

Unsupervised characterization of Opinions in terms of topics and sentiment

Riccardo Ali, Enrico Fontana, Mattia Jacopo Villani *

April 2023

Abstract

We present a flexible framework for opinion mining in a highly supervised fashion. We present evidence that opinion can be efficiently represented by the topics it touches upon and its the sentiment in which it is expressed and implement an algorithm for unsupervised opinion clustering. We generalise existing techniques and increase their unsupervised component, as well as lift the need for extensive fine tuning, making this methodology highly flexible and employable in different settings. First, we download a large corpus of tweets based on an hashtag, then we use state of the art deep learning to extract their topics and perform sentiment analysis. Finally, we select a topic and use an unsupervised clustering algorithm to cluster the sentiment of the tweets belonging to that topic, with the resulting clusters representing opinions.

1 Introduction

Historians often speak of *deep forces* as subtle economic and social processes occurring throughout the centuries, which, due to the lack of accurate information, often needed to be speculated. The impact of technological development, cultural and political evolutions, changes in customs and traditions occurring with societal changes are all examples of the underbelly of history: phenomena that do not manifest in specific events, but that are part of the iterative development of humankind. It may be possible to capture some of these developments in the modern world through the analysis of large corpora of data and communications that humans leave as traces on the internet through the analysis of public opinion.

Indeed, part of public opinion develops through conversations between pseudonymous users in the web, who detail their thoughts as they respond to current events and daily affairs. This phenomenon allows analysts of social media to draw conclusions on the humours of large user bases; yet, capturing the relevant features of the signatures that users leave online in order to distill actionable insight is a complex and endearing task. In particular, being able to map public opinion as it unfolds may help policy-makers comprehend people, avert crises, capture malcontent, and promote a democratic participation.

Our analysis focuses on the static representation of opinions; specifically, the interest lies in being able to generate a portrait of a given debate in an unsupervised fashion. This approach could improve the research quality in other domains due the elimination of the researcher’s own bias and homogeneity in the data processing, as well as efficiently providing quantitative insight to policy makers.

This paper provides a methodology that underscores how opinions can be extracted from a corpus of tweets; we describe opinions in terms of (multiple) clustered topics that they touch upon and their overall sentiment. We do so by employing an existing large language model (LLM) based methodology and implement an algorithm to perform unsupervised clustering of public opinion, which shows that sentiment and topics are excellent and almost sufficient representors of opinion. In particular, we take the view that an opinion is better comprehended when analysed in relation to other opinions and compared, which reflects our natural human approach. As such, we portray opinions through a collection of clusters to which the tweets belong. This is necessary in order to have an overview of the topics at play and how they interact with each other.

The novelty in our approach is in viewing the opinion detection task as a hybrid of sentiment analysis and topic clustering, and to perform it in a way that is stable, easily transferable with little to none fine tuning required and heavily unsupervised. Indeed, we view an opinion as the joint signature that is obtained once we find topics in a collection of tweets, in an unsupervised fashion, and assign a valence, or sentiment, to the tone of each tweet. To better explain the intuition behind these modeling choices, consider the sentences

*These research efforts have been undertaken by the United Italian Societies Research Centre. The authors thank the Consulate of Italy in London, particularly Francesco de Angelis and Diego Solinas for the encouragement and useful exchanges.

(1), "I love Natural Language Processing!" (2) "The weather today is fantastic", (3) "The weather is so bad, it's been raining the whole day". The first two have both positive sentiment but they refer to different subjects, while the last two, albeit sharing the same topic, express an opposite opinion (and have opposite sentiment). We find that it is quite rare that two tweets have the same topic *distributions* and sentiment, which makes the analysis of these two elements sufficient for an effective clustering; however, cases in which different opinions on the same topic with the same tone can be easily constructed.

An important challenge in this endeavour is the lack of an objective metric: not only opinion are subjective, but also it is not clear when two opinions are actually distinct (and by how much) if not heuristically. Therefore, it will necessary to provide many examples to demonstrate a strong empirical relation that allows to model opinion as a function of *topics* and *sentiment*.

2 Literature Review

The problem of understanding and clustering public opinion has been open for a long time and efforts have been made to model it in a classical way. For example, in [Li et al., 2013], the authors model public opinions as a dynamical system and they study their dynamics through PDEs. However, the complexity of the system can very quickly become intractable and too intricate to be analysed with these methods, and it is hardly applicable to real-world scenarios. Also, many assumptions are made about the agents in the system, which makes the model unrealistic. To develop a robust methodology, it is desirable to reduce assumptions to a minimum and to be able to directly process textual data without human annotations.

In [Bail, 2016], the author investigates how engagement is promoted by advocacy organisations, and they show that it is maximally stimulated when these organisations combine conversational themes together. We will embed this result in our treatment of public opinion by keeping track of the multiple topics a tweet touches upon. This also matches our intuition that an opinion should be relative to one or multiple topics, and it can be a different opinion when these topics are combined differently.

In [Bennett et al., 2021], the authors employ Twitter data to augment results coming from surveys to understand climate opinion in the USA. In particular, they use Latent Dirichlet Allocation (LDA) and a *coherence metric* to extract the right amount of key topics in an unsupervised way, and use a random forest algorithm to map topic distributions to climate opinion. However, one of the challenges of LDA, apart from finding a suitable number of topics to identify, is interpreting the resulting topics. In our work, we will employ state of the art methods and deep learning to overcome this difficulty and make the methodology even more unsupervised, with little need for fine tuning.

The authors of [Monti et al., 2019] use geometric deep learning to detect fake news on social media. In particular, they recover a graph structure for Twitter data and use connections between tweets and users to process and analyse the data. We will work using the intuition that there is an "underlying structure" on the tweets spaces and tweets connections to enhance our understanding of public opinion. In our work, this structure will be implicit and we will take it into account in the topic modelling phase, because topics will be assigned to tweets in relation to the topics of all other tweets. Additionally, we will combine these interconnections with evaluations on the tweets themselves in the form of sentiment analysis.

