Interpretation for clusters of Twitter accounts (Z-score charts)

READ CAREFULLY: The U.S Presidential Elections in 2016 were accompanied by many controversies. One of them is that the Russian government allegedly tried to influence result of the elections by spreading fake news, propaganda and misinformation. The U.S. Congress released a list of 2,848 Twitter accounts suspected of being tied to Russian goverment. We call those accounts "Troll accounts".

The aim of our study is to determine how to cluster* those Troll accounts according to the similarity of tweets that were posted by them. We created a clustering model that clusters Troll accounts into six clusters. Due to amount of data, we had to use computational Natural Language Processing** algorithms to perform the clustering. As a consequence, the result of the clustering is not directly understandable to humans.

To facilitate communication of the results, we propose several ways of visualization of the clusters. In this study, we would like to evaluate these alternative visualization for their interpretability and comprehensibility.

* Refer to https://en.wikipedia.org/wiki/Cluster_analysis (https://en.wikipedia.org/wiki/Cluster_analysis) for more information about clustering.

** Refer to https://en.wikipedia.org/wiki/Natural_language_processing (https://en.wikipedia.org/wiki/Natural_language_processing) for more information about NLP.

There are 29 questions in this survey.

Prolific ID

Please, enter your Prolific ID: *

Please write your answer here:

Prior knowledge

In this section, we will ask you about your prior knowledge of topics related to this survey.

On scale of **1** to **10** how would you rate your knowledge about the following topics?

(**1** - no knowledge at all; **10** - highly knowledgable about this topic) *

Please choose the appropriate response for each item:

	1	2	3	4	5	6	7	8	9	10
Clustering / Segmentation (unsupervised data mining algorithms)	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
NLP (natural language processing)	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
Concept of Z-scores (Standardization technique)	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
Russian interference on U.S. Presidential Election in 2016	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯

With which U.S. political party is **Hilary Clinton** affiliated? *

❗ Choose one of the following answers
Please choose **only one** of the following:

◯ Democrats
◯ Republicans
◯ Other

With which U.S. political party is **Donald Trump** affiliated? *

❗ Choose one of the following answers
Please choose **only one** of the following:

◯ Democrats
◯ Republicans
◯ Other

Which candidate won the **U.S. Presidential Election in 2016**? *

❗ Choose one of the following answers
Please choose **only one** of the following:

◯ Hillary Clinton
◯ Ted Cruz
◯ Donald Trump
◯ Bernie Sanders

Classify Troll accounts

Z-score chart visualization of the clustering model is shown below. Charts outline ten most and least frequent words in each cluster. Words marked **orange** are more frequent in the cluster than in the complete data set. Words marked **blue** are less frequent in the cluster than in the complete data set. Horizontal axis values represent word's frequency* normalized by z-score method**.

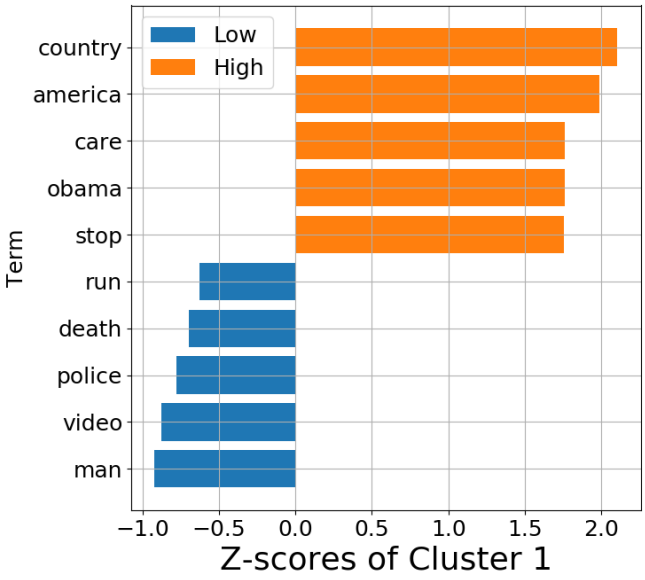
In the picture below, you can see a Z-score charts for each cluster of Troll accounts. We ask you to assign each of the six Troll accounts presented below into one of the clusters. There are six clusters*** to choose from. Each cluster is presented by one of the charts. None of the six Troll accounts presented below belong to the same cluster.

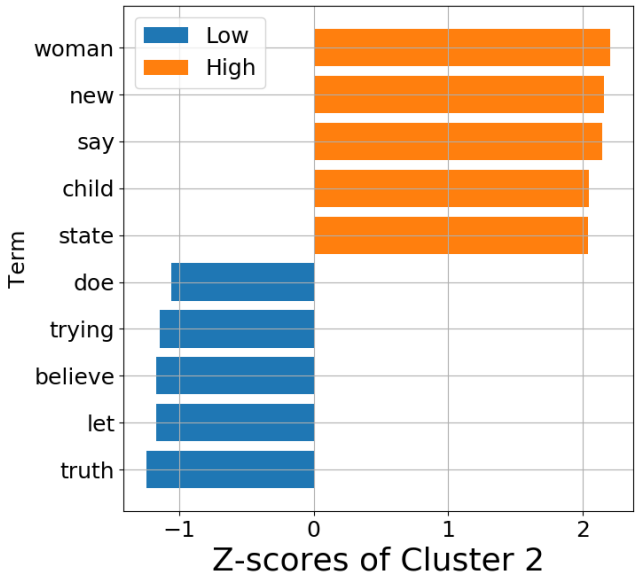
Troll accounts are represented by an example consisting of five tweets posted by them.

