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THE RUSSIA-UKRAINE WAR IN 400 YOUTUBE VIDEOS: A BIG DATA ANALYSIS

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Abstract
The ultimate goal of this paper is to analyze 400 YouTube videos and their comments regarding the Russia-Ukraine war.A point to note is that there occurred 56 words whose frequency is 12 tokens (the highest frequency). A further point to note is that in a word cloud, the word *Ukraine* is represented as the biggist in size. This in turn indicates that in 400 YouTube videos and their comments, this word occurred more frequently than the other words and thus it counts as central and pivotal. With respect to topics constituting 400 YouTube videos and their comments, it is worth noting that topic 13 was the most occurred one, followed by topic 7, topic 5, and topic 3, in that order. When it comes to the frequency of words occurred in 400 YouTube videos and their comments, the word *Ukraine* was the most occurred one, followed by the word *War*, the word *Russia*, the word *facebook*, and the word *News*, in descending order.More importantly, this paper argues that the word comskynews has the highest centrality, followed by the word Facebook, the word News, and the word Ukraine,in that order. Finally, this paper shows that the keywords war, Russian, Russia, Ukraine, TV, channel, google,etc. are directly linked to the name Putin, whereas the keywords war, Ukrine, Russia, google, etc. are directly linked to the name Zelenskyy.
Keywords: Russia-Ukraine war, YouTube, topic, word cloud, centrality, keyword

1. Introduction

The main purpose of this paper is to analyze 400 YouTube videos and their comments regarding the Russia-Ukraine war from 24, 2, 2022 to 11, 1, 2023. In this paper, the YouTube data collector was used to collect 400 YouTube videos and their comments and the software package NetMiner was used to analyze them. First, we aim to provide information on the frequency of the relevant nouns used in 400 YouTube videos and their comments, their proportion, and their cumulative proportion. Second, we aim at providing a word cloud related to 400 YouTube videos and their comments through which we can see which words count as frequent and central ones. Third, we look into 13 topics constituting 400 YouTube videos and their comments and 5 keywords constituting each topic. Also, we aim at investigatingthe frequency of each topic through which we can see how often particular words are used in 400 YouTube videos and their comments. Fourth, we inquire into network properties which show the number of links, their density, and average degree (refers to the number of nodes). Fifth, we aim to consider centrality (the term of NetMiner) which shows how important the relevant words are. The term centrality indicates that the more a particular word is linked to more words, the more the centrality is high. Simply put, if the centrality of a particular word is high, the word is regarded as pivotal. Sixth, we provide the visualization of the relevant keywords through which we can see the links among a central keyword and the other words. The organization of this paper is as follows. In section 2.1, we argue that 56 words have the highest

frequency (12 tokens). In section 2.2, we show that in the word cloud, the word *Ukraine* is represented as the biggist in size. This in turn shows that in 400 YouTube videos and their comments, this word occurred more frequently than the other words and thus it counts as central and pivotal. In section 2.3, we maintain that topic 13 was the most occurred one in 400 YouTube videos and their comments, followed by topic 7, topic 5, and topic 3. In section 2.4, we contend that the word *Ukraine* was the most occurred one in 400 YouTube videos and their comments, followed by the word *War*, the word *Russia*, the word *facebook*, and the word *News*, in descending order. In section 2.6, we argue that the word comskynews has the highest centrality, followed by the
word Facebook, the word News, and the word Ukraine, in that order. In section 2.7, we show that the keywords war, Russian, Russia, Ukraine, TV, channel, google, etc. are directly linked to the name Putin, while thekeywords war, Ukrine, Russia, google, etc. are directly linked to the name Zelenskyy..

2. Results

2.1. Information on the frequency of the relevant words and their proportion

In what follows, we aim at providing information on the frequency of the relevant words constituting 400 YouTube videos and their comments and the proportion of the words:

Table 1 Information on the frequency of words and their proportion

Value	Frequency	Proportion	Cumulative Proportion
50.0	7	0.007	0.007
51.0	8	0.008	0.014
52.0	6	0.006	0.02
53.0	3	0.003	0.023
54.0	7	0.007	0.03
55.0	6	0.006	0.035
56.0	12	0.011	0.047
57.0	7	0.007	0.053
58.0	9	0.009	0.062
59.0	6	0.006	0.068
60.0	6	0.006	0.073
61.0	4	0.004	0.077
62.0	4	0.004	0.081
63.0	3	0.003	0.084
64.0	9	0.009	0.092

65.0	11	0.01	0.103
66.0	4	0.004	0.107
67.0	4	0.004	0.111
68.0	3	0.003	0.113
69.0	5	0.005	0.118
70.0	4	0.004	0.122
71.0	3	0.003	0.125
72.0	9	0.009	0.133
73.0	3	0.003	0.136
74.0	6	0.006	0.142
75.0	5	0.005	0.147
76.0	8	0.008	0.154
77.0	3	0.003	0.157
78.0	9	0.009	0.166
79.0	5	0.005	0.171
80.0	5	0.005	0.175
81.0	9	0.009	0.184
82.0	2	0.002	0.186
83.0	5	0.005	0.191
84.0	7	0.007	0.197
85.0	5	0.005	0.202
86.0	3	0.003	0.205
87.0	3	0.003	0.208
88.0	6	0.006	0.214
89.0	3	0.003	0.216
90.0	1	0.001	0.217
91.0	6	0.006	0.223
92.0	4	0.004	0.227
93.0	4	0.004	0.231
94.0	1	0.001	0.232
95.0	5	0.005	0.236
96.0	3	0.003	0.239

