IEERG Research Briefing

Sydney Siege, December 2014:
A Semantic Social Media Sentiment Analysis

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Team

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The University of Sydney

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The University of Sydney
Agenda

- Sentiment Analysis Approaches
- Research Design
- Case – 2014 Sydney Siege
- Sentiment Patterns during 2014 Sydney Siege
Sentiment Analysis Approaches
Example of Sentiment Analysis Approaches

http://okhin.com/blog/sentiment-analysis-methods/
Problems with Sentiment Analysis Approaches

- Sentiment can indicate feelings and emotions, opinion and reactions or indicate outlooks or perspectives of those who are communicating.

- Most sentiment analysis systems are not based on any specific theories of communicated sentiment.

- Usual ways of determining social media sentiment are based on ‘bag of words’ algorithms where words are classified according to a presumed emotional polarity.

- This gives us only limited view of what social media users are feeling about an extreme event.
Towards Functional Linguistic Analysis
Methods

- We are applying a functional linguistic theory of communication called **Systemic Functional Linguistics**

- We are using the **Appraisal Framework** to unpack the attitudes and sentiment of social media messages during extreme events
Software Prototype

User Interface to annotate Tweets

Machine Learning Classifier

Analysis & Visualisation Tool
User Interface to annotate Tweets

Training procedure for dictionary

1. Identify Clauses
2. Identify Appraisal Items
3. Classify appraisal

Appraised items and categorization
To feed the machine learning process with additional information, you can optionally choose an appraised item. Otherwise just categorize the appraisal items.

⚠️ By clicking on the classifier proposals, you can accept them.

<table>
<thead>
<tr>
<th>clause</th>
<th>appraisal item</th>
<th>appraised item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thinking of the hostages</td>
<td>hostages</td>
<td></td>
</tr>
<tr>
<td>at this terrible and frightening time</td>
<td>terible</td>
<td></td>
</tr>
<tr>
<td>at this terrible and frightening time</td>
<td>frightening</td>
<td></td>
</tr>
</tbody>
</table>

Classify HOSTAGES

Appreciation  Affect  Judgement  Amplification
Machine Learning Classifier
## Machine Learning Classifier

<table>
<thead>
<tr>
<th>Setting</th>
<th>Base Classifier</th>
<th>Feature Type</th>
<th>Appraisal Boost</th>
<th>MAP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setting 1</td>
<td>Naïve Bayes</td>
<td>binary</td>
<td>X</td>
<td>46.59%</td>
</tr>
<tr>
<td>Setting 2</td>
<td>Naïve Bayes</td>
<td>TF/IDF</td>
<td>X</td>
<td>45.53%</td>
</tr>
<tr>
<td>Setting 3</td>
<td>Naïve Bayes</td>
<td>frequency</td>
<td>X</td>
<td>49.26%</td>
</tr>
<tr>
<td>Setting 4</td>
<td>Naïve Bayes</td>
<td>TF/IDF</td>
<td>1.7</td>
<td>45.98%</td>
</tr>
<tr>
<td>Setting 5</td>
<td>Naïve Bayes</td>
<td>frequency</td>
<td>1.7</td>
<td>49.72%</td>
</tr>
<tr>
<td>Setting 6</td>
<td>Logistic Regression</td>
<td>binary</td>
<td>X</td>
<td>48.59%</td>
</tr>
<tr>
<td>Setting 7</td>
<td>Logistic Regression</td>
<td>TF/IDF</td>
<td>X</td>
<td>44.63%</td>
</tr>
<tr>
<td>Setting 8</td>
<td>Logistic Regression</td>
<td>frequency</td>
<td>X</td>
<td>50.24%</td>
</tr>
<tr>
<td>Setting 9</td>
<td>Logistic Regression</td>
<td>TF/IDF</td>
<td>1.7</td>
<td>48.92%</td>
</tr>
<tr>
<td>Setting 10</td>
<td>Logistic Regression</td>
<td>frequency</td>
<td>1.7</td>
<td>51.46%</td>
</tr>
</tbody>
</table>
Analysis and Visualisation Tool

The evacuation of Martin Place starts shortly after 10.00am. Staff members of Channel Seven are subject to a lockdown of Seven’s news studio at Martin Place and observe the scene from the windows of their office. Hostages are seen pressed on the windows of Lindt Café holding a black flag with Arabic writing on it in their raised hands.

