

APPENDIX

A. Regional Results

1) Country Results:

TABLE I

COUNTRY TWEET AND SENTIMENT STATISTICS. TOP: COVID, BOTTOM: LOCKDOWN

	No. Tweets	Pos Ratio	Neg Ratio	Neu Ratio
England	228006	0.55	0.36	0.10
Scotland	50450	0.54	0.36	0.10
Wales	26542	0.51	0.37	0.09
Northern Ireland	4945	0.58	0.33	0.12
	No. Tweets	Pos Ratio	Neg Ratio	Neu Ratio
England	203551	0.55	0.35	0.10
Scotland	21354	0.55	0.35	0.10
Wales	14145	0.55	0.35	0.10
Northern Ireland	5402	0.54	0.36	0.10

2) County Results:

TABLE II

COUNTY TWEET AND SENTIMENT STATISTICS. **TOP:** COVID, **BOTTOM:** LOCKDOWN

	County	No. Tweets	Ratio
Highest Pos Ratio	Cumbria	341	0.65
Highest Neg Ratio	South Ayrshire	802	0.4
	County	No. Tweets	Ratio
Highest Pos Ratio	Leicestershire	349	0.6
Highest Neg Ratio	Fife	120	0.4

3) County Tweet Count: :

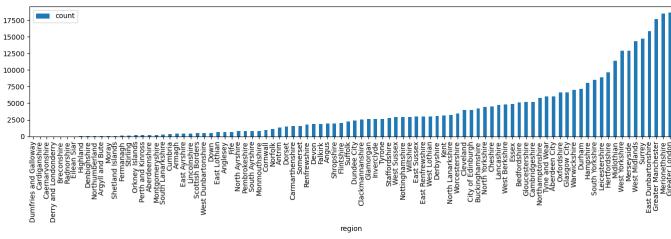


Fig. 1. Sorted Bar Chart of Number of Collected Tweets from Each Region Over Both Dataset

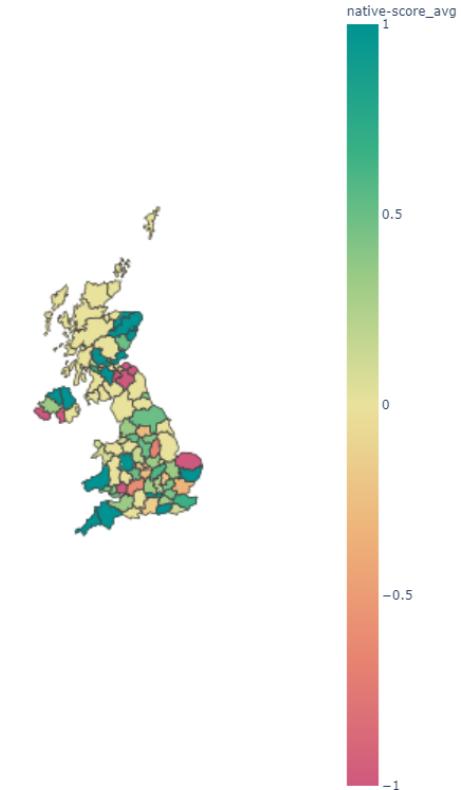


Fig. 2. Choropleth Map for the Covid Dataset and Naive Bayes sentiment on the date: 2020-12-27

C. Sentiment Analysis

1) Sentiment Technique Comparison: :



Fig. 3. Comparison of 7MA Sentiment Scores Between Techniques(COVID)



Fig. 4. Comparison of 7MA Sentiment Scores Between Techniques(Lockdown)

TABLE IV
ACCURACY MEASURE OF MODELS

Metrics:	Models:			
	Vader	TextBlob	LSTM	Naive Bayes
Accuracy	0.78	0.56	0.78	0.67
F-1 score	0.78	0.59	0.74	0.61

TABLE V
MODEL ERROR AND PRECISION RATES

Metrics:	Models:			
	Vader	TextBlob	LSTM	Naive Bayes
TPR	0	0	0	0
TNR	0	0	0	0
FNR	0	0	0	0
FPR	0	0	0	0

2) Country Sentiment Comparison: :

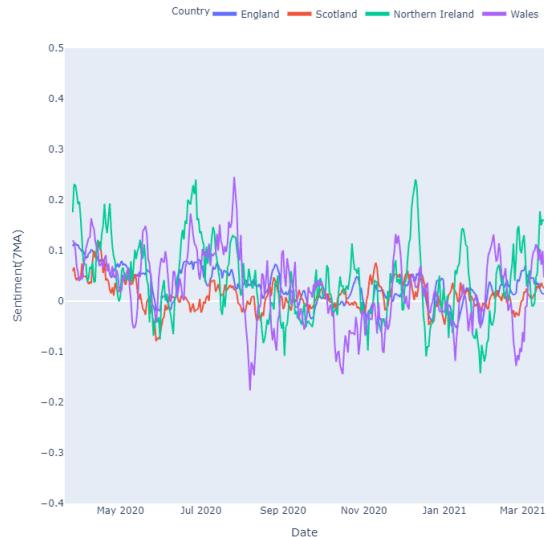


Fig. 5. Comparison of 7MA Sentiment Scores Between Countries(COVID)

