Social Media Mining and Retrieval

Carlos Castillo

http://chato.cl/    http://bigcrisisdata.org/
@chatox          @bigcrisisdata
Outline

• Part 01: Preliminaries
• Part 02: Social media mining
• Part 03: Social networks
• Part 04: Information cascades
• Social media and natural disasters
Social Media Mining and Retrieval
Part 01: Preliminaries
Social media changes *everything*

https://xkcd.com/1239/
An attractive topic

• If you work in IR sooner or later you’ll be dealing with documents from social media

• Many in science, technology and engineering have also interest in the humanities
  – Plus a bit of actual formal education on the subject
  – Plus a ton of intuitions, a few of them correct

Cut-off between 1 and 2 is 30 years old for social media.
An attractive topic (cont.)

- Social media is a “young” technology (~10 to 15 years old)

- Douglas Adams on new technologies:
  - Anything that is in the world when you're born is normal and ordinary and is just a natural part of the way the world works.
  - Anything that's invented between when you're 15 and 35 is new and exciting and revolutionary and you can probably get a career in it.
  - Anything invented after you're 35 is against the natural order of things.
This talk is about …

- **Social software**
  - Software to facilitate or mediate social interactions

- **Social networking sites**
  - Web applications to maintain social connections

- **Social media sites**
  - Web applications to create, share, and exchange content

- **Social media content**
  - The content shared by users in social media platforms
Example

“Media must report about d alleged 20k RSS chaps off 2 #Nepal.here’s a pic coz d 1 @ShainaNC shared isn’t true.. ;)”
Example

“Media must report about d alleged 20k RSS chaps off 2 #Nepal. here’s a pic coz d 1 @ShainaNC shared isn’t true.. ;)

Fourth batch of RSS volunteers left for Nepal for relief operations. More than 20,000 RSS Workers are reaching Nepal without any hope for appreciation or conversion.

ShainaNC
Proud to be associated to the @RSSorg @RSS_Org true patriots during calamities
5:36 PM - 26 Apr 2015
_reply_154  _favorite_126
Social media messages

