[0.81269841 0.82764098 0.79507546 0.80063542 0.79666402]
Mean Validation F1 Score0.8065428596643847

SVC()

Training Accuracy scores
[0.70671168 0.71173317 0.71034346 0.71490967 0.71391701]
Mean Training Accuracy
71.1522998279767

Training Precision scores
[0.70671168 0.71173317 0.71034346 0.71490967 0.71391701]
Mean Training Precision
0.7115229982797671

Training Recall scores[0.70671168 0.71173317 0.71034346 0.71490967 0.71391701]
Mean Training Recall0.7115229982797671

Training F1 scores[0.70671168 0.71173317 0.71034346 0.71490967 0.71391701]
Mean Training F1 Score0.7115229982797671

Validation Accuracy scores[0.6952381 0.69658459 0.68069897 0.68546465
0.67831612]
Mean Validation Accuracy68.72604864026627

Validation Precision scores[0.6952381 0.69658459 0.68069897 0.68546465
0.67831612]
Mean Validation Precision0.6872604864026627

Validation Recall scores[0.6952381 0.69658459 0.68069897 0.68546465 0.67831612]
Mean Validation Recall0.6872604864026627

Validation F1 scores[0.6952381 0.69658459 0.68069897 0.68546465 0.67831612]
Mean Validation F1 Score0.6872604864026627

KNeighborsClassifier(n_jobs=10)

Training Accuracy scores
[0.64138205 0.65118126 0.65237244 0.65316657 0.65177685]
Mean Training Accuracy
64.99758341095591

Training Precision scores
[0.64138205 0.65118126 0.65237244 0.65316657 0.65177685]
Mean Training Precision
0.6499758341095591

Training Recall scores[0.64138205 0.65118126 0.65237244 0.65316657 0.65177685]
Mean Training Recall0.6499758341095591

Training F1 scores[0.64138205 0.65118126 0.65237244 0.65316657 0.65177685]
Mean Training F1 Score0.6499758341095591

Validation Accuracy scores[0.56587302 0.57664813 0.55123114 0.55837967
0.58379666]
Mean Validation Accuracy56.718572311106065

Validation Precision scores[0.56587302 0.57664813 0.55123114 0.55837967
0.58379666]
Mean Validation Precision0.5671857231110606

Validation Recall scores[0.56587302 0.57664813 0.55123114 0.55837967 0.58379666]
Mean Validation Recall0.5671857231110606

Validation F1 scores[0.56587302 0.57664813 0.55123114 0.55837967 0.58379666]
Mean Validation F1 Score0.5671857231110606

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LogisticRegression(max_iter=5000, n_jobs=10)

Training Accuracy scores

[0.71862589 0.72046853 0.71749057 0.72404209 0.72563034]

Mean Training Accuracy

72.12514840537449

Training Precision scores

[0.71862589 0.72046853 0.71749057 0.72404209 0.72563034]

Mean Training Precision

0.721251484053745

Training Recall scores[0.71862589 0.72046853 0.71749057 0.72404209 0.72563034]

Mean Training Recall0.721251484053745

Training F1 scores[0.71862589 0.72046853 0.71749057 0.72404209 0.72563034]

Mean Training F1 Score0.721251484053745

Validation Accuracy scores[0.70714286 0.70849881 0.69976172 0.70214456
0.69579031]

Mean Validation Accuracy70.26676500624079

Validation Precision scores[0.70714286 0.70849881 0.69976172 0.70214456
0.69579031]

Mean Validation Precision0.7026676500624078

Validation Recall scores[0.70714286 0.70849881 0.69976172 0.70214456 0.69579031]

Mean Validation Recall0.7026676500624078

Validation F1 scores[0.70714286 0.70849881 0.69976172 0.70214456 0.69579031]

Mean Validation F1 Score0.7026676500624078

#####

LinearDiscriminantAnalysis()

Training Accuracy scores

[0.68606037 0.68155648 0.6938654 0.68513004 0.68671828]