TABLE III
COMPARING THE OUTCOMES ACROSS NLP TECHNIQUES

Model:	Total:	Agreement in %			% of Sentiment Labels
		Pos	Neg	Neu	
Vader v Textblob	56.47	55.31	29.70	14.99	
Vader v LSTM	56.95	54.29	45.71	Nan	
Vader v Naive Bayes	56.66	62.75	37.25	Nan	
Textblob v LSTM	47.54	67.45	32.55	Nan	
Textblob v Naive Bayes	49.80	75.76	24.24	Nan	
LSTM v Naive Bayes	68.70	66.21	33.79	Nan	
All models Combined	28.66	72.23	27.77	Nan	



Fig. 6. Comparison of 7MA Sentiment Scores Between Countries(Lockdown)

3) Sentiment and Tweet Volume in England vs COVID Rates: (Top: Covid, Bottom: Lockdown)

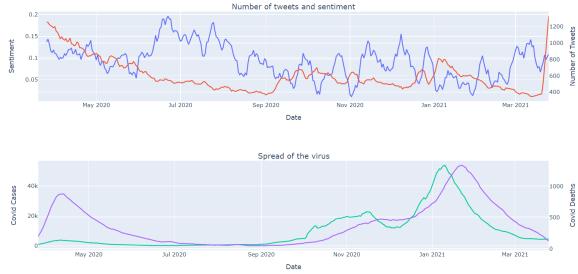


Fig. 7. Graphs of how Covid sentiment, tweet volume, COVID cases and COVID deaths changes over a year in England.



Fig. 8. Graphs of how Lockdown sentiment, tweet volume, COVID cases and COVID deaths changes over a year in England.

4) Sentiment and Tweet Volume in Scotland vs COVID Rates: (Top: Covid, Bottom: Lockdown)

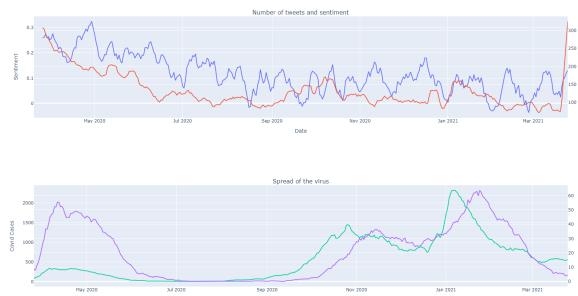


Fig. 9. Graphs of how Covid sentiment, tweet volume, COVID cases and COVID deaths changes over a year in Scotland.

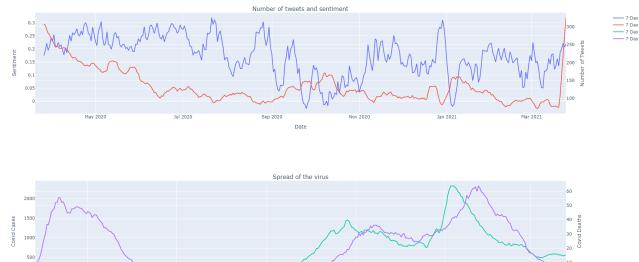


Fig. 10. Graphs of how Lockdown sentiment, tweet volume, COVID cases and COVID deaths changes over a year in Scotland.

5) Sentiment and Tweet Volume in Wales vs COVID Rates: (Top: Covid, Bottom: Lockdown)



Fig. 11. Graphs of how Covid sentiment, tweet volume, COVID cases and COVID deaths changes over a year in Wales.

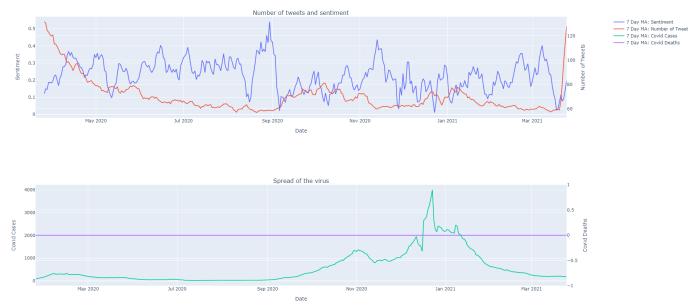


Fig. 12. Graphs of how Lockdown sentiment, tweet volume, COVID cases and COVID deaths changes over a year in Wales.