• Social media is more like a transcript of a conversation than like text meant to stand on its own
  – Awkward entry methods:
    • Fragmented language and incomplete sentences
    • Many typographic and grammatical errors
  – Conversational:
    • Little or no context (hard to comprehend in isolation)
    • Code switching and borrowing
    • Internet slang
<table>
<thead>
<tr>
<th>Slang</th>
<th>Abbreviation</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>All the best</td>
<td>ATB</td>
<td></td>
</tr>
<tr>
<td>At the moment</td>
<td>ATM</td>
<td></td>
</tr>
<tr>
<td>Be</td>
<td>B</td>
<td></td>
</tr>
<tr>
<td>Before</td>
<td>B4</td>
<td></td>
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<td>Bye for now</td>
<td>B4N</td>
<td></td>
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<td>Be seeing you</td>
<td>BCNU</td>
<td></td>
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<tr>
<td>Because</td>
<td>BCDZ</td>
<td></td>
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<tr>
<td>Be right back</td>
<td>BRB</td>
<td></td>
</tr>
<tr>
<td>Be right there</td>
<td>BRT</td>
<td></td>
</tr>
<tr>
<td>By the way</td>
<td>BTW</td>
<td></td>
</tr>
<tr>
<td>Check it out</td>
<td>CIO</td>
<td></td>
</tr>
<tr>
<td>Can’t stop laughing</td>
<td>CSL</td>
<td></td>
</tr>
<tr>
<td>See you later</td>
<td>CUL8R</td>
<td></td>
</tr>
<tr>
<td>Don’t go there</td>
<td>DGT</td>
<td></td>
</tr>
<tr>
<td>Don’t know, don’t care</td>
<td>DKDK</td>
<td></td>
</tr>
<tr>
<td>Everyone</td>
<td>EVRY1</td>
<td></td>
</tr>
<tr>
<td>For the time being</td>
<td>FTTB</td>
<td></td>
</tr>
<tr>
<td>For your info</td>
<td>FYI</td>
<td></td>
</tr>
<tr>
<td>Great</td>
<td>GR8</td>
<td></td>
</tr>
<tr>
<td>Get to go</td>
<td>GTG</td>
<td></td>
</tr>
<tr>
<td>Hug and kiss</td>
<td>H&amp;K</td>
<td></td>
</tr>
<tr>
<td>Hato</td>
<td>VHB</td>
<td></td>
</tr>
<tr>
<td>In any case</td>
<td>IAC</td>
<td></td>
</tr>
<tr>
<td>I don’t know</td>
<td>IDK</td>
<td></td>
</tr>
<tr>
<td>In my opinion</td>
<td>IMO</td>
<td></td>
</tr>
<tr>
<td>I’m outta here</td>
<td>IQH</td>
<td></td>
</tr>
<tr>
<td>In other words</td>
<td>IOW</td>
<td></td>
</tr>
<tr>
<td>In your dreams</td>
<td>IYD</td>
<td></td>
</tr>
<tr>
<td>Keep in touch</td>
<td>KIT</td>
<td></td>
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<tr>
<td>Late</td>
<td>LB</td>
<td></td>
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<tr>
<td>Later</td>
<td>LBR</td>
<td></td>
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<tr>
<td>Let me know</td>
<td>LMK</td>
<td></td>
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<tr>
<td>Laughing out loud</td>
<td>LOL</td>
<td></td>
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<tr>
<td>Love</td>
<td>LUV</td>
<td></td>
</tr>
<tr>
<td>Love you lots</td>
<td>LYL</td>
<td></td>
</tr>
<tr>
<td>Mate</td>
<td>M8</td>
<td></td>
</tr>
<tr>
<td>Mobile</td>
<td>MOB</td>
<td></td>
</tr>
<tr>
<td>Message</td>
<td>MSG</td>
<td></td>
</tr>
<tr>
<td>Anyone</td>
<td>NE1</td>
<td></td>
</tr>
<tr>
<td>No one</td>
<td>NO1</td>
<td></td>
</tr>
<tr>
<td>No reply necessary</td>
<td>NRR</td>
<td></td>
</tr>
<tr>
<td>Oh I see</td>
<td>OIC</td>
<td></td>
</tr>
<tr>
<td>Please</td>
<td>PLS</td>
<td></td>
</tr>
<tr>
<td>Are</td>
<td>R</td>
<td></td>
</tr>
<tr>
<td>You</td>
<td>UR</td>
<td></td>
</tr>
<tr>
<td>You are</td>
<td>U</td>
<td></td>
</tr>
<tr>
<td>You are a cutie!</td>
<td>URAQT</td>
<td></td>
</tr>
<tr>
<td>With</td>
<td>WIV</td>
<td></td>
</tr>
<tr>
<td>Weekend</td>
<td>WKND</td>
<td></td>
</tr>
<tr>
<td>What’s up?</td>
<td>WOT</td>
<td></td>
</tr>
<tr>
<td>Hugs and kisses</td>
<td>XOXOX</td>
<td></td>
</tr>
<tr>
<td>You never know</td>
<td>YNK</td>
<td></td>
</tr>
</tbody>
</table>
Alternatives to traditional text proc.

- Change the methods
  - Develop new methods that are aware of these particularities

- Change the queries and/or the documents
  - Pre-process: “r u ok m8” → “Are you OK, mate?”

- Change both
Social Media Mining and Retrieval
Part 02: Mining
Why mining social media?

- “What do people think / how do they feel about X?”
  - Sentiment analysis and opinion mining

- An alternative to traditional opinion polls?

- Attractive for many reasons including:
  - Lower latency (waiting time)
  - Lower cost
  - Larger population
Low latency: people query symptoms before going to the doctor!
Many social media mining papers

Domain-specific data

Social media data

Correlation/Influence

Profit?
The devil is in the details

- Which domain-specific data? This is not always readily available

- Mapping social media data to a time series?
  - Geolocation of messages
  - Mapping to topics/sentiments/intents or other characteristics
  - What is the variable: Volume? Sentiment? Other?

- Measuring correlation/influence
  - Correlation (lagged); Transfer entropy

- Finding a mechanism
Caveat 1: correlation might be spurious
Caveat 2: correlation might be useless

- Sometimes there are much better predictors
- Social media can be used to predict box office revenue
  - But ticket sales on first weekend *almost* always determine total sales, with exceptions: Citizen Kane (1941), Blade Runner (1982), Fight Club (1999)
- Social media can be used to detect earthquakes
  - But seismographic sensors are quite dense in many areas of the world, the exception being underdeveloped areas
Caveat 3: the “war on terror”

We also are currently monitoring a lot of phone surveillance indicating a high percentage of conversation concerned with the explosions.
The Hype Curve

Examples in the 1980s: (a) AI, (b) online learning.
Example social media mining topics

