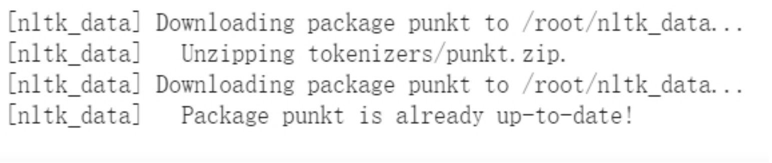
Report for the group of Wei Yu, You Peng and Mohsin Reza

Breakdown of our work:

Both analysis and presentation are done collaboratively by us to let everyone get involved.

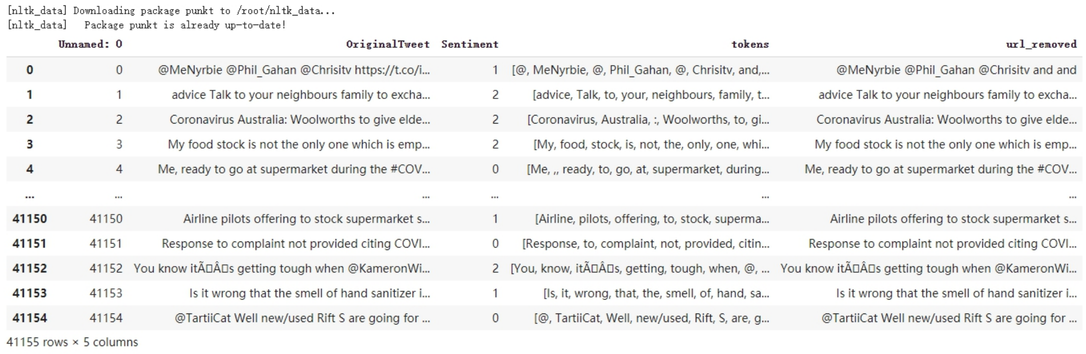
1. A.The proportion of negative sentiment is 0.374122220872312; the proportion of neutral sentiment is 0.18738913862228163; the proportion of positive sentiment is 0.4383914469687766.



```
[nltk_data] Downloading package punkt to /root/nltk_data...
[nltk_data]   Unzipping tokenizers/punkt.zip.
[nltk_data] Downloading package punkt to /root/nltk_data...
[nltk_data]   Package punkt is already up-to-date!
```

B.

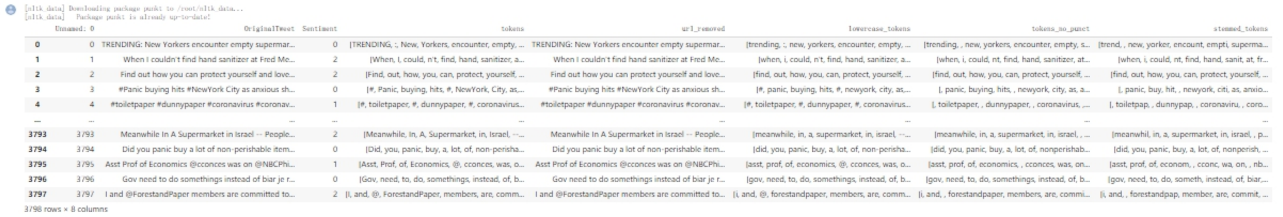
C.



```
[nltk_data] Downloading package punkt to /root/nltk_data...
[nltk_data]   Package punkt is already up-to-date!
```

	Unnamed: 0	OriginalTweet	Sentiment	tokens	url_removed
0	0	@MeNyrbie @Phil_Gahan @Chrisitv https://t.co/i...	1	[@, MeNyrbie, @, Phil_Gahan, @, Chrisitv, and,...	@MeNyrbie @Phil_Gahan @Chrisitv and and
1	1	advice Talk to your neighbours family to excha...	2	[advice, Talk, to, your, neighbours, family, t...	advice Talk to your neighbours family to excha...
2	2	Coronavirus Australia: Woolworths to give elde...	2	[Coronavirus, Australia, :, Woolworths, to, gi...	Coronavirus Australia: Woolworths to give elde...
3	3	My food stock is not the only one which is emp...	2	[My, food, stock, is, not, the, only, one, whi...	My food stock is not the only one which is emp...
4	4	Me, ready to go at supermarket during the #COV...	0	[Me, ,, ready, to, go, at, supermarket, during...	Me, ready to go at supermarket during the #COV...
...	...	...	...	...	...
41150	41150	Airline pilots offering to stock supermarket s...	1	[Airline, pilots, offering, to, stock, superma...	Airline pilots offering to stock supermarket s...
41151	41151	Response to complaint not provided citing COVI...	0	[Response, to, complaint, not, provided, citin...	Response to complaint not provided citing COVI...
41152	41152	You know itÃ‚Â’s getting tough when @KameronWi...	2	[You, know, itÃ‚Â’s, getting, tough, when, @, ...	You know itÃ‚Â’s getting tough when @KameronWi...
41153	41153	Is it wrong that the smell of hand sanitizer i...	1	[Is, it, wrong, that, the, smell, of, hand, sa...	Is it wrong that the smell of hand sanitizer i...
41154	41154	@TartiiCat Well new/used Rift S are going for ...	0	[@, TartiiCat, Well, new/used, Rift, S, are, g...	@TartiiCat Well new/used Rift S are going for ...