Mean Training Accuracy

68.66661131771042

Training Precision scores

[0.68606037 0.68155648 0.6938654 0.68513004 0.68671828]

Mean Training Precision

0.6866661131771041

Training Recall scores[0.68606037 0.68155648 0.6938654 0.68513004 0.68671828]

Mean Training Recall0.6866661131771041

Training F1 scores[0.68606037 0.68155648 0.6938654 0.68513004 0.68671828]

Mean Training F1 Score0.6866661131771041

Validation Accuracy scores[0.67460317 0.67275616 0.67116759 0.66401906
0.65845909]
Mean Validation Accuracy66.82010161755991

Validation Precision scores[0.67460317 0.67275616 0.67116759 0.66401906
0.65845909]
Mean Validation Precision0.6682010161755991

Validation Recall scores[0.67460317 0.67275616 0.67116759 0.66401906 0.65845909]
Mean Validation Recall0.6682010161755991

Validation F1 scores[0.67460317 0.67275616 0.67116759 0.66401906 0.65845909]
Mean Validation F1 Score0.6682010161755991

BaggingClassifier(estimator=MultinomialNB(), n_jobs=10)

Training Accuracy scores
[0.5180699 0.5189597 0.51816557 0.51816557 0.51796704]
Mean Training Accuracy
51.82655576691182

Training Precision scores
[0.5180699 0.5189597 0.51816557 0.51816557 0.51796704]
Mean Training Precision
0.5182655576691182

Training Recall scores[0.5180699 0.5189597 0.51816557 0.51816557 0.51796704]
Mean Training Recall0.5182655576691182

Training F1 scores[0.5180699 0.5189597 0.51816557 0.51816557 0.51796704]
Mean Training F1 Score0.5182655576691182

Validation Accuracy scores[0.51904762 0.51548848 0.51866561 0.51866561
0.51945989]
Mean Validation Accuracy51.82654412042815

Validation Precision scores[0.51904762 0.51548848 0.51866561 0.51866561
0.51945989]
Mean Validation Precision0.5182654412042815

Validation Recall scores[0.51904762 0.51548848 0.51866561 0.51866561 0.51945989]
Mean Validation Recall0.5182654412042815

Validation F1 scores[0.51904762 0.51548848 0.51866561 0.51866561 0.51945989]
Mean Validation F1 Score0.5182654412042815

BaggingClassifier(estimator=GaussianNB(), n_jobs=10)

Training Accuracy scores

[0.30321684 0.30871551 0.30395076 0.295811 0.29998015]
Mean Training Accuracy
30.233485077779477

Training Precision scores
[0.30321684 0.30871551 0.30395076 0.295811 0.29998015]
Mean Training Precision
0.30233485077779476

Training Recall scores[0.30321684 0.30871551 0.30395076 0.295811 0.29998015]
Mean Training Recall0.30233485077779476

Training F1 scores[0.30321684 0.30871551 0.30395076 0.295811 0.29998015]
Mean Training F1 Score0.30233485077779476

Validation Accuracy scores[0.29761905 0.28991263 0.28355838 0.27958697
0.29150119]
Mean Validation Accuracy28.843564431332503

Validation Precision scores[0.29761905 0.28991263 0.28355838 0.27958697
0.29150119]
Mean Validation Precision0.288435644313325

Validation Recall scores[0.29761905 0.28991263 0.28355838 0.27958697 0.29150119]
Mean Validation Recall0.288435644313325

Validation F1 scores[0.29761905 0.28991263 0.28355838 0.27958697 0.29150119]
Mean Validation F1 Score0.288435644313325

BaggingClassifier(estimator=BernoulliNB(), n_jobs=10)

Training Accuracy scores
[0.51568705 0.51598174 0.51598174 0.51518761 0.51439349]
Mean Training Accuracy
51.544632467950045

Training Precision scores
[0.51568705 0.51598174 0.51598174 0.51518761 0.51439349]
Mean Training Precision
0.5154463246795005