- Economics
- Politics
- Public health
- Smart cities
- Event detection

Most examples on this section come from
https://sites.google.com/site/twitterandtherealworld/home
Examples in economics

- Financial success of movies
- Economic indices such as DJIA or NASDAQ
  - Words related to anxiety/worry/calmness/hope
- Stock option prices
  - Centrality in interaction graphs
Trading stock using social media
Examples in politics

- Hashtags are a good indicator of political topics
- Signs of political leaning
  - Connections, profiles, conversations
- Political manipulation
  - Fake “grassroot” campaigns = “astroturfing”
- “No, you can’t predict elections with Twitter”
Astroturfing (4K followers for USD 5)

Examples in public health

- Many works derived from original Flu Trends
- Increasingly complex models of symptom-messages, treatment-messages
- Allergies, obesity, insomnia
- Mapping well-being in a city
Examples in “smart cities”

- Data-driven neighborhood boundaries
- Data-driven residencial/commercial zones
- Tourism and beauty
Smells

http://researchswinger.org/smellymaps/
Examples in event detection

• Mass convergence events, e.g. demonstrations
• Precursors of riots
• Traffic jams, accidents, or road blocks
• Man-made and natural disasters
  – And sub-events
Best practices in social media mining

- Interdisciplinary work
- Mixed methods: qualitative and quantitative
- Well-grounded in the domains’ literature
- Recognize, measure, and possibly counter sample biases
- Robust to different settings, metrics, datasets
- Outcomes provide an advantage to practitioners
  - E.g. to make better decisions than without this data
Social Media Mining and Retrieval
Part 03: Social Network Analysis
Social media and retrieval

- (In addition to the new characteristics of texts)
- Social media is a prolific source of new relevance signals:
  - Social networks (structural signals)
  - Information cascades (propagation signals)

Graph essentials in next slides mostly from http://dmml.asu.edu/smm/book/
Social networks

- Sociograms started to be collected systematically in the 1930s
  - E.g. Girls/Boys (triangles/circles)
- Built from interviews and direct observation
- Now we call them social networks
We still build some sociograms by hand!

Special romantic relationship

—OR—

Nonromantic sexual relationship

[Bearman et al. 2004]
http://www.jstor.org/stable/10.1086/386272
Lots of social network data to play with

https://snap.stanford.edu/data/
Graphs

- For a set A of objects, a graph provides a very convenient representation of relations in A, which are subsets of A x A

- Symmetry of relation determines type of graph
  - Symmetric relations: undirected graphs having vertices and edges
  - Non-symmetric relations: directed graphs having nodes and arcs
Matrix representation

$A_{ij} = \begin{cases} 
1, & \text{if there is an edge between nodes } v_i \text{ and } v_j \\
0, & \text{otherwise}
\end{cases}$

- Can be extended to weighted graphs
- Social networks tend to be sparse matrices
Community structure

- Connected components (undirected graphs)
  - Nodes reachable

- Strongly connected components (directed graphs)
  - Nodes mutually reachable

Community structure (cont.)

• A community, cluster, or partition is a group of nodes that is *more connected among them* than with the rest of the graph.

• Many formal definitions and algorithms.

• [Girvan & Newman 2002]: remove high-betweenness edges, keep track of connected components.

http://math.aalto.fi/~lleskela/SDLRG/
Karate Club, US University in 1970

Nodes 1 and 34 were the karate instructor and an administrator from the university.

They had a big argument, and the club splitted in two.

Degree

- Number of connections of a node
- In-degree, Out-degree in directed graphs
- Weighted (in-/out-)degree in weighted graphs
Degree distributions

- Social networks have skewed degree distributions
  - Scale-free networks, power laws
  - Many nodes with huge degree
- Plausible mechanism: preferential attachment
Centrality

A) Betweenness centrality
   - Being in many shortest paths

B) Closeness
   - Being close to many nodes

C) Eigenvector centrality
   - End of many paths

D) Degree centrality
   - High degree
Centrality = Quality?

