REPORT 3

ALGORITHMS:

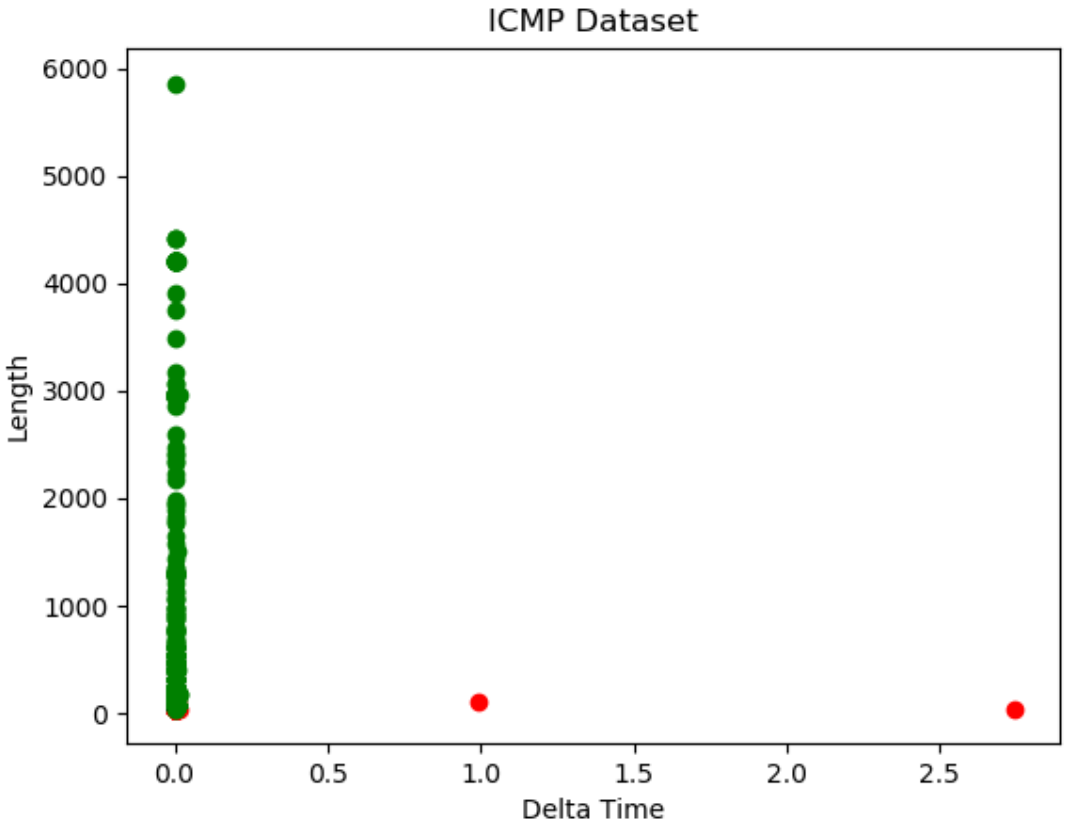
1. **Majority Voting Classifier:** This is an ensemble classification method in which the predicted class with the maximum frequency is chosen from the predictions by all the classifiers. This is not a probabilistic classifier and gives one of the classes as the answer (probability 1). This is same as using a weighted average classifier with weights one. It should be used when the algorithms complement each other well, i.e. for some inputs say one classifier gives errors then the others should counter its vote by their majority.

2. **Weighted Average Classifier:** Weighted Average classifier is used when the algorithms must be given different priorities. It is like the voting classifier but some algorithms get more votes than the others. Example, if Naïve Bayes is a highly accurate algorithm but for a small subset of the data it gives inaccurate readings, while the other classifiers are accurate in the same region but have inaccuracies in other regions, giving a weight of 2 ensures Naïve Bayes has a better say for most of the dataset while it reduces the error caused by Naïve Bayes because of the other classifiers.

3. **Stacking Classifier:** Stacking is an ensemble meta-classifier. It takes base classifiers and fits them to the dataset and generates output. This output is then used to train a second-level classifier to generate a final output. The class probabilities of the first-level classifiers can be used as input for the second-level classifier. The probabilities can be passed as averages or as a stack (gives better results). Stacking is multi-level classifier and hence usually gives better results than other single-level classifiers.

VISUALIZATION GRAPHS OF THE DATASETS: (red – flood, green – normal)

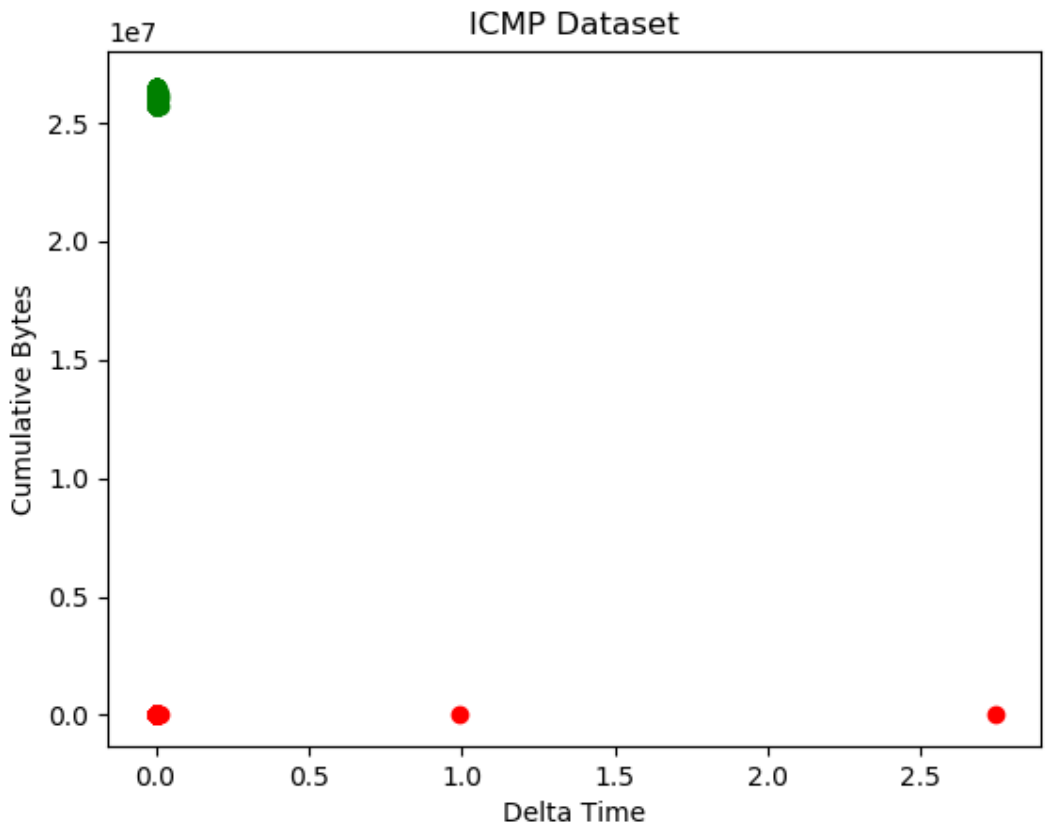
ICMP



We can see from this graph that when the length of the sent packets is 0, then irrespective of delta time values, it is a flood condition

Similarly, when delta time is 0, then irrespective of length values, it is a normal condition.

This shows that packets that take lesser time and are larger in size are of normal condition and packets that take more time and are smaller in size are of flood condition.

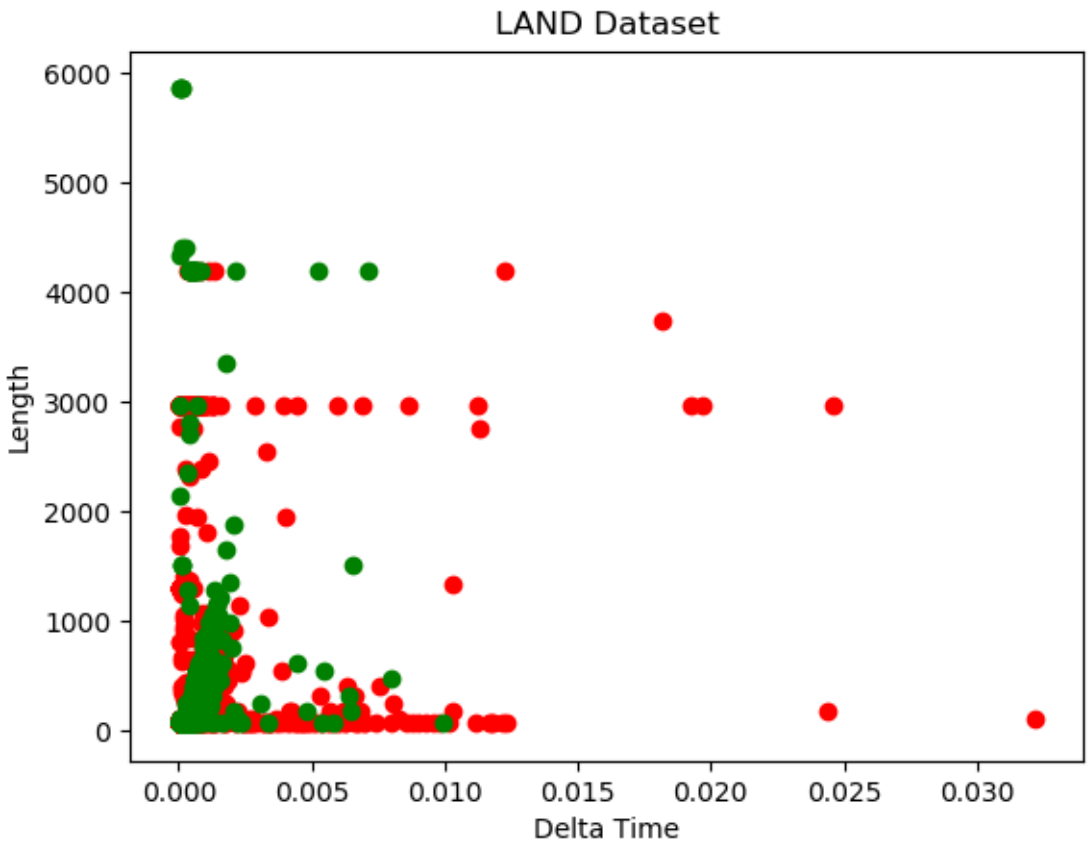


From this graph, we can see that when cumulative bytes is 0, for all Delta times values, it is a flood condition.

