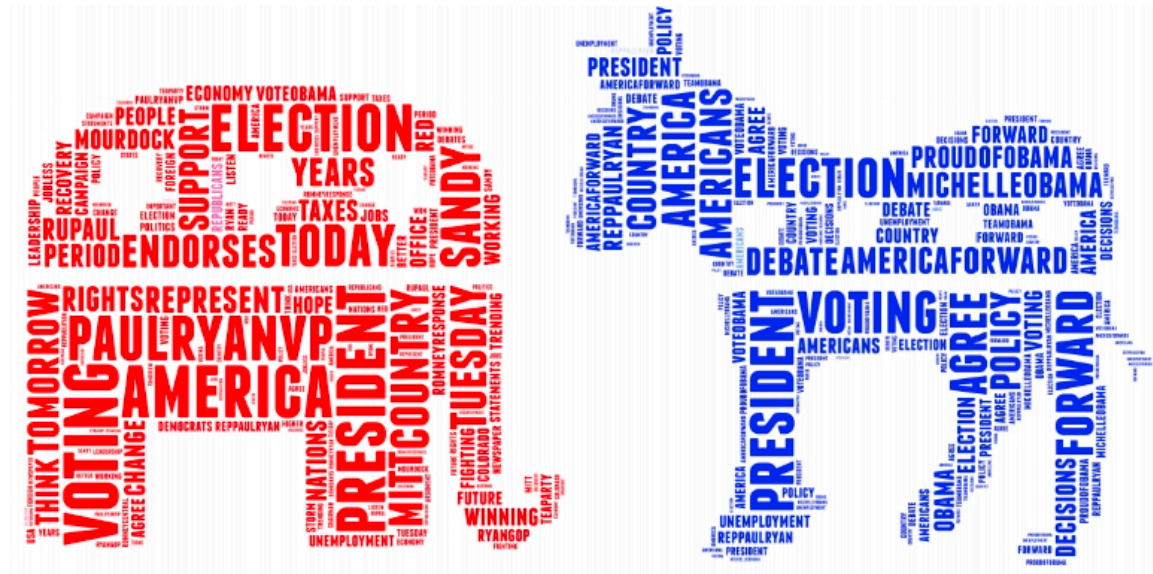# Analyzing Electoral Tweets for
Affect, Purpose, and Style

Saif Mohammad, Xiaodan Zhu, Svetlana Kiritchenko, Joel Martin

National Research Council Canada

Clouds of tweet words @MittRomney and @BarackObama (Oct 23 - Nov 7)

Early Project Specifications

- Emotion analysis of tweets
  - Who is feeling?
  - What emotion?
  - Towards whom?
  - And why?

- Domain
  - Tweets about the US 2012 presidential elections

- Additional deliverable
  - NRC Emotion Lexicon: word-emotion associations

- Short-term exploratory project

Outline

- Introduction to emotion detection
  - Challenges
  - Applications

- Data annotation
  - Designing questionnaires
  - Crowdsourcing
  - Analysis

- Automatic detection
  - Detecting the experiencer, emotional state, stimulus
  - Detecting the purpose behind electoral tweets

Emotions in Tweets

Tweeter: Cant wait for Obama to thrash Romney in the elections #4moreyears

Tweeter: CNN reports having found Ambassador Stevens's diary, which indicates concern about security threats in #Benghazi WHEREWASFBI??

Tweeter: Chicago making plans to build Obama Presidential Library. It'll have a special section on Benghazi full of nothing but locked doors. #tcot

Related problem: Sentiment Analysis

- Is a given tweet positive, negative, or neutral?
- Is a word within a tweet positive, negative, or neutral?

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- Is a given tweet positive, negative, or neutral?
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NRC team stood first among 30 teams participating in an international competition on sentiment analysis of tweets.

NRC-Canada: Sentiment Analysis of Tweets.

Saif Mohammad, Svetlana Kiritchenko, Xiaodan Zhu.

SemEval 2013: International Workshop on Semantic Evaluation, June 2013, Atlanta.

Related problem: Sentiment Analysis

- Is a given tweet positive, negative, or neutral?
- Is a word within a tweet positive, negative, or neutral? ~90

NRC team stood first among 30 teams participating in an international competition on sentiment analysis of tweets.

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SemEval 2013: International Workshop on Semantic Evaluation, June 2013, Atlanta.

Related problem: Sentiment Analysis

- Is a given tweet positive, negative, or neutral? ~70
- Is a word within a tweet positive, negative, or neutral? ~90

NRC team stood first among 90 teams participating in an international competition on sentiment analysis of tweets.

NRC-Canada: Sentiment Analysis of Tweets.

Saif Mohammad, Svetlana Kiritchenko, Xiaodan Zhu.