• Various hypothesis about high-centrality authors
  - They can produce “better” content
  - They are more “influential”
  - They are “experts” (within a community/cluster/partition)

• To some extent, yes, but ...
  - How to combine this with other signals requires careful tuning
  - Ideally on a learning-to-rank framework
Social Media Mining and Retrieval
Part 04: Information Cascades
“Twitter Revolution”

- “Viral” calls to demonstrations against fraud in elections in Moldova and Iran in 2009
- Explosive “bursts” of messages that reach huge audiences
- Example: 

  #Kony2012
Viral content

Everybody wants their content to “go viral”
Example cascade [Ienco et al. 2010]

What we infer about predictability of cascades?
Large cascades are rare

- Most content is never shared
- Content that is shared is mostly shared just once
  - Shares per item have a very skewed distribution

http://www.boyntons.us/website/new-media/analyses/concentration/focus-twitter-streams.html
Many Phenomena are Epidemic

• “Infected” can mean many things:
  – Buying a product, hiring an insurance, sharing a post, preferring a beverage, voting for a candidate, etc.

• Obesity is “contagious”
  [Christakis&Fowler 2007]

• Happiness, too!
  [Fowler&Christakis 2008]

Circles are female, squares are male; lines indicate relationships (black = siblings; red = friends, spouses). Color is happiness, with blue indicating “the blues,” and yellow indicating sheer joy. Green is somewhere in between.

http://web.med.harvard.edu/sites/RELEASES/html/christakis_happiness.html
Epidemic models

- Many possible stages: Susceptible-Infected simplest one
  - Susceptible-Infected-Susceptible / Susceptible-Infected-Inmune

- Populations described by simple differential equations
  - See e.g. https://en.wikipedia.org/wiki/Epidemic_model

- Current models are discrete, stochastic, and assume only certain propagations/contagions are possible
Discrete models of viral propagation

- Linear threshold
  - Activate if sum of weighted in-links exceeds a threshold

- Independent cascades
  - One attempt to activate through each probability-weighted out-link

- General activation functions
Linear threshold

- Each node has a threshold
- Activate if weighted sum of inputs reaches or exceeds threshold
- Arc weights represent influence

\[ \theta_v = 3 \]

\[ w_{rv} = 1 \]
\[ w_{sv} = 2 \]
\[ w_{tv} = 1 \]
\[ w_{uv} = 2 \]
Linear threshold (cont.)

- Each node has a threshold
- Activate if weighted sum of inputs reaches or exceeds threshold
- Arc weights represent influence

\[
\theta_v = 3 \\
\begin{align*}
   w_{rv} &= 1 \\
   w_{sv} &= 2 \\
   w_{tv} &= 1 \\
   w_{uv} &= 2
\end{align*}
\]
Independent cascades

- Each active node has one chance of activating neighbors
- Arc probabilities are the chance of succeeding

\[ P_u = 1 - (1 - 0.3) \times (1 - 0.5) \]
Some problems

- Determining expected size of cascades
  - Simulation is main approach
- Inferring influence probabilities
- Topic-specific cascades
- Time-critical cascades
- Competitive cascades
Engineering cascades?

- Strategy 1: invest money in convincing a few influentials
- Strategy 2: invest money in convincing random people
- Strategy 1 vs Strategy 2 still a controversy
  - Viral marketing business driven by outliers?
  - Models not faithful enough?
  - One model doesn't fit all cases?
Social Media in Natural Disasters

Carlos Castillo

Thanks to: Patrick Meier, Alexandra Olteanu, Muhammad Imran, Sarah Vieweg, Fernando Diaz, Aditi Gupta, Hemant Purohit

http://bigcrisisdata.org/
@bigcrisisdata
Humanitarian Computing

At least **775** publications:

- Crisis Analysis (55)
- Crisis Management (309)
- Situational Awareness (67)
- Social Media (231)
- Mobile Phones (74)
- Crowdsourcing (116)
- Software and Tools (97)
- Human-Computer Interaction (28)
- Natural Language Processing (33)
- Trust and Security (33)
- Geographical Analysis (53)

Source: [http://humanitariancomp.referata.com/](http://humanitariancomp.referata.com/)
An earthquake hits a Twitter user

- When an earthquake strikes, the first tweets are posted 20-30 seconds later.
- Damaging seismic waves travel at 3-5 km/s, while network communications are light speed on fiber/copper + latency.
- After ~100km seismic waves may be overtaken by tweets about them.

http://xkcd.com/723/
Actual messages during disasters

- “OMG! The fire seems out of control: It’s running down the hills!” (bush fire near Marseilles, France, in 2009)
- “Red River at East Grand Forks is 48.70 feet, +20.7 feet of flood stage, -5.65 feet of 1997 crest. #flood09” (Red River Valley floods in 2009).
- “My moms backyard in Hatteras. That dock is usually about 3 feet above water [photo]” (Hurricane Sandy 2013 - reddit)
- “Sirens going off now!! Take cover...be safe!” (Moore Tornado 2013)
- “There is shooting at Utøya, my little sister is there and just called home!” (2011 attacks in Norway)
Possible topics