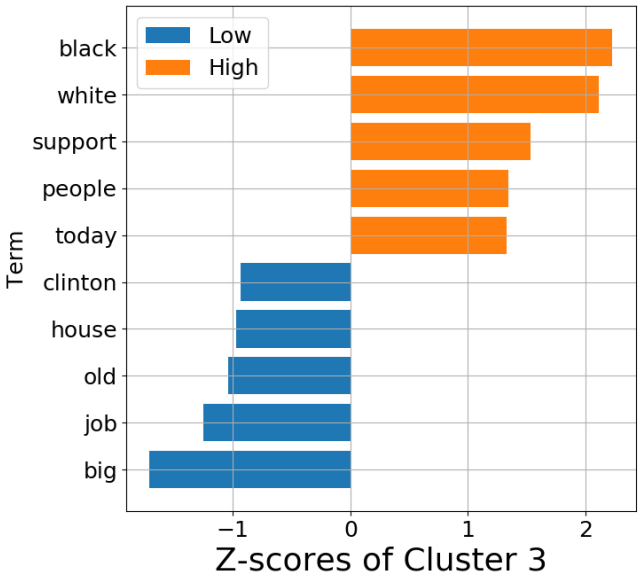
** We use TF-IDF to measure frequency. TF-IDF, short for term frequency–inverse document frequency, is a numerical statistic that is intended to reflect how important a word is to a document in a collection or corpus. It is often used as a weighting factor in searches of information retrieval, text mining, and user modeling. The tf–idf value increases proportionally to the number of times a word appears in the document and is offset by the number of documents in the corpus that contain the word, which helps to adjust for the fact that some words appear more frequently in general [Wikipedia].*

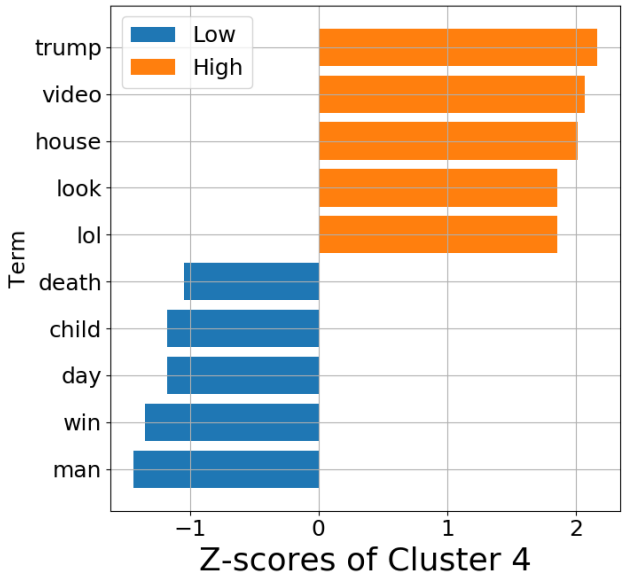
*** In statistics, the z-score is the signed fractional number of standard deviations by which the value of an observation or data point is above the mean value of what is being observed or measured. Observed values above the mean have positive z-scores, while values below the mean have negative z-scores [Wikipedia].*

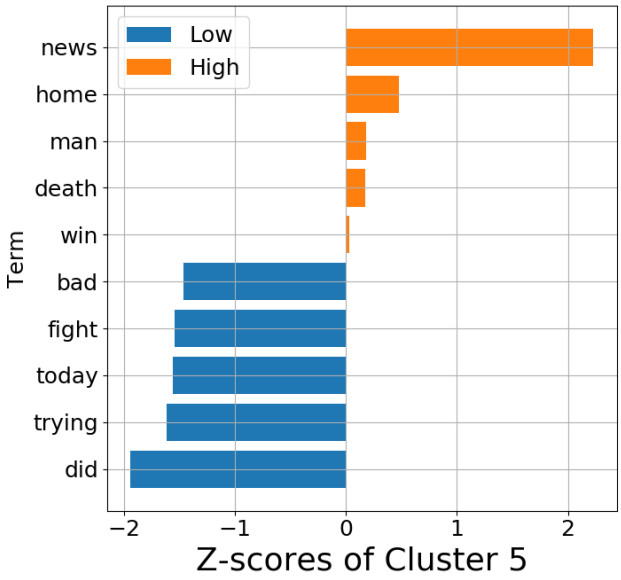
**** Cluster analysis or clustering is the task of grouping a set of objects in such a way that objects in the same group (called a cluster) are more similar (in some sense) to each other than to those in other groups (clusters). It is a main task of exploratory data mining, and a common technique for statistical data analysis, used in many fields, including machine learning, pattern recognition, image analysis, information retrieval, bioinformatics, data compression, and computer graphics [Wikipedia].*











To which cluster would you assign a Troll account that posted the following tweets?

- #BlackHistoryMonth #BlackEveryDay #BlackIsBeautiful #AmericanHistoryIsBlack
- I woke up in a cold sweat. Can't go back to sleep. My People, always on my mind. #BlackLivesMatter #BlackPowerBaby https://t.co/OxEsCEzzip (https://t.co/OxEsCEzzip)
- We need justice. Police are not who can help with it. #policebrutality #WearHoodieForTrayvon https://t.co/RNCJoa9tIz (https://t.co/RNCJoa9tIz)
- Any black journalist worth a damn would've researched race of the #OscarsSoWhite supporters, managers
- Get $0.05 for every download. $5.00 for every biz. https://t.co/jtsItkOFRk (https://t.co/jtsItkOFRk) #blackowned #BuyBlack #blacktwitter https://t.co/FTpIQbHH8a (https://t.co/FTpIQbHH8a)

*

Choose one of the following answers
Please choose **only one** of the following:

- ◯ Cluster 0
- ◯ Cluster 1
- ◯ Cluster 2
- ◯ Cluster 3
- ◯ Cluster 4
- ◯ Cluster 5

To which cluster would you assign a Troll account that posted the following tweets?

