

1. Introduction

- In addition to traditional news media, social media platforms have become an important site for political conversations throughout the world
- we use both news articles and tweets from Twitter to analyze public sentiment toward political figures
- This work tries to answer the following questions :
 - Q1: Is any difference between news articles and social media, in terms of their sentiment toward political figures?
 - Q2: In social media, when people express sentiment toward a political figure, what aspects of the politician are they talking about or based on. Is there any difference between positive and negative messages?
 - Q3: In political campaign, if one candidate dropped out of the race, will the sentiment toward this candidate change?

2. Data Set and Methodology

Data set: We used two data sets in this study, the GDELT data set and tweets from Twitter

GDELT: 13 million articles from GDELT from 04/20 to 05/20/2016. Person names and sentiment scores are extracted from GDELT.

Twitter: We collected about 60 million tweets related to the four presidential candidates from Twitter's public streaming API, from the same period of time as GDELT data

Methods:

Tweet sentiment identification:

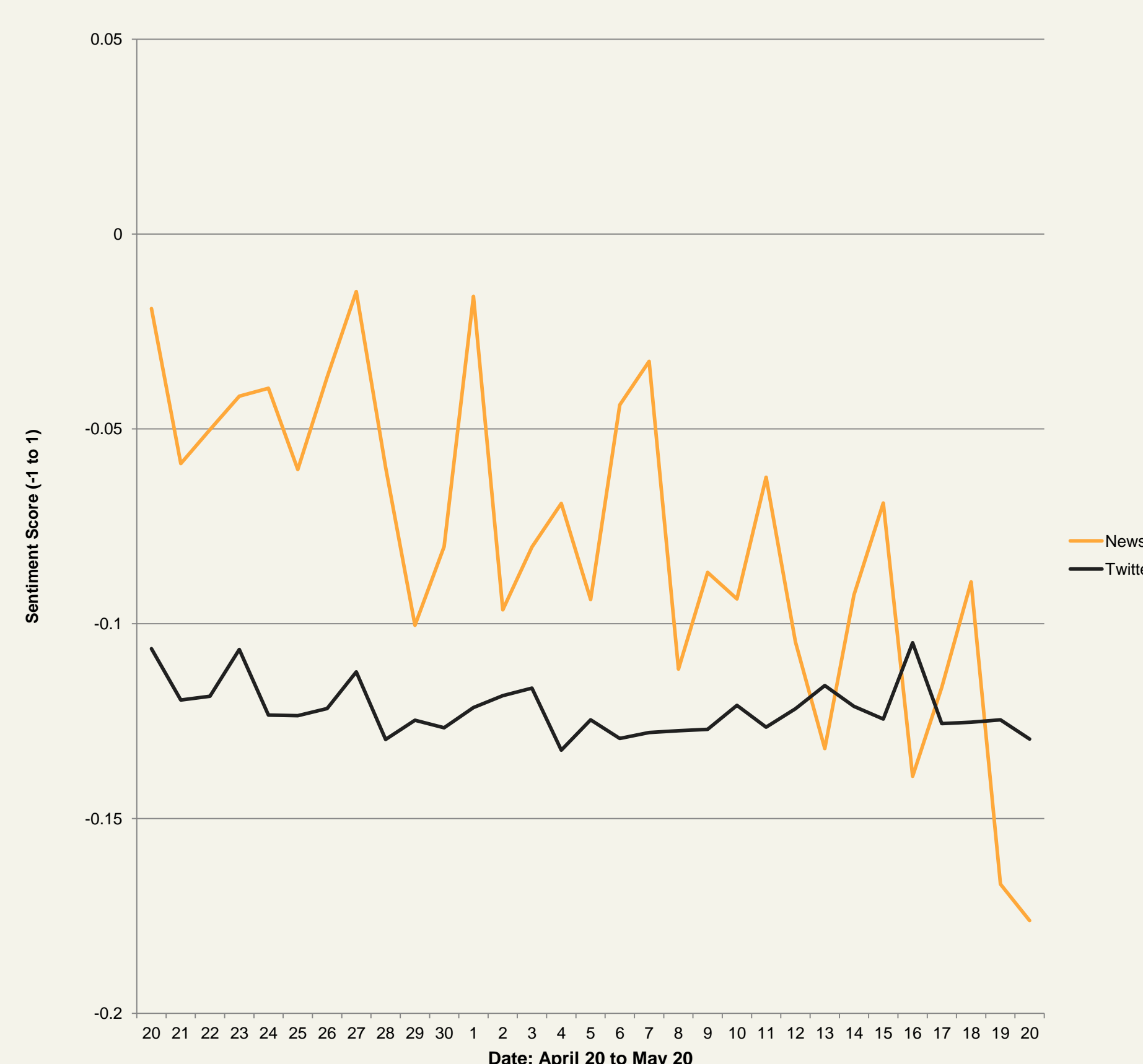
A target dependant sentiment analysis to get more accurate polarity value for each person in the tweet.