- (Sub-)event detection
- Characterizing (sub-)events with structured data
- Summarizing (sub-)events
- Prioritizing/filtering messages
- Helping to evaluate severity of damage, urgency of needs
- Routing messages to responders
- Matching messages describing problems and solutions

A map.”
Crisis mapping goes mainstream (2011)

Social media is critical for humanitarian work & now you can see why. Crisis Map of #Libya is now public: http://bit.ly/g8xCtm #UN #OCHA

about 1 hour ago via Tweet Spinner
Retweeted by 100+ people

UN
United Nations

Please help us document the crimes in Syria. Here is a short tutorial on how to report. In addition, please see the Instructions page for security precautions to take while submitting reports from the field. Reports can be submitted anonymously or you have the option to provide your personal information. You can also submit reports via email to syriatracker@gmail.com or by adding the hashtag #basharcimes to your tweet(s) (please make sure you include the location or geo-location of the report when submitting via email or twitter). Learn to protect your security online (Arabic version - English version).

Reports can be downloaded here. You can subscribe to alerts here. To report cases of human rights violations of sexualized violence, please visit Women Under Siege.

Eyewitness account from Syria

More Information
Zoom In | Zoom Out
Digital Humanitarians: The Book

Patrick Meier is writing a book charting the sudden rise of Digital Humanitarians by sharing their remarkable, real-life stories, highlighting how their humanity coupled with innovative solutions is changing humanitarian response forever. Look for it spring 2015!

BECOME A MEMBER

Organizations working in this space can apply to become members. Find out how here.
Read More

ACTIVATE DHN

When disaster strikes, humanitarian organizations can apply here to activate a DHN team to support response.
Read More

FIND USEFUL MATERIALS

On volunteer & technical communities, past activations, effectively collaborating and more.
Read More
http://newsbeatocial.com/watch/0_s6xxcr3p
# Classification

## Filtered tweets

<table>
<thead>
<tr>
<th>Category</th>
<th>Caution &amp; Advice</th>
<th>Information Sources</th>
<th>Damage &amp; Casualties</th>
<th>Donations</th>
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<tbody>
<tr>
<td>Gov</td>
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<td>Outsider</td>
<td><img src="tweet.png" alt="Tweets" /></td>
<td><img src="tweet.png" alt="Tweets" /></td>
<td><img src="tweet.png" alt="Tweets" /></td>
<td><img src="tweet.png" alt="Tweets" /></td>
</tr>
</tbody>
</table>

...
Classification Axes

• By usefulness (application-dependent!)
  - Not related, Related but useless, Useful

• By factual, subjective, or emotional content

• By information provided

• By information source
  - Government, NGOs, media, eyewitnesses, etc.

• By humanitarian clusters
Humanitarian Clusters

Of the 15% of tweets potentially relevant to the humanitarian community:

- **Education and Child Welfare**
  - 4.1%
  - 18,076 tweets
  - RT @AdamsonUni: Classes and work at all levels are suspended today Nov 8 in anticipation of Typhoon Yolanda. Stay safe Adamsonians. #wala

- **Early Recovery**
  - 3.3%
  - 14,602 tweets
  - Doing relief efforts now for #YolandaPH. Need free shipping line info.

- **Telecommunication**
  - 1.8%
  - 8,002 tweets
  - MTSAT enhanced-IR satellite image of #YolandaPH as of 2:30 am 09 November 2013: http://…/ RT @govph

Overview
Number of tweets in the first 48 hours
442,560
Humanitarian Clusters (cont.)

1.8% 8,002 tweets
- Telecommunication
  MTSAT enhanced-IR satellite image of #YolandaPH as of 2:30 am 09 November 2013: http://.../ RT @govph

1.8% 7,884 tweets
- Safety and Security
  7000 kid's parents have been killed by the storm in the Philippines and #StayStrongJustin is trending... Ridiculous http://.../

1.1% 4,712 tweets
- Food and Nutrition
  Red Cross asks for help from police / military. their trucks w/ food and water for 25000 families are stopped in Tanauan
Information Provided in Crisis Tweets

N=26; Data available at http://crisislex.org/
What do people tweet about?