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Emotions

Courage Delight Hurt Fear Worry Relaxed W Joy Surprised Relieved Affection Pleasure Sadness Contempt Empathy Anger Amusement Pride Anxiety Content Annoyance Powerlessness Shame Stresss Excitement Envy Helplessness Satisfaction Friendliness Embarrassment Irritation Love Disappointment Boredom Hope Guilt Happiness Despair Elation Calm Frustration Disgust Interest Politeness Doubt Serene Tension Trust Shock

Challenges

- Many more kinds of emotions than sentiment
- Not explicitly stated
  - Need world knowledge and context
- No tone, pitch, or other prosodic information
- Text may have sarcasm, exaggeration, etc

Applications of Emotion Detection in Tweets

- Tracking sentiment towards politicians, movies, products
- Improving customer relation models
- Identifying what evokes strong emotions in people
- Detecting personality
- Detecting happiness and well-being
- Measuring the impact of activist movements through text generated in social media.
- Improving automatic dialogue systems
- Detecting how people use emotion-bearing-words and metaphors to persuade and coerce others

Applications of Emotion Detection in Tweets

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- Measuring the impact of activist movements through text generated in social media.
- Improving automatic dialogue systems
- Detecting how people use emotion-bearing-words and metaphors to persuade and coerce others

Which Emotions?

Courage Delight Hurt Fear Relaxed Worry W Relieved Anxiety
Affection Pleasure Surprised Pride Content
Annoyance Powerlessness Joy Contempt Empathy Anger Amusement Envy
Embarrassment Shame Sadness Excitement Helplessness
Love Satisfaction Friendliness Disappointment Stresss Boredom Irritation Guilt
Happiness Despair Elation Frustration Disgust Hope Interest
Politeness Calm Doubt Serene
Tension Trust Shock

Plutchik, 1980: Eight Basic Emotions

- Joy
- Trust
- Fear
- Surprise
- Sadness
- Disgust
- Anger
- Anticipation
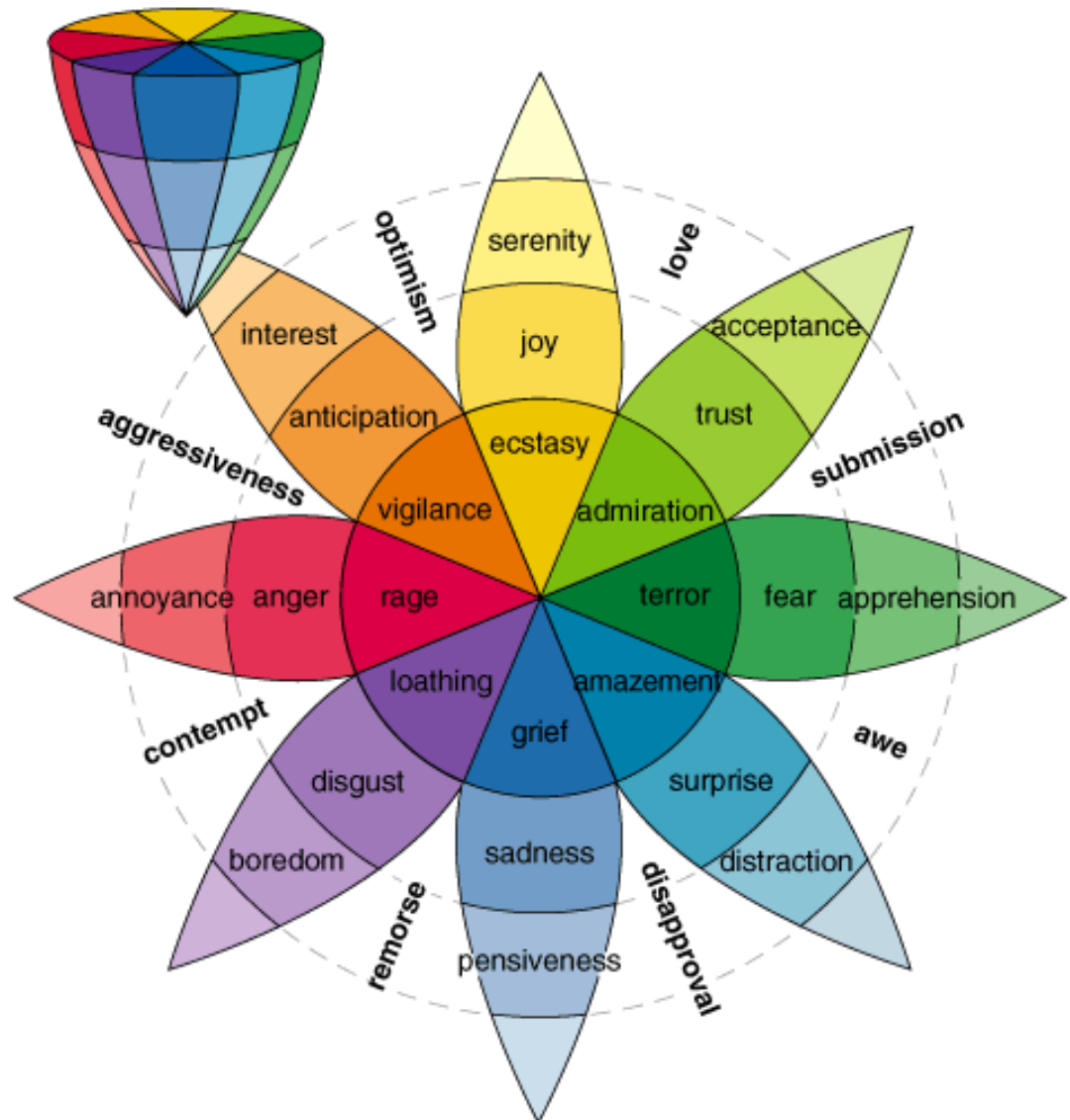
DATA ANNOTATION