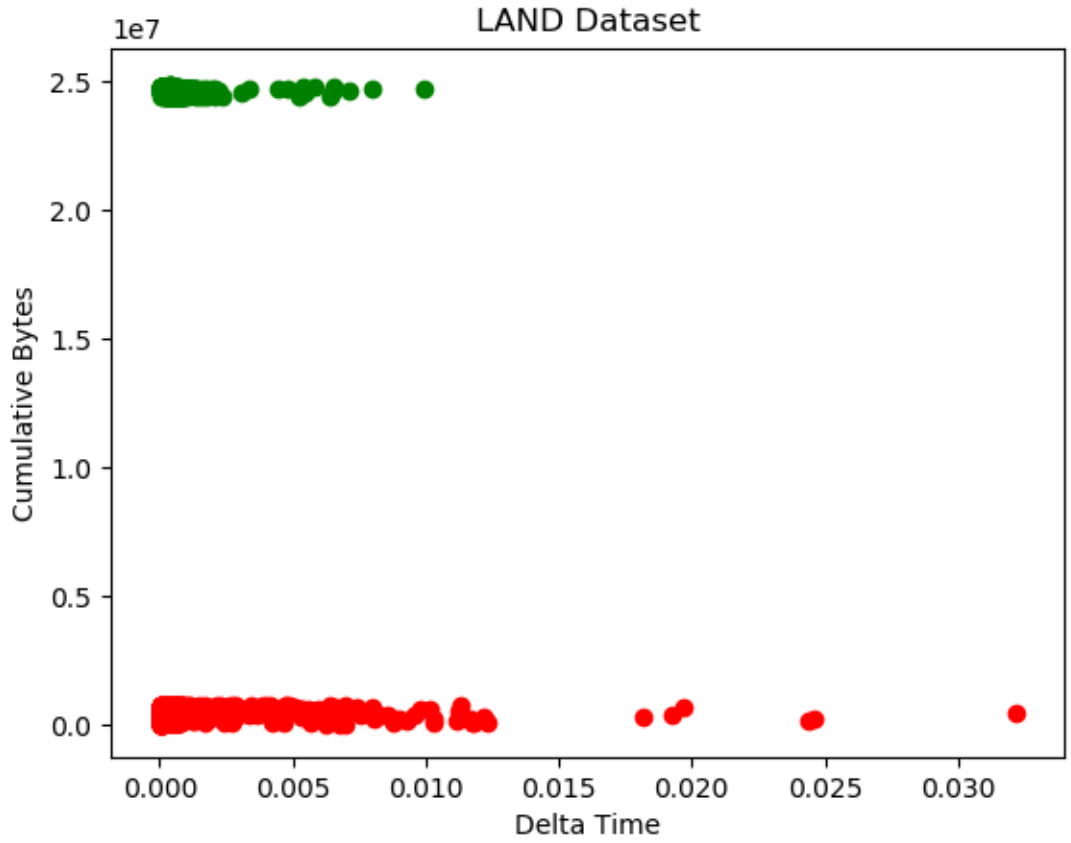
Similarly, when Delta time is 0, for all values of Cumulative bytes, it is a normal condition.

This shows that packets that take lesser time and have cumulative bytes are of normal condition and packets that take more time and do not have cumulative bytes are of flood condition.

LAND

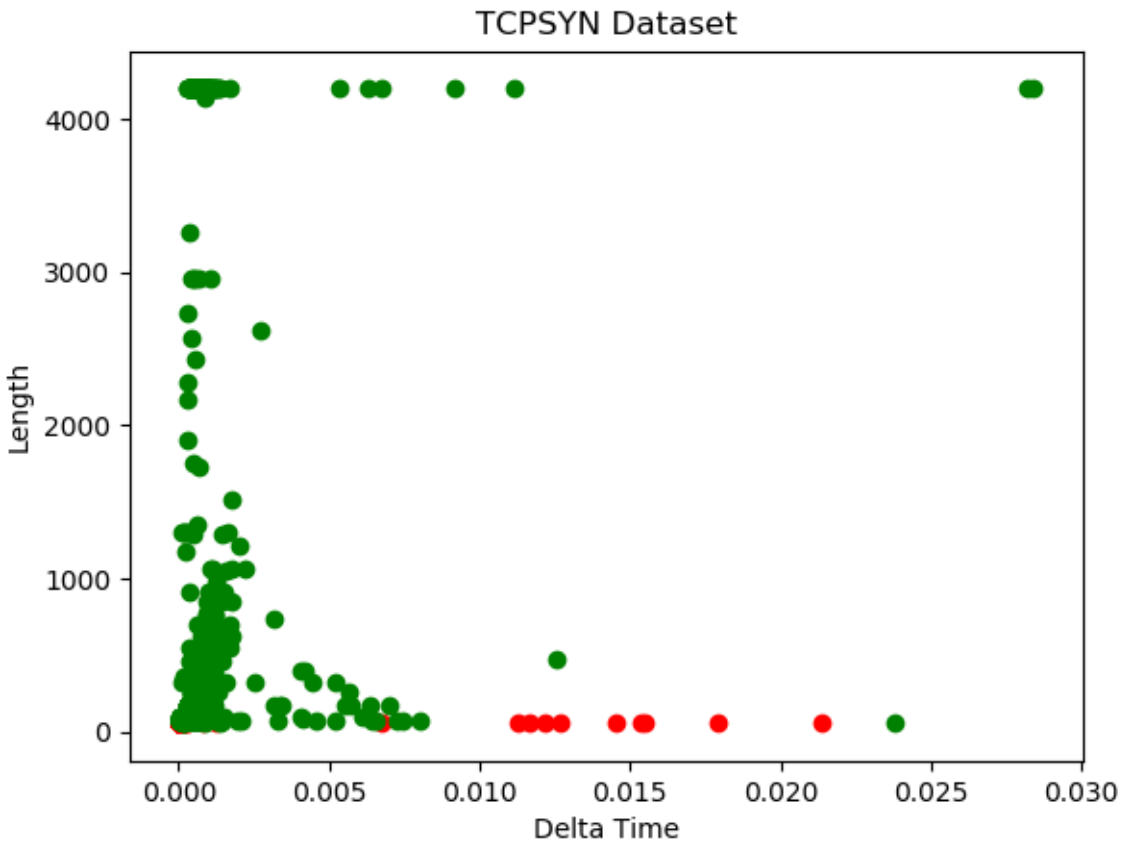


From the graph it is visible that when Delta time is closer to 0 (0 to 0.01), for all value of length, it can be either normal or flood condition thus showing that the following parameters are not enough to differentiate.
Similarly, when delta time is greater than 0.01, for all values of length, it definitely is a flood condition.



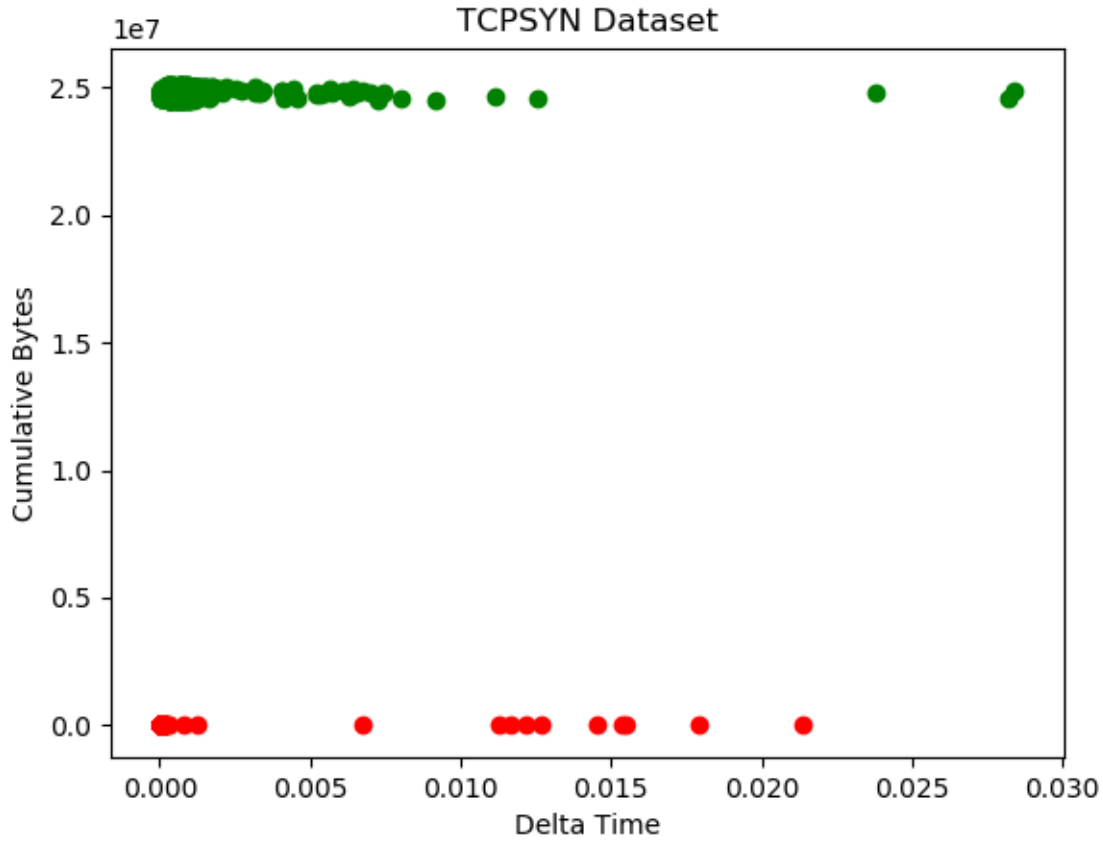
From the graph, it is visible that cumulative bytes alone determines flood or normal conditions. For higher values of cumulative bytes, for all value of delta time, it is a normal condition. Similarly, for lower values of cumulative bytes, for all values of delta time, it is a flood condition.