- **Affected individuals**
  - 20% on average (min. 5%, max. 57%)
  - most prevalent in human-induced, focalized & instantaneous events

- **Sympathy and emotional support**
  - 20% on average (min. 3%, max. 52%)
  - most prevalent in instantaneous events

- **Other useful information**
  - 32% on average (min. 7%, max. 59%)
  - least prevalent in diffused events
What do people tweet about? (cont.)

- Infrastructure and utilities
  - 7% on average (min. 0%, max. 22%)
  - most prevalent in diffused events, in particular floods

- Caution and advice
  - 10% on average (min. 0%, max. 34%)
  - least prevalent in instantaneous & human-induced events

- Donations and volunteering
  - 10% on average (min. 0%, max. 44%)
  - most prevalent in natural hazards
Distribution over time

- Donations & Volunteering
- Infrastructure & Utilities
- Other Specific Info.
- Sympathy & Support
- Affected Individuals
- Caution & Advice

Time intervals:
- 12h
- 24h
- 36h
- 48h
- ... several days
@JimFreund: Apparently we have no choice. There is a tornado watch in effect tonight.
Output examples

✅ RT @weatherchannel: .@NYGovCuomo orders **closing of NYC bridges**. Only Staten Island bridges unaffected at this time. Bridges must close by 7pm. #Sandy #NYC

❌ Wow what a mess #Sandy has made. Be sure to check on the elderly and **homeless** please! Thoughts and prayers to all affected

✅ RT @twc_hurricane: **Wind gusts over 60 mph** are being reported at Central Park and JFK airport in #NYC this hour. #Sandy

✅ RT @mitchellreports: Red Cross tells us grateful for Romney donation but prefer people send money or **donate blood dont collect goods** NOT best way to help #Sandy
Outline of rest of this part

- Example 1: Readability
- Example 2: Credibility
- AIDR
Example 1/2: Readability

• The ease with which text can be understood

• History
  – Started in early 20th century
  – Purpose: grade school texts
  – Vocabulary, syntax, structure
  – Classical approach: readability formulae

• Modern approaches: machine learning
If there are any points on which you require explanation or further particulars we shall be glad to furnish such additional details as may be required by telephone. 28 words

If you have any questions, please phone. 7 words
Typical readability problems

• Misspellings
• Unknown or unfamiliar words
• Unknown abbreviations and acronyms
• Long sentences
• Too many hashtags

• Non-standard word ordering
• No connectives
• Ambiguous syntax
• Impersonal style and passive voice
Readability in Crisis Communications

- During crises people have limited time
- Texts that are hard to read require more time
- Texts that are hard to read can be misleading
Data: 15 crises

- 15 events from CrisisLexT26 in countries with majority of native English speakers
- “Informative” tweets from media+gov. +NGOs

<table>
<thead>
<tr>
<th>Crisis</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013 Alberta floods</td>
<td>Canada</td>
</tr>
<tr>
<td>2013 Australia bushfires</td>
<td>Australia</td>
</tr>
<tr>
<td>2013 Bohol earthquake</td>
<td>Philippines</td>
</tr>
<tr>
<td>2013 Boston bombings</td>
<td>USA</td>
</tr>
<tr>
<td>2013 Colorado Floods</td>
<td>USA</td>
</tr>
<tr>
<td>2013 Glasgow helicopter crash</td>
<td>UK</td>
</tr>
<tr>
<td>2013 Los Angeles airport shooting</td>
<td>USA</td>
</tr>
<tr>
<td>2013 Lac Mégantic train crash</td>
<td>Canada</td>
</tr>
<tr>
<td>2013 Manila floods</td>
<td>Philippines</td>
</tr>
<tr>
<td>2013 New York train crash</td>
<td>USA</td>
</tr>
<tr>
<td>2013 Queensland floods</td>
<td>Australia</td>
</tr>
<tr>
<td>2013 Savar building collapse</td>
<td>Bangladesh</td>
</tr>
<tr>
<td>2013 Singapore haze</td>
<td>Singapore</td>
</tr>
<tr>
<td>2013 Typhoon Yolanda</td>
<td>Philippines</td>
</tr>
<tr>
<td>2013 West Texas explosion</td>
<td>USA</td>
</tr>
</tbody>
</table>
Data Annotation

- Used CrowdFlower
  - Annotators in AU, CA, NZ, UK, USA
  - 5 annotators/tweet
  - Instructions and quiz before starting
- Annotated 500 tweets
- Pre-processing: Removed "RT @user:"
- Only tweets with a weighted measure of agreement $\theta \geq 0.66$ selected

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#SGhaze update: 3-hour PSI at 5pm is 73, in 'moderate' range, 24-hr PSI is 52-65. @NEAsg
(Posted during the 2013 Singapore haze)

This tweet:
- Is very CLEAR - easy to understand
- Needs slight IMPROVEMENT to be clear
- Is very UNCLEAR - hard to understand

How would you improve this tweet?