- Data collection
- Crowdsourcing
- Questionnaires
- Annotation analyses

Amazon's Mechanical Turk

- Requester
  - breaks task into small independent units – HITs
  - specifies:
    - compensation for solving each HIT

- Turkers
  - attempt as many HITs as they wish

NRC Emotion Lexicon

- Annotations for 14,000 words
- Associations with 8 basic emotion
- Associations with positive and negative sentiment
- Licensed to about 170 universities and research labs.

Crowdsourcing a Word-Emotion Association Lexicon, Saif Mohammad and Peter Turney, Computational Intelligence, Wiley Blackwell Publishing Ltd., 2013.

Collecting Election Tweets

- Polled the Twitter API for certain hashtags
  - August—September 2012

#4moreyears	#Barack	#campaign2012
#dems2012	#democrats	#election
#election2012	#gop2012	#gop
#joebiden2012	#mitt2012	#Obama
#ObamaBiden2012	#PaulRyan2012	#president
#president2012	#Romney	#republicans
#RomneyRyan2012	#veep2012	#VP2012
Barack	Obama	Romney

- Number of tweets: about one million
  - most frequent: #election2012, #campaign, #gop, #president
- Removed: non-english tweets, badly spelled tweets, retweets

Two Phases of Annotation

- Questionnaire I: 3 annotations per tweet
  - Identifies tweets with emotion
  - Determine style and purpose of tweet
  - Determines if tweet is relevant to 2012 US elections

- Questionnaire II: 5 annotations per tweet
  - Detects the experiencer, emotional state, stimulus
  - Identifies the relevant electoral issue

Annotated about 2000 tweets.

Questionnaire I

Tweeter: Mitt Romney is arrogant as hell. He has racism written all over his face.

Q1. Which of the following best describes the Emotions in this tweet? (required)

- ○ This tweet has no emotional content.
- ○ There is some emotion here, but the tweet does not give enough context to determine which emotion it is.
- ○ This tweet expresses or suggests an emotional attitude or response to something.
- ○ This tweet expresses or suggests two or more contrasting emotional attitudes or responses. (For example, the tweeter likes X but dislikes Y and Z.)
- ○ It is not possible to decide which of the above options is appropriate because of reasons such as: the tweet does not give enough information, one needs additional context to understand the emotion, and the tweet does not make sense because of weird spellings.

Questionnaire I

Tweeter: Mitt Romney is arrogant as hell. He has racism written all over his face.

Q1. Which of the following best describes the Emotions in this tweet? (required)

⚪ This tweet has no emotional content.

⚪ There is some emotion here, but the tweet does not give enough context to determine which emotion it is.

⚪ This tweet expresses or suggests an emotional attitude or response to something. 87.98%

⚪ This tweet expresses or suggests two or more contrasting emotional attitudes or responses. (For example, the tweeter likes X but dislikes Y and Z.)

⚪ It is not possible to decide which of the above options is appropriate because of reasons such as: the tweet does not give enough information, one needs additional context to understand the emotion, and the tweet does not make sense because of weird spellings.

Questionnaire I

Tweeter: Mitt Romney is arrogant as hell. He has racism written all over his face.

Q1. Which of the following best describes the Emotions in this tweet? (required)

○ This tweet has no emotional content. 8.21%

○ There is some emotion here, but the tweet does not give enough context to determine which emotion it is.

○ This tweet expresses or suggests an emotional attitude or response to something. 87.98%

○ This tweet expresses or suggests two or more contrasting emotional attitudes or responses. (For example, the tweeter likes X but dislikes Y and Z.)

○ It is not possible to decide which of the above options is appropriate because of reasons such as: the tweet does not give enough information, one needs additional context to understand the emotion, and the tweet does not make sense because of weird spellings.

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◯ There is some emotion here, but the tweet does not give enough context to determine which emotion it is.

◯ This tweet expresses or suggests an emotional attitude or response to something. 87.98%

◯ This tweet expresses or suggests two or more contrasting emotional attitudes or responses. (For example, the tweeter likes X but dislikes Y and Z.) 2.22%

◯ It is not possible to decide which of the above options is appropriate because of reasons such as: the tweet does not give enough information, one needs additional context to understand the emotion, and the tweet does not make sense because of weird spellings.

Questionnaire I

Tweeter: Mitt Romney is arrogant as hell. He has racism written all over his face.

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◯ It is not possible to decide which of the above options is appropriate because of reasons such as: the tweet does not give enough information, one needs additional context to understand the emotion, and the tweet does not make sense because of weird spellings.

