2016 U.S. PRESIDENTIAL ELECTION

FAKE NEWS

OVERVIEW

- Introduction
- Main Paper
- Related Work and Limitation
- Proposed Solution
- Preliminary Result
- Conclusion and Future Work

TWITTER: A SOCIAL NETWORK AND A NEWS MEDIA

- Microblogging is a new form of communication in which users can describe their current status in short posts distributed by instant messages, mobile phones, email or the Web.
- Twitter, a popular microblogging tools has been a lot of growth since it launched in October, 2006.
- Twitter has become a new medium of information sharing.

TWITTER PLAYS A IMPORTANT ROLE IN ELECTION

- Both candidates used Twitter as social media platform for online campaigns.
- Millions of voters expressed their views and voting preferences through following and tweeting.
- Social media has been filled with fake news and rumor.
- Fake news and rumors on social media during the election has been criticized to have huge impacts on voters' decisions.

MAIN PAPER: RUMOR DETECTION ON TWITTER

- These are example of two sets of tweets about rumors that posted after the earthquake in Japan on March 11th.
- From the streaming API provided by twitter, there are 6 million tweets that were posted in March 2011.
- Extracting all 6 million tweets with keywords "server room" and "Cosmo Oil" for rumor1 and rumor2 separately, and then manually checked them to eliminate irrelevant tweets.
- As the result, there are 1,135 tweets for rumor1 and 2,042 tweets for rumor2.

Rumor1: Geek house Asakusa (Translated in English):

> When the earthquake occurred, I was in our server room. A rack collapsed on me now. My stomach is pressed and I'm shedding blood. Painful. Somebody help me. Doors look damaged. An announcement tells that no one should move before certain information. There is no time. I can use only my arm. Hard to breath.

Rumor2: Cosmo Oil (Translated in English):

> "Request for spreading" People living in Chiba-city area must use an umbrella or rain coat to avoid touching rain. Due to the explosion in Cosmo Oil Factory, harmful material will fall with rain.

CLUES FOR DETECTING RUMORS

- Burst: For rumors, they will burst suddenly in number of tweets and then it will go down when user posts a correction tweets.
- Retweet ratio: While the general retweet ratio is 8.03%, the retweet ratio for rumor1 is 96.2% and 70.7% for rumor2.
- Difference of word distribution: Extracting a list of content word from tweets by applying morphological analysis and give score. Finding out words with score higher than 1.0.

$$\text{score}(w) = \frac{\text{num_in_correction}(w)}{\text{num_in_rumor}(w)}$$

Rumor1		Rumor2	
word	score	word	score
デマ (false rumor)	630.00	確認 (check)	5690.00
		虚偽 (lie)	2910.00
		消防 (fire fighting)	2630.00
		送る (send)	2580.00
		否定 (negative)	1650.00
		事実 (truth)	1400.00
		:	:
		デマ (false rumor)	259.00

RUMOR CONTENT ANALYSIS

- To distinguish rumors from gossip or campaigns, it need content analysis. It may need deep semantic recognition from text, and it requires background knowledge to judge the tweets.
- Summarization by tag cloud consists of weighted keyword list can help. TF-IDF is a well known term weighting method, that works to extract keyword to summarize a set of tweets.
- These keywords help companies to recognize that a burst is a rumor or the result of their campaign.

word	TFIDF	*Frequency*
コスモ石油 (Cosmo Oil)	17248.70	2116
有害 (harmful)	10977.46	1405
雨 (rain)	10898.68	1847
物質 (material)	8777.04	1385
爆発 (explosion)	6862.35	1129
降る (fall)	6852.59	1102
付着 (attached)	5668.96	646
傘 (umbrella)	5415.50	703
外出 (go out)	4962.68	681
カッパ (rain coat)	4861.93	552

EXPERIMENT TO DETECT RUMORS

- Named Entity Extraction: Extracting named entities which occur more than 30 times at least in one day. 1,976 unique named entities were obtained. They were used as target source for the following steps.
- Filtering by Retweet Ratio: the system calculate the retweet ratio on each day in March for every targets. After filtering with high retweet ratio, 1,015 targets remained to be selected. Most of them were topics that widely spread, however, not all the topic were rumors.
- Filtering by Clue Keyword: Using keyword "false rumor" to detect rumors from the candidates. This keyword appears in 19.0% (in rumor1) and 12.5% (in rumor2) of tweets. So the system use 10% as the threshold to detect the topic is a rumor or not.