97.0	1	0.001	0.24
98.0	2	0.002	0.242
99.0	2	0.002	0.244
100.0	1	0.001	0.245
101.0	3	0.003	0.248
102.0	2	0.002	0.25
104.0	5	0.005	0.255
105.0	4	0.004	0.258
106.0	2	0.002	0.26
107.0	5	0.005	0.265
108.0	3	0.003	0.268
109.0	2	0.002	0.27
110.0	6	0.006	0.276
111.0	2	0.002	0.277
112.0	6	0.006	0.283
113.0	3	0.003	0.286
114.0	2	0.002	0.288
115.0	3	0.003	0.291
116.0	3	0.003	0.294
117.0	4	0.004	0.297
118.0	2	0.002	0.299
119.0	1	0.001	0.3
120.0	1	0.001	0.301
121.0	1	0.001	0.302
122.0	3	0.003	0.305
123.0	3	0.003	0.308
124.0	2	0.002	0.31
125.0	5	0.005	0.315
126.0	5	0.005	0.319
127.0	3	0.003	0.322
128.0	5	0.005	0.327
129.0	2	0.002	0.329

130.0	1	0.001	0.33
131.0	3	0.003	0.333
132.0	1	0.001	0.334
133.0	3	0.003	0.337
135.0	2	0.002	0.338
136.0	4	0.004	0.342
137.0	2	0.002	0.344
138.0	1	0.001	0.345
139.0	2	0.002	0.347
140.0	4	0.004	0.351
141.0	3	0.003	0.354
142.0	2	0.002	0.356
143.0	4	0.004	0.359
144.0	5	0.005	0.364
145.0	1	0.001	0.365
146.0	3	0.003	0.368
148.0	2	0.002	0.37
149.0	5	0.005	0.375
150.0	2	0.002	0.377
151.0	2	0.002	0.378
153.0	4	0.004	0.382
155.0	1	0.001	0.383
156.0	3	0.003	0.386
157.0	2	0.002	0.388
158.0	2	0.002	0.39
159.0	2	0.002	0.392
161.0	2	0.002	0.394
163.0	5	0.005	0.398
165.0	3	0.003	0.401
166.0	2	0.002	0.403
167.0	2	0.002	0.405
168.0	5	0.005	0.41

169.0	2	0.002	0.412
170.0	3	0.003	0.415
171.0	2	0.002	0.417
172.0	2	0.002	0.418
173.0	2	0.002	0.42
174.0	4	0.004	0.424
176.0	3	0.003	0.427
177.0	1	0.001	0.428
178.0	2	0.002	0.43
179.0	3	0.003	0.433
180.0	3	0.003	0.436
181.0	3	0.003	0.439
182.0	1	0.001	0.439
183.0	5	0.005	0.444
186.0	2	0.002	0.446
187.0	1	0.001	0.447
188.0	3	0.003	0.45
189.0	1	0.001	0.451
190.0	3	0.003	0.454
191.0	3	0.003	0.457
192.0	3	0.003	0.459
193.0	1	0.001	0.46
194.0	2	0.002	0.462
195.0	1	0.001	0.463
197.0	3	0.003	0.466
198.0	1	0.001	0.467
199.0	1	0.001	0.468
200.0	1	0.001	0.469
201.0	2	0.002	0.471
202.0	1	0.001	0.472
203.0	1	0.001	0.473
204.0	1	0.001	0.474

205.0	1	0.001	0.475
206.0	2	0.002	0.477
207.0	1	0.001	0.478
208.0	2	0.002	0.48
209.0	1	0.001	0.48
210.0	2	0.002	0.482
211.0	3	0.003	0.485
214.0	3	0.003	0.488
215.0	1	0.001	0.489
216.0	1	0.001	0.49
217.0	3	0.003	0.493
218.0	2	0.002	0.495
219.0	2	0.002	0.497
220.0	3	0.003	0.5
223.0	3	0.003	0.502
224.0	2	0.002	0.504
225.0	2	0.002	0.506
227.0	2	0.002	0.508
228.0	2	0.002	0.51
229.0	1	0.001	0.511
230.0	1	0.001	0.512
231.0	1	0.001	0.513
232.0	1	0.001	0.514
233.0	5	0.005	0.519
234.0	1	0.001	0.52
237.0	1	0.001	0.52
238.0	2	0.002	0.522
242.0	1	0.001	0.523
243.0	2	0.002	0.525
244.0	1	0.001	0.526
245.0	1	0.001	0.527
246.0	1	0.001	0.528