These tweets sent to questionnaire II.

Questionnaire I

Tweeter: Mitt Romney is arrogant as hell. He has racism written all over his face.

Q2. Which of the following best describes the Style of this tweet? (required)

◯ simple statement or question

◯ exaggeration or hyperbole

◯ sarcasm

◯ rhetorical question

◯ understatement

◯ weird, surreal, or off-the-wall

◯ humorous, but none of the above

◯ none of the above

Examples of the different kinds are listed in the instructions at the top of the page.

Questionnaire I

Tweeter: Mitt Romney is arrogant as hell. He has racism written all over his face.

Q2. Which of the following best describes the Style of this tweet? (required)

- ⚪ simple statement or question 76.87%
- ⚪ exaggeration or hyperbole
- ⚪ sarcasm
- ⚪ rhetorical question
- ⚪ understatement
- ⚪ weird, surreal, or off-the-wall
- ⚪ humorous, but none of the above
- ⚪ none of the above

Examples of the different kinds are listed in the instructions at the top of the page.

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Tweeter: Mitt Romney is arrogant as hell. He has racism written all over his face.

Q2. Which of the following best describes the Style of this tweet? (required)

○ simple statement or question 76.87%

○ exaggeration or hyperbole 9.75%

○ sarcasm

○ rhetorical question

○ understatement

○ weird, surreal, or off-the-wall

○ humorous, but none of the above

○ none of the above

Examples of the different kinds are listed in the instructions at the top of the page.

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Q2. Which of the following best describes the Style of this tweet? (required)

- ◯ simple statement or question 76.87%
- ◯ exaggeration or hyperbole 9.75%
- ◯ sarcasm 7.39%
- ◯ rhetorical question 3.19%
- ◯ understatement
- ◯ weird, surreal, or off-the-wall
- ◯ humorous, but none of the above
- ◯ none of the above

Examples of the different kinds are listed in the instructions at the top of the page.

Q3. Which of the following best describes the Purpose of this tweet? (required)

○ to point out hypocrisy or inconsistency

○ to point out mistake or blunder

○ to disagree

○ to ridicule

○ to criticize, but none of the above

○ to vent

○ to agree

○ to praise, admire, or appreciate

○ to support

○ to motivate or to incite action

○ to be entertaining

○ to provide information without any emotional content

○ none of the above

Q3. Which of the following best describes the Purpose of this tweet? (required)

○ to point out hypocrisy or inconsistency
○ to point out mistake or blunder
○ to disagree
○ to ridicule
○ to criticize, but none of the above
○ to vent

--- oppose

○ to agree
○ to praise, admire, or appreciate
○ to support

--- favor

○ to motivate or to incite action
○ to be entertaining
○ to provide information without any emotional content

--- other

○ none of the above

Q3. Which of the following best describes the Purpose of this tweet? (required)

- ◯ to point out hypocrisy or inconsistency
- ◯ to point out mistake or blunder
- ◯ to disagree   } oppose
- ◯ to ridicule
- ◯ to criticize, but none of the above
- ◯ to vent

- ◯ to agree
- ◯ to praise, admire, or appreciate   } favor
- ◯ to support

- ◯ to motivate or to incite action
- ◯ to be entertaining
- ◯ to provide information without any emotional content   } other

   ---

- ◯ none of the above

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○ to point out hypocrisy or inconsistency

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○ to disagree

○ to ridicule

○ to criticize, but none of the above

○ to vent

oppose

○ to agree

○ to praise, admire, or appreciate

○ to support

○ to motivate or to incite action

favor

~~○ to be entertaining~~

○ to provide information without any emotional content

○ none of the above

other

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○ to vent

○ to agree

○ to praise, admire, or appreciate

○ to support

○ to motivate or to incite action

~~○ to be entertaining~~

○ to provide information without any emotional content

○ none of the above

oppose: 58.07%

favor: 31.76%

other: 10.17%

Questionnaire I

Tweeter: Mitt Romney is arrogant as hell. He has racism written all over his face.

Q4. Is this tweet about US politics and elections? (required)

◯ Yes, this tweet is about US politics and elections.

◯ No. This tweet has nothing to do with US politics or anybody involved in it.

Questionnaire I

Tweeter: Mitt Romney is arrogant as hell. He has
racism written all over his face.

Q4. Is this tweet about US politics and elections? (required)

⚪ Yes, this tweet is about US politics and elections. 95.56%

⚪ No. This tweet has nothing to do with US politics or anybody involved in it.

Questionnaire I

Tweeter: Mitt Romney is arrogant as hell. He has racism written all over his face.

Q4. Is this tweet about US politics and elections? (required)

◯ Yes, this tweet is about US politics and elections.   95.56%

◯ No. This tweet has nothing to do with US politics or anybody involved in it.

These tweets sent to questionnaire II.

Questionnaire II

Tweeter: Mitt Romney is arrogant as hell. He has racism written all over his face.