Training Recall scores[0.51568705 0.51598174 0.51598174 0.51518761 0.51439349]
Mean Training Recall0.5154463246795005

Training F1 scores[0.51568705 0.51598174 0.51598174 0.51518761 0.51439349]
Mean Training F1 Score0.5154463246795005

Validation Accuracy scores[0.51031746 0.51310564 0.50913423 0.51151708
0.51628276]
Mean Validation Accuracy51.20714348752475

Validation Precision scores[0.51031746 0.51310564 0.50913423 0.51151708

0.51628276]

Mean Validation Precision0.5120714348752475

Validation Recall scores[0.51031746 0.51310564 0.50913423 0.51151708 0.51628276]

Mean Validation Recall0.5120714348752475

Validation F1 scores[0.51031746 0.51310564 0.50913423 0.51151708 0.51628276]

Mean Validation F1 Score0.5120714348752475

#####

BaggingClassifier(estimator=ComplementNB(), n_jobs=10)

Training Accuracy scores

[0.66799047 0.67123288 0.67182847 0.66984316 0.67480643]

Mean Training Accuracy

67.11402815353831

Training Precision scores

[0.66799047 0.67123288 0.67182847 0.66984316 0.67480643]

Mean Training Precision

0.6711402815353832

Training Recall scores[0.66799047 0.67123288 0.67182847 0.66984316 0.67480643]

Mean Training Recall0.6711402815353832

Training F1 scores[0.66799047 0.67123288 0.67182847 0.66984316 0.67480643]

Mean Training F1 Score0.6711402815353832

Validation Accuracy scores[0.67380952 0.67593328 0.65925338 0.66322478 0.649722

]

Mean Validation Accuracy66.43885926094029

Validation Precision scores[0.67380952 0.67593328 0.65925338 0.66322478 0.649722

]

Mean Validation Precision0.6643885926094029

Validation Recall scores[0.67380952 0.67593328 0.65925338 0.66322478 0.649722]

Mean Validation Recall0.6643885926094029

Validation F1 scores[0.67380952 0.67593328 0.65925338 0.66322478 0.649722]

Mean Validation F1 Score0.6643885926094029

#####

BaggingClassifier(estimator=RandomForestClassifier(), n_jobs=10)

Training Accuracy scores

[0.99324861 0.99265436 0.99245583 0.99086758 0.99186023]

Mean Training Accuracy

99.22173217633515

Training Precision scores

[0.99324861 0.99265436 0.99245583 0.99086758 0.99186023]

Mean Training Precision
0.9922173217633515

Training Recall scores[0.99324861 0.99265436 0.99245583 0.99086758 0.99186023]
Mean Training Recall0.9922173217633515

Training F1 scores[0.99324861 0.99265436 0.99245583 0.99086758 0.99186023]
Mean Training F1 Score0.9922173217633515

Validation Accuracy scores[0.84206349 0.84590945 0.84352661 0.83637808
0.83637808]
Mean Validation Accuracy84.08511416215944

Validation Precision scores[0.84206349 0.84590945 0.84352661 0.83637808
0.83637808]
Mean Validation Precision0.8408511416215945

Validation Recall scores[0.84206349 0.84590945 0.84352661 0.83637808 0.83637808]
Mean Validation Recall0.8408511416215945

Validation F1 scores[0.84206349 0.84590945 0.84352661 0.83637808 0.83637808]
Mean Validation F1 Score0.8408511416215942

BaggingClassifier(estimator=DecisionTreeClassifier(), n_jobs=10)

Training Accuracy scores
[0.99205719 0.99245583 0.99205877 0.99205877 0.99305142]
Mean Training Accuracy
99.23363929794814

Training Precision scores
[0.99205719 0.99245583 0.99205877 0.99205877 0.99305142]
Mean Training Precision
0.9923363929794815

Training Recall scores[0.99205719 0.99245583 0.99205877 0.99205877 0.99305142]
Mean Training Recall0.9923363929794815