TCPSYN



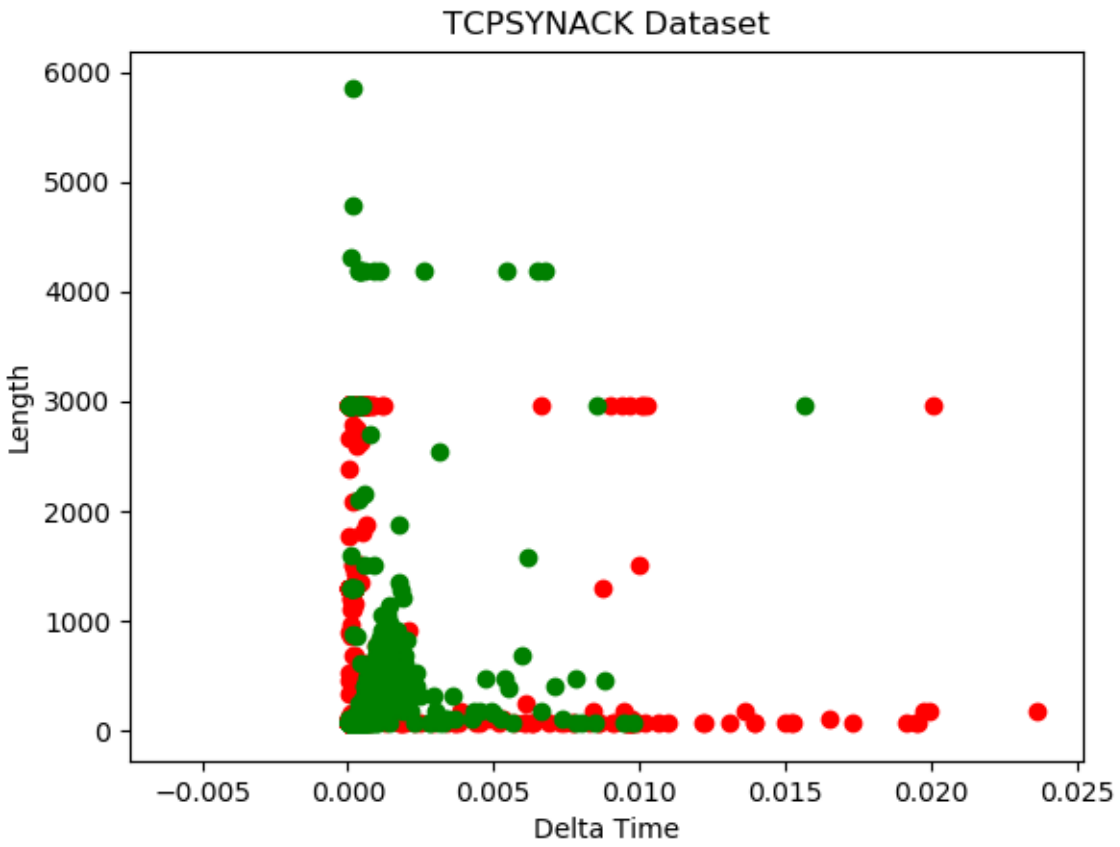
From the graph it is visible that flood conditions only arise when length is almost 0 and delta time is in the range [0.070 to 0.022]. Hence flood conditions depend on both parameters.

For all other values of Length and Delta Time, there exist normal conditions



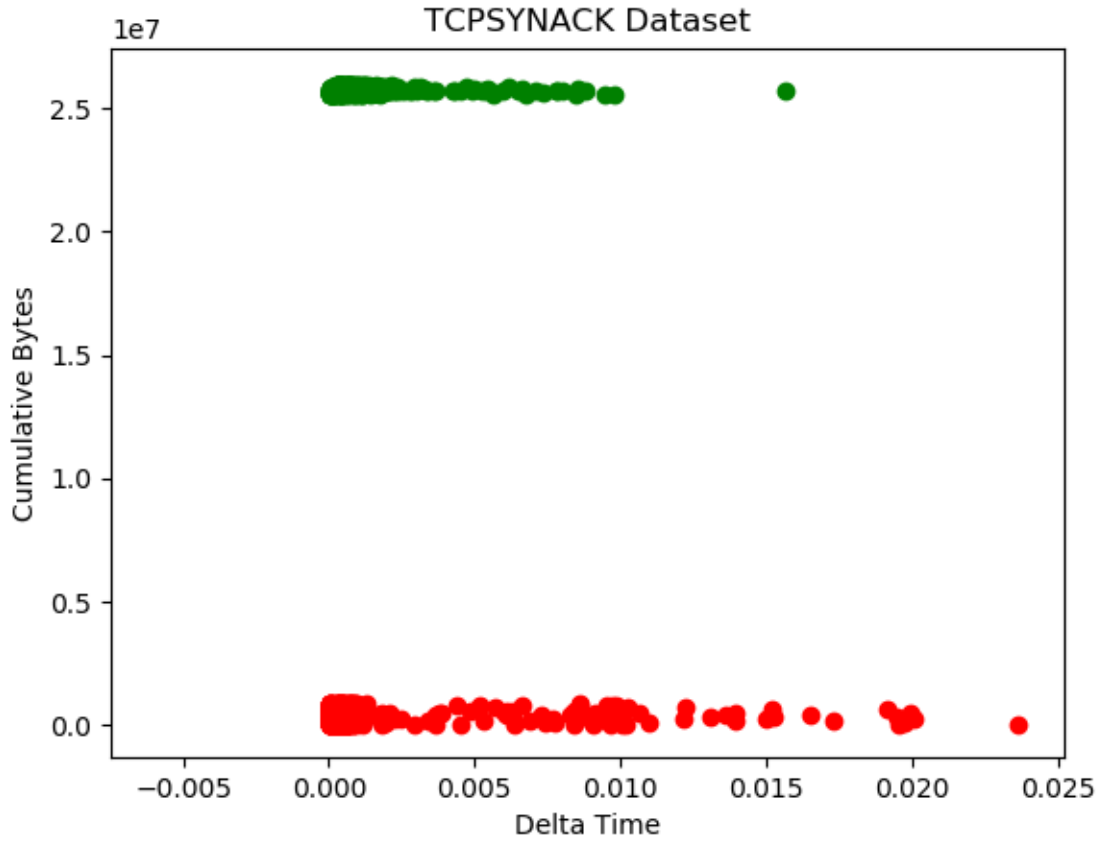
From the graph it is visible that for all Cumulative bytes alone determines the conditions. I.e. when cumulative bytes are high, for all values of Delta time, there is normal conditions.
Similarly when cumulative bytes are 0, for all values of Delta Time, there is flood conditions

TCPSYNACK



From the graph we can see that when delta time lies between 0 and 0.01 and length lies between 0 and 3000, it cannot be determined whether there is flood or normal conditions as both conditions occur, hence these two parameters are not enough.
For the same range of delta time (0 to 0.01) and length > 3000, only normal conditions exist.