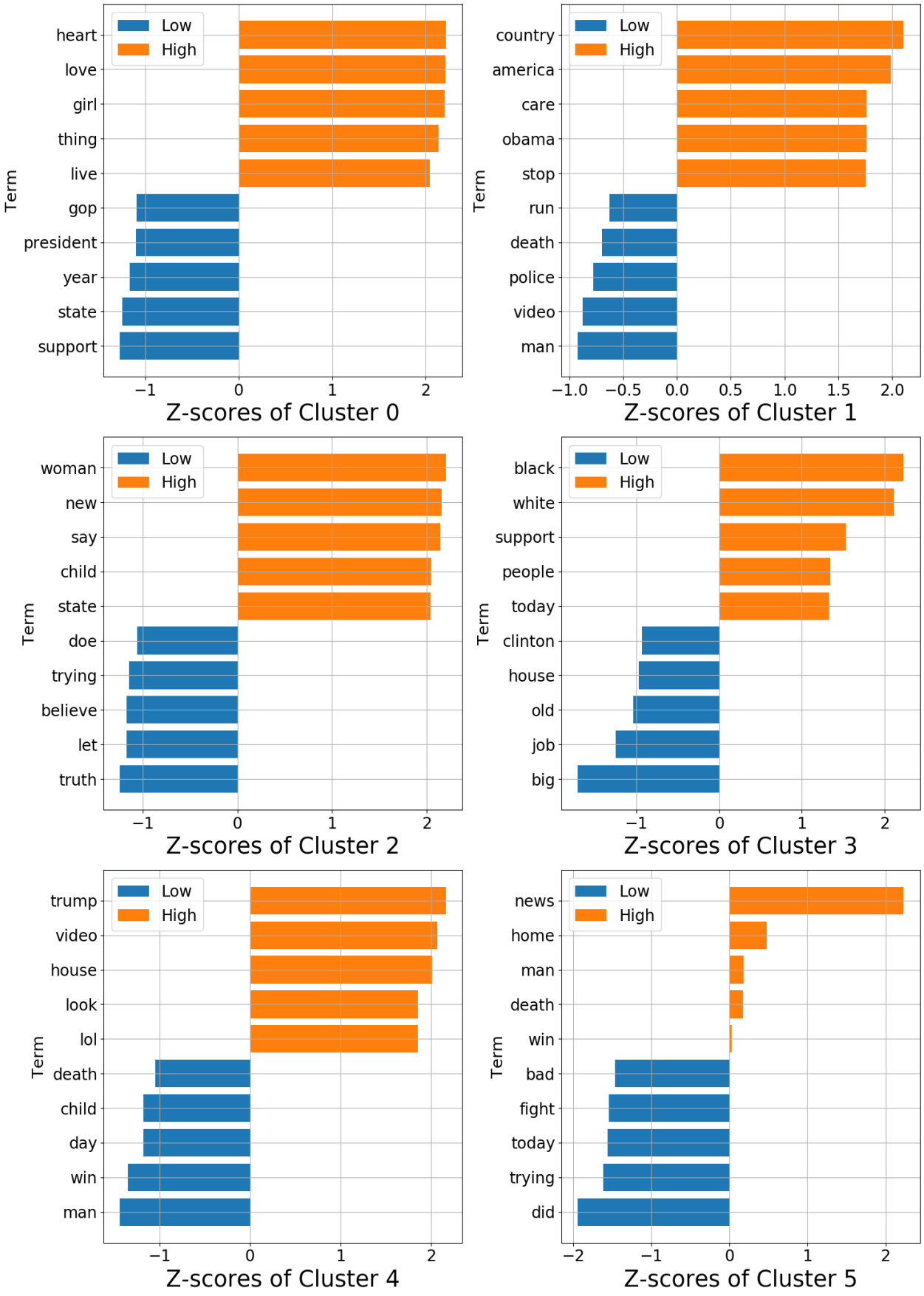
- #Politics #News U.S. Senate passes bill renewing federal terrorism insurance program: WASHINGTON (Reuters) - The U.S. Senate on Thurs…
- #Politics #News Paris attack complicates Republican plans on U.S. security funding: WASHINGTON (Reuters) - The deadly attack in Paris…
- #News #Crime Police seize 2,700 marijuana plants at grow houses in San Jose, San Leandro and Fairfield (San Jo... http://t.co/IfliGnccl8 (http://t.co/IfliGnccl8)
- #News #US U.S. military Twitter account hacked (CBS News) http://t.co/IbEbt7Taq6 (http://t.co/IbEbt7Taq6)
- #TopNews Short courses offer hope to U.S. education companies http://t.co/GQOhi63qbH (http://t.co/GQOhi63qbH)

*

Choose one of the following answers
Please choose **only one** of the following:

- ◯ Cluster 0
- ◯ Cluster 1
- ◯ Cluster 2
- ◯ Cluster 3
- ◯ Cluster 4
- ◯ Cluster 5

Same visualization repeated for easier reference:



To which cluster would you assign a Troll account that posted the following tweets?

- Of course, You can make America great again #VegasGOPDebate
- BREAKING: #HILLARY AUDITIONING TO BECOME 3RD MEMBER OF CIRCUS ACT. #MakeAmericaGreatAgain https://t.co/4rrRSnLebD (https://t.co/4rrRSnLebD)
- Of course, Obama has shown us how the dems are going to rule our country, and I don’t like it #VegasGOPDebate
- Donald Trump routinely lies, and the media lets him. Why? via @FortuneMagazine https://t.co/VfDHW6cgdr (https://t.co/VfDHW6cgdr) #CCOT #TeaParty #Nhprimary
- #demndebate What will you do with #Obamacare? #DemDebate

*

❗ Choose one of the following answers
Please choose **only one** of the following:

◯ Cluster 0
◯ Cluster 1
◯ Cluster 2
◯ Cluster 3
◯ Cluster 4
◯ Cluster 5

To which cluster would you assign a Troll account that posted the following tweets?