41155 rows × 5 columns

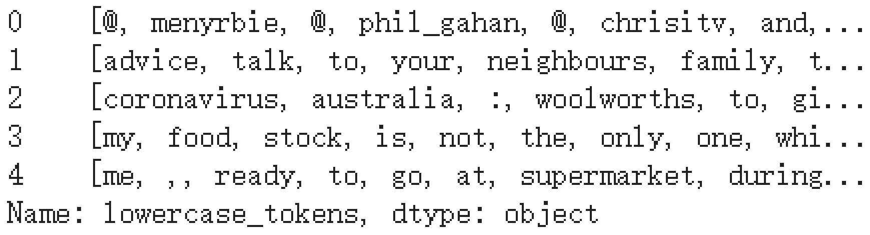


```
[nltk_data] Downloading package punkt to /root/nltk_data...
[nltk_data]   Package punkt is already up-to-date!
```

	Unnamed: 0	OriginalTweet	Sentiment	tokens	url_removed	lowercase_tokens	tokens_no_punct	stemmed_tokens
0	0	TRENDING: New Yorkers encounter empty supermar...	0	[TRENDING, :, New, Yorkers, encounter, empty, ...	TRENDING: New Yorkers encounter empty supermar...	[trending, :, new, yorkers, encounter, empty, ...	[trending, , new, yorkers, encounter, empty, s...	[trend, , new, yorker, encount, empti, superma...
1	1	When I couldn't find hand sanitizer at Fred Me...	2	[When, I, could, n't, find, hand, sanitizer, a...	When I couldn't find hand sanitizer at Fred Me...	[when, i, could, n't, find, hand, sanitizer, a...	[when, i, could, nt, find, hand, sanitizer, at...	[when, i, could, nt, find, hand, sanit, at, fr...
2	2	Find out how you can protect yourself and love...	2	[Find, out, how, you, can, protect, yourself, ...	Find out how you can protect yourself and love...	[find, out, how, you, can, protect, yourself, ...	[find, out, how, you, can, protect, yourself, ...	[find, out, how, you, can, protect, yourself, ...
3	3	#Panic buying hits #NewYork City as anxious sh...	0	[#, Panic, buying, hits, #, NewYork, City, as,...	#Panic buying hits #NewYork City as anxious sh...	[#, panic, buying, hits, #, newyork, city, as,...	[, panic, buying, hits, , newyork, city, as, a...	[, panic, buy, hit, , newyork, citi, as, anxio...
4	4	#toiletpaper #dunnypaper #coronavirus #coronav...	1	[#, toiletpaper, #, dunnypaper, #, coronavirus...	#toiletpaper #dunnypaper #coronavirus #coronav...	[#, toiletpaper, #, dunnypaper, #, coronavirus...	[, toiletpaper, , dunnypaper, , coronavirus, ,...	[, toiletpap, , dunnypap, , coronaviru, , coro...
...	...	...	...	...	...	...	...	...
3793	3793	Meanwhile In A Supermarket in Israel -- People...	2	[Meanwhile, In, A, Supermarket, in, Israel, --...	Meanwhile In A Supermarket in Israel -- People...	[meanwhile, in, a, supermarket, in, israel, --...	[meanwhile, in, a, supermarket, in, israel, , ...	[meanwhil, in, a, supermarket, in, israel, , p...
3794	3794	Did you panic buy a lot of non-perishable item...	0	[Did, you, panic, buy, a, lot, of, non-perisha...	Did you panic buy a lot of non-perishable item...	[did, you, panic, buy, a, lot, of, non-perisha...	[did, you, panic, buy, a, lot, of, nonperishab...	[did, you, panic, buy, a, lot, of, nonperish, ...
3795	3795	Asst Prof of Economics @cconces was on @NBCPhi...	1	[Asst, Prof, of, Economics, @, cconces, was, o...	Asst Prof of Economics @cconces was on @NBCPhi...	[asst, prof, of, economics, @, cconces, was, o...	[asst, prof, of, economics, , cconces, was, on...	[asst, prof, of, econom, , cconc, wa, on, , nb...
3796	3796	Gov need to do somethings instead of biar je r...	0	[Gov, need, to, do, somethings, instead, of, b...	Gov need to do somethings instead of biar je r...	[gov, need, to, do, somethings, instead, of, b...	[gov, need, to, do, somethings, instead, of, b...	[gov, need, to, do, someth, instead, of, biar,...
3797	3797	I and @ForestandPaper members are committed to...	2	[I, and, @, ForestandPaper, members, are, comm...	I and @ForestandPaper members are committed to...	[i, and, @, forestandpaper, members, are, comm...	[i, and, , forestandpaper, members, are, commi...	[i, and, , forestandpap, member, are, commit, ...