3 Methodology

In this section we discuss the methodology and the clustering algorithm. The *Cambridge Dictionary* defines 'opinion' as 'a thought or belief about something or someone'. An opinion always refers to some context, which is why we take into account the (multiple) topics that a tweet touches upon. This representation also carries information about the structure of the space where the tweets lie on, as these topics are constructed by considering the whole space. Moreover, it is common to talk about strong (weak) opinions, which refers to the strenght in tone in which these opinions are expressed. Consequently, we choose to also incorporate tweet sentiment as a constituent of the opinion it expresses.

The main objectives of this methodology are interpretability, flexibility and minimal requirement for supervision, and this is reflected in the choice of the methods employed. As discussed in the literature review, we decided to use a word-embedding deep learning approach to topic modeling using BERTopic [Grootendorst, 2022] because of its stability and flexibility, as shown in [Egger and Yu, 2022]. Indeed, unlike LDA, it does not require extensive fine tuning and detailed assumptions, and unlike Non-negative matrix factorization (NMF), it does not require a predefined number of topics to extract. These would be very strong limitations to the methodology, as it aims to be applicable to as many domains as possible with little to no assumptions. For the sentiment analysis stage, we use a model (Twitter-roBERTa-base for Sentiment Analysis [Barbieri et al., 2020]) specifically trained for sentiment analysis on tweets. For the unsupervised clustering part, we make use of the easily interpretable algorithm k-means in the implementation

provided in the scikit-learn package [Pedregosa et al., 2011]. To enhance the unsupervised component of the methodology, we could automatically extract the number of opinion clusters using the *silhouette score*, a well known methodology, or it can be set manually. The latter is preferable if the data is particularly noisy.

We provide a high-level abstraction of the workflow with implementation details to follow.

- **Step 1:** gather the tweets with a hashtag-based approach. For example, to understand and cluster public opinion around the war in Ukraine, we will use *#ukraine*. Denote *tweets* the array of tweets gathered this way.

- **Step 2:** we use BERTopic to extract an array

$$\text{microtopics} = [[p_{t_1}^1, \dots, p_{t_n}^1], \dots, [p_{t_1}^N, \dots, p_{t_n}^N]]$$

where N is the total number of tweets and n is the number of topics that BERTopic extracts. For example, `microtopics[0]` will contain the array $[p_{t_1}^1, \dots, p_{t_n}^1]$, which is the topic probability distribution for the first tweet, and each entry $p_{t_i}^1$ will be the probability of the first tweet to be about the topic t_i , for $i \in \{1, \dots, n\}$.

- **Step 3:** calculate the sentiment of each tweet using the model pre-trained on tweets discussed previously and create the array

$$\text{sentiments} = [[s_+^1, s_-^1, s_n^1], \dots, [s_+^N, s_-^N, s_n^N]]$$

where the i^{th} entry contains, in order, the positive (s_+^1), negative (s_-^1) and neutral components (s_n^1) of the i^{th} tweet.

- **Step 4:** define a function

$$\begin{aligned} \text{main_topic} : \text{tweets} = [\text{tweet}_1, \dots, \text{tweet}_N] &\rightarrow \{1, \dots, n\} \\ \text{tweet}_j &\mapsto \underset{i \in \{1, \dots, n\}}{\text{argmax}} \text{microtopics}[j] = \underset{i \in \{1, \dots, n\}}{\text{argmax}} [p_{t_1}^j, \dots, p_{t_n}^j] \end{aligned}$$

This function takes a tweet and returns the topic that is most likely related to the tweet.

- **Step 5:** Suppose we are interested in understanding or clustering opinions around the micro-topic number i . We gather all tweets with *main_topic* equal to i . Define

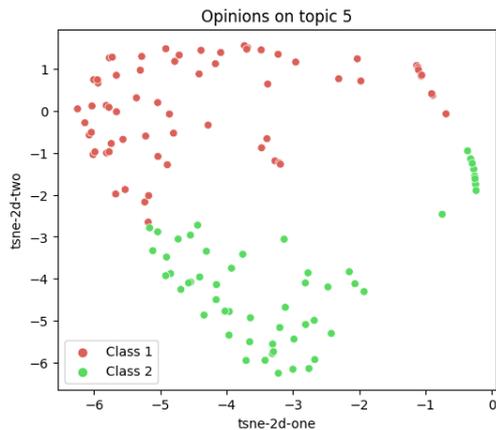
$$\text{kmeans_data} = [\text{sentiments}[j] \mid j \in \{1, \dots, N\} \text{ and } \text{main_topic}(\text{tweet}_j) = i]$$

and determine the number of clusters k^* for `kmeans_data`. To do so, one can either set it manually or run the kmeans clustering algorithm with $k = 1, \dots, \dots, \text{max_k}$ and calculate the *silhouette score* for the results of each run. Then, set k^* to be the value of k that obtains the maximum score.

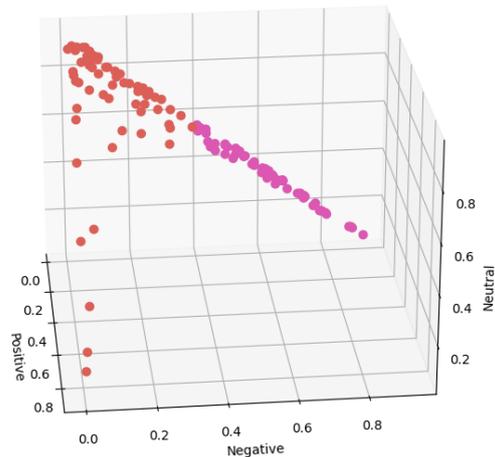
- **Step 6:** Run the kmeans clustering algorithm with $k = k^*$ on the `kmeans_data`. Each cluster found this way corresponds to an opinion on the topic i .

4 Results

Our analysis of the experiments is divided in two parts: first, we explore some examples of the clusters that are created and assess them qualitatively. Then we proceed to compare our results with other opinion representations.



(a) T-SNE embedding of the microtopics and sentiment vector of tweets whose main topic is 5, with colouring representing the result of the kmeans clustering.



(b) Sentiment of the tweets in topic 5 in their three coordinates: positive, negative and neutral. Colours represent the clusters identified by kmeans clustering.