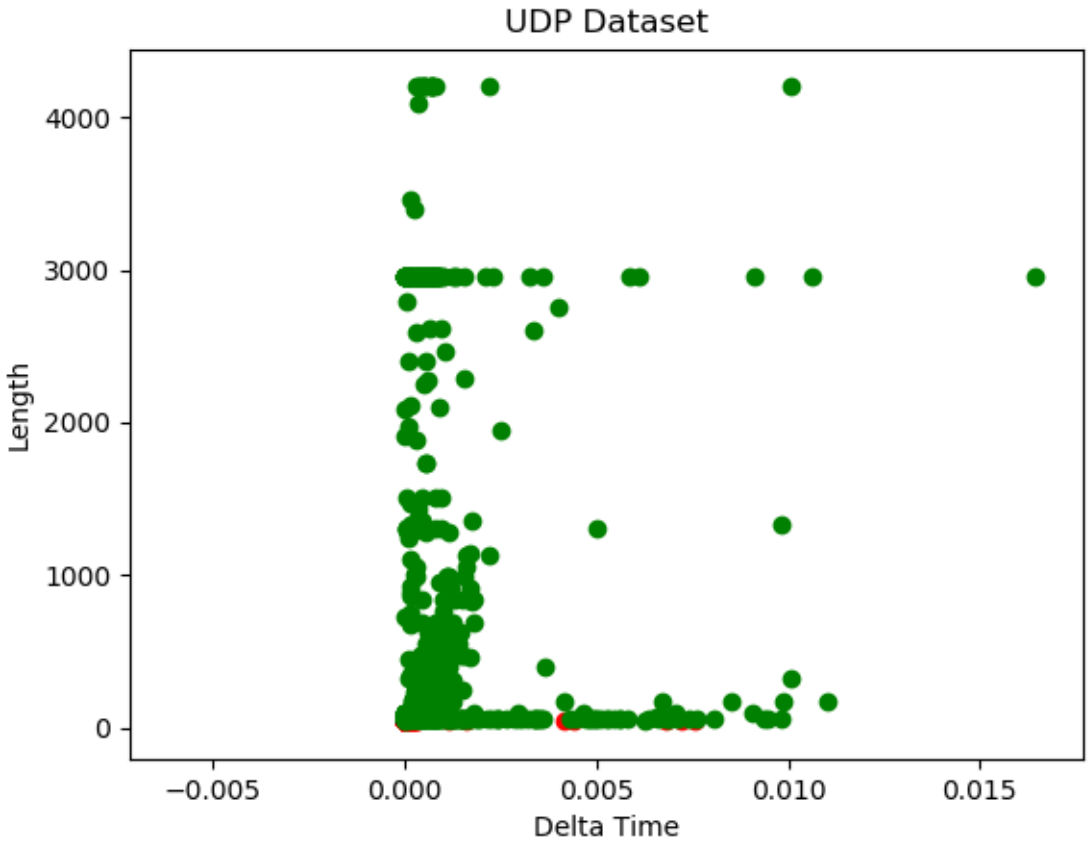
When delta time is greater than 0.01, for all values of length, flood conditions exist.



From the graph, we can see that cumulative bytes solely determine flood or normal conditions. When cumulative bytes is 0 then for all values of Delta time it is flood conditions.

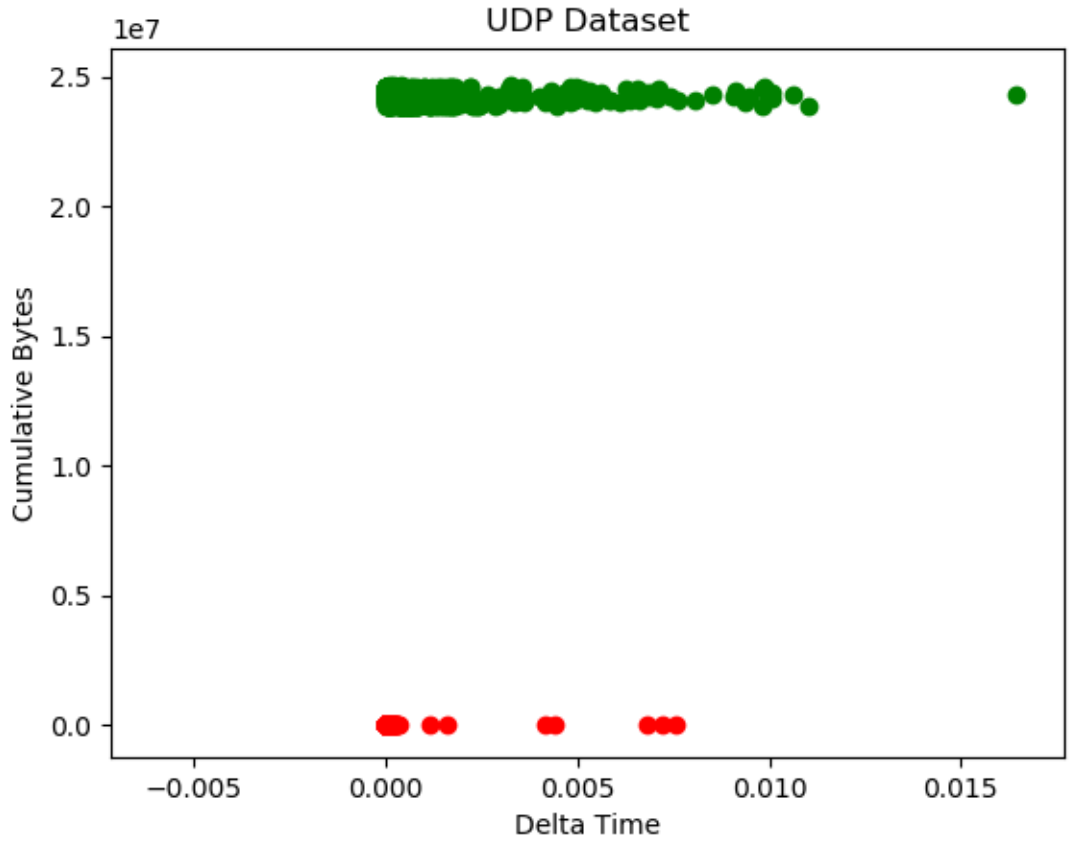
Similarly, when cumulative bytes are greater than 0, then for all values of Delta time, normal conditions exist.

UDP



From the graph it is visible that for length 0 we cannot determine whether flood conditions or normal conditions exist as for all values of delta time, many have both conditions.

When length is not 0 then it solely determines that there is normal conditions as for all values of delta time, there is normal conditions.



From the graph it is visible that cumulative bytes solely determine the condition. For Cumulative bytes equal to 0, for all values of Delta time flood conditions exist.

Similarly for higher values of cumulative bytes, for all values of delta time normal conditions exist.

Table1:

1. OneVsRestClassifier(LogisticRegression())
2. BaggingClassifier()
3. MultinomialNB()

Table2:

1. OneVsRestClassifier(GaussianNB())
2. BaggingClassifier(max_samples=200)
3. MultinomialNB(alpha=2)

Table3:

1. OneVsRestClassifier(RandomForestClassifier())
2. BaggingClassifier(n_estimators=5,max_samples=200)
3. MultinomialNB(alpha=2,fit_prior=False)

OUTPUT

ICMP

[VOTING] [TABLE1]

```
C:\Users\Joels PC\Desktop>python PBL2.py
sys:1: DtypeWarning: Columns (20) have mixed type
se.
Accuracy: 0.94 (+/- 0.11) [OneVsRestClassifier]
Precision: 0.98
Recall: 1.00
F-measure: 0.99
True positives: 278592
True Negatives: 29575
False positives: 157

Accuracy: 0.91 (+/- 0.16) [Bagging Classifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 279868
True Negatives: 29732
False positives: 0

Accuracy: 0.89 (+/- 0.16) [MultinomialNB]
Precision: 0.76
Recall: 0.95
F-measure: 0.82
True positives: 252704
True Negatives: 29575
False positives: 157

Accuracy: 0.94 (+/- 0.11) [Ensemble]
Precision: 0.98
Recall: 1.00
F-measure: 0.99
True positives: 278592
True Negatives: 29575
False positives: 157
```

[WEIGHTED] [TABLE1]

```
C:\Users\Joels PC\Desktop>python PBL2.py
sys:1: DtypeWarning: Columns (20) have mixed types
se.
Accuracy: 0.94 (+/- 0.11) [OneVsRestClassifier]
Precision: 0.98
Recall: 1.00
F-measure: 0.99
True positives: 278592
True Negatives: 29575
False positives: 157

Accuracy: 0.91 (+/- 0.16) [Bagging Classifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 279868
True Negatives: 29732
False positives: 0

Accuracy: 0.89 (+/- 0.16) [MultinomialNB]
Precision: 0.76
Recall: 0.95
F-measure: 0.82
True positives: 252704
True Negatives: 29575
False positives: 157

Accuracy: 0.94 (+/- 0.11) [Ensemble]
Precision: 0.98
Recall: 1.00
F-measure: 0.99
True positives: 278592
True Negatives: 29575
False positives: 157
```

[STACKING] [TABLE1]

```
C:\Users\Joels PC\Desktop>python SPBL2.py
sys:1: DtypeWarning: Columns (20) have mixed types
Accuracy: 0.94 (+/- 0.11) [OneVsRestClassifier]
Precision: 0.98
Recall: 1.00
F-measure: 0.99
True positives: 278592
True Negatives: 29575
False positives: 157

Accuracy: 0.91 (+/- 0.16) [Bagging Classifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 279868
True Negatives: 29732
False positives: 0

Accuracy: 0.89 (+/- 0.16) [MultinomialNB]
Precision: 0.76
Recall: 0.95
F-measure: 0.82
True positives: 252704
True Negatives: 29575
False positives: 157

Accuracy: 0.91 (+/- 0.16) [Ensemble]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 279863
True Negatives: 29732
False positives: 0
```