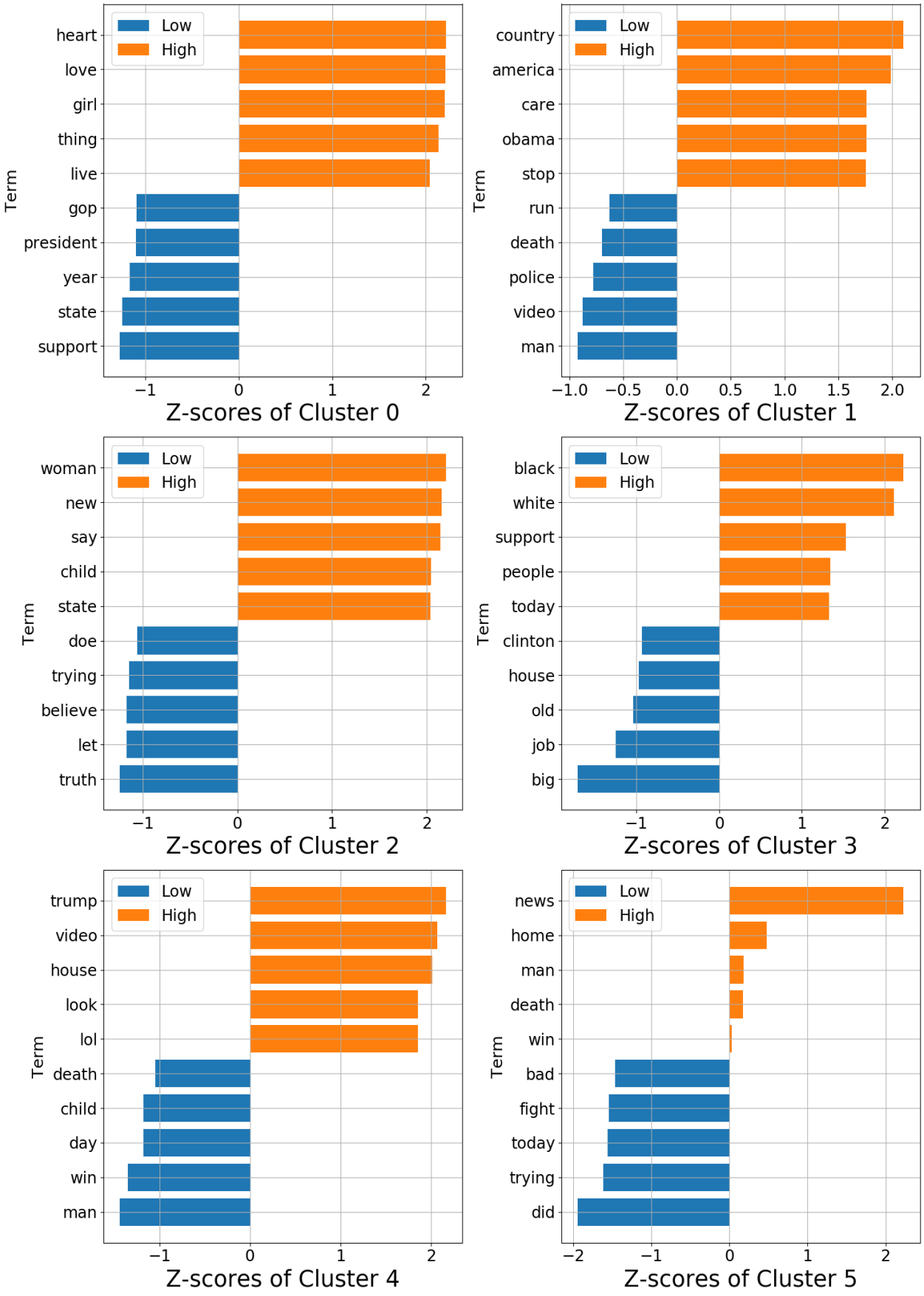
- don’t fall in love. fall off a bridge, it hurts less.
- I'm not gonna change for anyone, I don't care what people think, because I am me, and proud of it.
- If you truly love someone, then they never leave your heart, only your side. #iHQ
- "I like the way I feel when he looks at me. Like I wanna believe in myself." -Serena van der Woodsen #IAMONFIRE
- "Shut the fuck up and have the shot." -#GirlCode #Iamonfire

*

Choose one of the following answers
Please choose **only one** of the following:

- ◯ Cluster 0
- ◯ Cluster 1
- ◯ Cluster 2
- ◯ Cluster 3
- ◯ Cluster 4
- ◯ Cluster 5

Same visualization repeated for easier reference:



To which cluster would you assign a Troll account that posted the following tweets?

- 3 Dead, 4 Wounded in Mass Shooting on Rochesters Southwest Side
- Captured New York inmate pleads not guilty to escape charges
- New York Prison Escapee David Sweat Pleads Not Guilty to Escape an
- St. Louis Protests Sparked by 18-Year-Old Killed by Police
- Growing Washington wildfires are an unprecedented cataclysm, governor says

*

Choose one of the following answers
Please choose **only one** of the following:

- ◯ Cluster 0
- ◯ Cluster 1
- ◯ Cluster 2
- ◯ Cluster 3
- ◯ Cluster 4
- ◯ Cluster 5

To which cluster would you assign a Troll account that posted the following tweets?

- #ameliss Update : Google Fires Employee for Criticizing Forced Diversity https://t.co/EAYtQHy6kh (https://t.co/EAYtQHy6kh) #amelin https://t.co/xps1PXad6M (https://t.co/xps1PXad6M)
- #ameliss VIDEO : Corey SLAMS GOP Traitors Not on Board with Trump Agenda https://t.co/MVL7rFdi4Z (https://t.co/MVL7rFdi4Z) #amelin https://t.co/HuM2Ys8e9Y (https://t.co/HuM2Ys8e9Y)
- #ameliss Trump TRIGGERS Climate Change Freaks With THIS Policy Change https://t.co/TT3LJ1tP6c (https://t.co/TT3LJ1tP6c) #amelin https://t.co/j8BjZgtsKP (https://t.co/j8BjZgtsKP)
- #ameliss Anti-Trump Nevada Senator Dean Heller Just Got VERY BAD NEWS https://t.co/ipppFCnaac (https://t.co/ipppFCnaac) #amelin https://t.co/rmHlPPVOhq (https://t.co/rmHlPPVOhq)
- #ameliss BREAKING : Michelle Obama's Lunch Program Connected to Indicted Criminal https://t.co/tYznOdgwYS (https://t.co/tYznOdgwYS) #amelin https://t.co/faVpOVTvTL (https://t.co/faVpOVTvTL)

*

❗ Choose one of the following answers
Please choose **only one** of the following:

◯ Cluster 0
◯ Cluster 1
◯ Cluster 2
◯ Cluster 3
◯ Cluster 4
◯ Cluster 5

Explain clusters

Z-score chart visualization of the clustering model is shown below. Charts outline ten most and least frequent words in each cluster. Words marked **orange** are more frequent in the cluster than in the complete data set. Words marked **blue** are less frequent in the cluster than in the complete data set. Horizontal axis values represent word's frequency* normalized by z-score method**.

In the picture below, you can see z-score charts for each cluster of Troll accounts. We ask you to answer eight general questions about visualized clusters*.