248.0	1	0.001	0.529
250.0	2	0.002	0.531
252.0	3	0.003	0.534
253.0	1	0.001	0.535
254.0	1	0.001	0.536
255.0	2	0.002	0.538
256.0	1	0.001	0.539
257.0	1	0.001	0.54
259.0	1	0.001	0.541
261.0	3	0.003	0.543
262.0	1	0.001	0.544
263.0	1	0.001	0.545
264.0	1	0.001	0.546
265.0	1	0.001	0.547
266.0	2	0.002	0.549
267.0	2	0.002	0.551
269.0	2	0.002	0.553
270.0	2	0.002	0.555
271.0	2	0.002	0.557
273.0	1	0.001	0.558
275.0	3	0.003	0.561
276.0	2	0.002	0.562
277.0	2	0.002	0.564
278.0	2	0.002	0.566
279.0	1	0.001	0.567
280.0	2	0.002	0.569
283.0	1	0.001	0.57
284.0	1	0.001	0.571
285.0	1	0.001	0.572
287.0	4	0.004	0.576
290.0	1	0.001	0.577
291.0	2	0.002	0.579

293.0	1	0.001	0.58
295.0	1	0.001	0.581
298.0	1	0.001	0.582
299.0	1	0.001	0.582
302.0	1	0.001	0.583
303.0	1	0.001	0.584
304.0	2	0.002	0.586
305.0	3	0.003	0.589
306.0	3	0.003	0.592
308.0	1	0.001	0.593
309.0	2	0.002	0.595
311.0	2	0.002	0.597
313.0	1	0.001	0.598
315.0	2	0.002	0.6
317.0	1	0.001	0.601
321.0	2	0.002	0.602
323.0	2	0.002	0.604
326.0	1	0.001	0.605
327.0	1	0.001	0.606
330.0	1	0.001	0.607
331.0	4	0.004	0.611
332.0	1	0.001	0.612
333.0	1	0.001	0.613
336.0	2	0.002	0.615
338.0	1	0.001	0.616
339.0	3	0.003	0.619
341.0	1	0.001	0.62
344.0	2	0.002	0.622
345.0	1	0.001	0.622
347.0	2	0.002	0.624
349.0	3	0.003	0.627
352.0	1	0.001	0.628

354.0	1	0.001	0.629
355.0	1	0.001	0.63
357.0	1	0.001	0.631
358.0	2	0.002	0.633
360.0	2	0.002	0.635
361.0	3	0.003	0.638
363.0	2	0.002	0.64
364.0	1	0.001	0.641
366.0	1	0.001	0.642
367.0	1	0.001	0.643
372.0	1	0.001	0.643
375.0	2	0.002	0.645
376.0	1	0.001	0.646
378.0	1	0.001	0.647
379.0	3	0.003	0.65
380.0	1	0.001	0.651
381.0	4	0.004	0.655
384.0	1	0.001	0.656
388.0	1	0.001	0.657
393.0	1	0.001	0.658
394.0	1	0.001	0.659
395.0	1	0.001	0.66
396.0	1	0.001	0.661
399.0	3	0.003	0.663
401.0	1	0.001	0.664
405.0	3	0.003	0.667
407.0	1	0.001	0.668
417.0	1	0.001	0.669
419.0	1	0.001	0.67
420.0	1	0.001	0.671
421.0	1	0.001	0.672
422.0	2	0.002	0.674

424.0	2	0.002	0.676
425.0	1	0.001	0.677
428.0	1	0.001	0.678
430.0	1	0.001	0.679
432.0	1	0.001	0.68
433.0	1	0.001	0.681
434.0	1	0.001	0.682
437.0	1	0.001	0.683
438.0	1	0.001	0.684
439.0	1	0.001	0.684
441.0	3	0.003	0.687
443.0	1	0.001	0.688
448.0	1	0.001	0.689
449.0	1	0.001	0.69
450.0	1	0.001	0.691
452.0	1	0.001	0.692
454.0	1	0.001	0.693
456.0	2	0.002	0.695
457.0	1	0.001	0.696
458.0	1	0.001	0.697
460.0	1	0.001	0.698
462.0	1	0.001	0.699
463.0	1	0.001	0.7
464.0	1	0.001	0.701
470.0	1	0.001	0.702
471.0	1	0.001	0.703
474.0	1	0.001	0.704
475.0	3	0.003	0.706
477.0	1	0.001	0.707
483.0	1	0.001	0.708
484.0	1	0.001	0.709
485.0	1	0.001	0.71

489.0	1	0.001	0.711
490.0	1	0.001	0.712
497.0	1	0.001	0.713
499.0	2	0.002	0.715
507.0	1	0.001	0.716
510.0	1	0.001	0.717
512.0	1	0.001	0.718
517.0	1	0.001	0.719
518.0	2	0.002	0.721
521.0	1	0.001	0.722
523.0	2	0.002	0.724
525.0	1	0.001	0.724
527.0	1	0.001	0.725
529.0	1	0.001	0.726
530.0	2	0.002	0.728
533.0	1	0.001	0.729
535.0	2	0.002	0.731
543.0	1	0.001	0.732
547.0	1	0.001	0.733
551.0	1	0.001	0.734
562.0	2	0.002	0.736
568.0	1	0.001	0.737
570.0	1	0.001	0.738
571.0	1	0.001	0.739
573.0	1	0.001	0.74
575.0	1	0.001	0.741
577.0	2	0.002	0.743
581.0	1	0.001	0.744
582.0	2	0.002	0.745
584.0	1	0.001	0.746
586.0	1	0.001	0.747
587.0	1	0.001	0.748