Q1. Who is feeling (or who felt) an emotion? In other words, who is the source of the emotion? (required)

[   ]

If the person who has posted the tweet is the source, then type: tweeter. Otherwise, copy and paste your response from the tweet. If your response is made of words or phrases that are not adjacent to each other (that is, you have to copy and paste more than once), then separate these words and phrases with a semicolon.

Questionnaire II

Tweeter: Mitt Romney is arrogant as hell. He has racism written all over his face.

Q1. Who is feeling (or who felt) an emotion? In other words, who is the source of the emotion? (required)

> Tweeter

If the person who has posted the tweet is the source, then type: tweeter. Otherwise, copy and paste your response from the tweet. If your response is made of words or phrases that are not adjacent to each other (that is, you have to copy and paste more than once), then separate these words and phrases with a semicolon.

Q2. What emotion? Choose one of the options from below that best represents the emotion. (required)

Positive Emotions

- ⚪ acceptance
- ⚪ admiration
- ⚪ calmness or serenity
- ⚪ joy or happiness or elation
- ⚪ like
- ⚪ trust

Negative Emotions

- ⚪ anger or annoyance or hostility or fury
- ⚪ disappointment
- ⚪ dislike
- ⚪ disgust
- ⚪ fear or apprehension or panic or terror
- ⚪ hate
- ⚪ indifference
- ⚪ sadness or gloominess or grief or sorrow

Other Emotions

- ⚪ amazement
- ⚪ anticipation or expectancy or interest
- ⚪ surprise
- ⚪ uncertainty or indecision or confusion

Q2. What emotion? Choose one of the options from below that best represents the emotion. (required)

Positive Emotions

○ acceptance

○ admiration 10.5%

○ calmness or serenity

○ joy or happiness or elation   8.8%

○ like

○ trust

Negative Emotions

○ anger or annoyance or hostility or fury

○ disappointment

○ dislike 23.5%

○ disgust

○ fear or apprehension or panic or terror

○ hate

○ indifference

○ sadness or gloominess or grief or sorrow

Other Emotions

○ amazement

○ anticipation or expectancy or interest   10.6%

○ surprise

○ uncertainty or indecision or confusion

Q6. Towards whom or what? In other words, who or what is the target of the emotion? (required)

If the person who has posted the tweet is the target, then type: tweeter. If the target is not specified, then type: not specified. Otherwise, copy and paste your response from the tweet. If your response is made of words or phrases that are not adjacent to each other (that is, you have to copy and paste more than once), then separate these words and phrases with a semicolon.

Q6. Towards whom or what? In other words, who or what is the target of the emotion? (required)

If the person who has posted the tweet is the target, then type: tweeter. If the target is not specified, then type: not specified. Otherwise, copy and paste your response from the tweet. If your response is made of words or phrases that are not adjacent to each other (that is, you have to copy and paste more than once), then separate these words and phrases with a semicolon.

Q6b. Which of these best describes the target of the emotion? (required)

○ Barack Obama and/or Joe Biden

○ Mitt Romney and/or Paul Ryan

○ Some other individual

○ Democratic party, democrats, or DNC

○ Republican party, republicans, or RNC

○ Some other institution

○ Election campaign, election process, or elections

○ The target is not specified in the tweet

○ None of the above

Q6. Towards whom or what? In other words, who or what is the target of the emotion? (required)

[   ]

If the person who has posted the tweet is the target, then type: tweeter. If the target is not specified, then type: not specified. Otherwise, copy and paste your response from the tweet. If your response is made of words or phrases that are not adjacent to each other (that is, you have to copy and paste more than once), then separate these words and phrases with a semicolon.

Q6b. Which of these best describes the target of the emotion? (required)

◯ Barack Obama and/or Joe Biden 29.90%
◯ Mitt Romney and/or Paul Ryan 24.87%
◯ Some other individual
◯ Democratic party, democrats, or DNC 2.46%
◯ Republican party, republicans, or RNC 8.42%
◯ Some other institution
◯ Election campaign, election process, or elections
◯ The target is not specified in the tweet
◯ None of the above

Q9. This tweet is about which of the following issues: (required)

ECONOMY

⚪ federal debt

⚪ jobs

⚪ housing

⚪ taxes

⚪ military spending

⚪ About the Economy: but not related to any of the above issues

CONFLICTS AND TERRORISM

⚪ Terrorism

⚪ Afghanistan or Iraq war

⚪ Arab Spring, Egypt, Syria, or Libya

⚪ Iran, Israel, or Palestine

⚪ About Conflicts and Terrorism: but not related to any of the above issues

SOCIAL AND CIVIL ISSUES

⚪ education

⚪ environment

⚪ gay rights

⚪ gun control/rights

⚪ health care

⚪ racism

⚪ religion

⚪ women's rights

⚪ About Social and Civil Issues: but not related to any of the above issues

OTHER

⚪ About the election process, election publicity, or election campaign

⚪ None of the above

Q9. This tweet is about which of the following issues: (required)

ECONOMY

◯ federal debt

◯ jobs

◯ housing

◯ taxes

◯ military spending

◯ About the Economy: but not related to any of the above issues

CONFLICTS AND TERRORISM

◯ Terrorism

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◯ Arab Spring, Egypt, Syria, or Libya

◯ Iran, Israel, or Palestine

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SOCIAL AND CIVIL ISSUES

◯ education

◯ environment

◯ gay rights

◯ gun control/rights

◯ health care

◯ racism

◯ religion

◯ women's rights

◯ About Social and Civil Issues: but not related to any of the above issues

OTHER

◯ About the election process, election publicity, or election campaign

◯ None of the above

About the election process: 77%

Other Questions

- How intense is the emotion?
- Which words help identify the emotion?
- What is the cause of the emotion?