LIMITATIONS

- Many of the threshold parameters are not well established such as those threshold that filter out small topic name entity and filter out low retweet ratio tweets.
- The difference of world distribution that used to extract keyword for rumor detection is limited within specific topic. Such keyword found in rumor2 is not suitable for rumor1. and thus produce a lot of mis- classification.

RELATED WORK

DECEPTION DETECTION WITH DEEP SYNTAX

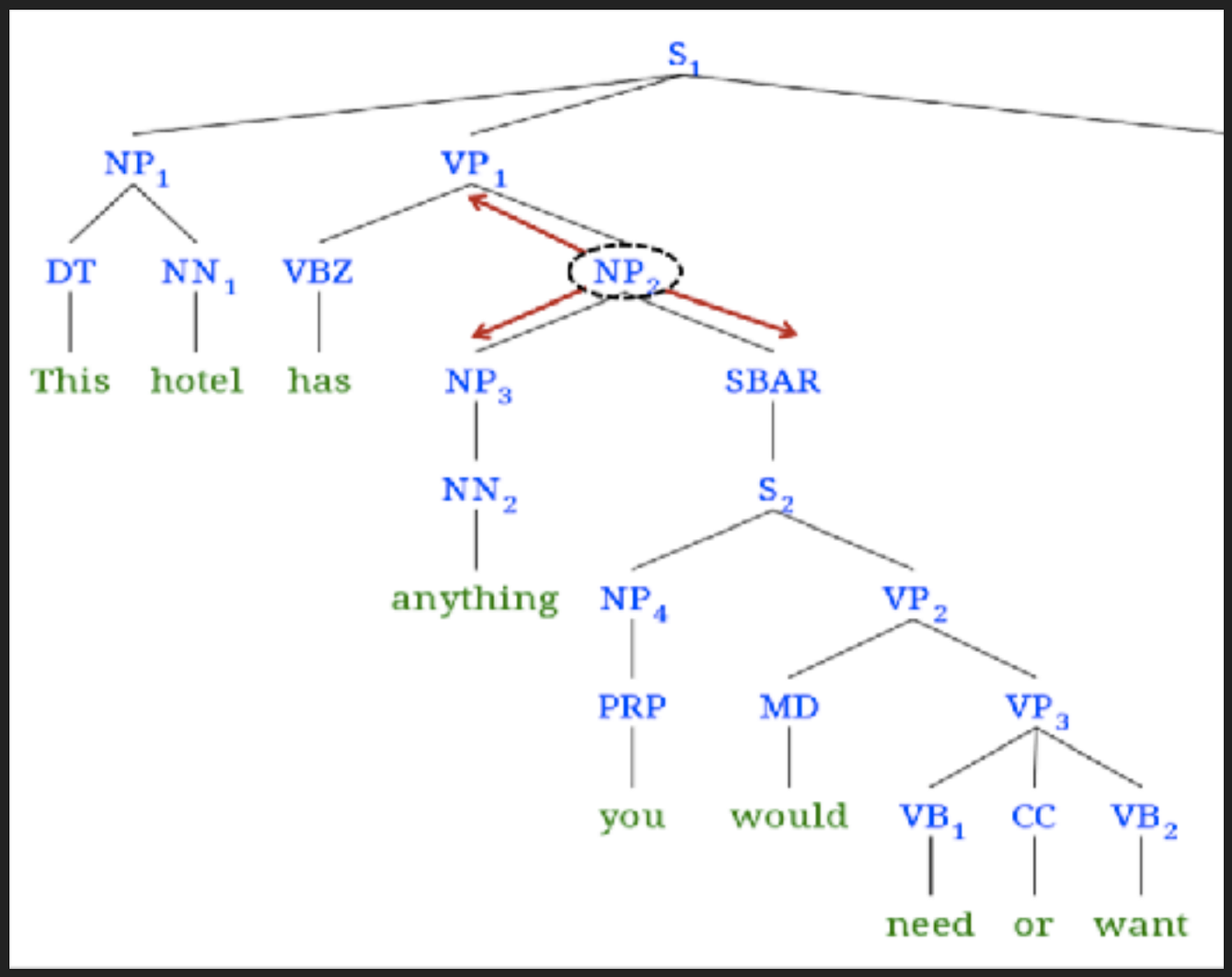
(Feng et.al) proposed a SVM classifier to detect deceptive reviews using features:

- simple unigram from bag-of-word
- rules driven by Probabilistic Context Free Grammars

Testing mainly on a TripAdvisor dataset that contains:

- 400 trustful reviews
- 400 deceptive reviews
- gathered by Amazon Mechanical Turk and evenly distributed cross 20 Chicago hotels
- achieved remarkable 91.2% accuracy

PCFG



ADJP	Adjective phrase
ADVP	Adverb phrase
NP	Noun phrase
PP	Prepositional phrase
S	Simple declarative clause
SBAR	Subordinate clause
SBARQ	Direct question introduced by *wh*-element
SINV	Declarative sentence with subject-aux inversion
SQ	Yes/no questions and subconstituent of SBARQ excluding *wh*-element
VP	Verb phrase
WHADVP	Wh-adverb phrase
WHNP	Wh-noun phrase
WHPP	Wh-prepositional phrase
X	Constituent of unknown or uncertain category
*	"Understood" subject of infinitive or imperative
0	Zero variant of *that* in subordinate clauses
T	Trace of wh-Constituent

TripAdvisor–Gold	
Deceptive	Truthful
NP^PP → DT NNP NNP NNP	S^ROOT → VP .
SBAR^NP → S	NP^NP → # CD
NP^VP → NP SBAR	PRN^NP → LRB NP RRB
NP^NP → PRP$ NN	NP^NP → NNS
NP^S → DT NNP NNP NNP	NP^S → NN
VP^S → VBG PP	NP^PP → DT NNP
NP^PP → PRP$ NN	NP^PP → CD NNS
VP^S → MD ADVP VP	NP^NP → NP PRN
VP^S → TO VP	PRN^NP → LRB PP RRB
ADJP^NP → RBS JJ	NP^NP → CD NNS

CONTENT-BASED MACHINE LEARNING

(Castillo et.al) proposed a supervised machine learning algorithm:

- automatically separates newsworthy topics from other type of conversations
- assess automatically the level of social media credibility of newsworthy topics

supervised process:

- Twitter Monitor extract burst topic keywords
- Mechanical Turk (real human being evaluators) judge whether a topic is a newsworthy topics or a personal comment or conversation topic. also used to judge the credibility of a topic (true, likely false, certain false)