3798 rows × 8 columns

D.



```
0    [@, menyrbie, @, phil_gahan, @, chrisitv, and,...
1    [advice, talk, to, your, neighbours, family, t...
2    [coronavirus, australia, :, woolworths, to, gi...
3    [my, food, stock, is, not, the, only, one, whi...
4    [me, ,, ready, to, go, at, supermarket, during...
Name: lowercase_tokens, dtype: object
```

```
0     [, menyrbie, , phil_gahan, , chrisitv, and, and]
1    [advice, talk, to, your, neighbours, family, t...
2    [coronavirus, australia, , woolworths, to, giv...
3    [my, food, stock, is, not, the, only, one, whi...
4    [me, , ready, to, go, at, supermarket, during,...
Name: tokens_no_punct, dtype: object
```

```
0    [trending, :, new, yorkers, encounter, empty, ...
1    [when, i, could, n’t, find, hand, sanitizer, a...
2    [find, out, how, you, can, protect, yourself, ...
3    [#, panic, buying, hits, #, newyork, city, as,...
4    [#, toiletpaper, #, dunnypaper, #, coronavirus...
Name: lowercase_tokens, dtype: object
```

```
0    [trending, , new, yorkers, encounter, empty, s...
1    [when, i, could, nt, find, hand, sanitizer, at...
2    [find, out, how, you, can, protect, yourself, ...
3    [, panic, buying, hits, , newyork, city, as, a...
4    [, toiletpaper, , dunnypaper, , coronavirus, ,...
Name: tokens_no_punct, dtype: object
```

A scenario I might want to keep some forms of punctuation is when punctuation plays an important role. For example, when people just type “?” without any word text to convey their feeling of surprise.

E. We use Porter stemmer,

```
After stemming:
 0      [, menyrbi, , phil_gahan, , chrisitv, and, and]
1    [advic, talk, to, your, neighbour, famili, to,...
2    [coronaviru, australia, , woolworth, to, give,...
Name: stemmed_tokens, dtype: object
```

\

```
After stemming:
 0    [trend, , new, yorker, encount, empti, superma...
1    [when, i, could, nt, find, hand, sanit, at, fr...
2    [find, out, how, you, can, protect, yourself, ...
Name: stemmed_tokens, dtype: object
```

```
After removal:
 ['Unnamed: 0', 'OriginalTweet', 'Sentiment', 'stemmed_tokens']
0            [menyrbi, phil_gahan, chrisitv, and, and]
1    [advic, talk, to, your, neighbour, famili, to,...
2    [coronaviru, australia, woolworth, to, give, e...
3    [my, food, stock, is, not, the, onli, one, whi...
4    [me, readi, to, go, at, supermarket, dure, the...
Name: tokens, dtype: object
Current Columns:
 ['Unnamed: 0', 'OriginalTweet', 'Sentiment', 'tokens']

After removal:
 ['Unnamed: 0', 'OriginalTweet', 'Sentiment', 'stemmed_tokens']
Current Columns:
 ['Unnamed: 0', 'OriginalTweet', 'Sentiment', 'tokens']
```

```
[nltk_data] Downloading package stopwords to /root/nltk_data...
[nltk_data]   Unzipping corpora/stopwords.zip.
```