This tool is based on the general word embedding and sentiment specific word embedding. Both of them are distributed word representations, and are learned based on deep learning technology

Relationship analysis between sentiment types and concepts: To answer Q2, for each sentiment polarity type, we exploit the word embedding model to find the most related terms that contribute to that polarity.

3. Cross-source sentiment

- This part tries to answer question Q1.
- The following figure shows the sentiment toward Hilary Clinton from news articles and Twitter from April 20 to May 20.
- The figure shows that there is a difference between news articles and twitter, in terms of their sentiment toward a political figure.
- Overall, sentiment for Clinton from news articles are less negative than tweets. And while the sentiment from news articles is becoming more negative, the tweet sentiment stay relatively unchanged.



4. Tweet Sentiment

- This section tries to answer question Q2.
- We did sentiment analysis for the following four US presidential candidates: Hillary Clinton, Bernie Sanders, Donald Trump and Ted Cruz.
- 60 million tweets between 4/20 to 5/20 related to these four candidates are analyzed
- we are interested in how verified twitter users and influential users are different from the ordinary users, in terms of their sentiment toward the four candidates. the following two tables show their distribution in the three polarity types.

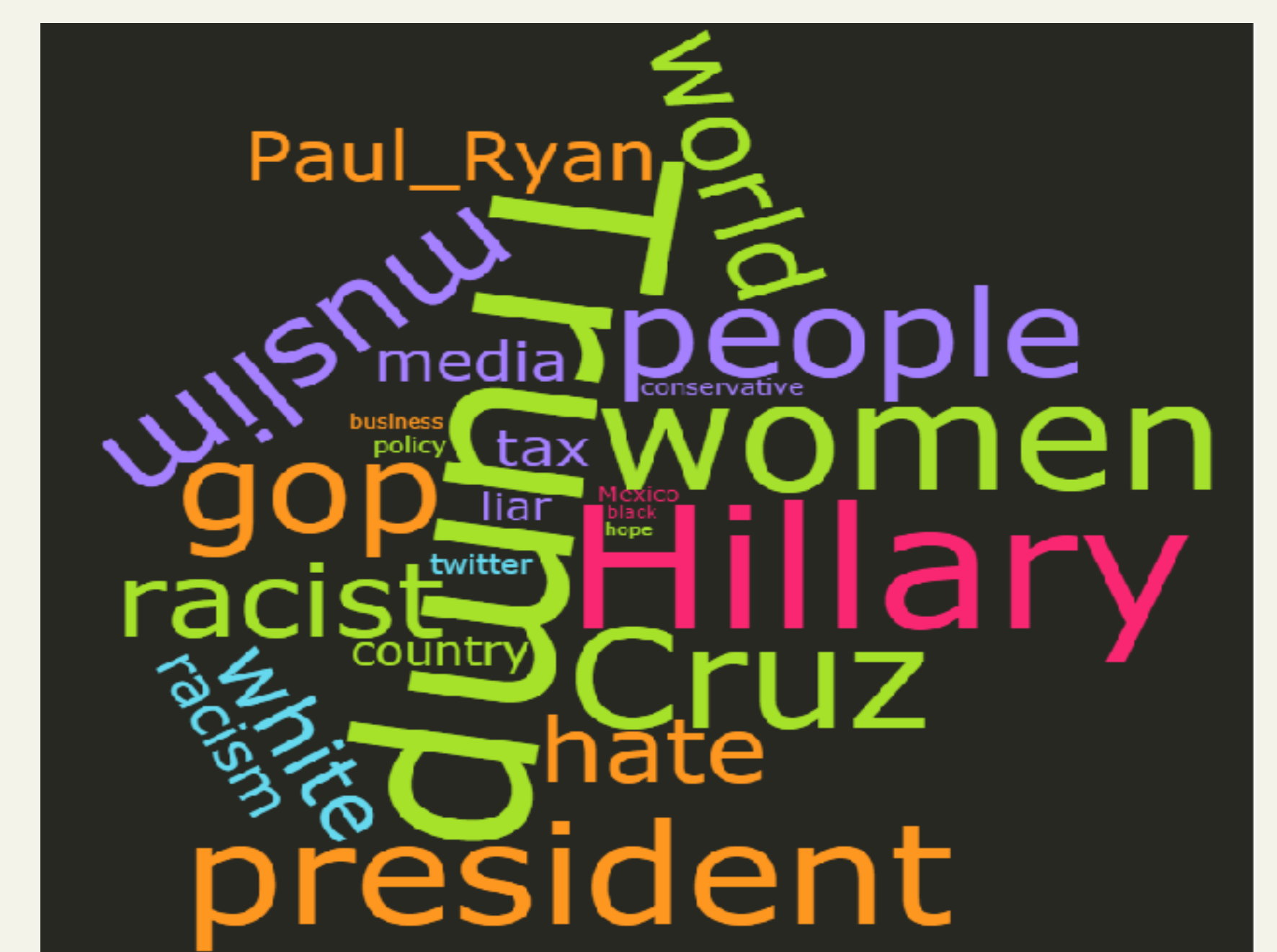
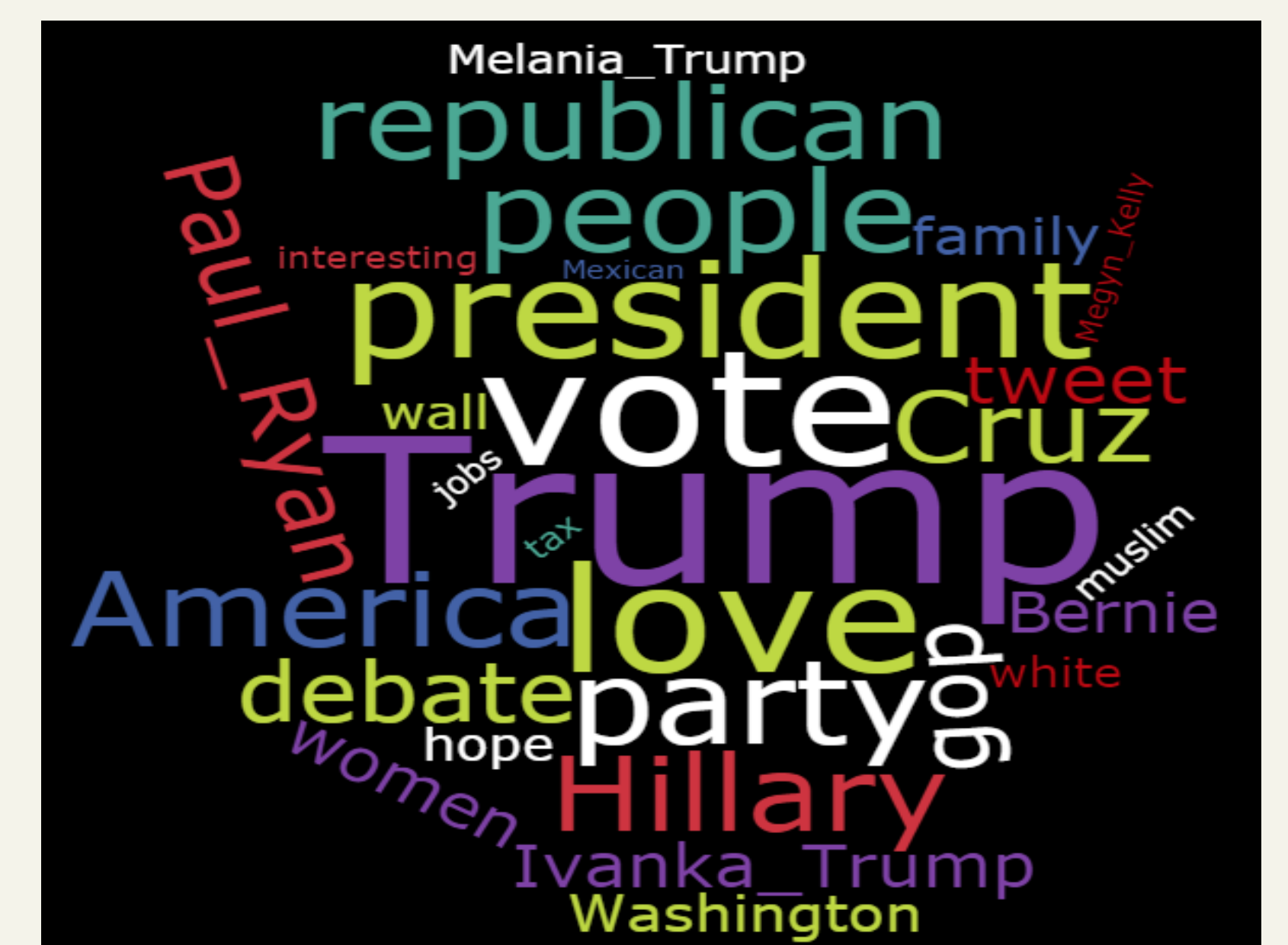
Politician	Sentiment		
	Positive	Neutral	Negative
Hillary Clinton	1.1%	0.8%	0.7%
Bernie Sanders	0.8%	1.1%	0.8%
Donald Trump	1.0%	1.2%	1.1%
Ted Cruz	1.1%	1.2%	0.9%