4.1 Examples

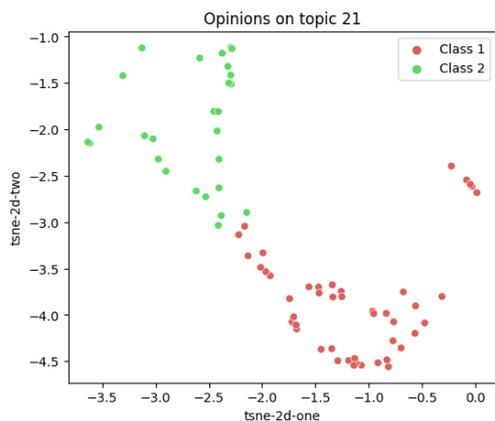
Here we present some examples of our findings. We downloaded 10,000 tweets that contained the hashtag #ukraine, and ran the steps above in the Methodology section. Then, we selected some topics that we found to be significant to demonstrate the algorithm, and report the clustering results after removing news-type tweets, with $\dots, \max k = 4$. In the tweets reported, we removed links, and mentions when not strictly necessary to understand the context.

Example 1: Topic 5. Key words: *embassy, planes, deliveries, consequences, send, continent, british, warned, possibility, raf.* Number of documents: 124. The number of clusters is manually set to 2.

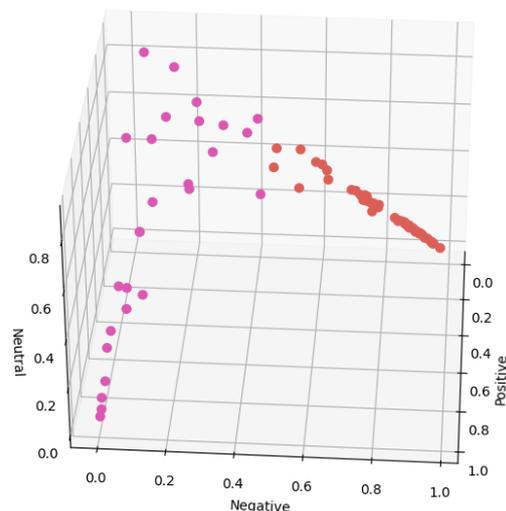
Here we report an extract of the clusters found by the algorithm for this topic. A more comprehensive list can be found in the appendix (Table 1).

Class 1	Class 2
These charlatans will leave the UK defenceless and penniless - BJ urges UK to offer ALL our fighter jets and tanks to #Ukraine absolute #Madness	Don't let the sky be the limit: Send #planes to #Ukraine – plane and simple.
The West doesn't need to send fighter jets to #Ukraine IF they have credible anti-aircraft defense systems to protect their ground forces. It's that simple & it has been the case since hostilities broke out. Jets can be used aggressively, defense systems can't	I wish it's because #Putin has had word that Britain has offered planes to #Ukraine and is organising a coalition to do likewise.
When you were UK PM I never heard you offering any planes to #Ukraine Easy to offer them when you know that you literally don't have to make that decision anymore #Hypocrite	@user Ukraine deserve more than just a fighter jets. #ukraine needs more men from #NATO allies to defeat #russia period.
An odd choice for #itvnews to lead on the fact that #Ukraine current #SU27 and #MIG29 aircraft are 30 year old technology when the Ukraine's preferred replacement is the #F16 that first flew in 1974. Even the Typhoon, which they also want, first flew in 1994 28 yrs ago.	Sending fighter jets to #Ukraine is a top priority issue on today's agenda.

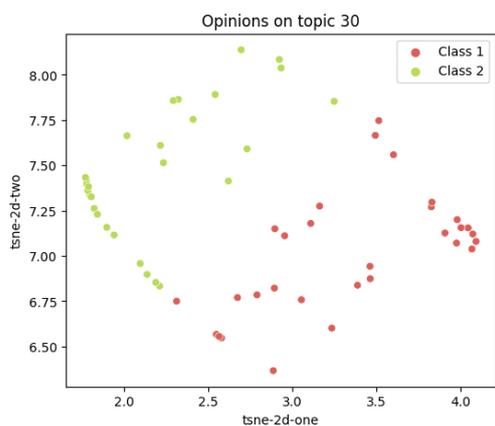
Example 2: Topic 21. Key words: *zelensky, stepan, leader, zionist, vova, ukrainians, msnbc, u4bwpezmee,*



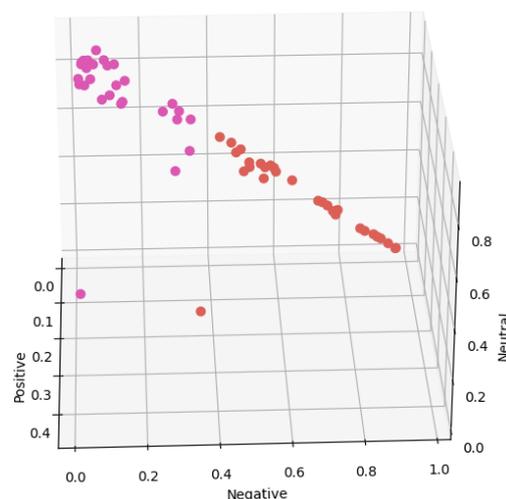
(a) T-SNE embedding of the microtopics and sentiment vector of tweets whose main topic is 21, with colouring representing the result of the kmeans clustering.



(b) Sentiment of the tweets in topic 21 in their three coordinates: positive, negative and neutral. Colours represent the clusters identified by kmeans clustering.



(a) T-SNE embedding of the microtopics and sentiment vector of tweets whose main topic is 30, with colouring representing the result of the kmeans clustering.



(b) Sentiment of the tweets in topic 30 in their three coordinates: positive, negative and neutral. Colours represent the clusters identified by kmeans clustering.

zog, liberties. Number of documents: 75. The number of clusters is manually set to 2.

Here we report an extract of the clusters found by the algorithm for this topic. A more comprehensive list can be found in the appendix (Table 2).

Example 3: Topic 30. Key words: *rogerwaters, council, pinkfloyd, floyd, founder, unprovoked, ceasefire, spoke, wall, denounces*. Number of documents: 58. The number of clusters is automatically detected to be 2 using the silhouette score.

Here we report an extract of the clusters found by the algorithm for this topic. A more comprehensive list can be found in the appendix (Table 3).