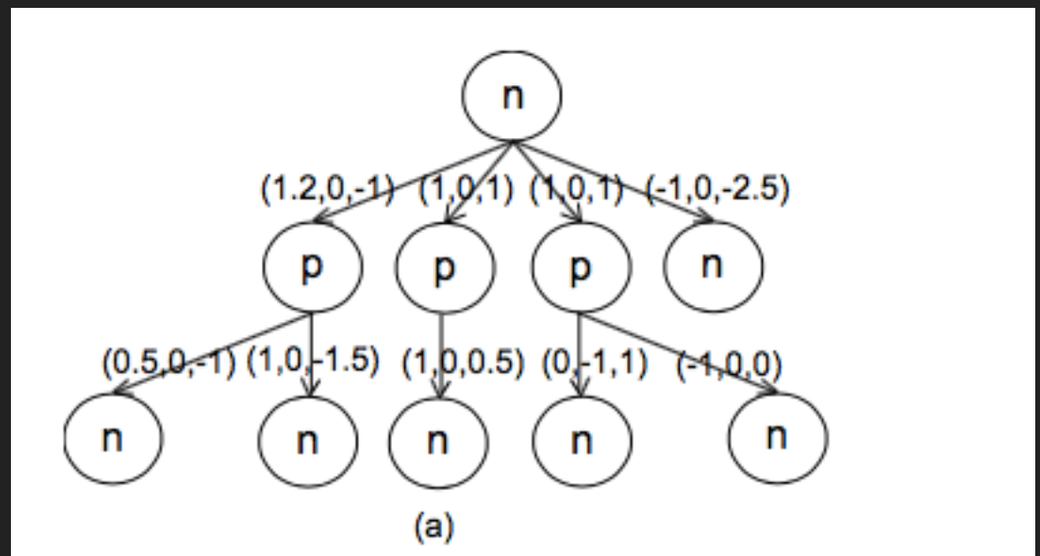
PROPAGATION-PATTERN BASED MACHINE LEARNING

(Ke Wu et al.) proposed a Support vector machine algorithm that feed:

- 2,601 original rumor message from Sina Weibo community rumor measurement center, mixed with other 2,536 normal message.
- Propagation tree for all this 2,601 rumor.
- 23 features, 15 features from Castillo, and extra 8 features such as topic type, user type(verification) and other sentiment relative features.

PROPAGATION-PATTERN BASED MACHINE LEARNING

- N node is regular user, P node is opinion leader who has more follower than following and at least 1,000 follower.
- The value above each node is
  - approve score
  - doubt score
  - sentiment score



LIMITATION OF RELATIVE WORK

- All required human interference to flag a rumor tweets to construct the training dataset.
- Computational expensive to drive the features. The lack of full plot of features can result in bias in the classification process.
- Most of the algorithm focus the detection of a fake news topic, not focus who is spreading the fake information, thus hard to mitigating or regulating such behavior.

PROPOSED SOLUTION

TF-IDF & COSINE SIMILARITY

I like music, but I don't like movie.
I don't like music, and I don't like movie.

↓

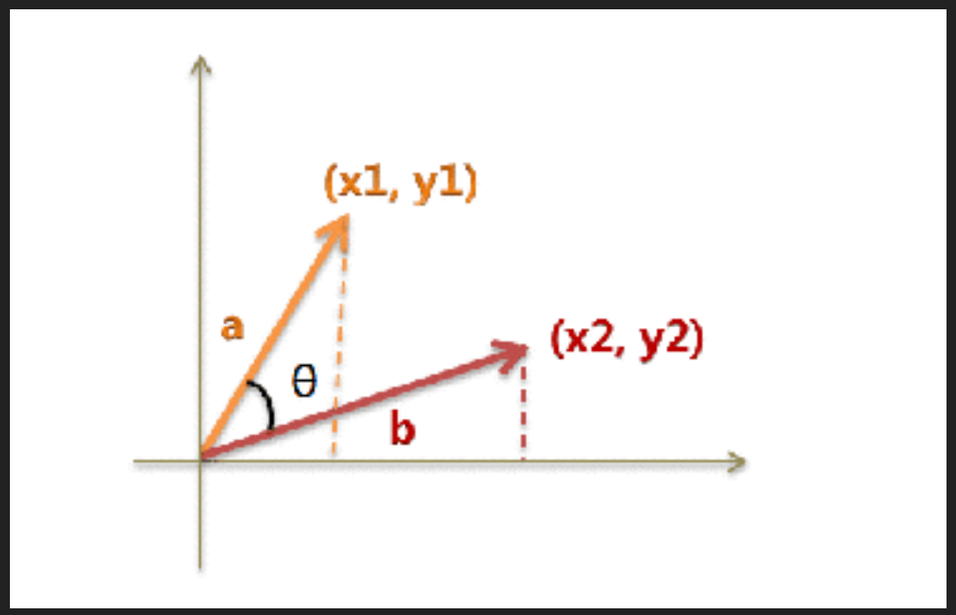
[I, don't, like, music, movie, and, but]