Training F1 scores[0.99205719 0.99245583 0.99205877 0.99205877 0.99305142]
Mean Training F1 Score0.9923363929794815

Validation Accuracy scores[0.85238095 0.85861795 0.84988086 0.84590945 0.8395552
]
Mean Validation Accuracy84.92688830893755

Validation Precision scores[0.85238095 0.85861795 0.84988086 0.84590945
0.8395552]
Mean Validation Precision0.8492688830893755

Validation Recall scores[0.85238095 0.85861795 0.84988086 0.84590945 0.8395552]
Mean Validation Recall0.8492688830893755

Validation F1 scores[0.85238095 0.85861795 0.84988086 0.84590945 0.8395552]
Mean Validation F1 Score0.8492688830893755

BaggingClassifier(estimator=SVC(), n_jobs=10)

Training Accuracy scores
[0.7132645 0.71669645 0.71232877 0.72086559 0.72225531]
Mean Training Accuracy
71.70821228705829

Training Precision scores
[0.7132645 0.71669645 0.71232877 0.72086559 0.72225531]
Mean Training Precision
0.7170821228705829

Training Recall scores[0.7132645 0.71669645 0.71232877 0.72086559 0.72225531]
Mean Training Recall0.7170821228705829

Training F1 scores[0.7132645 0.71669645 0.71232877 0.72086559 0.72225531]
Mean Training F1 Score0.7170821228705829

Validation Accuracy scores[0.69761905 0.69976172 0.68546465 0.68943606
0.68546465]
Mean Validation Accuracy69.15492265214266

Validation Precision scores[0.69761905 0.69976172 0.68546465 0.68943606
0.68546465]
Mean Validation Precision0.6915492265214266

Validation Recall scores[0.69761905 0.69976172 0.68546465 0.68943606 0.68546465]
Mean Validation Recall0.6915492265214266

Validation F1 scores[0.69761905 0.69976172 0.68546465 0.68943606 0.68546465]
Mean Validation F1 Score0.6915492265214266

BaggingClassifier(estimator=KNeighborsClassifier(), n_jobs=10)

Training Accuracy scores
[0.66858618 0.67659321 0.67679174 0.67222553 0.6803653]
Mean Training Accuracy
67.49123917482433

Training Precision scores
[0.66858618 0.67659321 0.67679174 0.67222553 0.6803653]
Mean Training Precision
0.6749123917482432

Training Recall scores[0.66858618 0.67659321 0.67679174 0.67222553 0.6803653]
Mean Training Recall0.6749123917482432

Training F1 scores[0.66858618 0.67659321 0.67679174 0.67222553 0.6803653]
Mean Training F1 Score0.6749123917482432

Validation Accuracy scores[0.55396825 0.56473392 0.55361398 0.53693407 0.5782367]
Mean Validation Accuracy55.74973839151759

Validation Precision scores[0.55396825 0.56473392 0.55361398 0.53693407 0.5782367]
Mean Validation Precision0.5574973839151759

Validation Recall scores[0.55396825 0.56473392 0.55361398 0.53693407 0.5782367]
Mean Validation Recall0.5574973839151759

Validation F1 scores[0.55396825 0.56473392 0.55361398 0.53693407 0.5782367]
Mean Validation F1 Score0.5574973839151759

BaggingClassifier(estimator=LogisticRegression(max_iter=5000), n_jobs=10)

Training Accuracy scores
[0.7132645 0.71967441 0.71351995 0.71967441 0.72384356]
Mean Training Accuracy
71.79953648797154

Training Precision scores
[0.7132645 0.71967441 0.71351995 0.71967441 0.72384356]
Mean Training Precision
0.7179953648797154

Training Recall scores[0.7132645 0.71967441 0.71351995 0.71967441 0.72384356]
Mean Training Recall0.7179953648797154

Training F1 scores[0.7132645 0.71967441 0.71351995 0.71967441 0.72384356]
Mean Training F1 Score0.7179953648797154