Free text, optional
Feel free to re-write the tweet completely.

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<table>
<thead>
<tr>
<th>All tweets with confidence $\geq \theta$</th>
<th>301</th>
<th>100.0%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is very CLEAR - easy to understand</td>
<td>247</td>
<td>82.1%</td>
</tr>
<tr>
<td>Needs slight IMPROVEMENT to be clear</td>
<td>36</td>
<td>12.0%</td>
</tr>
<tr>
<td>Is very UNCLEAR - hard to understand</td>
<td>18</td>
<td>6.0%</td>
</tr>
<tr>
<td>Tweet</td>
<td>Crisis</td>
<td>Source</td>
</tr>
<tr>
<td>-------</td>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td>[最新]截至9点，本地空气污染指数狂飙，达290点，属于非常不健康水平！公众请多留意！#sghaze</td>
<td>2013 Singapore haze</td>
<td>Media</td>
</tr>
<tr>
<td><img src="t.co/Lti7AeKB8a" alt="Image" /> or call 1-800-621-FEMA Plz RT</td>
<td>2013 Colorado floods</td>
<td>Government</td>
</tr>
<tr>
<td>NDRRMC Update SitRep No. 26 re Effects of Typhoon PABLO (BOPHA) as of 13 December 2012. 10:00AM. <a href="http://t.co/G8MHAWrq">Link</a></td>
<td>2013 Typhoon Pablo</td>
<td>Government</td>
</tr>
<tr>
<td>Tweet</td>
<td>How to improve?</td>
<td>Crisis</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td>#SGHaze: PSI now at 155 as of 10pm. Here's the health advisory from @NEAsg <a href="http://t.co/tvG4bIYZYO">http://t.co/tvG4bIYZYO</a></td>
<td>Singapore Haze update: Pressure per square inch now at 155 as of 10pm. Here's the health advisory from @NEAsg #SGHaze Pollutant standard index PSI now at 155 as of 10pm. Here's the health advisory from @NEAsg <a href="http://t.co/tvG4bIYZYO">http://t.co/tvG4bIYZYO</a> #SGHaze</td>
<td>2013 Singapore haze</td>
</tr>
<tr>
<td>Tweet</td>
<td>Crisis</td>
<td>Source</td>
</tr>
<tr>
<td>-------</td>
<td>--------</td>
<td>---------</td>
</tr>
<tr>
<td>Deadly quake hits Philippines <a href="http://t.co/ERb2CjSwzf">http://t.co/ERb2CjSwzf</a></td>
<td>2013 Bohol earthquake</td>
<td>Media</td>
</tr>
<tr>
<td>Breaking: Flood maps for Brisbane River are now available <a href="http://t.co/2ExK39rY">http://t.co/2ExK39rY</a> #bigwet</td>
<td>2013 Queensland floods</td>
<td>Media</td>
</tr>
<tr>
<td>Colorado Springs POLICE are closing PALMER PARK as a PRECAUTION ONLY!!!!! #WaldoCanyonFire</td>
<td>2013 Colorado fires</td>
<td>Government</td>
</tr>
</tbody>
</table>
Statistics

Characteristics of selected tweets in our dataset.

“Unclear” means “Needs Slight Improvement” or “Very Unclear”.