↓

I (2), don't (1), like (2), music (1), movie (1), but (1)
I (2), don't (2), like (2), music (1), movie (2), and (1)

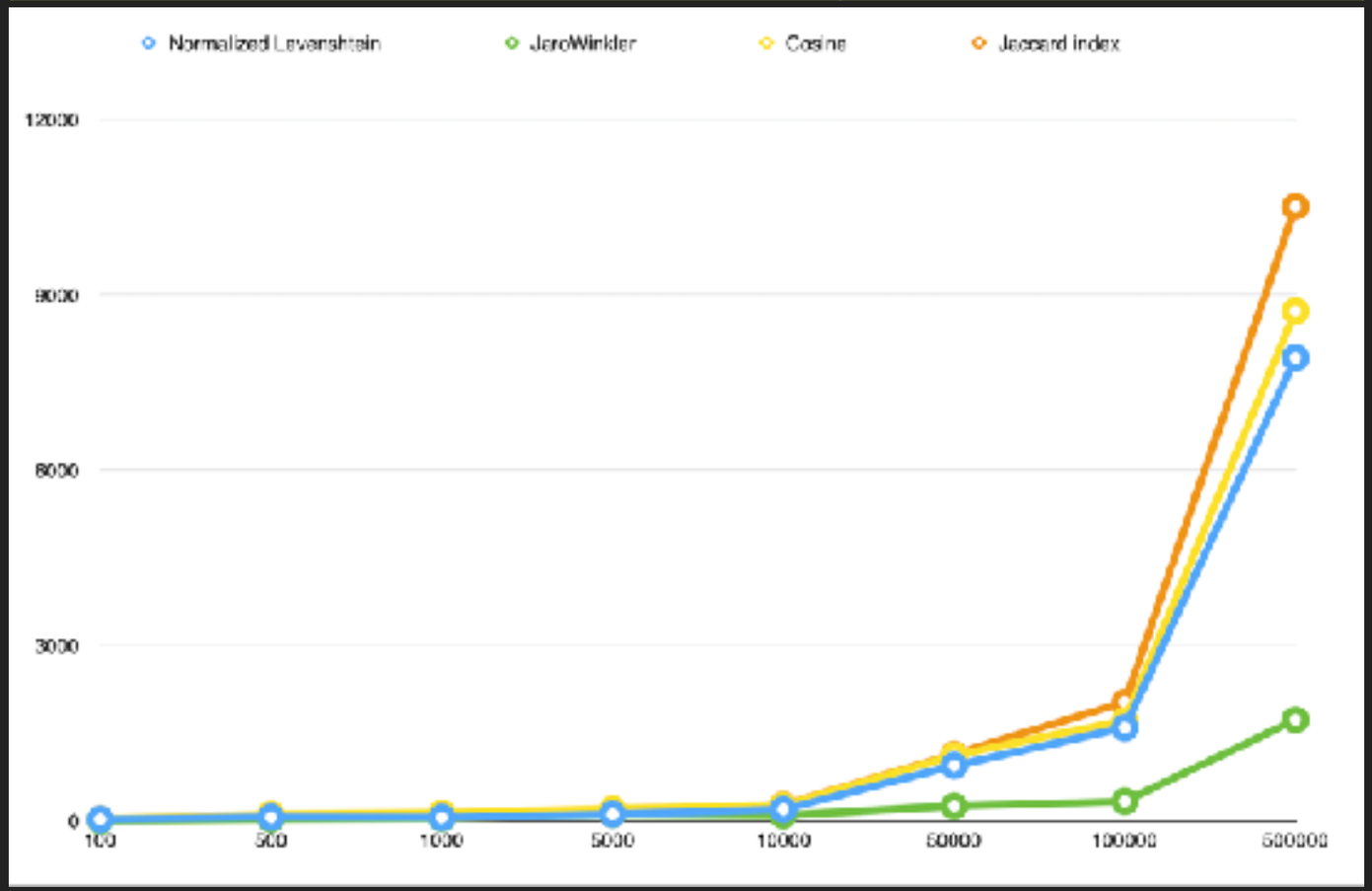
↓

X: [2, 1, 2, 1, 1, 1]
Y: [2, 2, 2, 1, 2, 1]



DISTANCE & SIMILARITY

Normalized Levenshtein	O(m*n)
Jaro-Winkler	O(m*n)
Cosine Similarity	O(m+n)
Jaccard Index	O(m+n)



Donald Trump's Intelligence Quotient

A chart purportedly showing Donald Trump's IQ ranking compared to that of other presidents is based on incomplete and inaccurate information.

CLAIM

Donald Trump's IQ, at 156, is comparable to that of the smartest U.S. presidents.

RATING