Validation Accuracy scores[0.6984127 0.7045274 0.69658459 0.69499603 0.69023034]
Mean Validation Accuracy69.69502124386953

Validation Precision scores[0.6984127 0.7045274 0.69658459 0.69499603 0.69023034]
Mean Validation Precision0.6969502124386954

Validation Recall scores[0.6984127 0.7045274 0.69658459 0.69499603 0.69023034]
Mean Validation Recall0.6969502124386954

Validation F1 scores[0.6984127 0.7045274 0.69658459 0.69499603 0.69023034]
Mean Validation F1 Score0.6969502124386954

BaggingClassifier(estimator=LinearDiscriminantAnalysis(), n_jobs=10)

Training Accuracy scores
[0.69420175 0.68314473 0.69684336 0.68632122 0.68850506]
Mean Training Accuracy
68.98032242107372

Training Precision scores
[0.69420175 0.68314473 0.69684336 0.68632122 0.68850506]
Mean Training Precision
0.6898032242107373

Training Recall scores[0.69420175 0.68314473 0.69684336 0.68632122 0.68850506]
Mean Training Recall0.6898032242107373

Training F1 scores[0.69420175 0.68314473 0.69684336 0.68632122 0.68850506]
Mean Training F1 Score0.6898032242107373

Validation Accuracy scores[0.68253968 0.67593328 0.67752184 0.66084194
0.66481334]
Mean Validation Accuracy67.23300175246165

Validation Precision scores[0.68253968 0.67593328 0.67752184 0.66084194
0.66481334]
Mean Validation Precision0.6723300175246164

Validation Recall scores[0.68253968 0.67593328 0.67752184 0.66084194 0.66481334]
Mean Validation Recall0.6723300175246164

Validation F1 scores[0.68253968 0.67593328 0.67752184 0.66084194 0.66481334]
Mean Validation F1 Score0.6723300175246164

GradientBoostingClassifier()

Training Accuracy scores
[0.9819301 0.97935279 0.98193369 0.98590431 0.98153663]
Mean Training Accuracy
98.21315040739827

Training Precision scores
[0.9819301 0.97935279 0.98193369 0.98590431 0.98153663]
Mean Training Precision
0.9821315040739828

Training Recall scores[0.9819301 0.97935279 0.98193369 0.98590431 0.98153663]
Mean Training Recall0.9821315040739828

Training F1 scores[0.9819301 0.97935279 0.98193369 0.98590431 0.98153663]
Mean Training F1 Score0.9821315040739828

Validation Accuracy scores[0.86587302 0.89118348 0.88006354 0.86894361
0.87132645]
Mean Validation Accuracy87.5478018583658

```
Validation Precision scores[0.86587302 0.89118348 0.88006354 0.86894361
0.87132645]
Mean Validation Precision0.875478018583658
```

```
Validation Recall scores[0.86587302 0.89118348 0.88006354 0.86894361 0.87132645]
Mean Validation Recall0.875478018583658
```

```
Validation F1 scores[0.86587302 0.89118348 0.88006354 0.86894361 0.87132645]
Mean Validation F1 Score0.875478018583658
```

```
#####
AdaBoostClassifier()
```

```
Training Accuracy scores
[0.5200556 0.39626762 0.51141553 0.28608299 0.42803256]
Mean Training Accuracy
42.83708578757071
```

```
Training Precision scores
[0.5200556 0.39626762 0.51141553 0.28608299 0.42803256]
Mean Training Precision
0.42837085787570706
```

```
Training Recall scores[0.5200556 0.39626762 0.51141553 0.28608299 0.42803256]
Mean Training Recall0.42837085787570706
```

```
Training F1 scores[0.5200556 0.39626762 0.51141553 0.28608299 0.42803256]
Mean Training F1 Score0.42837085787570706
```

```
Validation Accuracy scores[0.52063492 0.38760921 0.49960286 0.29070691
0.42970612]
Mean Validation Accuracy42.565200398401345
```

```
Validation Precision scores[0.52063492 0.38760921 0.49960286 0.29070691
0.42970612]
Mean Validation Precision0.4256520039840135
```

```
Validation Recall scores[0.52063492 0.38760921 0.49960286 0.29070691 0.42970612]
Mean Validation Recall0.4256520039840135
```

```
Validation F1 scores[0.52063492 0.38760921 0.49960286 0.29070691 0.42970612]
Mean Validation F1 Score0.4256520039840135
```

```
#####
StackingClassifier(estimators=[('mnb', MultinomialNB()), ('gnb', GaussianNB()),
                              ('bnb', BernoulliNB()), ('cnb', ComplementNB()),
                              ('rf', RandomForestClassifier()),
                              ('dt', DecisionTreeClassifier()), ('svc', SVC()),
                              ('lr', LogisticRegression(max_iter=10000000)),
                              ('knn', KNeighborsClassifier()),
                              ('lda', LinearDiscriminantAnalysis())],
```