588.0	2	0.002	0.75
592.0	1	0.001	0.751
593.0	1	0.001	0.752
598.0	1	0.001	0.753
603.0	1	0.001	0.754
608.0	1	0.001	0.755
609.0	1	0.001	0.756
611.0	1	0.001	0.757
616.0	1	0.001	0.758
617.0	1	0.001	0.759
623.0	1	0.001	0.76
628.0	2	0.002	0.762
629.0	1	0.001	0.763
630.0	1	0.001	0.764
639.0	1	0.001	0.765
642.0	2	0.002	0.766
644.0	1	0.001	0.767
655.0	1	0.001	0.768
656.0	1	0.001	0.769
657.0	1	0.001	0.77
670.0	1	0.001	0.771
674.0	1	0.001	0.772
679.0	1	0.001	0.773
686.0	1	0.001	0.774
688.0	1	0.001	0.775
694.0	1	0.001	0.776
695.0	1	0.001	0.777
696.0	1	0.001	0.778
699.0	1	0.001	0.779
700.0	1	0.001	0.78
702.0	1	0.001	0.781
704.0	2	0.002	0.783

715.0	1	0.001	0.784
717.0	1	0.001	0.785
724.0	2	0.002	0.786
729.0	1	0.001	0.787
732.0	1	0.001	0.788
734.0	4	0.004	0.792
737.0	1	0.001	0.793
738.0	1	0.001	0.794
742.0	1	0.001	0.795
755.0	2	0.002	0.797
756.0	1	0.001	0.798
759.0	1	0.001	0.799
766.0	1	0.001	0.8
773.0	1	0.001	0.801
774.0	2	0.002	0.803
788.0	1	0.001	0.804
793.0	1	0.001	0.805
796.0	1	0.001	0.806
797.0	1	0.001	0.806
800.0	1	0.001	0.807
818.0	1	0.001	0.808
822.0	1	0.001	0.809
823.0	1	0.001	0.81
826.0	1	0.001	0.811
834.0	1	0.001	0.812
844.0	1	0.001	0.813
845.0	1	0.001	0.814
849.0	1	0.001	0.815
852.0	1	0.001	0.816
861.0	1	0.001	0.817
875.0	1	0.001	0.818
877.0	1	0.001	0.819

879.0	1	0.001	0.82
887.0	1	0.001	0.821
907.0	1	0.001	0.822
921.0	1	0.001	0.823
925.0	1	0.001	0.824
926.0	1	0.001	0.825
932.0	1	0.001	0.826
934.0	1	0.001	0.827
937.0	1	0.001	0.827
943.0	1	0.001	0.828
955.0	1	0.001	0.829
959.0	1	0.001	0.83
960.0	1	0.001	0.831
961.0	1	0.001	0.832
965.0	2	0.002	0.834
968.0	1	0.001	0.835
999.0	1	0.001	0.836
1003.0	1	0.001	0.837
1006.0	1	0.001	0.838
1015.0	1	0.001	0.839
1016.0	2	0.002	0.841
1019.0	1	0.001	0.842
1038.0	1	0.001	0.843
1048.0	2	0.002	0.845
1059.0	1	0.001	0.846
1076.0	1	0.001	0.847
1079.0	1	0.001	0.847
1080.0	1	0.001	0.848
1083.0	1	0.001	0.849
1101.0	1	0.001	0.85
1106.0	1	0.001	0.851
1108.0	1	0.001	0.852

1113.0	1	0.001	0.853
1126.0	1	0.001	0.854
1130.0	1	0.001	0.855
1134.0	1	0.001	0.856
1140.0	1	0.001	0.857
1142.0	1	0.001	0.858
1146.0	1	0.001	0.859
1152.0	1	0.001	0.86
1154.0	1	0.001	0.861
1165.0	2	0.002	0.863
1167.0	1	0.001	0.864
1169.0	1	0.001	0.865
1173.0	1	0.001	0.866
1197.0	1	0.001	0.867
1199.0	2	0.002	0.868
1222.0	1	0.001	0.869
1223.0	1	0.001	0.87
1238.0	1	0.001	0.871
1243.0	1	0.001	0.872
1251.0	1	0.001	0.873
1262.0	1	0.001	0.874
1264.0	1	0.001	0.875
1273.0	1	0.001	0.876
1274.0	1	0.001	0.877
1275.0	1	0.001	0.878
1276.0	1	0.001	0.879
1279.0	1	0.001	0.88
1280.0	1	0.001	0.881
1289.0	1	0.001	0.882
1294.0	1	0.001	0.883
1306.0	1	0.001	0.884
1315.0	1	0.001	0.885