FALSE

ORIGIN

150 MILLION TWEETS

121 days, July 13 ~ Nov 10

Dev

STRING MATCHING

0.957173

CLAIM

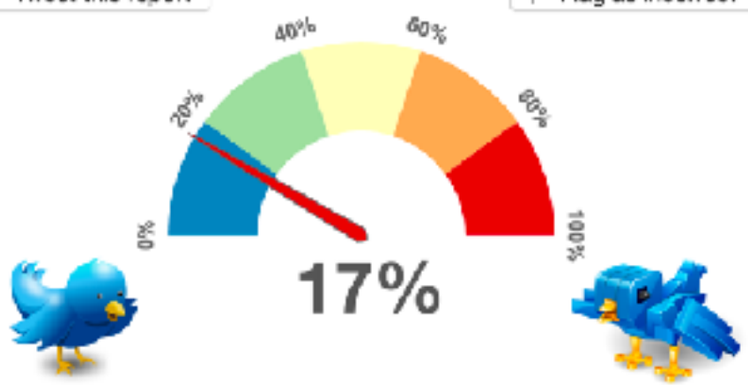
Donald Trump's IQ, at 156, is comparable to that of the smartest U.S. presidents.

BOTORNOT

Classification

Tweet this report

Flag as incorrect



Friend 23%

User 14%

Content 30%

Temporal 14%

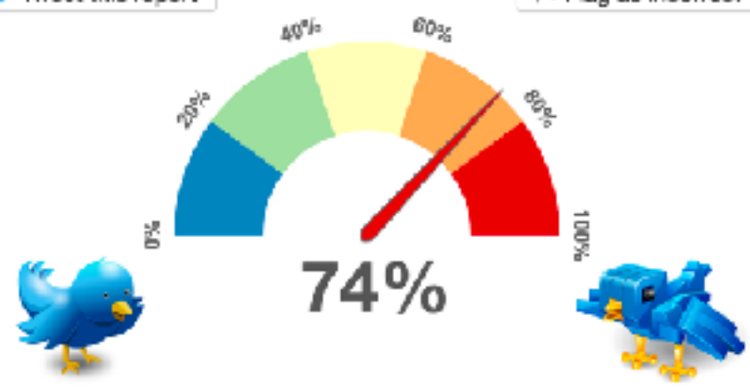
Sentiment 13%

Network 40%

Classification

Tweet this report

Flag as incorrect



Friend 79%

User 99%

Content 78%

Temporal 74%

Sentiment 61%

Network 96%

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CONCLUSION