F.

```
41150    [airlin, pilot, offer, stock, supermarket, she...
41151    [respons, complaint, not, provid, cite, covid1...
41152    [know, itãâ, get, tough, when, kameronwild, ra...
41153    [wrong, smell, hand, sanit, start, turn, coron...
41154    [tartiicat, well, newus, rift, s, go, 70000, a...
Name: tokens, dtype: object
```

.

```
3793    [meanwhil, supermarket, israel, peopl, danc, s...
3794    [panic, buy, lot, nonperish, item, echo, need,...
3795    [asst, prof, econom, cconc, wa, nbcphiladelphi...
3796    [gov, need, someth, instead, biar, je, rakyat,...
3797    [forestandpap, member, commit, safeti, employe...
Name: tokens, dtype: object
```

G.

The length of the vocabulary is 1000.

H.

Train Accuracy: 0.68234722390961

Test Accuracy: 0.42338072669826227

Five words:

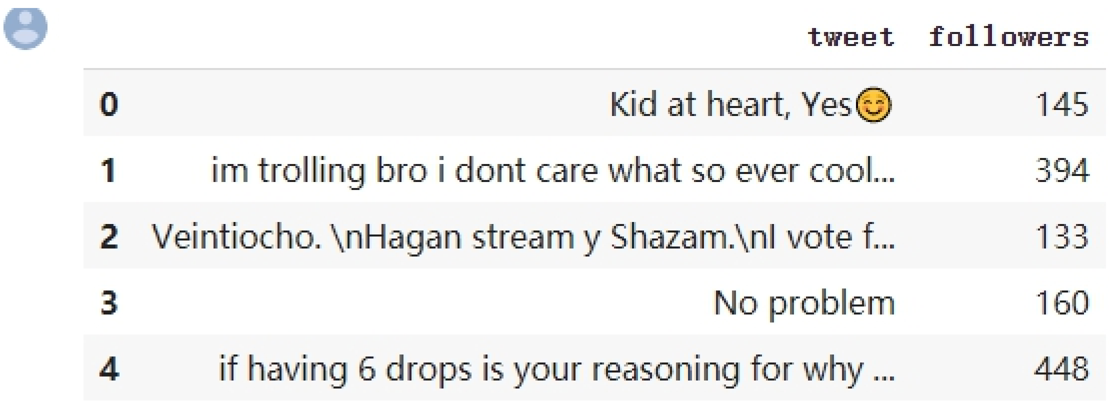
Not, my, our, could, and, but

I. No, because ROC curve is not suitable for labels involving multiple classes

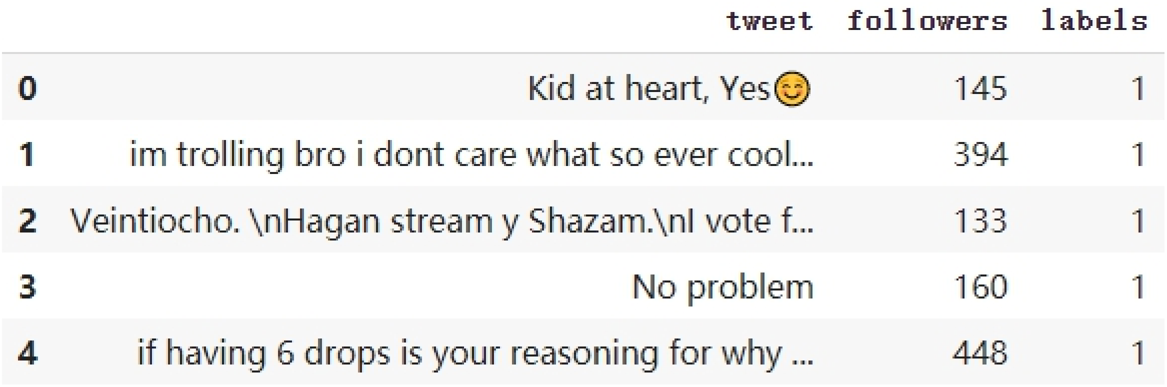
J. Train Accuracy: 0.6654841453043373，which is a bit lower than the train accuracy using count vectors. Test Accuracy: 0.42627698788836227，which is a bit higher than the accuracy using count vectors. They are about the same.
K. Train Accuracy: 0.6654841453043373；Test Accuracy: 0.42627698788836227， lower than the accuracy with stemming.