n_jobs=10)

Training Accuracy scores

[1. 0.99940441 0.99940441 0.99980147 0.99940441]

Mean Training Accuracy

99.96029382568989

Training Precision scores

[1. 0.99940441 0.99940441 0.99980147 0.99940441]

Mean Training Precision

0.9996029382568989

Training Recall scores

[1. 0.99940441 0.99940441 0.99980147 0.99940441]

Mean Training Recall0.9996029382568989

Training F1 scores

[1. 0.99940441 0.99940441 0.99980147 0.99940441]

Mean Training F1 Score0.9996029382568989

Validation Accuracy scores[0.86111111 0.88482923 0.87212073 0.85861795

0.87529786]

Mean Validation Accuracy87.03953755184891

Validation Precision scores[0.86111111 0.88482923 0.87212073 0.85861795

0.87529786]

Mean Validation Precision0.8703953755184891

Validation Recall scores[0.86111111 0.88482923 0.87212073 0.85861795 0.87529786]

Mean Validation Recall0.8703953755184891

Validation F1 scores[0.86111111 0.88482923 0.87212073 0.85861795 0.87529786]

Mean Validation F1 Score0.8703953755184891

#####

```
VotingClassifier(estimators=[('mnf', MultinomialNB()), ('gnb', GaussianNB()),
                             ('bnf', BernoulliNB()), ('cnf', ComplementNB()),
                             ('rf', RandomForestClassifier()),
                             ('dt', DecisionTreeClassifier()),
                             ('svc', SVC(probability=True)),
                             ('lr', LogisticRegression(max_iter=10000)),
                             ('knn', KNeighborsClassifier()),
                             ('lda', LinearDiscriminantAnalysis())],
```

n_jobs=10)

Training Accuracy scores

[0.71505163 0.72086559 0.72304943 0.72304943 0.72007147]

Mean Training Accuracy

72.04175124728322

Training Precision scores

[0.71505163 0.72086559 0.72304943 0.72304943 0.72007147]

Mean Training Precision

0.7204175124728321

Training Recall scores[0.71505163 0.72086559 0.72304943 0.72304943 0.72007147]
Mean Training Recall0.7204175124728321

Training F1 scores[0.71505163 0.72086559 0.72304943 0.72304943 0.72007147]
Mean Training F1 Score0.7204175124728321

Validation Accuracy scores[0.69285714 0.69340747 0.67990469 0.68308181
0.68705322]
Mean Validation Accuracy68.7260864631794

Validation Precision scores[0.69285714 0.69340747 0.67990469 0.68308181
0.68705322]
Mean Validation Precision0.6872608646317939

Validation Recall scores[0.69285714 0.69340747 0.67990469 0.68308181 0.68705322]
Mean Validation Recall0.6872608646317939

Validation F1 scores[0.69285714 0.69340747 0.67990469 0.68308181 0.68705322]
Mean Validation F1 Score0.6872608646317939