1317.0	1	0.001	0.886
1336.0	1	0.001	0.887
1343.0	1	0.001	0.888
1347.0	1	0.001	0.888
1353.0	1	0.001	0.889
1403.0	1	0.001	0.89
1411.0	1	0.001	0.891
1437.0	1	0.001	0.892
1439.0	1	0.001	0.893
1446.0	1	0.001	0.894
1449.0	1	0.001	0.895
1460.0	1	0.001	0.896
1491.0	1	0.001	0.897
1493.0	1	0.001	0.898
1524.0	1	0.001	0.899
1534.0	2	0.002	0.901
1535.0	1	0.001	0.902
1541.0	1	0.001	0.903
1543.0	2	0.002	0.905
1581.0	1	0.001	0.906
1615.0	1	0.001	0.907
1632.0	2	0.002	0.908
1638.0	1	0.001	0.909
1641.0	1	0.001	0.91
1653.0	1	0.001	0.911
1679.0	1	0.001	0.912
1731.0	1	0.001	0.913
1752.0	1	0.001	0.914
1759.0	1	0.001	0.915
1782.0	1	0.001	0.916
1792.0	1	0.001	0.917
1805.0	1	0.001	0.918

1807.0	2	0.002	0.92
1899.0	1	0.001	0.921
1922.0	2	0.002	0.923
1929.0	1	0.001	0.924
1942.0	1	0.001	0.925
1943.0	1	0.001	0.926
1945.0	1	0.001	0.927
1971.0	1	0.001	0.928
2038.0	1	0.001	0.929
2067.0	1	0.001	0.929
2120.0	1	0.001	0.93
2148.0	1	0.001	0.931
2166.0	1	0.001	0.932
2187.0	1	0.001	0.933
2236.0	1	0.001	0.934
2253.0	1	0.001	0.935
2258.0	1	0.001	0.936
2305.0	1	0.001	0.937
2323.0	1	0.001	0.938
2343.0	1	0.001	0.939
2441.0	1	0.001	0.94
2459.0	1	0.001	0.941
2502.0	1	0.001	0.942
2505.0	1	0.001	0.943
2533.0	1	0.001	0.944
2624.0	1	0.001	0.945
2637.0	1	0.001	0.946
2667.0	1	0.001	0.947
2676.0	1	0.001	0.948
2791.0	1	0.001	0.949
2828.0	1	0.001	0.949
2880.0	1	0.001	0.95

2891.0	1	0.001	0.951
2932.0	1	0.001	0.952
3011.0	1	0.001	0.953
3027.0	1	0.001	0.954
3042.0	1	0.001	0.955
3062.0	1	0.001	0.956
3232.0	1	0.001	0.957
3266.0	1	0.001	0.958
3267.0	1	0.001	0.959
3282.0	1	0.001	0.96
3291.0	1	0.001	0.961
3381.0	1	0.001	0.962
3464.0	1	0.001	0.963
3468.0	1	0.001	0.964
3491.0	1	0.001	0.965
3571.0	1	0.001	0.966
3656.0	1	0.001	0.967
3671.0	1	0.001	0.968
3677.0	1	0.001	0.969
3710.0	1	0.001	0.969
3770.0	1	0.001	0.97
3776.0	1	0.001	0.971
3797.0	1	0.001	0.972
3818.0	1	0.001	0.973
3893.0	1	0.001	0.974
3944.0	1	0.001	0.975
3983.0	1	0.001	0.976
4183.0	1	0.001	0.977
4315.0	1	0.001	0.978
4677.0	1	0.001	0.979
4733.0	1	0.001	0.98
4839.0	1	0.001	0.981

4870.0	1	0.001	0.982
4923.0	1	0.001	0.983
4990.0	1	0.001	0.984
5284.0	1	0.001	0.985
5478.0	1	0.001	0.986
5956.0	1	0.001	0.987
6140.0	1	0.001	0.988
6394.0	1	0.001	0.989
7321.0	1	0.001	0.99
7739.0	1	0.001	0.99
8163.0	1	0.001	0.991
8491.0	1	0.001	0.992
9683.0	1	0.001	0.993
11196.0	1	0.001	0.994
13201.0	1	0.001	0.995
17574.0	1	0.001	0.996
19894.0	1	0.001	0.997
27197.0	1	0.001	0.998
43920.0	1	0.001	0.999
44329.0	1	0.001	1
Total	1049	1	

It is worth mentioning that 56 words occurred in 400 YouTube videos and their comments and that their frequency is 12 tokens (the highest frequency). Note that their proportion and their cumulative proportion are 0.011 and 0.047, respectively. It is probably worthwhile pointing out that there occurred 65 words whose frequency is 11 tokens (the second highest). Notice that their proportion and their cumulative proportion are 0.01 and 0.103, respectively. More importantly, there appeared 353 words whose frequency is 9 tokens (the third highest). Note, however, that their proportion is 0.081 (the highest). It should also be pointed out that there occurred 51 words whose frequency is 8 tokens (the fourth highest). It must be stressed that their proportion and their cumulative proportion are 0.008 and 0.014, respectively. We thus conclude that 56 words that occurred in 400 YouTube videos and their comments has the highest frequency (12 tokens).