6) Sentiment and Tweet Volume in Northern Ireland vs COVID Rates: (Top: Covid, Bottom: Lockdown)

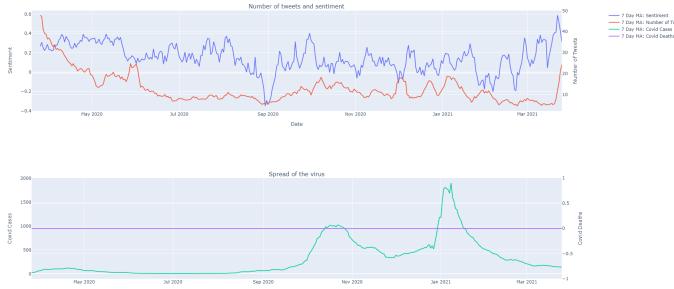


Fig. 13. Graphs of how Covid sentiment, tweet volume, COVID cases and COVID deaths changes over a year in Northern Ireland.

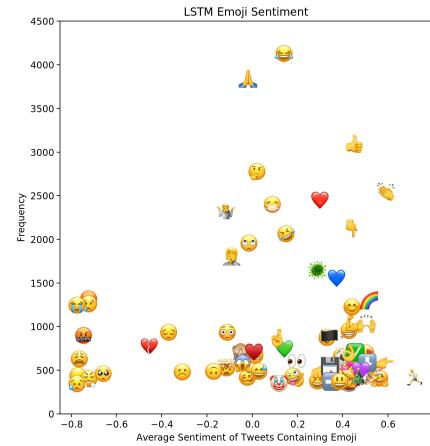


Fig. 16. Frequency and Sentiment of Emojis (LSTM)

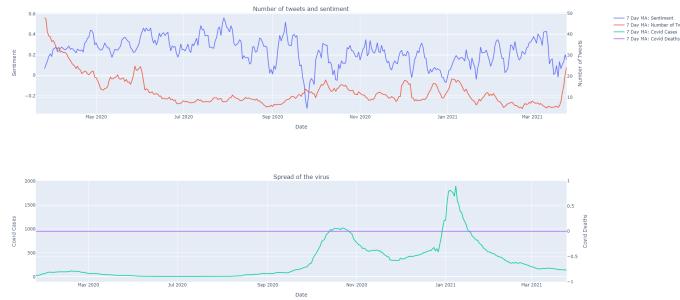


Fig. 14. Graphs of how Lockdown sentiment, tweet volume, COVID cases and COVID deaths changes over a year in Northern Ireland.

D. Emoji Trends

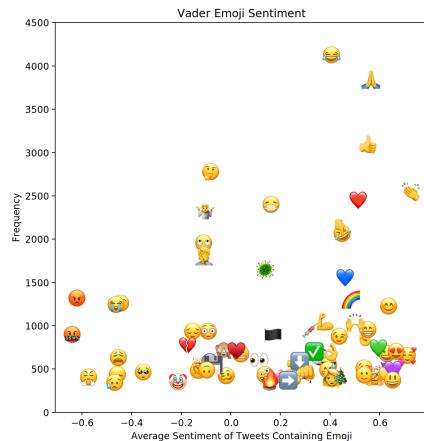


Fig. 15. Frequency and Sentiment of Emojis (Vader)

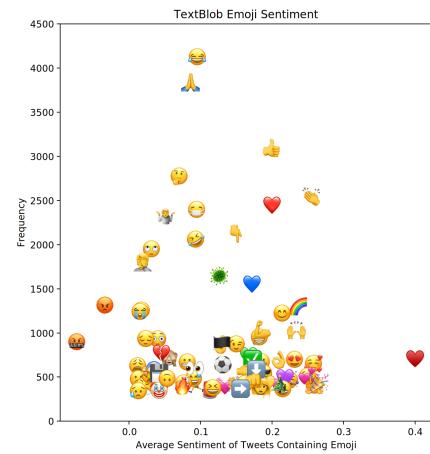


Fig. 17. Frequency and Sentiment of Emojis (TextBlob)

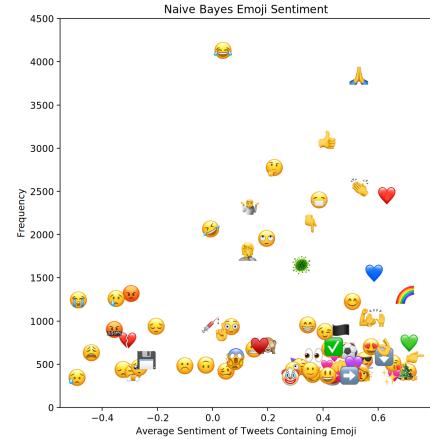


Fig. 18. Frequency and Sentiment of Emojis (Naive Bayes)