Base Classifiers

S. No	Model	Accuracy (%)
1	OneVsRestClassifier	94
2	BaggingClassifier	91
3	MultinomialNB	89

Ensemble Classifiers

S. No	Model	Accuracy (%)
1	Voting Classifier	94
2	Weighted Classifier	94
3	Stacking Classifier	91

[VOTING] [TABLE2]

```
C:\Users\Joels PC\Desktop>python PBL2.py
sys:1: DtypeWarning: Columns (20) have mixed type
Accuracy: 0.97 (+/- 0.07) [OneVsRestClassifier]
Precision: 0.88
Recall: 0.98
F-measure: 0.93
True positives: 270944
True Negatives: 29575
False positives: 157

Accuracy: 1.00 (+/- 0.01) [Bagging Classifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 279863
True Negatives: 29575
False positives: 157

Accuracy: 0.89 (+/- 0.16) [MultinomialNB]
Precision: 0.76
Recall: 0.95
F-measure: 0.82
True positives: 252704
True Negatives: 29575
False positives: 157

Accuracy: 0.97 (+/- 0.07) [Ensemble]
Precision: 0.88
Recall: 0.98
F-measure: 0.93
True positives: 270944
True Negatives: 29575
False positives: 157
```

[WEIGHTED] [TABLE2]

```
C:\Users\Joels PC\Desktop>python PBL2.py
sys:1: DtypeWarning: Columns (20) have mixed type
Accuracy: 0.97 (+/- 0.07) [OneVsRestClassifier]
Precision: 0.88
Recall: 0.98
F-measure: 0.93
True positives: 270944
True Negatives: 29575
False positives: 157

Accuracy: 1.00 (+/- 0.01) [Bagging Classifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 279863
True Negatives: 29575
False positives: 157

Accuracy: 0.89 (+/- 0.16) [MultinomialNB]
Precision: 0.76
Recall: 0.95
F-measure: 0.82
True positives: 252704
True Negatives: 29575
False positives: 157

Accuracy: 0.97 (+/- 0.07) [Ensemble]
Precision: 0.88
Recall: 0.98
F-measure: 0.93
True positives: 270944
True Negatives: 29575
False positives: 157
```

[STACKING] [TABLE2]

```
C:\Users\Joels PC\Desktop>python SPBL2.py
sys:1: DtypeWarning: Columns (20) have mixed type
Accuracy: 0.97 (+/- 0.07) [OneVsRestClassifier]
Precision: 0.88
Recall: 0.98
F-measure: 0.93
True positives: 270944
True Negatives: 29575
False positives: 157

Accuracy: 1.00 (+/- 0.00) [Bagging Classifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 279859
True Negatives: 29575
False positives: 157

Accuracy: 0.89 (+/- 0.16) [MultinomialNB]
Precision: 0.76
Recall: 0.95
F-measure: 0.82
True positives: 252704
True Negatives: 29575
False positives: 157

Accuracy: 0.97 (+/- 0.07) [Ensemble]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 279859
True Negatives: 29575
False positives: 157
```

Base Classifiers

S. No	Model	Accuracy (%)
1	OneVsRestClassifier	97
2	BaggingClassifier	100
3	MultinomialNB	89

Ensemble Classifiers

S. No	Model	Accuracy (%)
1	Voting Classifier	97
2	Weighted Classifier	97
3	Stacking Classifier	97

[VOTING] [TABLE3]

```
C:\Users\Joels PC\Desktop>python PBL2.py
sys:1: DtypeWarning: Columns (20) have mixed types.
Accuracy: 0.93 (+/- 0.13) [OneVsRestClassifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 279868
True Negatives: 29732
False positives: 0

Accuracy: 1.00 (+/- 0.00) [Bagging Classifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 279863
True Negatives: 29728
False positives: 4

Accuracy: 0.89 (+/- 0.16) [MultinomialNB]
Precision: 0.76
Recall: 0.95
F-measure: 0.82
True positives: 252704
True Negatives: 29575
False positives: 157

Accuracy: 1.00 (+/- 0.00) [Ensemble]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 279859
True Negatives: 29696
False positives: 36
```

[WEIGHTED] [TABLE3]

```
C:\Users\Joels PC\Desktop>python PBL2.py
sys:1: DtypeWarning: Columns (20) have mixed types.
Accuracy: 0.93 (+/- 0.13) [OneVsRestClassifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 279868
True Negatives: 29732
False positives: 0

Accuracy: 1.00 (+/- 0.00) [Bagging Classifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 279863
True Negatives: 29728
False positives: 4

Accuracy: 0.89 (+/- 0.16) [MultinomialNB]
Precision: 0.76
Recall: 0.95
F-measure: 0.82
True positives: 252704
True Negatives: 29575
False positives: 157

Accuracy: 1.00 (+/- 0.00) [Ensemble]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 279859
True Negatives: 29696
False positives: 36
```

[STACKING] [TABLE3]

```
C:\Users\Joels PC\Desktop>python SPBL2.py
sys:1: DtypeWarning: Columns (20) have mixed type
Accuracy: 0.93 (+/- 0.13) [OneVsRestClassifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 279861
True Negatives: 29732
False positives: 0

Accuracy: 0.97 (+/- 0.06) [Bagging Classifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 279859
True Negatives: 29575
False positives: 157

Accuracy: 0.89 (+/- 0.16) [MultinomialNB]
Precision: 0.76
Recall: 0.95
F-measure: 0.82
True positives: 252704
True Negatives: 29575
False positives: 157

Accuracy: 0.93 (+/- 0.13) [Ensemble]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 279864
True Negatives: 29732
False positives: 0
```

Base Classifiers

S. No	Model	Accuracy (%)
1	OneVsRestClassifier	93
2	BaggingClassifier	97
3	MultinomialNB	89

Ensemble Classifiers

S. No	Model	Accuracy (%)
1	Voting Classifier	100
2	Weighted Classifier	100
3	Stacking Classifier	93

LAND

[VOTING] [TABLE1]

```
C:\Users\Joels PC\Desktop>python PBL2.py
Accuracy: 0.59 (+/- 0.00) [OneVsRestClassifier]
Precision: 0.56
Recall: 0.53
F-measure: 0.48
True positives: 3548
True Negatives: 31009
False positives: 3539

Accuracy: 0.92 (+/- 0.10) [Bagging Classifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 23052
True Negatives: 34548
False positives: 0

Accuracy: 0.61 (+/- 0.02) [MultinomialNB]
Precision: 0.59
Recall: 0.58
F-measure: 0.58
True positives: 9714
True Negatives: 25616
False positives: 8932

Accuracy: 0.73 (+/- 0.08) [Ensemble]
Precision: 0.72
Recall: 0.66
F-measure: 0.66
True positives: 9714
True Negatives: 31009
False positives: 3539
```

[WEIGHTED] [TABLE1]

```
C:\Users\Joels PC\Desktop>python PBL2.py
Accuracy: 0.59 (+/- 0.00) [OneVsRestClassifier]
Precision: 0.56
Recall: 0.53
F-measure: 0.48
True positives: 3548
True Negatives: 31009
False positives: 3539

Accuracy: 0.92 (+/- 0.10) [Bagging Classifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 23052
True Negatives: 34548
False positives: 0

Accuracy: 0.61 (+/- 0.02) [MultinomialNB]
Precision: 0.59
Recall: 0.58
F-measure: 0.58
True positives: 9714
True Negatives: 25616
False positives: 8932

Accuracy: 0.92 (+/- 0.10) [Ensemble]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 23052
True Negatives: 34548
False positives: 0
```

[STACKING] [TABLE1]

```
C:\Users\Joels PC\Desktop>python SPBL2.py
Accuracy: 0.59 (+/- 0.00) [OneVsRestClassifier]
Precision: 0.56
Recall: 0.53
F-measure: 0.48
True positives: 3548
True Negatives: 31009
False positives: 3539

Accuracy: 0.92 (+/- 0.10) [Bagging Classifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 23052
True Negatives: 34548
False positives: 0

Accuracy: 0.61 (+/- 0.02) [MultinomialNB]
Precision: 0.59
Recall: 0.58
F-measure: 0.58
True positives: 9714
True Negatives: 25616
False positives: 8932

Accuracy: 0.92 (+/- 0.10) [Ensemble]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 23052
True Negatives: 34548
False positives: 0
```

Base Classifiers

S. No	Model	Accuracy (%)
1	OneVsRestClassifier	59
2	BaggingClassifier	92
3	MultinomialNB	61

Ensemble Classifiers

S. No	Model	Accuracy (%)
1	Voting Classifier	73
2	Weighted Classifer	92
3	Stacking Classifier	92

[VOTING] [TABLE2]

```
C:\Users\Joels PC\Desktop>python PBL2.py
Accuracy: 0.61 (+/- 0.02) [OneVsRestClassifier]
Precision: 0.60
Recall: 0.55
F-measure: 0.51
True positives: 4332
True Negatives: 31385
False positives: 3163

Accuracy: 0.92 (+/- 0.10) [Bagging Classifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 23052
True Negatives: 34548
False positives: 0

Accuracy: 0.61 (+/- 0.02) [MultinomialNB]
Precision: 0.59
Recall: 0.58
F-measure: 0.58
True positives: 9714
True Negatives: 25616
False positives: 8932

Accuracy: 0.71 (+/- 0.06) [Ensemble]
Precision: 0.73
Recall: 0.67
F-measure: 0.67
True positives: 9779
True Negatives: 31385
False positives: 3163
```