2.2. Word cloud

In the following, we aim to provide a word cloud in which frequent and pivotal words are represented in bigger sizes. Table 2 shows the word cloud in which each word is represented differently in size in accordance with the degree of importance:

Table 2 Word cloud

It is particularly noteworthy that the word *Ukraine* is represented as the biggist in size. This in turn shows that in 400 YouTube videos and their comments, this word occurred more frequently than the other words and thus it counts as central and pivotal. It must be emphasized, on the other hand, that the word *Russia* is represented as the second biggest in size. This in turn implies that this word appeared frequently and thus it is regarded as an important keyword. Perhaps it is worthwhile noting that the word *war* is the third biggest among the relevant words, thereby meaning the third most impotant one. It is worth observing the word *country* in the word cloud. It is represented as the fourth biggest in size, which in turn suggests that it is the fourth most central one. Note that the word *country* is followed by the word *person* (the fifth biggest in size). More importantly, the word *Nato* is the sixthbiggist in size, which in turn indicates that it often occurred in 400 YouTube videos and thus it is considered as a central keyword. We thus conclude that the word *Ukraine* is the most occurred one and thus it is a central and pivotal keyword.

2.3. Topics and their keywords

The goal of this section is to examine 13 topics consisting of 400 YouTube videos and their comments and their keywords. Table 3 shows 13 topics and 5 keywords consisting of each topic:

Table 3 Topic info

	1st Keyword	2nd Keyword	3rd Keyword	4th Keyword	5th Keyword
Topic-1	News	youtube	Updates	Hindi	Ukraine
Topic-2	TV	use	content	Bangladesh	news
Topic-3	Sky	comskynews	News	video	youtube
Topic-4	news	News	Ukraine	world	channel
Topic-5	news	News	Ukraine	War	Hindi
Topic-6	Republic	RussiaUkraine	Sadhguru	Official	CTV News
Topic-7	tv9hindi	Bharatvarsh	News	TV9	news
Topic-8	UPSC	Batch	main	visit	IAS
Topic-9	bbc	TC	dragon	youtube	complaylist
Topic-10	Abhijit	Jaipur	Dialogues	thejaipurdialogues	Chavda
Topic-11	today	Discord	stuff	Doctor	SOCIAL
Topic-12	video	Crux	CRUX	Blog	pilot
Topic-13	Ukraine	Russia	war	War	Russian

It is significant to note that topic 13 includes the keywords *Ukraine*, *Russia*, *war*, and *Russian*. As illustrated in Table 3, the first keyword is the word *Ukrine*, which in turn implies that it was the most widely used one, thus leading to the 1st keyword. It is also worth considering topic 9. The keywords *bbc*, *TC*, *dragon*, *youtube*, and *complayist* are made up of topic 9. In this topic,

the keyword *bbc* is the most occurred one, thus resulting in the 1st keyword. It must be pointed out, on the other hand, that the keywords *news*, *Ukraine*, *world*, and *channel* consist of topic 4. In this topic, there occurred the word*news* as the 1st keyword, thereby implying that it was the most widely used one in topic 4. It should also be noted that the keywords *Sky*, *comskynews*, *News*, *video*, and *youtube* constitute topic 3.
Now let us turn our attention to the frequency of each topic:

Table 4 Frequency of each topic

	# of documents
Topic-1	40
Topic-2	15
Topic-3	41
Topic-4	30
Topic-5	55
Topic-6	8
Topic-7	72
Topic-8	7
Topic-9	14
Topic-10	1
Topic-11	5
Topic-12	14
Topic-13	98

It is important to note that topic 13 occurred in 98 YouTube videos (the highest). As exemplified in Table 3, the keywords *Ukraine*, *Russia*, *war*, and *Russian* are made up of topic 13. This in turn suggests that these keywords are the most widely occurred ones in 400 YouTubes and their comments. It should also be stressed that topic 7 appeared in 72 YouTube videos (the second highest). The keywords *tv9hindi*, *Bharatvarsh*, *News*, and *TV9* consist of topic 7. It must also be noted, on the other hand, that topic 5 occurred in 55 YouTube videos (the third highest). This in turn shows that these keywords were the third most occurred ones in 400 YouTubes and their comments. Perhaps it is worthwhile mentioning that topic 4 appeared in 41 YouTube videos. As indicated in Table 3, the keywords *news*, *Ukrine*, *world*, and *channel* form topic 4. From all of this, it seems evident that topic 13 was the most occurred one in 400 YouTube videos and their comments, followed by topic 7, topic 5, and topic 3, in

that order. It can thus be concluded that topic 13 occurred in 98 YouTube videos, hence leading to the highest frequency.

2.4. The frequency of words in 400 YouTubes

In what follows, we aim at exploring the frequency of key nouns occurred in 400 YouTube videos and comments. This list was cut off in the top 50:

Table 5 Frequency of key words

Number	Word	Degree
1	Ukraine	350
2	War	312
3	Russia	300
4	facebook	271
5	News	264
6	Facebook	241
7	news	214
8	com	195
9	Subscribe	190
10	Putin	175
11	youtube	170
12	Follow	161
13	Twitter	159
14	russiaukrainewar	156
15	channel	155
16	YouTube	152
17	Bollywood	148
18	war	135
19	update	116
20	Channel	113
21	Business	110
22	Political	106
23	world	99
24	Watch	95
25	Instagram	95
26	video	93
27	Live	92
28	Hindi	89
29	putin	85
30	google	82
31	instagram	81
32	comstoreappsdetails	81
33	Videos	81
34	visit	78