Bonus:
Naive bayes is a generative model since it is based on the joint probability， p(x， y)， of the inputs x and the label y， and make their predictions by using Bayes rules to calculate p(y | x)， and then picking the most likely label y.

2.



	tweet	followers
0	Kid at heart, Yes😊	145
1	im trolling bro i dont care what so ever cool...	394
2	Veintiocho. \nHagan stream y Shazam.\nI vote f...	133
3	No problem	160
4	if having 6 drops is your reasoning for why ...	448



	tweet	followers	labels
0	Kid at heart, Yes😊	145	1
1	im trolling bro i dont care what so ever cool...	394	1
2	Veintiocho. \nHagan stream y Shazam.\nI vote f...	133	1
3	No problem	160	1
4	if having 6 drops is your reasoning for why ...	448	1

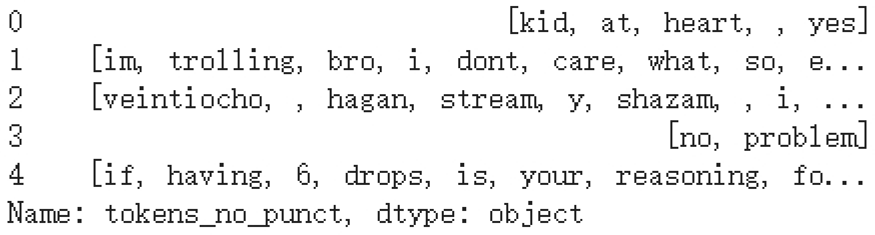
```
289 686 25
<bound method Series.mean of 0       145
1       394
2       133
3       160
4       448
       ...
995       3
996     181
997    1095
998     393
999     114
Name: followers, Length: 1000, dtype: int64>
```

\

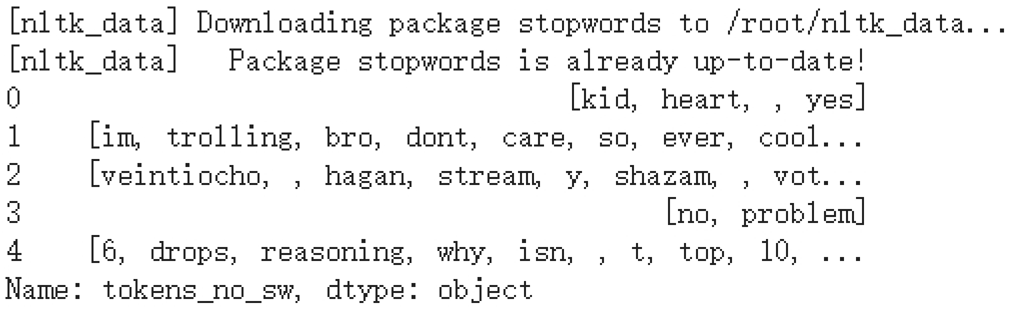
```
[nltk_data] Downloading package punkt to /root/nltk_data...
[nltk_data]   Package punkt is already up-to-date!
0                            [Kid, at, heart, ,, Yes😊]
1     [im, trolling, bro, i, dont, care, what, so, e...
2     [Veintiocho, ., Hagan, stream, y, Shazam, ., I...
3                                         [No, problem]
4     [if, having, 6, drops, is, your, reasoning, fo...
Name: tokens, dtype: object
```

```
[nltk_data] Downloading package punkt to /root/nltk_data...
[nltk_data]   Package punkt is already up-to-date!
0                            [Kid, at, heart, ,, Yes😊]
1     [im, trolling, bro, i, dont, care, what, so, e...
2     [Veintiocho, ., Hagan, stream, y, Shazam, ., I...
3                                         [No, problem]
4     [if, having, 6, drops, is, your, reasoning, fo...
Name: tokens, dtype: object
```