** We use TF-IDF to measure frequency. TF-IDF, short for term frequency–inverse document frequency, is a numerical statistic that is intended to reflect how important a word is to a document in a collection or corpus. It is often used as a weighting factor in searches of information retrieval, text mining, and user modeling. The tf–idf value increases proportionally to the number of times a word appears in the document and is offset by the number of documents in the corpus that contain the word, which helps to adjust for the fact that some words appear more frequently in general [Wikipedia].*

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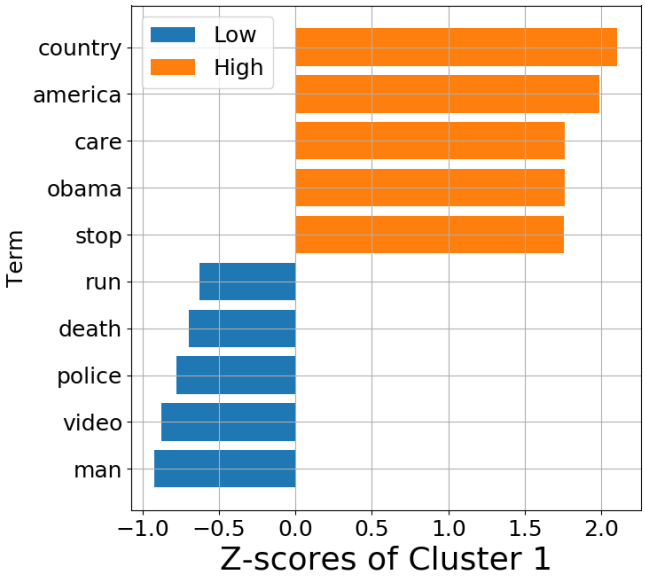
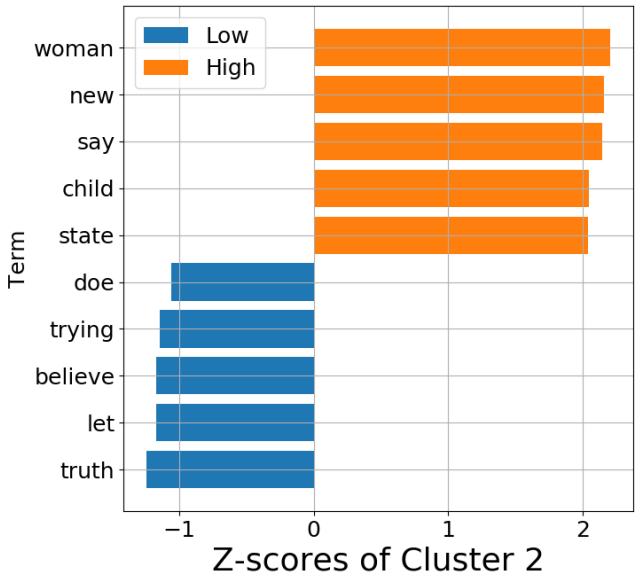
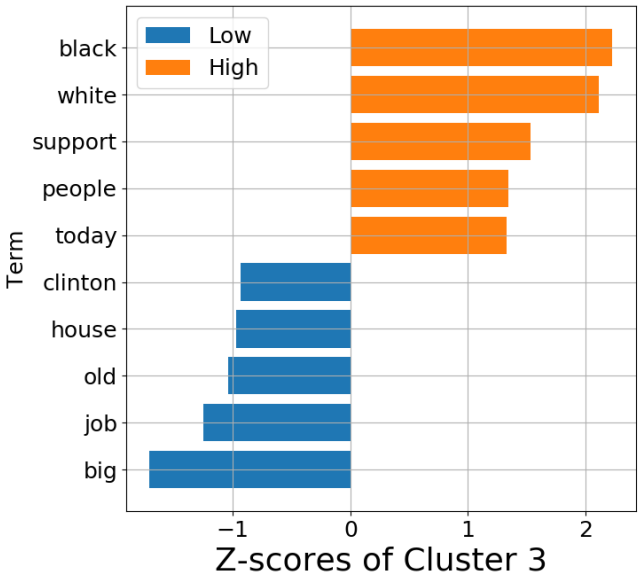
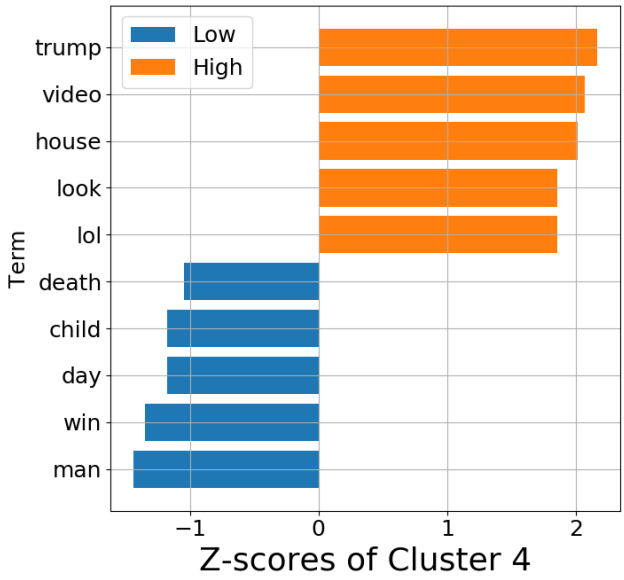
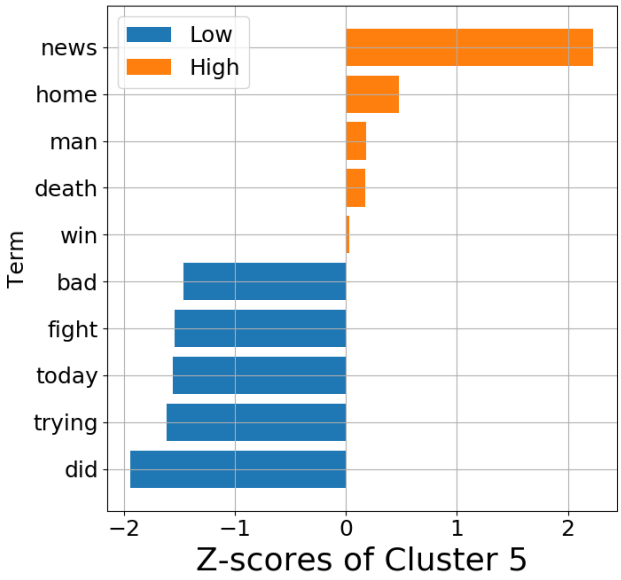










Which three words are the most characteristic for the **cluster 0**? *

Choose one of the following answers
Please choose **only one** of the following:

- ◯ police, Trump, Obama
- ◯ love, heart, thing
- ◯ black, police, white
- ◯ video, look, Obama

Which three words are the most characteristic for the **cluster 3**? *

Choose one of the following answers
Please choose **only one** of the following:

- ◯ police, Trump, Obama
- ◯ love, heart, thing
- ◯ black, police, white
- ◯ video, look, Obama

Which word would have to be added to the following tweet to most increase the probability of it becoming a **cluster 5** member?