4.2 Comparison with other opinions representations

4.2.1 sentiment vs. sentiment + microtopic

Perhaps surprisingly, we found minimal differences when the clustering was performed on arrays of the form microtopics \oplus sentiment, where \oplus denotes concatenation of arrays. The main difference was that the

Class 1	Class 2
Just when you thought you couldn't respect him even more... #Zelenskyuk #Zelenskyy #ukraine	@user @user Just a nugget of info.. Zelensky is a Zionist and SUPPORTS #Israel's INVASION, OPPRESSION & ETHNIC CLEANSING of #Palestine yet expects the world to be outraged at Putin doing SIMILAR to #Ukraine.. the only difference is Putin doesn't want to kill EVERYONE unlike #Israel who does.
#Zelensky What an inspirational hero #Ukraine #Ukrainemustwin Make Ukraine Great Again	If #Russia ends up winning this war, and #Ukraine partitioned....which may well end up as the likely scenario What will #Zelensky have achieved for the people of Ukraine? Territory losses alongside 1000s dead, infrastructure broken.... the losses will have been preventable Lol
#Zelenskyy seriously is different gravy. His fortitude and resolve, our 'leaders' could learn a lot from - sadly nearly all don't have the Cajones, apart empty posturing. #Zelenski #Ukraine	Zelenskyy is playing the entire Western world for fools. #Ukraine
My goodness, Zelensky is powerful. I hope that a certain politician is standing in there somewhere actually listening to what this man is saying and accepting the truth of what is happening in this man's country. #SlavaUkraini #Ukraine	#Odessa #Ukraine man I'd dragged off by the manhunters for forced mobilization as he desperately tries to call his family. While Zelensky is getting greeted as a hero in the #UK. Ukrainian ppl had enough!

silhouette score frequently found that the optimal number of clusters was higher compared to the case where it was performed on just the sentiment.

4.2.2 sentiment vs. word embeddings

In comparing clusters obtained on just the sentiment representation of tweets with the word embedding representations, we find that the sentiment representation is a better fitting. Below are the T-SNE embeddings of the microtopics and sentiment vector of tweets whose main topic is the one indicated, with colouring representing the result of the kmeans clusters. One can clearly see that these methods produce different results. In some cases, such as 4b, one notices that embeddings produced poor results by counting how many tweets are in the red cluster, and compare this number with the tweets appearing in Table 2. By inspecting the tweets in this table, we would expect any of the two clusters to have a much higher number of members. By inspection, we assessed that the quality of the clusters produced using the entire tweet embeddings in the clustering stage is poorer compared to the results obtained when clustering based on the sentiment. A priori, the word embedding of a tweet contains information about both its topics and its sentiment, but in a much larger space. Given these experiments, which highlight a poorer quality of clusters, we believe that our methodology provides evidence that topic and sentiment are good and almost sufficient representations of opinion. This pipeline can therefore be viewed similarly to a *manifold learning* process, where we extract information about opinion from a (very) high dimensional manifold, the word embeddings, and map it onto a lower dimensional manifold where we perform opinion mining.

5 Conclusion

Although social media sites, and Twitter in particular, have become the main public platforms where people express their opinions, there is not a clear definition of opinion nor a standard way to extract them from raw data. In this work, we presented a methodology and an algorithm to extract and cluster public opinions from the Twitter space with very little assumptions. By doing so, we provided strong empirical evidence that opinions, expressed in written form, are largely determined by their topic distribution and by the sentiment

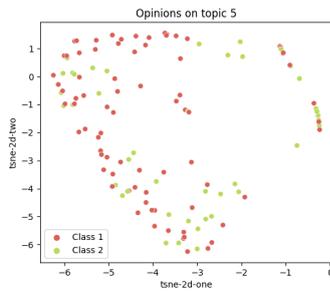
Class 1	Class 2
Talent is not wisdom, barfing is not singing, and there is no fool like an old fool! Ukraine denounces @rogerwaters as ‘another brick in the wall’ of Moscow propaganda, and urges him to cease chasing ‘flying pigs’. #Ukraine #PinkFloyd	Pink Floyd’s Roger Waters calls for peace in #Ukraine at #UN Security Council #UNSC #USA #NATO #Nazism #StateSanctionTerrorism #Norway #NordStream #ICC #WarCrimes #NATOWarOnRussia #ProxyWar #Ukraine #Russia #Iraq #Syria #TurkeySyriaEarthquake #NPR #NYTimes
@rogerwaters has just arranged an appointment for himself at #TheHague for his unadulterated support for a heinous, rapacious #Russian #oligarchy dripping with the blood of their #warcrimes in #Ukraine. #RussiaIsATerroristState #WarCrimesofRussia	WE DON’T NEED DENAZIFICATION: With hope lost in Western politicians, the truth comes from the odd artist, as founder of legendary band Pink Floyd, Roger Waters, says Russia’s Special Operation in #Ukraine was NOT UNPROVOKED, during his address to UN Security Council.
Roger Waters addressed the U.N. condemned Moscow invasion of #Ukraine as illegal though adding he believed it was PROVOKED. He is lucky to be in NYC, if he had been in Russia he would be in custody by now. Infuriating #Ukraine #UkraineRussiaWar	Volgens #RogerWaters: #Ukraine Invasion Was ‘Not Unprovoked’ at #UN #SecurityCouncil #stopNATOexpansion #usaproxywar #usabiolabs
#UkraineWar #Ukraine #Russia Ukraine denounces Roger Waters as ‘another brick in the wall’ of Moscow propaganda. Kyiv outraged as #PinkFloyd star accepts Russian invitation to speak at #UN security council and calls for immediate ceasefire	@user @rogerwaters @rogerwaters is only part of @pinkfloyd history. The real @pinkfloyd support #Ukraine.

they are expressed with. Additionally, we presented some results of the clustering algorithm by showing the clusters it finds on two significant topics, with excellent results. One of the main advantages of this work is that it takes an unsupervised approach, it requires no human annotations and it is robust and easily transferable because of the lack of assumptions on the data.