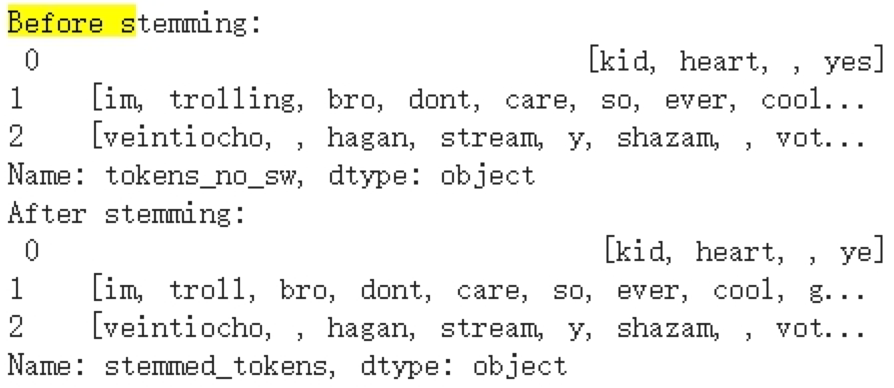
```
0                            [kid, at, heart, ,, yes😊]
1     [im, trolling, bro, i, dont, care, what, so, e...
2     [veintiocho, ., hagan, stream, y, shazam, ., i...
3                                         [no, problem]
4     [if, having, 6, drops, is, your, reasoning, fo...
Name: lowercase_tokens, dtype: object
```



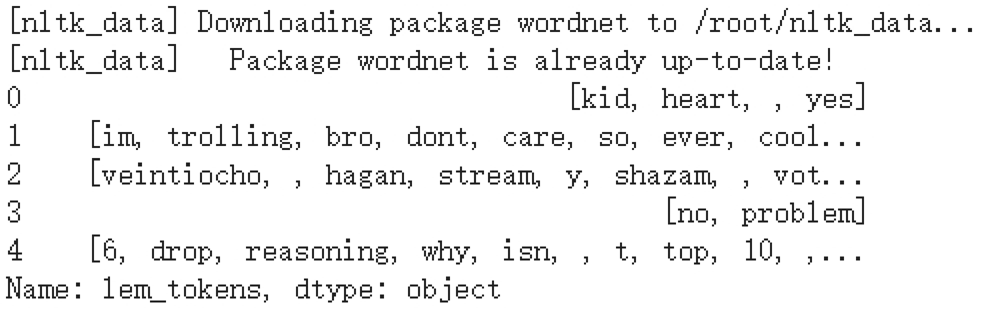
```
0                             [kid, at, heart, , yes]
1    [im, trolling, bro, i, dont, care, what, so, e...
2    [veintiocho, , hagan, stream, y, shazam, , i, ...
3                                       [no, problem]
4    [if, having, 6, drops, is, your, reasoning, fo...
Name: tokens_no_punct, dtype: object
```



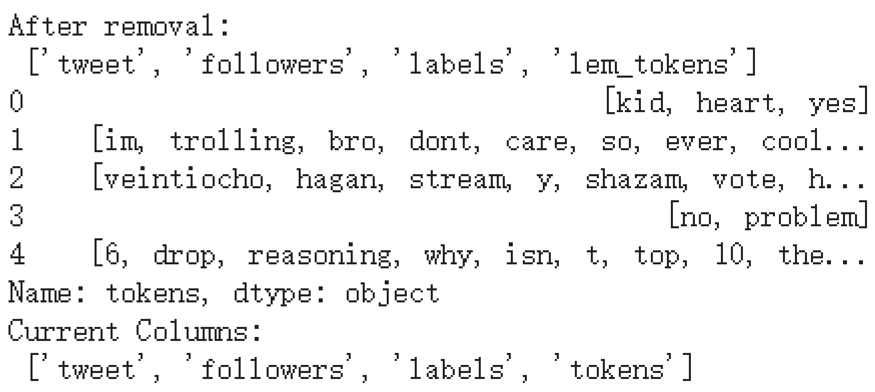
```
[nltk_data] Downloading package stopwords to /root/nltk_data...
[nltk_data]   Package stopwords is already up-to-date!
0                                 [kid, heart, , yes]
1    [im, trolling, bro, dont, care, so, ever, cool...
2    [veintiocho, , hagan, stream, y, shazam, , vot...
3                                       [no, problem]
4    [6, drops, reasoning, why, isn, , t, top, 10, ...
Name: tokens_no_sw, dtype: object
```