<table>
<thead>
<tr>
<th></th>
<th>Clear</th>
<th>Unclear</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average length</td>
<td>108.6</td>
<td>93.1</td>
<td>***</td>
</tr>
<tr>
<td>Average num. of words</td>
<td>15.5</td>
<td>14.0</td>
<td>**</td>
</tr>
<tr>
<td>Average num. of English words</td>
<td>12.0</td>
<td>7.7</td>
<td>***</td>
</tr>
<tr>
<td>Average word length</td>
<td>6.3</td>
<td>6.1</td>
<td></td>
</tr>
<tr>
<td>Average number of acronyms</td>
<td>0.3</td>
<td>0.7</td>
<td>***</td>
</tr>
<tr>
<td>Average number of mentions</td>
<td>0.3</td>
<td>0.5</td>
<td>*</td>
</tr>
<tr>
<td>Average number of hashtags</td>
<td>1.1</td>
<td>1.2</td>
<td></td>
</tr>
<tr>
<td>Fraction with acronyms</td>
<td>25.5%</td>
<td>64.8%</td>
<td>***</td>
</tr>
<tr>
<td>Fraction with mentions</td>
<td>23.5%</td>
<td>38.9%</td>
<td>**</td>
</tr>
<tr>
<td>Fraction with URLs</td>
<td>56.3%</td>
<td>22.2%</td>
<td>***</td>
</tr>
<tr>
<td>Fraction with URLs in the middle</td>
<td>29.2%</td>
<td>11.1%</td>
<td>***</td>
</tr>
<tr>
<td>Fraction with ellipsis</td>
<td>17.8%</td>
<td>14.8%</td>
<td></td>
</tr>
<tr>
<td>Fraction with hashtags (#)</td>
<td>68.8%</td>
<td>87.0%</td>
<td>***</td>
</tr>
<tr>
<td>Fraction with # at the beginning</td>
<td>6.1%</td>
<td>37.0%</td>
<td>***</td>
</tr>
<tr>
<td>Fraction with # in the middle</td>
<td>31.6%</td>
<td>35.2%</td>
<td></td>
</tr>
<tr>
<td>Fraction with # at the end</td>
<td>37.3%</td>
<td>25.9%</td>
<td>*</td>
</tr>
</tbody>
</table>

*** p<0.01  
** p<0.05  
* p< 0.1
Readability observations

Tweets should be short, but not shorter than necessary:

- Include a maximum of 1 or 2 main points per tweet
- Use abbreviations and acronyms with care (e.g. PSI in Singapore), simple and familiar words.
- **Bad strategies for shortening tweets can render them unreadable!**
- **Write brief, concise sentences, but avoid incomplete sentences.**

Use Twitter-specific syntax with care:

- Hashtags at the beginning of tweets make them less readable!
- **Include at most 1 or 2 hashtags, and only at the end of the tweet.**
- **Avoid user mentions (i.e. "@user") when possible.**

Next steps: automation?
Example 2/2: Credibility

- Another perceived characteristic
- Can be approximated quite well with content-based, user-based, and propagation-based features
Credibility evaluation: TweetCred

- Real-time web-based service
- Used as a Chrome extension
- Annotates Twitter's timeline with credibility scores
http://twitdigest.iiitd.edu.in/TweetCred/
AIDR—Artificial Intelligence for Disaster Response—is a free and open platform to filter and classify social media messages related to emergencies, disasters, and humanitarian crises. AIDR uses human and machine intelligence to automatically tag up to thousands of messages per minute. Learn more.

Live data

Crisis: EMSC Landslides by KW eng

NowPlaying Avalanche - Johnny, Johnny Come Home

Landslide: Not physical landslide (Confidence: 1.0)

Volunteers
Volunteer with MicroMappers

Analysts
View crisis data

Operators
Test AIDR

Developers
Get the source code

The AIDR team fully endorses ICRC's Data Protection Protocols and UN's Guidelines on Cyber Security. AIDR users should familiarize themselves with both documents and respect international standards on data privacy, security, and protection.

Subscribe to aidr-users to receive announcements about the platform. Contact Patrick Meier for inquiries.

Featured in Wired, WSJ, Mashable, Forbes, Nature
Social Media Mining and Retrieval

Conclusions
Some ethical aspects

- Disclosing private information is not a consent for any usage of this information in any context
- Authenticity, edited self and social anxiety
- Reducing/increasing inequality (gender, race, social class)
- Values embedded in social media platforms
  - Business thrive on disclosure and frame it as a value
  - Marketing strategies used by individuals: what is exactly the product and what is its price?
Finding an Interesting Problem

- **Useful**
  - Supported by data
  - Computationally feasible
  - Usefulness

- **Temptation! Danger!**
  - Poorly planned projects 😞
  - “AI-complete” problems
Things to remember

• Social media is beautifully chaotic

• Validity vs hype of social media mining
  – Interdisciplinary research is hard but rewarding

• Lots of interesting topics to work on
  – Some of them are also useful

• Happiness is contagious!
Further references

- Tutorial: Twitter and the real world [Weber and Mejova 2013]
  - https://sites.google.com/site/twitterandtherealworld/home

- Social media mining [Zafarani, Abbasi and Liu 2014]

- Information and Influence Propagation in Social Networks
  [Chen, Lakshmanan and Castillo 2013]
  - http://www.morganclaypool.com/doi/abs/10.2200/S00527ED1V01Y201308DTM037