[WEIGHTED] [TABLE2]

```
C:\Users\Joels PC\Desktop>python PBL2.py
Accuracy: 0.61 (+/- 0.02) [OneVsRestClassifier]
Precision: 0.60
Recall: 0.55
F-measure: 0.51
True positives: 4332
True Negatives: 31385
False positives: 3163

Accuracy: 0.92 (+/- 0.10) [Bagging Classifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 23052
True Negatives: 34548
False positives: 0

Accuracy: 0.61 (+/- 0.02) [MultinomialNB]
Precision: 0.59
Recall: 0.58
F-measure: 0.58
True positives: 9714
True Negatives: 25616
False positives: 8932

Accuracy: 0.71 (+/- 0.06) [Ensemble]
Precision: 0.73
Recall: 0.67
F-measure: 0.67
True positives: 9779
True Negatives: 31385
False positives: 3163
```

[STACKING] [TABLE2]

```
C:\Users\Joels PC\Desktop>python SPBL2.py
Accuracy: 0.61 (+/- 0.02) [OneVsRestClassifier]
Precision: 0.60
Recall: 0.55
F-measure: 0.51
True positives: 4332
True Negatives: 31385
False positives: 3163

Accuracy: 0.92 (+/- 0.10) [Bagging Classifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 23052
True Negatives: 34548
False positives: 0

Accuracy: 0.61 (+/- 0.02) [MultinomialNB]
Precision: 0.59
Recall: 0.58
F-measure: 0.58
True positives: 9714
True Negatives: 25616
False positives: 8932

Accuracy: 0.92 (+/- 0.10) [Ensemble]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 23052
True Negatives: 34548
False positives: 0
```

Base Classifiers

S. No	Model	Accuracy (%)
1	OneVsRestClassifier	61
2	BaggingClassifier	92
3	MultinomialNB	61

Ensemble Classifiers

S. No	Model	Accuracy (%)
1	Voting Classifier	71
2	Weighted Classifer	71
3	Stacking Classifier	92

[VOTING] [TABLE3]

```
C:\Users\Joels PC\Desktop>python PBL2.py
Accuracy: 0.95 (+/- 0.10) [OneVsRestClassifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 23052
True Negatives: 34548
False positives: 0

Accuracy: 0.92 (+/- 0.10) [Bagging Classifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 23052
True Negatives: 34548
False positives: 0

Accuracy: 0.61 (+/- 0.02) [MultinomialNB]
Precision: 0.59
Recall: 0.58
F-measure: 0.58
True positives: 9733
True Negatives: 25603
False positives: 8945

Accuracy: 0.96 (+/- 0.08) [Ensemble]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 23052
True Negatives: 34548
False positives: 0
```

[WEIGHTED] [TABLE3]

```
C:\Users\Joels PC\Desktop>python PBL2.py
Accuracy: 0.95 (+/- 0.10) [OneVsRestClassifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 23052
True Negatives: 34548
False positives: 0

Accuracy: 0.92 (+/- 0.10) [Bagging Classifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 23052
True Negatives: 34548
False positives: 0

Accuracy: 0.61 (+/- 0.02) [MultinomialNB]
Precision: 0.59
Recall: 0.58
F-measure: 0.58
True positives: 9733
True Negatives: 25603
False positives: 8945

Accuracy: 0.96 (+/- 0.08) [Ensemble]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 23052
True Negatives: 34548
False positives: 0
```

[STACKING] [TABLE3]

```
C:\Users\Joels PC\Desktop>python SPBL2.py
Accuracy: 0.95 (+/- 0.10) [OneVsRestClassifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 23052
True Negatives: 34548
False positives: 0

Accuracy: 0.92 (+/- 0.10) [Bagging Classifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 23052
True Negatives: 34548
False positives: 0

Accuracy: 0.61 (+/- 0.02) [MultinomialNB]
Precision: 0.59
Recall: 0.58
F-measure: 0.58
True positives: 9733
True Negatives: 25603
False positives: 8945

Accuracy: 0.91 (+/- 0.11) [Ensemble]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 23052
True Negatives: 34548
False positives: 0
```

Base Classifiers

S. No	Model	Accuracy (%)
1	OneVsRestClassifier	95
2	BaggingClassifier	92
3	MultinomialNB	61

Ensemble Classifiers

S. No	Model	Accuracy (%)
1	Voting Classifier	96
2	Weighted Classifer	96
3	Stacking Classifier	91

TCPSYN

[VOTING] [TABLE1]

```
C:\Users\Joels PC\Desktop>python PBL2.py
Accuracy: 0.94 (+/- 0.03) [OneVsRestClassifier]
Precision: 0.99
Recall: 0.92
F-measure: 0.95
True positives: 231843
True Negatives: 24738
False positives: 5010

Accuracy: 0.86 (+/- 0.26) [Bagging Classifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 231852
True Negatives: 29748
False positives: 0

Accuracy: 0.66 (+/- 0.16) [MultinomialNB]
Precision: 0.58
Recall: 0.68
F-measure: 0.55
True positives: 154749
True Negatives: 20430
False positives: 9318

Accuracy: 0.91 (+/- 0.13) [Ensemble]
Precision: 0.99
Recall: 0.94
F-measure: 0.96
True positives: 231852
True Negatives: 26053
False positives: 3695
```

[WEIGHTED] [TABLE1]

```
C:\Users\Joels PC\Desktop>python PBL2.py
Accuracy: 0.94 (+/- 0.03) [OneVsRestClassifier]
Precision: 0.99
Recall: 0.92
F-measure: 0.95
True positives: 231843
True Negatives: 24738
False positives: 5010

Accuracy: 0.86 (+/- 0.26) [Bagging Classifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 231852
True Negatives: 29748
False positives: 0

Accuracy: 0.66 (+/- 0.16) [MultinomialNB]
Precision: 0.58
Recall: 0.68
F-measure: 0.55
True positives: 154749
True Negatives: 20430
False positives: 9318

Accuracy: 0.91 (+/- 0.13) [Ensemble]
Precision: 0.99
Recall: 0.94
F-measure: 0.96
True positives: 231852
True Negatives: 26053
False positives: 3695
```

[STACKING] [TABLE1]

```
C:\Users\Joels PC\Desktop>python SPBL2.py
Accuracy: 0.94 (+/- 0.03) [OneVsRestClassifier]
Precision: 0.99
Recall: 0.92
F-measure: 0.95
True positives: 231843
True Negatives: 24738
False positives: 5010

Accuracy: 0.86 (+/- 0.26) [Bagging Classifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 231852
True Negatives: 29748
False positives: 0

Accuracy: 0.66 (+/- 0.16) [MultinomialNB]
Precision: 0.58
Recall: 0.68
F-measure: 0.55
True positives: 154749
True Negatives: 20430
False positives: 9318

Accuracy: 0.86 (+/- 0.26) [Ensemble]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 231852
True Negatives: 29748
False positives: 0
```

Base Classifiers

S. No	Model	Accuracy (%)
1	OneVsRestClassifier	94
2	BaggingClassifier	86
3	MultinomialNB	66

Ensemble Classifiers

S. No	Model	Accuracy (%)
1	Voting Classifier	91
2	Weighted Classifer	91
3	Stacking Classifier	86

[VOTING] [TABLE2]

```
C:\Users\Joels PC\Desktop>python PBL2.py
Accuracy: 0.85 (+/- 0.09) [OneVsRestClassifier]
Precision: 0.72
Recall: 0.75
F-measure: 0.73
True positives: 213678
True Negatives: 17302
False positives: 12446

Accuracy: 0.99 (+/- 0.02) [Bagging Classifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 231852
True Negatives: 29748
False positives: 0

Accuracy: 0.66 (+/- 0.16) [MultinomialNB]
Precision: 0.58
Recall: 0.68
F-measure: 0.55
True positives: 154749
True Negatives: 20430
False positives: 9318

Accuracy: 0.82 (+/- 0.14) [Ensemble]
Precision: 0.74
Recall: 0.80
F-measure: 0.77
True positives: 213687
True Negatives: 20430
False positives: 9318
```

[WEIGHTED] [TABLE2]

```
C:\Users\Joels PC\Desktop>python PBL2.py
Accuracy: 0.85 (+/- 0.09) [OneVsRestClassifier]
Precision: 0.72
Recall: 0.75
F-measure: 0.73
True positives: 213678
True Negatives: 17302
False positives: 12446

Accuracy: 0.99 (+/- 0.02) [Bagging Classifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 231852
True Negatives: 29748
False positives: 0

Accuracy: 0.66 (+/- 0.16) [MultinomialNB]
Precision: 0.58
Recall: 0.68
F-measure: 0.55
True positives: 154749
True Negatives: 20430
False positives: 9318

Accuracy: 0.82 (+/- 0.14) [Ensemble]
Precision: 0.74
Recall: 0.80
F-measure: 0.77
True positives: 213687
True Negatives: 20430
False positives: 9318
```

[STACKING] [TABLE2]

```
C:\Users\Joels PC\Desktop>python SPBL2.py
Accuracy: 0.85 (+/- 0.09) [OneVsRestClassifier]
Precision: 0.72
Recall: 0.75
F-measure: 0.73
True positives: 213678
True Negatives: 17302
False positives: 12446

Accuracy: 0.99 (+/- 0.02) [Bagging Classifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 231852
True Negatives: 29748
False positives: 0

Accuracy: 0.66 (+/- 0.16) [MultinomialNB]
Precision: 0.58
Recall: 0.68
F-measure: 0.55
True positives: 154749
True Negatives: 20430
False positives: 9318

Accuracy: 0.86 (+/- 0.26) [Ensemble]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 231852
True Negatives: 29748
False positives: 0
```