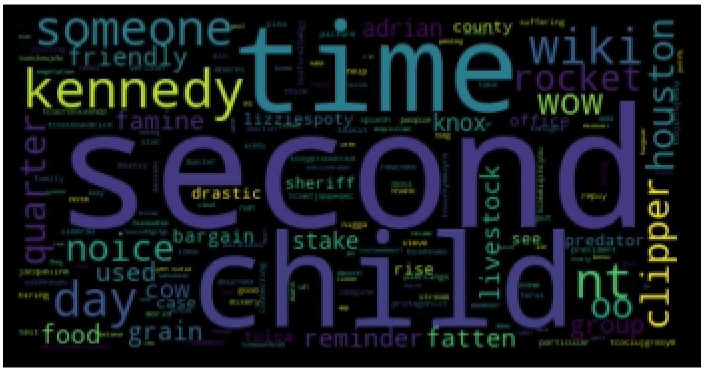
```
Before stemming:
 0                                 [kid, heart, , yes]
1    [im, trolling, bro, dont, care, so, ever, cool...
2    [veintiocho, , hagan, stream, y, shazam, , vot...
Name: tokens_no_sw, dtype: object
After stemming:
 0                                  [kid, heart, , ye]
1    [im, troll, bro, dont, care, so, ever, cool, g...
2    [veintiocho, , hagan, stream, y, shazam, , vot...
Name: stemmed_tokens, dtype: object
```

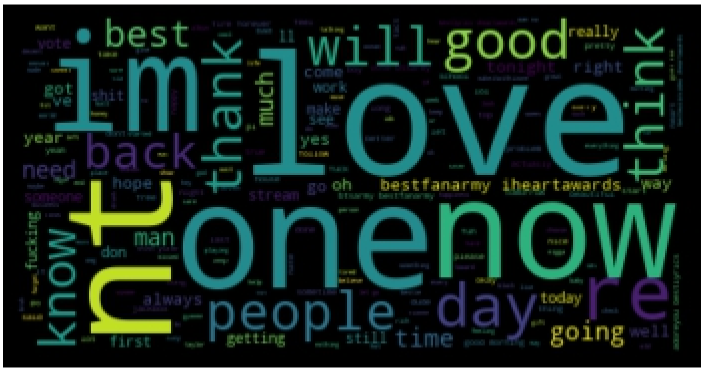


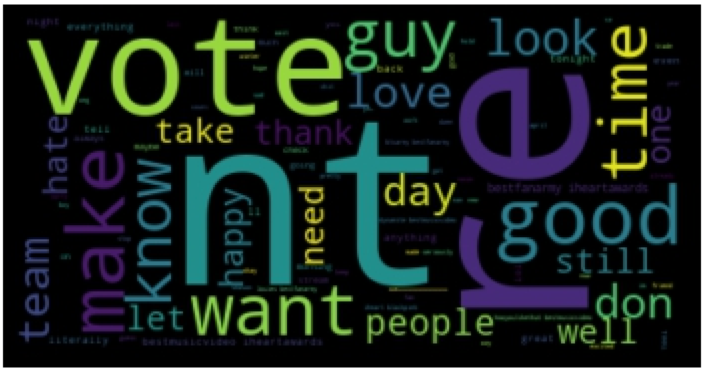
```
[nltk_data] Downloading package wordnet to /root/nltk_data...
[nltk_data]   Package wordnet is already up-to-date!
0                                 [kid, heart, , yes]
1    [im, trolling, bro, dont, care, so, ever, cool...
2    [veintiocho, , hagan, stream, y, shazam, , vot...
3                                       [no, problem]
4    [6, drop, reasoning, why, isn, , t, top, 10, ,...
Name: lem_tokens, dtype: object
```

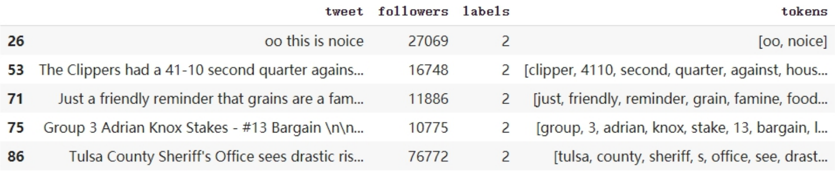


```
After removal:
 ['tweet', 'followers', 'labels', 'lem_tokens']
0                                   [kid, heart, yes]
1    [im, trolling, bro, dont, care, so, ever, cool...
2    [veintiocho, hagan, stream, y, shazam, vote, h...
3                                       [no, problem]
4    [6, drop, reasoning, why, isn, t, top, 10, the...
Name: tokens, dtype: object
Current Columns:
 ['tweet', 'followers', 'labels', 'tokens']
```