Agreement

- Inter-annotator agreement (IAA)
  - Percentage of times two annotators agree with each other.
- Average probability of choosing the Majority Class (APMS)

	IAA	APMS
Questionnaire I		
Q1. Number of emotions in tweet?	78	0.85
Q2. Style of tweet?	56	0.69
Q3. Purpose of tweet: 11 fine classes	44	0.52
Q3. Purpose of tweet: 3 coarse classes	84	0.86
Q4. About 2012 US elections?	97	0.97
Questionnaire II		
Q2. Emotional state?	60	0.74
Q6. Stimulus of emotions?	45	0.64

DETECTING EXPERIENCER, STATE, STIMULUS

- Problem
- Approach
- Results
- Summary

Problem

Input:

Matt tweeted:

I am very happy that #4moreyears came into reality.

Task: find key emotion-oriented information—who feels what towards whom?

Exemplary output:

Semantic role	Value
Who (**experiencer**)	tweeter (Matt)
Feels what (**state**)	joy
Towards whom (**stimulus**)	Barack Obama

Problem

- FrameNet (Baker et al., 1998): A resource defining and annotating the semantic roles of words in a sentence.

    The girl on the swing whispered to the boy beside her.

         agent   pred   recipient

- ~1,200 semantic frames defined.

Problem

- FrameNet (Baker et al., 1998): A resource defining and annotating the semantic roles of words in a sentence.

<u>The girl on the swing</u> <u>whispered</u> to <u>the boy beside her.</u>

agent   pred   recipient

- ~1,200 semantic frames defined.

The emotion frame:

Role	Description
Core:	
Event	Ocasion or happening that Experiencers in a certain emotional state participate in.
Experiencer	Person or sentient entity that experiences or feels the emotions.
Expressor	Body part, gesture, or expression of the Experiencer that reflects the emotional state.
State	A lasting (emotion) experience of the Experiencer.
Stimulus	Person, event, or state of affairs that evokes the emotional response in the Experiencer.
Topic	General area in which the emotion occurs. It indicates a range of possible Stimulus.
Non-Core:	
Circumstances	Condition(s) under which the Stimulus evokes its response.
Degree	Extent to which the Experiencer's emotion deviates from the norm for the emotion.
Empathy_target	Individual or individuals with which the Experiencer identifies emotionally.
Manner	Description of the way in which the Experiencer experiences the Stimulus.
Parameter	Domain in which the Experiencer experiences the Stimulus.
Reason	Explanation for why the Stimulus evokes a certain emotional response.

Problem

I am very happy that #4moreyears have come into reality.
experiencer   state   stimulus

- Instead of labeling the original text spans, we directly classify the semantic roles to the pre-defined categories that users may be interested in.

  Happy ➜ joy

  #4moreyear, #obama, Barack H. Obama ➜ Barack Obama

  ◦ Normalized *state* and *stimulus* are often what's ultimately needed.

  ◦ Emotions are often not explicitly expressed.

  ◦ Tweet texts are noisy: a labeling task would be very challenging here (e.g. syntactic parsing is less reliable).

Detecting experiencer, state, stimulus

- Detecting *experiencers* is super easy: most experiencers (99.83%) are the tweeters themselves
  - This is actually a good property---many applications need to collect the tweeters' feeling.

- Below, we focus on detecting *state* and *stimulus*.

Approach

- A multi-task classification problem: classifying tweets by emotion *state* and *stimulus*.

  ◦ Unfortunately, the two classifiers do not benefit from each other—using the gold labels of one subtask does not help classify the other.

  ◦ We hence simply treat them as two independent subtasks.

Classifying Emotion State & Stimulus

- Classifier: LibSVM (Chang and Lin 2011), RBF kernel
- 10-fold cross validation

Features:

	Examples	State	Stimulus
Word n-gram	"F-word good"	✔	✔
Emoticon	:-) D:< :@ :-ll	✔	
Punctuation	?! !!!	✔	
Character	dis-, sooooo	✔	✔
Hashtag	#BiggestDayOfTheYear		✔
Lexical	NRC-emo, Osgood, autoLex	✔	✔
Negation	Can't cant n't	✔	
Position	Beginning of a sentence?	✔	✔
Combined	position/lexical features	✔	✔

Results of Classifying State

	P	R	F
Random baseline	30.26	30.26	30.26
Majority baseline	47.75	47.75	47.75
Automatic system	56.84	56.84	56.84
Upper bound	69.80	69.80	69.80

Our current system achieves a 56.84% F-score, which is significantly better than those of the two baselines.