- 3 Dead, 4 Wounded in Mass Shooting on Rochesters Southwest Side

*

Choose one of the following answers
Please choose **only one** of the following:

- ◯ police
- ◯ black
- ◯ news
- ◯ death

Which word would have to be added to the following tweet to most increase the probability of it becoming a **cluster 4** member?

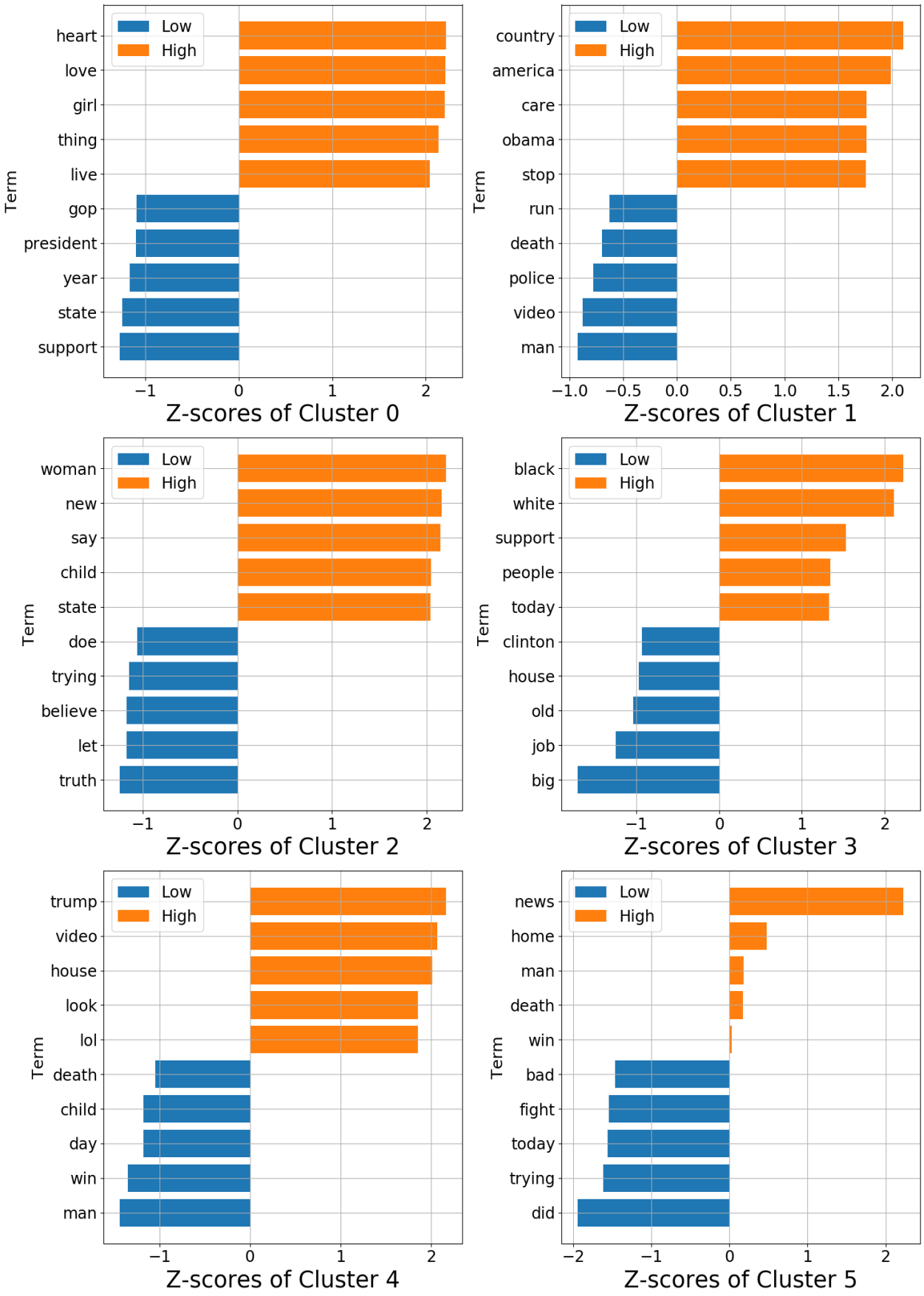
- We need justice. Police are not who can help with it. #policebrutality #WearHoodieForTrayvon https://t.co/RNCJoa9tIz (https://t.co/RNCJoa9tIz)

*

Choose one of the following answers
Please choose **only one** of the following:

- ◯ new
- ◯ trump
- ◯ look
- ◯ obama

Same visualization repeated for easier reference:



Which cluster could be described as accounts that tweet about racial issues?
*

Choose one of the following answers
Please choose **only one** of the following:

- ◯ Cluster 0
- ◯ Cluster 1
- ◯ Cluster 2
- ◯ Cluster 3
- ◯ Cluster 4
- ◯ Cluster 5

Which cluster could be described as accounts that tweet about news stories? *

Choose one of the following answers
Please choose **only one** of the following:

- ◯ Cluster 0
- ◯ Cluster 1
- ◯ Cluster 2
- ◯ Cluster 3
- ◯ Cluster 4
- ◯ Cluster 5

What is the best suitable description for the **cluster 2**? *

Choose one of the following answers
Please choose **only one** of the following:

- ◯ accounts that tweet about crime
- ◯ accounts that tweet about news stories
- ◯ accounts that tweet about Donald Trump
- ◯ accounts that tweet American presidents

What is the best suitable description for the **cluster 1**? *

❗ Choose one of the following answers
Please choose **only one** of the following:

◯ accounts that tweet about Donald Trump
◯ accounts that tweet about American presidents
◯ accounts that tweet about crime
◯ accounts that tweet about news stories

True/false questions

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In the picture below, you can see z-score charts for each cluster*** of Troll accounts. We would like to ask you eight true/false questions about the visualizations.