TABLE VI
FACE WITH TEARS OF JOY SENTIMENT

	Vader	TextBlob	LSTM	Naive Bayes	Emoji Sentiment Ranking v1.0
Sentiment	0.447	0.103	0.167	-0.002	0.221
IQR	0.48	0.25	2.0	2.0	n/a

E. Notable Days

TABLE VII
NOTABLE DAYS. TOP: COVID, BOTTOM: LOCKDOWN

	Date/Month	No. Tweets/Ratio
Highest Tweet Volume Day	2021-03-25	2640
Highest Tweet Volume Month	March 2020	1659
Highest Positive Sentiment Ratio Day	2020-03-21	0.65
Highest Positive Sentiment Ratio Month	March 2020	0.53
Highest Negative Sentiment Ratio Day	2020-10-04	0.53
Highest Negative Sentiment Ratio Month	January 2021	0.47
	Date/Month	No. Tweets/Ratio
Highest Tweet Volume Day	2021-01-04	1810
Highest Tweet Volume Month	November 2020	1454
Highest Positive Sentiment Ratio Day	2020-06-29	0.79
Highest Positive Sentiment Ratio Month	April 2020	0.63
Highest Negative Sentiment Ratio Day	2021-01-03	0.52
Highest Negative Sentiment Ratio Month	October 2020	0.46

F. Popular Emojis

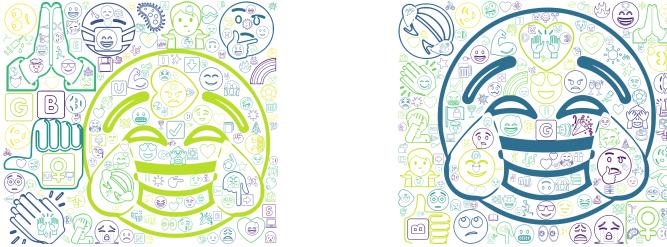


Fig. 19. Popular Emojis, Left: Covid, Right: Lockdown

G. Popular Words(Keywords Removed)

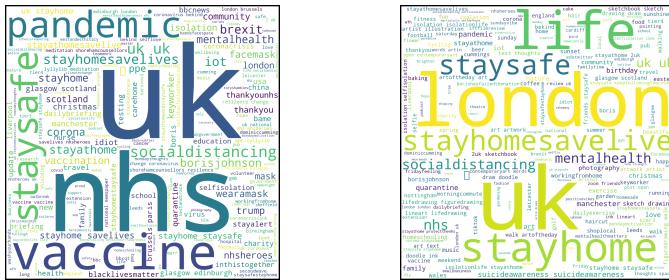


Fig. 20. Popular Words, Left: Covid, Right: Lockdown

H. Scaled Scatter Plots Between Features

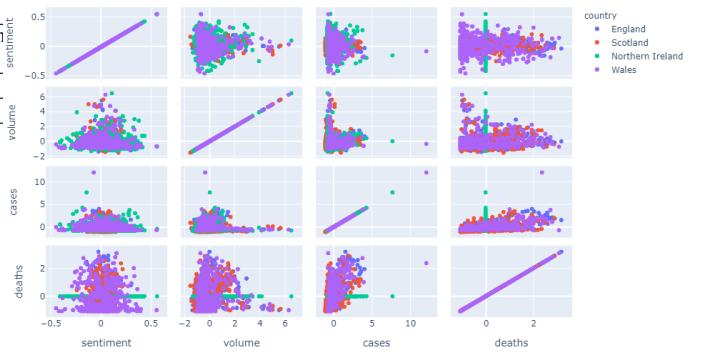


Fig. 21. Correlation Between Features for Each Country(Covid)

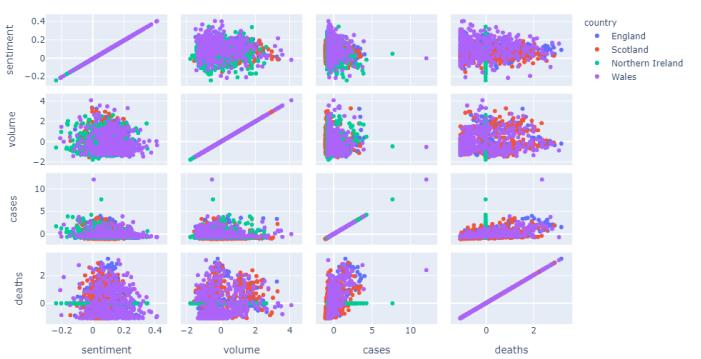


Fig. 22. Correlation Between Features for Each Country(Lockdown)