35	Android	76
36	Zelenskyy	74
37	Russian	74
38	idcom	73
39	apple	73
40	RussiaUkraine	73
41	tv9hindi	72
42	russia	72
43	gludchcy	72
44	comvideos	72
45	comtrending	72
46	comindia	72
47	comentertainment	72
48	combusiness	72
49	Trending	72
50	TV9	72

Perhaps it is worthwhile noting that the word *Ukraine* has the highest frequency among the relevant words. More specifically, it occurred in 350 YouTube videos and their comments (the highest frequency). This in turn indicates that the word *Ukraine* was the most occurred one in 400 YouTube videos and their comments. It must be emphasized, on the other hand, that the word *War* appeared in 312 YouTube videos and their comments (the second highest), thus implying that it was the second most widely used one. It should also be pointed out that the word *Russia* occurred in 300 YouTube videos and their comments, thereby indicating the third most occurred one. It is worth noting, on the other hand, that the word *facebook* appeared in 271 YouTube videos and their comments. This in turn implies that it occurred 271 times in YouTube videos. It is worth observing the word *News*. It appeared 264 times in YouTube videos (the fifth highest). It seems thus reasonable to conclude that the word *Ukraine* was the most occurred one in 400 YouTube videos and their comments, followed by the word *War*, the word *Russia*, the word *facebook*, and the word *News*, in descending order. It is worth observing that the name *Putin* occurred in 175 YouTube videos and their comments. Finally, it should be noted that the name *Zelenskyy* appeared in 74 YouTube videos and their comments. We thus conclude that the word *Ukraine* was the most occurred one in YouTube videos and their comments regarding the Russia-Ukraine war.

2.5. Network properties

In this section, we are concerned with network properties that refer to the number of links among the relevant words, their density, the number of nodes, and the number of the group of not being isolated:

Table 6 Network properties

	# of Links : O(m)	Density : O(m)	Average Degree : O(m)	# of Components(Weak) : O(m)
≥ 0	2,904	0.003	2.768	20
≥ 1	2,904	0.003	2.768	20
≥ 2	959	0.001	0.914	597
≥ 3	524	0	0.5	776
≥ 4	367	0	0.35	848
≥ 5	304	0	0.29	878
≥ 6	280	0	0.267	882
≥ 7	242	0	0.231	901
≥ 8	215	0	0.205	909
≥ 9	192	0	0.183	922
≥ 10	180	0	0.172	928

Note, to begin with, that the software package NetMiner can capture the relationship among all words by linking them. In 400 YouTube videos and their comments, when the link is ≥ 0, the number of the links among the relevant words is 2,904, as exemplified in Table 6. Notice that the density of the links is 0.003 and that the number of nodes is 2,768. It must also be pointed out that the number of the group of not being isolated is 20. Quite interestingly, when the link is ≥ 1, the number of the links is 2,904, as illustrated in Table 6. The density of the links, the number of nodes, and the number of the unisolated group are the same as the first one. It is probably worthwhile pointing out that when the link is ≥ 2, the number of the links is smaller. In this case, the density of the links is 0.001, whereas the number of nodes is 0.914. To sum up, the software package NetMiner captures the relationship among the relevant words by linking them and provides network properties.

2.6. Centrality

In the following, we aim to examine centrality (the term of NetMiner) that refers to the degree of importance. The term centrality indicates that the more the centrality index is high, the more the relevant word counts as pivotal. Our list was cut off in the top 20:

Table 7 Centrality

Number	Word	Centrality
1	comskynews	0.003795
2	Facebook	0.003581

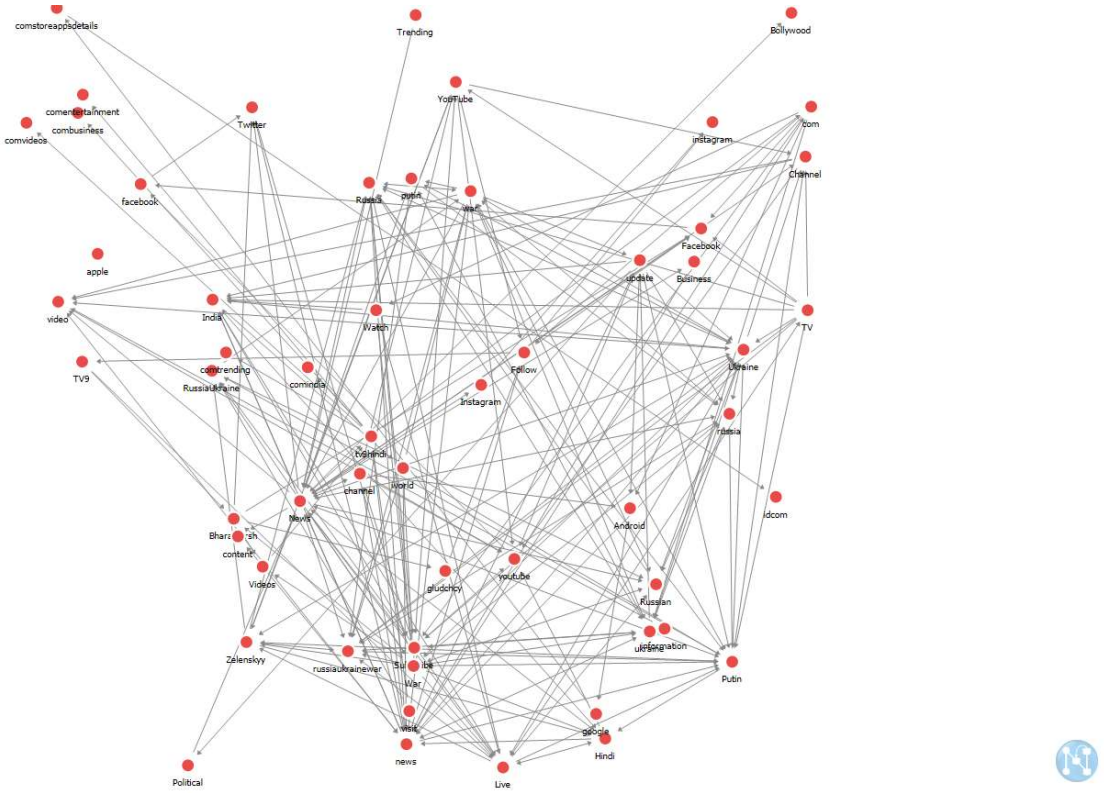
3	News	0.003405
4	facebook	0.003346
5	Ukraine	0.002049
6	entertainment	0.001792
7	sport	0.001792
8	Russia	0.001734
9	News	0.001710
10	Banglaadesh	0.0011367
11	russiaukrainewar	0.001335
12	Government	0.001305
13	war	0.001269
14	NATO	0.001232
15	War	0.001202
16	nato	0.001084
17	Putin	0.001071
18	ukraine	0.000964
19	channel	0.000942
20	youtube	0.000934