Table 1. Percentage of Twitter Verified users in each category

Politician	Sentiment		
	Positive	Neutral	Negative
Hillary Clinton	13.3%	11.5%	9.6%
Bernie Sanders	10.5%	11.2%	9.0%
Donald Trump	10.3%	11.9%	10.6%
Ted Cruz	10.3%	14.4%	9.9%

Table 2. Percentage of Twitter Influential users in each category. Influential user is defined as: Number of followers > 5000.

- Q2: when people express sentiment toward a political figure, what aspects of the politician are they talking about or based on, this politician's policies, family, opponents, or others? Is there any difference between positive and negative messages.
- To answer this question, we take Trump as an example, the following two figures show the top terms extracted from positive tweets and negative tweets for Trump, respectively.
- Some observations:
 - In the positive word map, we have: Melania, Ivanka, family, debate, etc. In contrast, in the negative figure, there are women, racist, hate, world, etc.
 - This will give us an idea of what people like and dislike about Trump.



5. Sentiment change when an candidate dropped out the race

- This section is for question Q3.
- The following figure shows the sentiment change over one month fro Ted Cruz, from 4/20 to 5/20. It included May 3, when Ted Cruz dropped out the race.
- It shows that after he exited, the sentiment on Twitter gradually changed toward positive direction.. But the sentiment from news articles became slightly more negative.
- There is a dip for both news and twitter around May 3, which may reflect his loss in Indiana and the disappointment from his supporters on his sudden drop out.