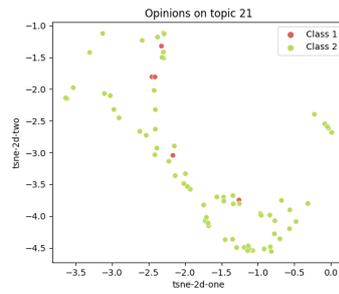
This methodology can be used by the social sciences in theoretical speculations and in our understanding of opinion, as well as in applied settings to cluster opinions with few assumptions and limiting the researcher’s own personal bias. Alternatively, it can also be employed as an instrument in more practical scenarios such as policy-making.

6 Limitations and Future Work

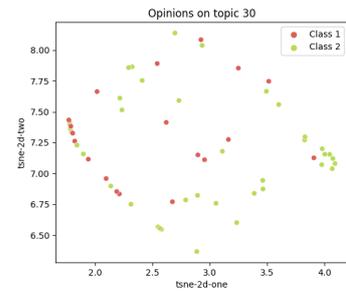
We believe that the main limitation in the line of work work is the lack of ground truth, which limits the development of objective success metrics. This limitation is intrinsic to any work in this area, as the separation of opinions is subjective in nature, but it poses difficulties in assessing the quality of the clusters. An important next step would be to find ways to clean the data in order to make the detection of the optimal number of clusters easier and more effective. The topic modelling stage partially takes care of this, but the presence of ‘neutral’ news that carry no opinions makes the clustering harder. Another much harder improvement would be to automatically cluster opinions from the *entire* tweets space, without conditioning on a specific topic (the first part of step 5 in the methodology section). Additionally, it would be interesting to adapt this methodology to study the development of discourse over time and to observe opinions’ dynamics.



(a) T-SNE embedding of the microtopics and sentiment vector of tweets whose main topic is 5, with colouring representing the result of the kmeans clustering.



(b) T-SNE embedding of the microtopics and sentiment vector of tweets whose main topic is 5, with colouring representing the result of the kmeans clustering.



(c) T-SNE embedding of the microtopics and sentiment vector of tweets whose main topic is 5, with colouring representing the result of the kmeans clustering.

7 Appendix

Table 1: Full clusters of non-news tweets regarding topic 5

Class 1	Class 2
These charlatans will leave the UK defenceless and penniless - BJ urges UK to offer ALL our fighter jets and tanks to #Ukraine absolute #Madness	Don't let the sky be the limit: Send #planes to #Ukraine – plane and simple.
The West doesn't need to send fighter jets to #Ukraine IF they have credible anti-aircraft defense systems to protect their ground forces. It's that simple &; it has been the case since hostilities broke out. Jets can be used aggressively, defense systems can't	I wish it's because #Putin has had word that Britain has offered planes to #Ukraine and is organising a coalition to do likewise.
When you were UK PM I never heard you offering any planes to #Ukraine Easy to offer them when you know that you literally don't have to make that decision anymore #Hypocrite	@user Ukraine deserve more than just a fighter jets. #ukraine needs more men from #NATO allies to defeat #russia period.
An odd choice for #itvnews to lead on the fact that #Ukraine current #SU27 and #MIG29 aircraft are 30 year old technology when the Ukraine's preferred replacement is the #F16 that first flew in 1974. Even the Typhoon, which they also want, first flew in 1994 28 yrs ago.	Sending fighter jets to #Ukraine is a top priority issue on today's agenda
@user Make no mistake: Whatever Western war-planes will be sent to Ukraine will NOT be sent to prevent #Ukraine's inevitable military defeat but to gather valuable combat data against Russian air defence. The real threat to #Russia from that, likewise, is on the future battlefield, not in Ukraine	Bravo! 1st step. How about a lend-lease, to #Ukraine? The Republic of Ukraine are fighting for us! Jets will protect the tanks. Together, they make the difference for a coordinated effort to liberate UA ...as we all know. #ArmUkraineNow
@user I think that's a load of tosh. #Poland already gave #Ukraine jets (older ones) right at the beginning of the war. They broke them down into pieces and trucked them over the border. I don't see how this is any different, it's just newer planes. #UK	Looks like United Kingdom will be the first western country to send Ukraine fighter jets?! #Ukraine #UkraineRussianWar
They cannot take our fighter jets. The UK needs our Typhoons and F35's more than we have ever needed them in the past. Also the war would just escalate #Ukraine #bbcnews	Time for tea? Time for plane

<p>"Deliveries of British fighter jets to Ukraine would have military and political consequences for the entire European continent, Russian embassy in UK says - TASS" I did not think that UK wanted to send Hunter, Javelin, Lightning or Meteor? No "British" after those.</p>	<p>Didn't BAE Systems recently say that upgrading (& retaining) the RAF's remaining 30 Typhoon Tranche 1s, due to retired in 2025, was feasible? #avgeek #Ukraine</p>
<p>Sending jets is probably not the best idea, tanks is enough, the UK is a tiny island let the USA send some before we get nuked! Has our PM got a brain! #Ukraine</p>	<p>Great to see the #UK leading and going all-in. After being the first to offer #Ukraine modern battle tanks, HM Government will begin to train Ukrainians to use modern fighter jets...</p>
<p>If we give them fighter jets, does that constitute entering the war. #Ukraine</p>	<p>@RishiSunak Sir, do we have any mothballed aircraft we could send to Ukraine? I am specifically thinking of the recently retired Panavia Tornado fleet... #Parliament #Ukraine #presidentzelenskyy</p>
<p>Should we send #fighterjets to #Ukraine I say no.</p>	<p>@user the question should be 'will the UK give #Ukraine fighter planes soon?'</p>
<p>Give us jets to secure our freedom, Volodymyr Zelensky urges UK. We can only supply Ukraine the Weaponry we do, by weakening our capability to defend ourselves. Ukraine like UK has not previously invested enough in defence! #NATO #UK #Ukraine</p>	<p>Now we must send #Ukraine modern fighter planes to protect their skies.</p>
<p>Any use of fighter planes for Ukraine should be a Nato decision and not a stunt from the desperate Tory regime to try and gain some credibility ##nato #Ukraine</p>	<p>"It doesn't matter what these foreign aircraft will be: be it an #AmericanF16, a #SwedishGripen, #FrenchMirage or Rafale, or be it a #Eurofighter" NATO fighters of any kind are needed as #RussianArmy forces are poised to take. E. #Ukraine by storm!</p>
<p>Can someone explain to me if ukraine is winning the war why are the uk USA and Germany sending tanks to them and now the uk is sending jets. Surely that's the actions of a side losing? Or am I wrong #Ukraine</p>	<p>If you're winning a war, be sure to go around the world asking for more fighter jets. #Ukraine #PMQs</p>
<p>Unprecedented yesterday we were talking tanks today fighter aircraft as UK says it will consider sending jets as 'long-term solution' What is really going on? As usual the public are given The Mushroom Treatment #Ukraine #truth #Tanks #FighterAircraft</p>	<p>Judging by the early evening's press conference & tomorrow's Newspaper headlines it seems like MSM have decided that we need to send Fighter Jets to #Ukraine. Almost every newspaper appears to be leading on Zelensky request. What about Defence Budget? Hmm #GBNews #Headliners</p>
<p>I've always thought that 'the west' supplying jets to #Ukraine will be seen as Putin's red line. Which is pretty scary... I can see us leading the way doing so though #UkraineWar</p>	
<p>@user Absolutely delusional to believe sending fighter jets will allow #Ukraine to 'finish the job'! #UkraineRussiaWar</p>	
<p>Q: Would YOU be willing to see British Armed Forces personnel lose their lives, fighting for Ukraine #UkraineRussiaWar #Ukraine #UkraineWar #BritishMilitary #Army #Navy #RAF</p>	
<p>@user In my annoyance I forgot the basics. #Ukraine won't be able to fly them anyways. Yup. #GBNews</p>	