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Low
High
heart
love
girl
thing
live
gop
president
year
state
support
Term
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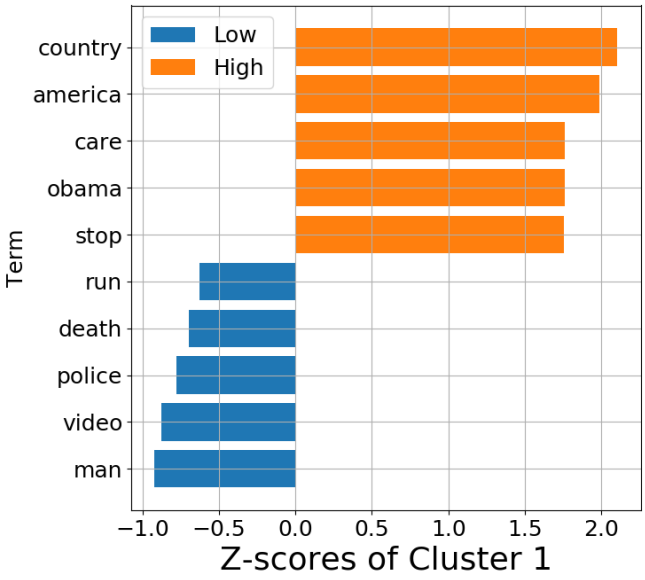
0
1
2
Z-scores of Cluster 0


Low
High
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america
care
obama
stop
run
death
police
video
man
Term
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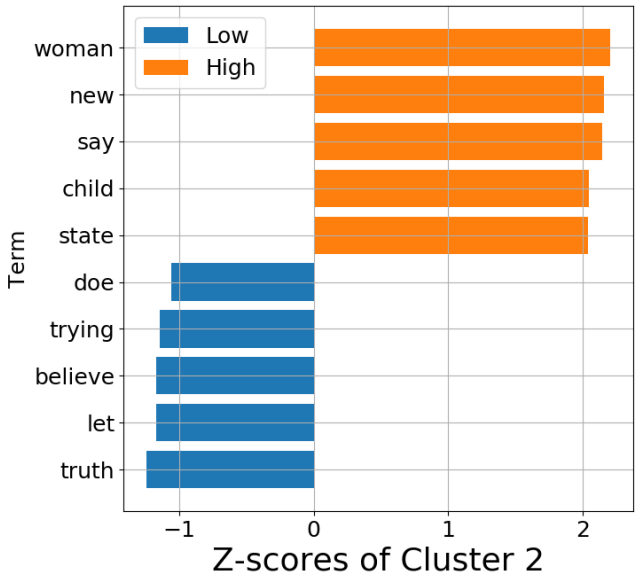
−0.5
0.0
0.5
1.0
1.5
2.0
Z-scores of Cluster 1


Low
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woman
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trying
believe
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truth
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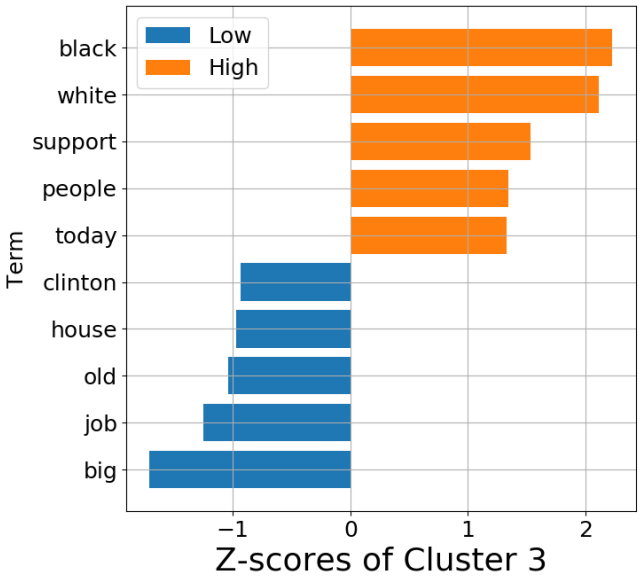
2
Z-scores of Cluster 2


Low
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people
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clinton
house
old
job
big
Term
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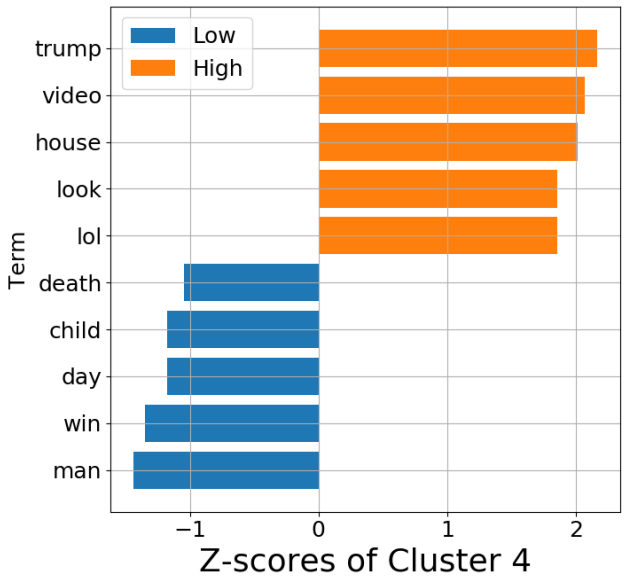
2
Z-scores of Cluster 3


Low
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trump
video
house
look
lol
death
child
day
win
man
Term
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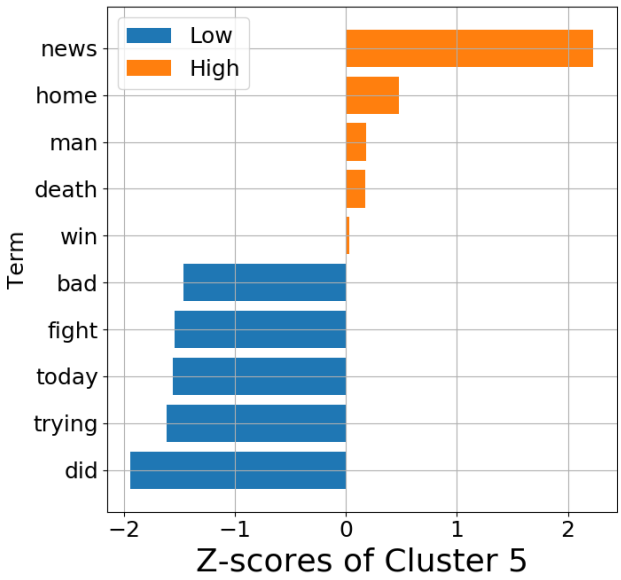
1
2
Z-scores of Cluster 4