Results of Classifying Stimulus

	P	R	F
random baseline	16.45	20.87	18.39
majority baseline	34.45	38.00	36.14
rule-based system	43.47	55.15	48.62
SVM system	57.30	59.32	58.30
upper bound	82.87	81.36	82.11

The performance of *stimulus* classification is similar to that of the *state* subtask: our best system achieves a 58.30% F-score, which is significantly better than those of the baselines.

Summary

- Electoral tweets are rich in emotions; we framed emotion detection as a semantic role classification problem, focusing on experiencer, state, and stimulus.

- Our statistics shows that most tweets (~99.8%) express emotions of the tweeter themselves, so the experiencer subtask is very easy.

- However, detecting the emotion *state* and *stimulus* of electoral tweets are much difficult:

    - Our models achieve F-scores in the range of 55%-60% — a 56.84% F-score for the *state* subtask and 58.3% for the *stimulus* subtask.

- Further work would be desirable to consider the emotion subtask here with the purpose problem.

DETECTING PURPOSE

- Task
- Classifier and features
- Results
- Relation between purpose and emotions

Applications of Purpose Detection in Tweets

- Determining political alignment of the electorate

- Identifying controversial issues and political opinions

- Summarizing the stream of political tweets

Purpose Identification Task

11-class

to agree
to praise
to support

⎫ favour

to point out hypocrisy
to point out mistake
to disagree
to ridicule
to criticize
to vent

⎫ oppose

to provide information
none of the above

⎫ other

3-class

Automatically Identifying Purpose

- Data:
  - 1072 tweets with strong majority for 11-class task
  - 1672 tweets with strong majority for 3-class task

- Pre-processing:
  - URL -> http://someurl
  - UserID -> @someuser
  - Tokenization and part-of-speech (POS) tagging

- Classifier:
  - SVM with linear kernel

- Experiments:
  - 10-fold cross-validation x 10 times

Features

- **n-grams:** token n-grams, skip n-grams, character n-grams
  - Romney, Mitt_Romney, Romney_is_arrogant, …

- **part-of-speech:** # of occurrences for each POS
  - # of nouns, verbs, adjectives, …

- **word clusters:** presence of tokens from each of 1000 clusters

- **all-caps:** # of tokens with all characters in upper case
  - VOTE, PLEASE, WHEREWASFBI

- **NRC Emotion Lexicon:** # of tokens/POS/all-caps/hashtags per emotion
  - proud (anticipation, joy, trust, positive), failure (disgust, fear, sadness, negative)

Features (cont.)

- **negation:** # of negated contexts
  - It's a shame #Politions *can't be honest*.
  - honest -> honest_NEG, trust_E -> trust_E_NEG

- **punctuation:** # of !+, ?+,(?!)+

- **emoticons:** presence of positive/negative emoticons
  - :) , :(((

- **hashtags:** # of hashtags
  - #4moreyears, #Romney

- **elongated words:** # of words with a character repeated more than 2 times
  - soooo, yayyy

Results

Overall accuracy

	11-class	3-class
Majority class	26.49	58.07
SVM	**43.56**	**73.91**

Results per feature group

Experiment	Accuracy	Difference
all features	43.56	0
all – n-grams	39.51	-4.05
all – NRC Emotion lexicon	42.27	-1.29
all – POS	42.63	-0.93
all – word clusters	43.24	-0.32
all – negation	43.18	-0.38
all – all-caps, punctuation, emoticons, hashtags, elongated words	43.38	-0.18