#ukraine claims to need fighter jets because all of it's air force has been shot down... can anyone guess what will happen to western jets donated to @zelen-sky? #cdnpoli #ukpoli @user @user @user @user @user @user @user @user	
#Labour and #Tories may grant Fighter jets to #Ukraine, and in lieu train up to 20,000 Ukraine personnel, ramp up the defence budget.... While ignoring #Nurses, #Paramedics #Teachers and #EnergyCosts in UK ...	
@nexta.tv #Ukraine has needed Fighter Jets since #Putin invaded !	

Table 2: Full clusters of non-news tweets regarding topic 21

Class 1	Class 2
Just when you thought you couldn't respect him even more... #Zelenskyuk #Zelensky #ukraine	@user @user Just a nugget of info.. Zelensky is a Zionist and SUPPORTS #Israel's INVASION, OPPRESSION & ETHNIC CLEANSING of #Palestine yet expects the world to be outraged at Putin doing SIMILAR to #Ukraine.. the only difference is Putin doesn't want to kill EVERYONE unlike #Israel who does.
@user Have you seen Nadia Whittome tweet praising #Zelensky and calling for a #Ukraine victory? She's supposed to be one of the good ones	@user And Zelensky is a Zionist. He was filmed signing a Zionist mandate to cut the Palestinians human rights EVEN further while he was on a visit to #Israel. You know the #Israel thst invaded, oppresses and kills #Palestinians.. Very similar to the #Ukraine/#Russia situation
#Zelensky What an inspirational hero #Ukraine #Ukrainemustwin Make Ukraine Great Again	If #Russia ends up winning this war, and #Ukraine partitioned....which may well end up as the likely scenario What will #Zelensky have achieved for the people of Ukraine? Territory losses alongside 1000s dead, infrastructure broken.... the losses will have been preventable Lol
Prez #Zelensky today effortlessly being a sincere human being and world class leader at the same time. #UkraineWillWin #ArmUkraineNow #WingsFor-Freedom #ZelenskyWarHero #Ukraine #United-Kingdom #RussiaIsATerroristState	Volodymyr Zelenskyy and his friends playing the piano with their penises in 2016. Can't make this shit up. #Ukraine #UkraineRussiaWar
#UKRAINE TO FACE STAGNATION IN WAR WITHOUT NEW WEAPON: ZELENSKIY	@user What the well known corrupt Zelensky 'knows,' is irrelevant. The world does not need Zelensky's worthless, rotten endorsement. #cdnpoli #Ukraine

Zelensky, the war hero. #Zelensky #Ukraine #Russia	Zelensky & co., don't like peace. War is a profitable business . The bloodshed is worth every penny to them, and sacrificing Ukrainians & Russians, worth it. This corrupt calculation could never get out of control, they think. #Ukraine #Zelensky #War
Zelensky and the King. #Ukraine #StandWithUkraine	President Vladimir Zelensky condemned Ukraine to destruction in the name of Western interests because he is too incompetent and ambitious to govern it properly, exiled opposition leader Viktor Medvedchuk believes. #Ukraine
Good to see Zelensky getting the reception as a world leader he is #ukraine	@user Nothing has value for #Zelensky All fake, like him #Ukraine
#Zelenskyy Clearly Wants to Survive & Take His Millions OUT of #Ukraine When the #AzovBattalion Nazis Collapse Later this Year	@user @user Are you likening Zelensky to Hitler?? Seriously? Germany invaded, Ukraine didn't #Zelensky #Ukraine #KingCharles
Couldn't agree more. President Zelenskyy is inspirational, such a courageous leader #Zelenskyy #Zelensky #Ukraine	Does Vova get what Vova wants? Well, Vova wanted Zelenskiy's head on a plate in February 2022 and yet, one full year later, here we are. #Ukraine #Putin #Russia
Today our friend Viktor would have celebrated his birthday. But russia take lives as if no one except them should exist. Viktor died defending #Ukraine. We love you, friend, and we remember you (and everyone!)	The state of this sycophantic little snool #Zelensky #Ukraine
Long live a free Ukraine. #Ukraine #Zelensky	#Ukraine And this is where it's got to stop. Zelensky's begging rounds need to be tempered with insistence on negotiations. We can't keep supporting this death and destruction for a war driven by lobbyists.
Zelensky made it clear what Ukraine needs to win #zelensky #ukraine #war #UkraineRussiaWar	Be careful who you praise, Mr Zelensky as you'll become the left's number one enemy in the blink of an eye. #Ukraine #UkraineRussianWar
President Zelensky may be short in stature, but you don't see that when you look at him. He's a giant of a man and a leader in every way. He puts our tawdry politicians to shame. #Ukraine #ZelenskyWarHero	@user UK/GB:Yep, you haven't disappointed me at all. First the corrupt hypocrites of the West hid him from Soviet Justice so he couldn't be tried for his crimes against humanity. Now you all openly applaud him. Stepan Bandera and his disciples thank you!:#GlorificationOfNazism #Ukraine
@user But despite Zelensky's English the message was conveyed well. #Ukraine will win, I have no doubt. Russia should pay reparations to Ukraine as well. Volodymyr Zelensky has shown great leadership for his country, far more than any of the spineless lot we've had since Brexit.	Zelensky is now comparing himself to the racist blowhard Winston Churchill. Evidently, the Ukrainian autocrat is drinking too much of his own KoolAid. #zelensky #Ukraine #UkraineRussianWar
#Zelenskyy seriously is different gravy. His fortitude and resolve, our 'leaders' could learn a lot from - sadly nearly all don't have the Cajones, apart empty posturing. #Zelenski #Ukraine	Zelenskyy is playing the entire Western world for fools. #Ukraine