Base Classifiers

S. No	Model	Accuracy (%)
1	OneVsRestClassifier	85
2	BaggingClassifier	99
3	MultinomialNB	66

Ensemble Classifiers

S. No	Model	Accuracy (%)
1	Voting Classifier	82
2	Weighted Classifer	82
3	Stacking Classifier	86

[VOTING] [TABLE3]

```
C:\Users\Joels PC\Desktop>python PBL2.py
Accuracy: 0.86 (+/- 0.26) [OneVsRestClassifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 231852
True Negatives: 29748
False positives: 0

Accuracy: 0.86 (+/- 0.26) [Bagging Classifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 231852
True Negatives: 29748
False positives: 0

Accuracy: 0.66 (+/- 0.16) [MultinomialNB]
Precision: 0.58
Recall: 0.68
F-measure: 0.55
True positives: 154748
True Negatives: 20430
False positives: 9318

Accuracy: 0.86 (+/- 0.26) [Ensemble]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 231850
True Negatives: 29748
False positives: 0
```

[WEIGHTED] [TABLE3]

```
C:\Users\Joels PC\Desktop>python PBL2.py
Accuracy: 0.86 (+/- 0.26) [OneVsRestClassifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 231852
True Negatives: 29748
False positives: 0

Accuracy: 0.86 (+/- 0.26) [Bagging Classifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 231852
True Negatives: 29748
False positives: 0

Accuracy: 0.66 (+/- 0.16) [MultinomialNB]
Precision: 0.58
Recall: 0.68
F-measure: 0.55
True positives: 154748
True Negatives: 20430
False positives: 9318

Accuracy: 0.86 (+/- 0.26) [Ensemble]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 231850
True Negatives: 29748
False positives: 0
```

[STACKING] [TABLE3]

```
C:\Users\Joels PC\Desktop>python SPBL2.py
Accuracy: 0.86 (+/- 0.26) [OneVsRestClassifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 231852
True Negatives: 29748
False positives: 0

Accuracy: 0.86 (+/- 0.26) [Bagging Classifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 231852
True Negatives: 29748
False positives: 0

Accuracy: 0.66 (+/- 0.16) [MultinomialNB]
Precision: 0.58
Recall: 0.68
F-measure: 0.55
True positives: 154748
True Negatives: 20430
False positives: 9318

Accuracy: 0.86 (+/- 0.26) [Ensemble]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 231852
True Negatives: 29748
False positives: 0
```

Base Classifiers

S. No	Model	Accuracy (%)
1	OneVsRestClassifier	86
2	BaggingClassifier	86
3	MultinomialNB	66

Ensemble Classifiers

S. No	Model	Accuracy (%)
1	Voting Classifier	86
2	Weighted Classifer	86
3	Stacking Classifier	86

TCPSYNACK

[VOTING] [TABLE1]

```
C:\Users\Joels PC\Desktop>python PBL2.py
Accuracy: 0.89 (+/- 0.19) [OneVsRestClassifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 27112
True Negatives: 28060
False positives: 28

Accuracy: 0.92 (+/- 0.10) [Bagging Classifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 27112
True Negatives: 28088
False positives: 0

Accuracy: 0.85 (+/- 0.16) [MultinomialNB]
Precision: 0.78
Recall: 0.77
F-measure: 0.77
True positives: 18708
True Negatives: 23793
False positives: 4295

Accuracy: 0.96 (+/- 0.06) [Ensemble]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 27112
True Negatives: 28060
False positives: 28
```

[WEIGHTED] [TABLE1]

```
C:\Users\Joels PC\Desktop>python PBL2.py
Accuracy: 0.89 (+/- 0.19) [OneVsRestClassifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 27112
True Negatives: 28060
False positives: 28

Accuracy: 0.92 (+/- 0.10) [Bagging Classifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 27112
True Negatives: 28088
False positives: 0

Accuracy: 0.85 (+/- 0.16) [MultinomialNB]
Precision: 0.78
Recall: 0.77
F-measure: 0.77
True positives: 18708
True Negatives: 23793
False positives: 4295

Accuracy: 0.96 (+/- 0.06) [Ensemble]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 27112
True Negatives: 28060
False positives: 28
```

[STACKING] [TABLE1]

```
C:\Users\Joels PC\Desktop>python SPBL2.py
Accuracy: 0.89 (+/- 0.19) [OneVsRestClassifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 27112
True Negatives: 28060
False positives: 28

Accuracy: 0.92 (+/- 0.10) [Bagging Classifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 27112
True Negatives: 28088
False positives: 0

Accuracy: 0.85 (+/- 0.16) [MultinomialNB]
Precision: 0.78
Recall: 0.77
F-measure: 0.77
True positives: 18708
True Negatives: 23793
False positives: 4295

Accuracy: 0.92 (+/- 0.10) [Ensemble]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 27112
True Negatives: 28088
False positives: 0
```

Base Classifiers

S. No	Model	Accuracy (%)
1	OneVsRestClassifier	89
2	BaggingClassifier	92
3	MultinomialNB	85

Ensemble Classifiers

S. No	Model	Accuracy (%)
1	Voting Classifier	96
2	Weighted Classifer	96
3	Stacking Classifier	92

[VOTING] [TABLE2]

```
C:\Users\Joels PC\Desktop>python PBL2.py
Accuracy: 0.54 (+/- 0.07) [OneVsRestClassifier]
Precision: 0.58
Recall: 0.58
F-measure: 0.57
True positives: 17588
True Negatives: 14178
False positives: 13910

Accuracy: 0.91 (+/- 0.11) [Bagging Classifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 27112
True Negatives: 28088
False positives: 0

Accuracy: 0.85 (+/- 0.16) [MultinomialNB]
Precision: 0.78
Recall: 0.77
F-measure: 0.77
True positives: 18707
True Negatives: 23793
False positives: 4295

Accuracy: 0.88 (+/- 0.16) [Ensemble]
Precision: 0.94
Recall: 0.94
F-measure: 0.94
True positives: 23712
True Negatives: 27961
False positives: 127
```

[WEIGHTED] [TABLE2]

```
C:\Users\Joels PC\Desktop>python PBL2.py
Accuracy: 0.54 (+/- 0.07) [OneVsRestClassifier]
Precision: 0.58
Recall: 0.58
F-measure: 0.57
True positives: 17588
True Negatives: 14178
False positives: 13910

Accuracy: 0.91 (+/- 0.11) [Bagging Classifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 27112
True Negatives: 28088
False positives: 0

Accuracy: 0.85 (+/- 0.16) [MultinomialNB]
Precision: 0.78
Recall: 0.77
F-measure: 0.77
True positives: 18707
True Negatives: 23793
False positives: 4295

Accuracy: 0.88 (+/- 0.16) [Ensemble]
Precision: 0.94
Recall: 0.94
F-measure: 0.94
True positives: 23712
True Negatives: 27961
False positives: 127
```

[STACKING] [TABLE2]

```
C:\Users\Joels PC\Desktop>python SPBL2.py
Accuracy: 0.54 (+/- 0.07) [OneVsRestClassifier]
Precision: 0.58
Recall: 0.58
F-measure: 0.57
True positives: 17588
True Negatives: 14178
False positives: 13910

Accuracy: 0.91 (+/- 0.11) [Bagging Classifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 27112
True Negatives: 28088
False positives: 0

Accuracy: 0.85 (+/- 0.16) [MultinomialNB]
Precision: 0.78
Recall: 0.77
F-measure: 0.77
True positives: 18707
True Negatives: 23793
False positives: 4295

Accuracy: 0.91 (+/- 0.11) [Ensemble]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 27112
True Negatives: 28088
False positives: 0
```

Base Classifiers

S. No	Model	Accuracy (%)
1	OneVsRestClassifier	54
2	BaggingClassifier	91
3	MultinomialNB	85

Ensemble Classifiers

S. No	Model	Accuracy (%)
1	Voting Classifier	88
2	Weighted Classifer	88
3	Stacking Classifier	91

[VOTING] [TABLE3]

```
C:\Users\Joels PC\Desktop>python PBL2.py
Accuracy: 0.93 (+/- 0.09) [OneVsRestClassifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 27112
True Negatives: 28086
False positives: 2

Accuracy: 0.92 (+/- 0.10) [Bagging Classifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 27112
True Negatives: 28088
False positives: 0

Accuracy: 0.85 (+/- 0.16) [MultinomialNB]
Precision: 0.78
Recall: 0.77
F-measure: 0.77
True positives: 18712
True Negatives: 23793
False positives: 4295

Accuracy: 0.92 (+/- 0.10) [Ensemble]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 27112
True Negatives: 28088
False positives: 0
```

[WEIGHTED] [TABLE3]

```
C:\Users\Joels PC\Desktop>python PBL2.py
Accuracy: 0.93 (+/- 0.09) [OneVsRestClassifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 27112
True Negatives: 28086
False positives: 2

Accuracy: 0.92 (+/- 0.10) [Bagging Classifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 27112
True Negatives: 28088
False positives: 0

Accuracy: 0.85 (+/- 0.16) [MultinomialNB]
Precision: 0.78
Recall: 0.77
F-measure: 0.77
True positives: 18712
True Negatives: 23793
False positives: 4295

Accuracy: 0.92 (+/- 0.10) [Ensemble]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 27112
True Negatives: 28088
False positives: 0
```