Low
High
news
home
man
death
win
bad
fight
today
trying
did
Term
−2
−1
0
1
2
Z-scores of Cluster 5

Could **cluster 4** be described as "accounts that often tweet about Donald Trump"? *

Choose one of the following answers
Please choose **only one** of the following:

- ◯ True
- ◯ False

Is it true that tweets in **clusters 3 and 5** rarely mention love? *

Choose one of the following answers
Please choose **only one** of the following:

- ◯ True
- ◯ False

Is it true that tweets in **clusters 2 and 5** rarely mention crime and violence? *

Choose one of the following answers
Please choose **only one** of the following:

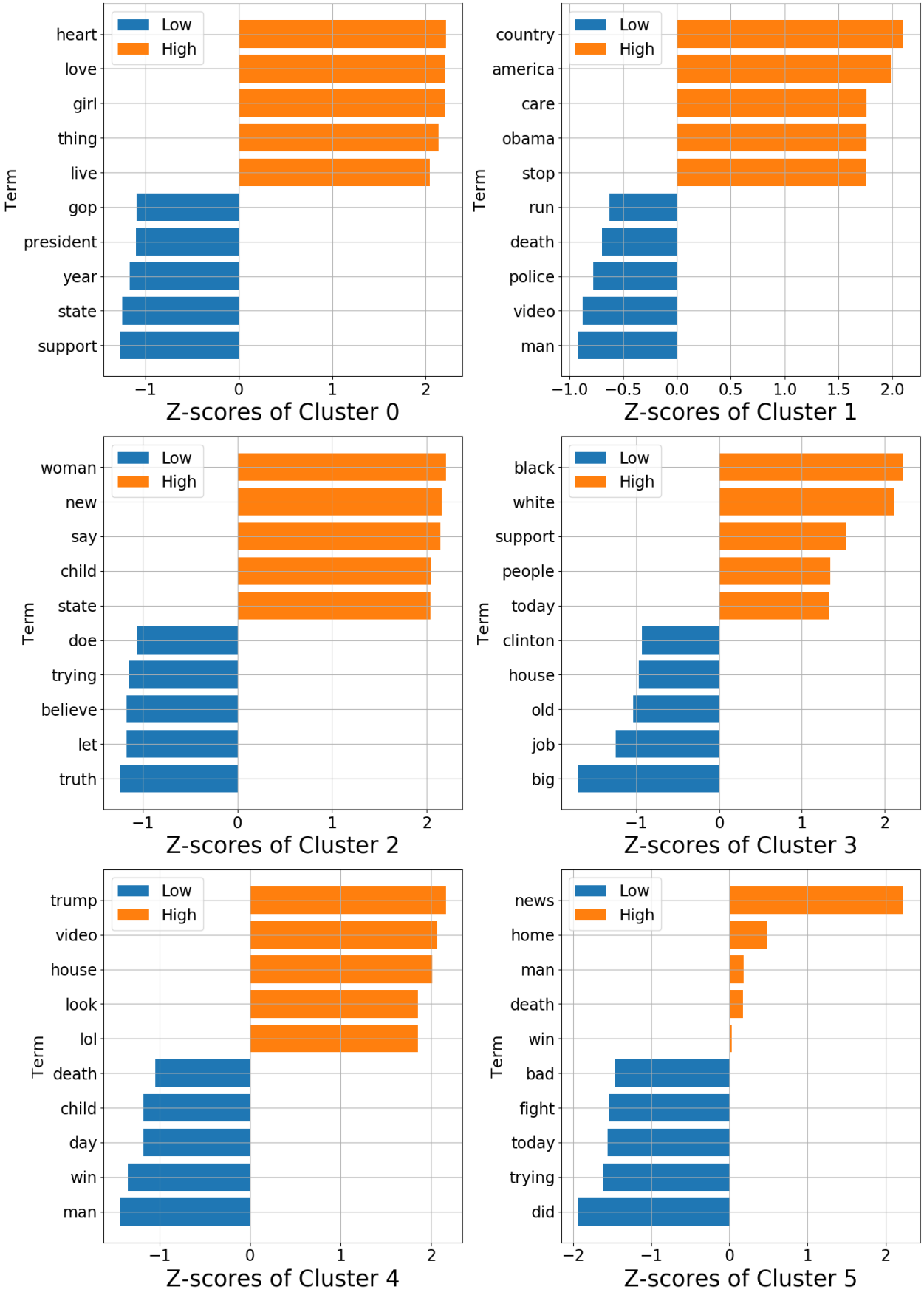
- ◯ True
- ◯ False

Could **cluster 0** be described as "accounts that often tweet about American presidents"? *

Choose one of the following answers
Please choose **only one** of the following:

- ◯ True
- ◯ False

Same visualization repeated for easier reference:



Is it true that accounts that often mention women also often mention truth?
*

❗ Choose one of the following answers
Please choose **only one** of the following:

◯ True

◯ False

Is it true that accounts in **clusters 1 and 5** often talk about America and presidents? *

❗ Choose one of the following answers
Please choose **only one** of the following:

◯ True

◯ False

Is it true that accounts that often mention black people also often mention support? *

❗ Choose one of the following answers
Please choose **only one** of the following:

◯ True

◯ False

Is it true that accounts in **clusters 0 and 2** often talk about crime and violence? *

❗ Choose one of the following answers
Please choose **only one** of the following:

◯ True

◯ False

Comprehensibility

In this section, we ask you questions about comprehensibility of Z-score charts visualization for representing results of our clustering model.

What is your opinion on the comprehensibility of the Z-score charts visualization for communicating the results of tweet clustering?
*

Choose one of the following answers
Please choose **only one** of the following:

- ◯ very easy to comprehend
- ◯ easy to comprehend
- ◯ comprehensible
- ◯ difficult to comprehend
- ◯ very difficult to comprehend

Make a comment on Z-score charts comprehensibility here:

Please write your answer here:

Submit your survey.
Thank you for completing this survey.