My goodness, Zelensky is powerful. I hope that a certain politician is standing in there somewhere actually listening to what this man is saying and accepting the truth of what is happening in this man's country. #SlavaUkraini #Ukraine	#Odessa #Ukraine man I'd dragged off by the manhunters for forced mobilization as he desperately tries to call his family. While Zelensky is getting greeted as a hero in the #UK. Ukrainian ppl had enough!
#Ukraine #Russia Easy solution for both sides. Zelensky and Putin go to the MMA cage and have at it. Winner takes all. Save thousands of lives.	@user #Zelensky explains Stepan #Bandera (#Nazi collaborator) is a hero for #Ukraine and "that's cool". you are a cymru nazi
Zelensky ;3 It just takes one person! #Zelensky #Ukraine #wednesdaythought	Starmer, a bought & paid-for ZOG muppet (married to a Zionist Jewess) crowing for #Zelensky the Jew puppet put in place by a ZOG colour revolution. Hilarious #Zelenskyy #Ukraine
	#Ukraine #Russia #Nato #Zelenskyy it seems zelenskyy was ready to fight even before the war started??? zelenskyy knew in advance he would provoke russia with crossing the red line (potential NATO membership) and it's very risky to do so (many leaders even warned him).
	Ukrainian men really don't want to fight. Why should the war continue? #Zelensky should listen to Ukrainians. #Ukraine #UkraineRussiaWar
	There's a strong possibility that this guy Zelensky could be the antichrist. The one thing that this guy doesn't have is.... (He's not homosexual) (I believe he's married) but we'll see. #Zelensky #Ukraine #United-Kingdom
	When the war in Ukraine is finally over, with half the country dead or maimed, Zelensky will end up living in LA with billions in the bank and a TV talk show.... #Ukraine #UkraineRussianWar #UkraineWar #Russia #NATO #USA #Selenskyj #EU #NAFO #UkraineIsLosing #Breaking #Soledar
	Kid's fighting in #Ukraine #Zelensky #ZelenskyyWarCriminal
	#Zelenskyy's NeoNazis are Losing Control in #Ukraine. Clearly Sensible People are Sick of #AZOV NAZI Agenda which has Destroyed the Country. #msnbc #foxnews #nytimes #cnn #politico #huffpost #newsmax #gop #npr #fox #nyt #wapo #nbc #cbs #NATO #EU #g7 #bbc

	#Ukraine Won't surrender Insignificant #Bakhmut? #Zelenskyy Keeps Making Crazy Irrational Statements that Can't be Done. How Much More will #Ukrainians Tolerate? #msnbc #foxnews #nytimes #cnbc #politico #huffpost #npr #fox #nyt #wapo #nbc #cbs #NATO #EU
	#ukraine is a corrupt nation... we all know by now that this is a proxy war, the west Vs #russia. #Zelensky is an idiot, he's the face of the #nwo and this is why he's doing the rounds.
	I hadn't realised until now that this hashtag and some variations are actually a thing. #Zelenskyy #Ukraine
	The welfare queen forcing his citizens to their death. I thought Ukraine was winning? #ZelenskyWarCriminal #Ukraine
	@user I'm not going to read any article regarding this terrorist just like I'm not going to read any article regarding #ZelenskyWarCriminal #Ukraine Zelensky
	As Ted Galen Carpenter writes, the "fawning" treatment of Zelensky by political and media elites in the West "ignores the mounting evidence of Zelensky's flagrant abridgment of civil liberties and democratic norms." #zelensky #ukraine
	giving more importance to a little man called #Zelensky and his ravings, rather than listening to the voice of a people of a nation #Ukraine at the mercy of this person, reminds me so much of 1940...
	president zelensky 77th brigade bot ukraine are losing bad no one gives a shit about #Ukraine
	Zelensky to the @UKParliament: 'Everyone who invests in terror should be taken accountable'. #Ukraine #Zelenskyy #StandWithUkraine
	Zelensky and the murderous delusion that wars and more wars are the foundations of western liberties and societies... #Zelensky #Ukraine #UkraineRussiaWar @user @user @user
	Zelensky is clueless about the public sentiment towards Johnson #Bojo #Ukraine #Zelensky

	An untruth from @Skynews and their reporter @user. #Zelenskyy is not in fear of his life. He has gotten assurance from Putin via Israel that Putin will not kill him. So why are you peddling this false information?? #Ukraine #UkraineRussiaWar #skynews #PMQ
	All this fawning over Zelenskyy is very weird if you ask me.
	nskyy #Ukraine
	Ironic that young Zelensky who played a man unwilling to go to war, is now rounding up Ukrainians, against their will, to die in America's war against Russia.(video via @user) #Ukraine
	Not boxing, Zelenskyy go away and o wouldn't let you put my bins out you slimy piece of shit #uk #Ukraine
	Even west knows, #Ukraine would never win this war of no substance against #Russia. Zelensky will go down in history, how he destroyed his own nation, livelihoods over his pettiness. #RussianUkrainianWar A true leader never chooses war, only small sighted person does!
	Tbh, #Ukraine ppl deserved a better leader! Zelensky didn't even honor the plebiscite, and attacked on Crimean bridge and nuclear contaminations etc. And when #Russia retaliate, he turns on front camera, goes live and starts crying again infront of world.
	President Vladimir #Zelensky condemned #Ukraine to destruction in the name of Western interests because he is too incompetent and ambitious to govern it properly, exiled opposition leader Viktor #Medvedchuk believes.
	#Ukraine How dare even consider imposing on Mr. Zelensky and the Ukrainians to negotiate with this barbarian ?
	You see and understand, it literally and only is a western war against #Russia, it never is and was a Russian war against #Ukraine. ps, #Zelensky = big time and completely sold out coward, #Naftali has spilled the beans. Thank you @user, you my favorite eye into the world.