[STACKING] [TABLE3]

```
C:\Users\Joels PC\Desktop>python SPBL2.py
Accuracy: 0.93 (+/- 0.09) [OneVsRestClassifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 27112
True Negatives: 28086
False positives: 2

Accuracy: 0.92 (+/- 0.10) [Bagging Classifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 27112
True Negatives: 28088
False positives: 0

Accuracy: 0.85 (+/- 0.16) [MultinomialNB]
Precision: 0.78
Recall: 0.77
F-measure: 0.77
True positives: 18712
True Negatives: 23793
False positives: 4295

Accuracy: 0.91 (+/- 0.11) [Ensemble]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 27112
True Negatives: 28088
False positives: 0
```

Base Classifiers

S. No	Model	Accuracy (%)
1	OneVsRestClassifier	93
2	BaggingClassifier	92
3	MultinomialNB	85

Ensemble Classifiers

S. No	Model	Accuracy (%)
1	Voting Classifier	92
2	Weighted Classifer	92
3	Stacking Classifier	91

UDP

[VOTING] [TABLE1]

```
C:\Users\Joels PC\Desktop>python PBL2.py
sys:1: DtypeWarning: Columns (20) have mixed type
Accuracy: 0.96 (+/- 0.01) [OneVsRestClassifier]
Precision: 0.97
Recall: 0.82
F-measure: 0.88
True positives: 271526
True Negatives: 17915
False positives: 10171

Accuracy: 0.90 (+/- 0.18) [Bagging Classifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 271914
True Negatives: 28086
False positives: 0

Accuracy: 0.74 (+/- 0.15) [MultinomialNB]
Precision: 0.61
Recall: 0.78
F-measure: 0.62
True positives: 205199
True Negatives: 22499
False positives: 5587

Accuracy: 0.97 (+/- 0.02) [Ensemble]
Precision: 0.98
Recall: 0.90
F-measure: 0.94
True positives: 271526
True Negatives: 22499
False positives: 5587
```

[WEIGHTED] [TABLE1]


```
C:\Users\Joels PC\Desktop>python PBL2.py
sys:1: DtypeWarning: Columns (20) have mixed type
Accuracy: 0.96 (+/- 0.01) [OneVsRestClassifier]
Precision: 0.97
Recall: 0.82
F-measure: 0.88
True positives: 271526
True Negatives: 17915
False positives: 10171

Accuracy: 0.90 (+/- 0.18) [Bagging Classifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 271914
True Negatives: 28086
False positives: 0

Accuracy: 0.74 (+/- 0.15) [MultinomialNB]
Precision: 0.61
Recall: 0.78
F-measure: 0.62
True positives: 205199
True Negatives: 22499
False positives: 5587

Accuracy: 0.97 (+/- 0.02) [Ensemble]
Precision: 0.98
Recall: 0.90
F-measure: 0.94
True positives: 271526
True Negatives: 22499
False positives: 5587
```

[STACKING] [TABLE1]

```
C:\Users\Joels PC\Desktop>python SPBL2.py
sys:1: DtypeWarning: Columns (20) have mixed types
Accuracy: 0.96 (+/- 0.01) [OneVsRestClassifier]
Precision: 0.97
Recall: 0.82
F-measure: 0.88
True positives: 271526
True Negatives: 17915
False positives: 10171

Accuracy: 0.90 (+/- 0.18) [Bagging Classifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 271914
True Negatives: 28086
False positives: 0

Accuracy: 0.74 (+/- 0.15) [MultinomialNB]
Precision: 0.61
Recall: 0.78
F-measure: 0.62
True positives: 205199
True Negatives: 22499
False positives: 5587

Accuracy: 0.90 (+/- 0.18) [Ensemble]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 271914
True Negatives: 28086
False positives: 0
```

Base Classifiers

S. No	Model	Accuracy (%)
1	OneVsRestClassifier	96
2	BaggingClassifier	90
3	MultinomialNB	74

Ensemble Classifiers

S. No	Model	Accuracy (%)
1	Voting Classifier	97
2	Weighted Classifer	97
3	Stacking Classifier	90

[VOTING] [TABLE2]

```
C:\Users\Joels PC\Desktop>python PBL2.py
sys:1: DtypeWarning: Columns (20) have mixed types.
Accuracy: 0.96 (+/- 0.02) [OneVsRestClassifier]
Precision: 0.98
Recall: 0.75
F-measure: 0.82
True positives: 271914
True Negatives: 13961
False positives: 14125

Accuracy: 1.00 (+/- 0.00) [Bagging Classifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 271913
True Negatives: 28083
False positives: 3

Accuracy: 0.74 (+/- 0.15) [MultinomialNB]
Precision: 0.61
Recall: 0.78
F-measure: 0.62
True positives: 205199
True Negatives: 22499
False positives: 5587

Accuracy: 0.98 (+/- 0.02) [Ensemble]
Precision: 0.99
Recall: 0.90
F-measure: 0.94
True positives: 271914
True Negatives: 22499
False positives: 5587
```

[WEIGHTED] [TABLE2]

```
C:\Users\Joels PC\Desktop>python PBL2.py
sys:1: DtypeWarning: Columns (20) have mixed types.
Accuracy: 0.96 (+/- 0.02) [OneVsRestClassifier]
Precision: 0.98
Recall: 0.75
F-measure: 0.82
True positives: 271914
True Negatives: 13961
False positives: 14125

Accuracy: 1.00 (+/- 0.00) [Bagging Classifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 271913
True Negatives: 28083
False positives: 3

Accuracy: 0.74 (+/- 0.15) [MultinomialNB]
Precision: 0.61
Recall: 0.78
F-measure: 0.62
True positives: 205199
True Negatives: 22499
False positives: 5587

Accuracy: 0.98 (+/- 0.02) [Ensemble]
Precision: 0.99
Recall: 0.90
F-measure: 0.94
True positives: 271914
True Negatives: 22499
False positives: 5587
```

[STACKING] [TABLE2]

```
C:\Users\Joels PC\Desktop>python SPBL2.py
sys:1: DtypeWarning: Columns (20) have mixed type
Accuracy: 0.96 (+/- 0.02) [OneVsRestClassifier]
Precision: 0.98
Recall: 0.75
F-measure: 0.82
True positives: 271914
True Negatives: 13961
False positives: 14125

Accuracy: 1.00 (+/- 0.00) [Bagging Classifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 271913
True Negatives: 28083
False positives: 3

Accuracy: 0.74 (+/- 0.15) [MultinomialNB]
Precision: 0.61
Recall: 0.78
F-measure: 0.62
True positives: 205199
True Negatives: 22499
False positives: 5587

Accuracy: 0.94 (+/- 0.09) [Ensemble]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 271914
True Negatives: 28086
False positives: 0
```

Base Classifiers

S. No	Model	Accuracy (%)
1	OneVsRestClassifier	96
2	BaggingClassifier	100
3	MultinomialNB	74

Ensemble Classifiers

S. No	Model	Accuracy (%)
1	Voting Classifier	98
2	Weighted Classifer	98
3	Stacking Classifier	94

[VOTING] [TABLE3]

```
C:\Users\Joels PC\Desktop>python PBL2.py
sys:1: DtypeWarning: Columns (20) have mixed type
Accuracy: 0.90 (+/- 0.18) [OneVsRestClassifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 271914
True Negatives: 28086
False positives: 0

Accuracy: 0.91 (+/- 0.19) [Bagging Classifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 271914
True Negatives: 28086
False positives: 0

Accuracy: 0.74 (+/- 0.15) [MultinomialNB]
Precision: 0.61
Recall: 0.78
F-measure: 0.62
True positives: 205194
True Negatives: 22499
False positives: 5587

Accuracy: 0.99 (+/- 0.01) [Ensemble]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 271914
True Negatives: 28086
False positives: 0
```

[WEIGHTED] [TABLE3]

```
C:\Users\Joels PC\Desktop>python PBL2.py
sys:1: DtypeWarning: Columns (20) have mixed type
Accuracy: 0.90 (+/- 0.18) [OneVsRestClassifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 271914
True Negatives: 28086
False positives: 0

Accuracy: 0.91 (+/- 0.19) [Bagging Classifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 271914
True Negatives: 28086
False positives: 0

Accuracy: 0.74 (+/- 0.15) [MultinomialNB]
Precision: 0.61
Recall: 0.78
F-measure: 0.62
True positives: 205194
True Negatives: 22499
False positives: 5587

Accuracy: 0.99 (+/- 0.01) [Ensemble]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 271914
True Negatives: 28086
False positives: 0
```

[STACKING] [TABLE3]

```
C:\Users\Joels PC\Desktop>python SPBL2.py
sys:1: DtypeWarning: Columns (20) have mixed types
Accuracy: 0.90 (+/- 0.18) [OneVsRestClassifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 271914
True Negatives: 28086
False positives: 0

Accuracy: 0.91 (+/- 0.19) [Bagging Classifier]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 271914
True Negatives: 28086
False positives: 0

Accuracy: 0.74 (+/- 0.15) [MultinomialNB]
Precision: 0.61
Recall: 0.78
F-measure: 0.62
True positives: 205194
True Negatives: 22499
False positives: 5587

Accuracy: 0.94 (+/- 0.09) [Ensemble]
Precision: 1.00
Recall: 1.00
F-measure: 1.00
True positives: 271914
True Negatives: 28086
False positives: 0
```

Base Classifiers

S. No	Model	Accuracy (%)
1	OneVsRestClassifier	90
2	BaggingClassifier	91
3	MultinomialNB	74

Ensemble Classifiers

S. No	Model	Accuracy (%)
1	Voting Classifier	99
2	Weighted Classifer	99
3	Stacking Classifier	94