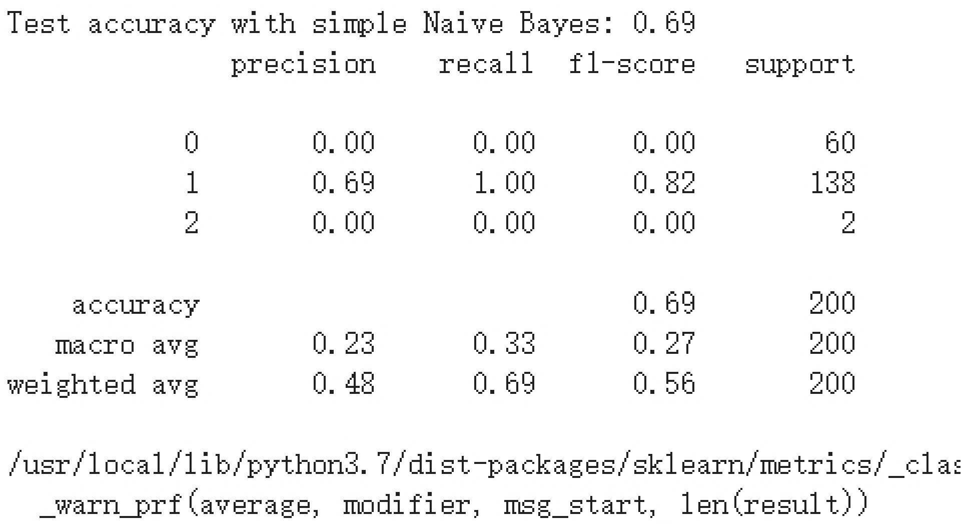








	tweet	followers	labels	tokens
26	oo this is noice	27069	2	[oo, noice]
53	The Clippers had a 41-10 second quarter agains...	16748	2	[clipper, 4110, second, quarter, against, hous...
71	Just a friendly reminder that grains are a fam...	11886	2	[just, friendly, reminder, grain, famine, food...
75	Group 3 Adrian Knox Stakes - #13 Bargain \n\n...	10775	2	[group, 3, adrian, knox, stake, 13, bargain, l...
86	Tulsa County Sheriff's Office sees drastic ris...	76772	2	[tulsa, county, sheriff, s, office, see, drast...

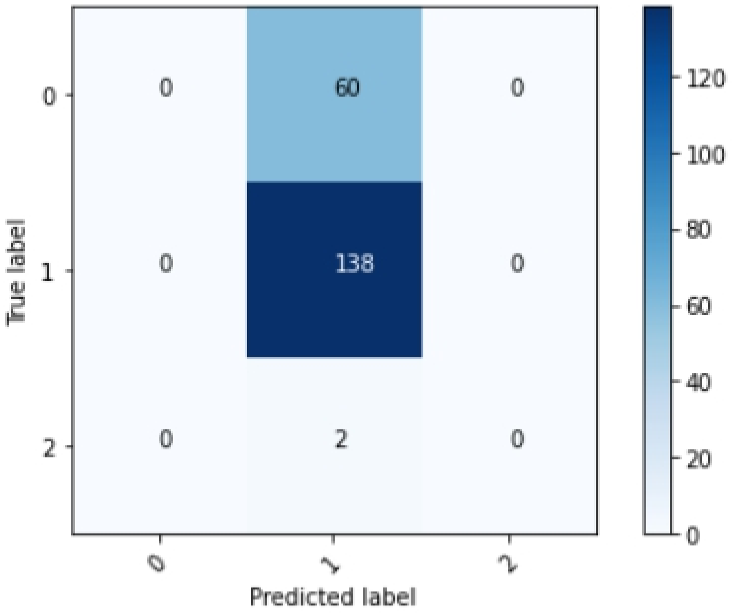


```
Test accuracy with simple Naive Bayes: 0.69
              precision    recall  f1-score   support

           0       0.00      0.00      0.00        60
           1       0.69      1.00      0.82       138
           2       0.00      0.00      0.00         2

    accuracy                           0.69       200
   macro avg       0.23      0.33      0.27       200
weighted avg       0.48      0.69      0.56       200

/usr/local/lib/python3.7/dist-packages/sklearn/metrics/_clas
  _warn_prf(average, modifier, msg_start, len(result))
```



The csv file can be downloaded at the end of the ipynd file.