Table 3: Full clusters of non-news tweets regarding topic 30

Class 1	Class 2
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<p>Talent is not wisdom, barfing is not singing, and there is no fool like an old fool! Ukraine denounces @rogerwaters as ‘another brick in the wall’ of Moscow propaganda, and urges him to cease chasing ‘flying pigs’. #Ukraine #PinkFloyd</p>	<p>Pink Floyd’s Roger Waters calls for peace in #Ukraine at #UN Security Council #UNSC #USA #NATO #Nazism #StateSanctionTerrorism #Norway #NordStream #ICC #WarCrimes #NATOWarOnRussia #ProxyWar #Ukraine #Russia #Iraq #Syria #TurkeySyriaEarthquake #NPR #NYTimes</p>
<p>@rogerwaters has just arranged an appointment for himself at #TheHague for his unadulterated support for a heinous, rapacious #Russian #oligarchy dripping with the blood of their #warcrimes in #Ukraine. #RussiaIsATerroristState #WarCrimesofRussia</p>	<p>WE DON’T NEED DENAZIFICATION: With hope lost in Western politicians, the truth comes from the odd artist, as founder of legendary band Pink Floyd, Roger Waters, says Russia’s Special Operation in #Ukraine was NOT UNPROVOKED, during his address to UN Security Council.</p>
<p>Roger Waters addressed the U.N. condemned Moscow invasion of #Ukraine as illegal though adding he believed it was PROVOKED. He is lucky to be in NYC, if he had been in Russia he would be in custody by now. Infuriating #Ukraine #UkraineRussiaWar</p>	<p>Volgens #RogerWaters: #Ukraine Invasion Was ‘Not Unprovoked’ at #UN #SecurityCouncil #stopNATOexpansion #usaproxywar #usabiolabs</p>
<p>#UkraineWar #Ukraine #Russia Ukraine denounces Roger Waters as ‘another brick in the wall’ of Moscow propaganda. Kyiv outraged as #PinkFloyd star accepts Russian invitation to speak at #UN security council and calls for immediate ceasefire</p>	<p>@user @rogerwaters @rogerwaters is only part of @pinkfloyd history. The real @pinkfloyd support #Ukraine.</p>
<p>Ukraine denounces Roger Waters as ‘another brick in the wall’ of Moscow propaganda #KYIV #UKRAINE</p>	<p>Roger Waters said this bravely before we had Hersh’s inside source alleging the same things (provocations were long planned). #Ukraine</p>
<p>@user you @rogerwaters really are insane and a fucking putintroll #Ukraine #russia #UN</p>	<p>Ukraine’s UN ambo @user as Pink Floyd’s Roger Waters addresses the UNSC on #Ukraine</p>
<p>Roger Waters for President #ApartheidIsrael #NATO #Ukraine</p>	<p>Yup, world-renowned weapons expert @rogerwaters is on videoscreen live in #UN Security Council in Russian-led meeting on arms flows to #Ukraine</p>
<p>@RollingStone Not once has Waters said he supports #Putin’s invasion of the #Ukraine. Waters has said is work towards peace & avoid WW3. Corporate Media won’t tell that side. They want war, ratings, clicks, & profits. Also defending Palestinians makes you antisemitic now? We’ve lost our way.</p>	
<p>@user @rogerwaters @rogerwaters was cool in the 20th century, but is apparently a RUSSIAN SYMPATHISER now. If #Ukraine is allowed to become Russia, nothing will stop them from invading Europe. Fuck Roger Waters’ beliefs. #FirstStrike #Moscow Now!!!</p>	
<p>It is pretty sick to see @rogerwaters become one of the bricks in the wall of colonialist regimes, and genocidal egomaniac billionaire dictators. #Ukraine</p>	

Well that kind of backfired for #Russia, eh? – Invited by Russia, #PinkFloyd co-founder Roger Waters condemns "illegal" invasion of #Ukraine - by @user @user	
@user since when has Roger Waters become a source of evidence regarding #Ukraine? #Russia'n clowns.	
@user Kindly go Fuckoff @rogerwaters it's ashame you become a shill for the murderous Putin. #rogerwatersdefendsmurderousdictators #ukraine	
Roger Waters, you are a dick! I once loved your music... Well, thanks to the rest of @pinkfloyd I am still able to enjoy their wonderful music here in #Ukraine! @davidgilmour #SupportUkraine	
#US questions @rogerwaters' expertise on weapons & his speaking on behalf of Ukrainians We are in #UNSC yet again to hear it's Ukraine's fault for the war Russia's invasion of #Ukraine is illegal	
If you, for some odd reason, ever looked at Waters as your moral compass, I truly hope that at least this video will make you stop doing that #Russia #Ukraine	
#Russia asks Pink Floyd's Roger Waters to speak at UN Security Council on #Ukraine – [Note the gratuitous inclusion of the bullshit opinion of an associate's wife] #MSM	
@user #RogerWaters I disagree with Roger Waters over the war in #Ukraine, 100% in agreement with him that the current gov't of #Israel is cruel and brutal and committing war-crimes on a daily basis against the #Palestinians. I don't believe he has an antisemitic bone in his body.	
Roger Waters destroys CNN on Ukraine war ##war ##russia ##putin ##Ukrainewillwin ##Ukraine ##UkraineRussianWar	
Roger Waters is trending because radical right wingers and neo liberals hate peace its that simple he speaks truths and fash's hate on him for it...they hate him because he has moral consistency. #Russia #Ukraine #UN	

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