Note that the more a particular word is linked to more words, the more the centrality index is high. It is
significant to note that the word comskynews has the highest centrality(0.003795). This in turn indicates that the
number of the links of the word comskynews is the highest, thereby meaning that it counts as important and
pivotal. It is worthwhile noting, on the other hand, that the centrality index of the word Facebook is the second
highest, which in turn implies that it is the second most important one since the number of the links of Facebook
is the second highest. It should also be noted that the centrality index of the word News is the third
highest(0.003405).We take this fact as meaning that it is the third most central one. More importantly, Ukraine&'s centrality index is 0.002049 (the fifth highest). It can thus be inferred that the word comskynews has the highest centrality index (it is the most linked), followed by the word Facebook, the word News, and the word Ukraine, in that order. Notice that the name Putin ranks fourteenth and its centrality indexis 0.001071. Finally, it must be pointed out that the centrality index of NATO is 0.001232 (the fourteenth highest). We thus conclude that the word comskynews is the most linked to the relevant words occurred in 400 YouTube videos and their comments..

2.7 The visualization of the relevant words

In what follows, we provide the visualization of the links among major keywords occurred in 400 YouTube
videos and their comments:

Figure1Visualizationoftherelevantkeywords



As exemplified in Figure 1, this visualization provides information on the relationship among the relevantkeywords. Note that many words can be linked to a particular word, whereas a particular word can be linked to
many words. When the centraility index of a particular word is higher, the word is linked to more words. As
illustrated in Figure 1, the keywords *war*, *Russian*, *Russia*, *Ukraine*, *TV*, *channel*, *google*, etc. are directly linked
to the word *Putin*. More importantly, the keywords *war*, *Ukrine*, *Russia*, *google*, etc. are directly linked to the
word *Zelenskyy*. It is thus reasonable to assume that the keywords *Putin* and *Zelenskyy* have high centrality. It is
worth observing the word *Russia*. The keywords *war*, *Putin*, *world*, *news*, etc. are linked to the word *Russia*. For
the visualization of synonyms and keywords, see Kang (2022a, 2022b, 2022c, 2022d, 2023a, 2023b). To sum
up, this visualization provides us with information on the relationship (obtained with the links) among major
words.

3.Conclusion

To sum up, we have analyzed 400 YouTube videos and their comments regarding the Russia-Ukraine war. In section 2.1, we have argued that 56 words have the highest frequency (12 tokens). In section 2.2, we have

shown that in the word cloud, the word *Ukraine* is represented as the biggist in size. This in turn indicates that in 400 YouTube videos and their comments, this word occurred more frequently than the other words and thus it counts as central and pivotal. In section 2.3, we have maintained that topic 13 was the most occurred one in 400 YouTube videos and their comments, followed by topic 7, topic 5, and topic 3, in that order. In section 2.4, we have contended that the word *Ukraine* was the most occurred one in 400 YouTube videos and their comments, followed by the word *War*, the word *Russia*, the word *facebook*, and the word *News*, in descending order. In section 2.6, we have argued that the word *comskynews* has the highest centrality index, followed by the word *Facebook*, the word *News*, and the word *Ukraine*, in that order. In section 2.7, we have shown that the keywords *war*, *Russian*, *Russia*, *Ukraine*, *TV*, *channel*, *google*, etc. are directly linked to the name *Putin*, whereas the keywords *war*, *Ukrine*, *Russia*, *google*, etc. are directly linked to the name *Zelenskyy*. Thus, these two keywords are assumed to have high centrality.

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