Hashtag Emotion Lexicon

- 585 emotion-related hashtags
  - #love, #annoyed, #schadenfreude

- thousands of tweets with one of these hashtags
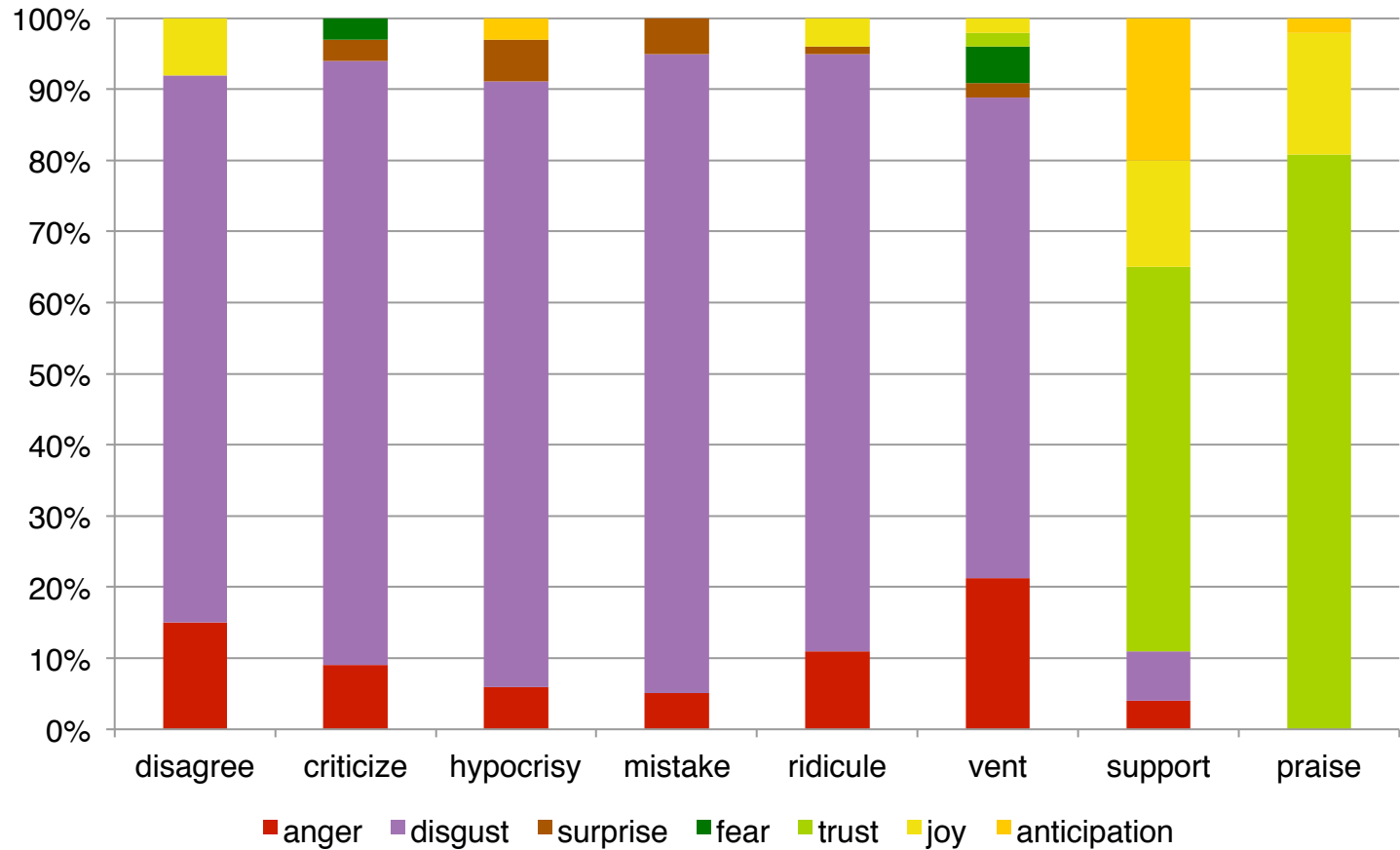
- pointwise mutual information (PMI):

$$PMI(hashtag, word) = \log \frac{p(hashtag, word)}{p(hashtag) * p(word)}$$

- add 585 features: $feature(hashtag_i) = \sum_{w_j \in tweet} PMI(hashtag_i, w_j)$

Results with Hashtag Lexicon

Lexicon	Accuracy
NRC Emotion lexicon	43.56
Hashtag lexicon	44.35
NRC Emotion + Hashtag lexicons	**44.58**

Relation: purpose and emotion

Conclusions

- Compiled a large collection of electoral tweets
- Annotated them for style, purpose, and emotion by crowdsourcing
  - Tweeters opposed much more often than supported
  - Disgust was the dominant emotion
  - Mostly conveyed emotions of the tweeter
- Developed SVM classifiers to detect emotional state, stimulus, and purpose
- Showed that the same emotion can be associated with different types of purpose

Future Work

- Determine the reason for emotions, when stated in tweets.
- Detect a broader range of emotions than just 8 basic ones.
- Determine intensity of emotion.
- Detect exaggeration or hyperbole.
- Analyze tweets from other domains such as natural disaster responses.
- Detect personality from tweets.

Comments and Questions!

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Research papers:

* Semantic Role Labeling of Emotions in Tweets.
  Saif Mohammad, Xiaodan Zhu, and Joel Martin.

* Identifying Purpose Behind Electoral Tweets.
  Saif Mohammad, Svetlana Kiritchenko, and Joel Martin.

* Analyzing Electoral Tweets for Affect, Purpose, and Style.
  Saif Mohammad, Xiaodan Zhu, Svetlana Kiritchenko, and Joel Martin.
  Technical report, March 2013.

Results per category

category	# inst.	Precision	Recall	F1
to agree	5	0	0	0
to praise	161	57.59	50.43	53.77
to support	284	49.35	69.47	57.71
to point out hypocrisy	75	30.81	21.20	25.12
to point out mistake	37	0	0	0
to disagree	27	0	0	0
to ridicule	165	31.56	43.76	36.67
to criticize	76	22.87	9.87	13.79
to vent	88	36.06	23.07	28.14
to provide information	143	45.14	50.63	47.73
none of the above	**11**	0	0	0
micro-average	1072	43.56	43.56	43.56