A blurry picture of the gunman is broadcasted.

Half an hour before noon, Tony Abbott releases a press statement informing the public about the hostage taking incident on Martin Place. Also the National Security Committee of Cabinet is convened for briefings.

20 minutes later, the NSW police force releases another statement to inform about the incident.

At 03:30pm hostages are reportedly running from the scene.
Analysis and Visualisation Tool
Analysis and Visualisation Tool

Can't imagine anything worse than being in that Lindt cafe at the moment. Definitely something I never thought I'd say. Hope this ends okay.

DeannerKebab
Dec 15, 12:11PM
Positive reaction

Hoping for a peaceful resolution with no casualties #sydneysiege

ricky__b
Dec 15, 7:50PM
Positive reaction

My thoughts are with Sydney today. A country like Australia doesn't deserve this.

fameega
Dec 15, 8:27PM
Positive reaction

@guardiannews too much coverage of this sad event. Every would be jihadi can see what attention one sad guy with a flag and a shotgun gets.

gordonh59
Dec 16, 2:30AM
Sadness
## Sydney Siege 2014 - Timeline

<table>
<thead>
<tr>
<th>Timeline</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>15th December 2014</strong></td>
<td></td>
</tr>
<tr>
<td>08:33 am</td>
<td>later hostage-taker enters the café</td>
</tr>
<tr>
<td>~09:40 am</td>
<td>hostage-taker speaks to the manager; hostage situation unfolds</td>
</tr>
<tr>
<td>09:41 am</td>
<td>forced call to 000 (Australia’s emergency phone number)</td>
</tr>
<tr>
<td>09:49 am</td>
<td>Police arrives at Martin Place</td>
</tr>
<tr>
<td>10:20 am (approx.)</td>
<td>Hostages were forced to hold black flag against the window</td>
</tr>
<tr>
<td>10:45 am</td>
<td>Sydney Opera House was evacuated (caused by suspicious package)</td>
</tr>
<tr>
<td>03:37 pm</td>
<td>Three hostages escaped the building</td>
</tr>
<tr>
<td>04:58 pm</td>
<td>Two more hostages escaped through another exit</td>
</tr>
<tr>
<td><strong>16th December 2014</strong></td>
<td></td>
</tr>
<tr>
<td>2:00 am</td>
<td>Six hostages were fleeing out of the building; followed by one gun shot.</td>
</tr>
<tr>
<td>2:11 am</td>
<td>Second gun shot. Hostage escapes.</td>
</tr>
<tr>
<td>2:13 am</td>
<td>One hostage was shot. Police are storming the café.</td>
</tr>
<tr>
<td>2:14 am</td>
<td>Ongoing firefight; One further hostage was killed by stray bullet</td>
</tr>
<tr>
<td>2:44 am</td>
<td>Hostage situation is declared resolved through a NSW Police Tweet. “Siege over. More details to follow”</td>
</tr>
</tbody>
</table>
## Overview Dataset

<table>
<thead>
<tr>
<th>Dataset Overview</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Collected Keywords:</td>
<td>“sydneysiege”, “martinplace”, “sydney”, “lindt”</td>
</tr>
<tr>
<td>Timeframe:</td>
<td>15(^{th}) – 29(^{th}) of December 2014</td>
</tr>
<tr>
<td>Collected Tweets:</td>
<td>5,429,345</td>
</tr>
<tr>
<td>Geotagged Tweets:</td>
<td>50,670</td>
</tr>
</tbody>
</table>
Hourly Tweet rate - Australia
Findings - Overview

Figure 5.2: Hourly tweet rates in Australia, December 15 - 18

distribution of sentiment on December 15 between 10:00 am and 10:00 pm is shown.

In South American countries, African countries besides South Africa and Kenya, the Middle East, and North Asia people did not at all or just rarely respond to the event. While this may be accounted for by a lack of interest, it may very well be a low a

Figure 5.3: Worldwide distribution of sentiment regarding the Lindt Cafè Siege, December 15, 10:00 am - 10:00 pm

APPRECIATION

<table>
<thead>
<tr>
<th>APPRECIATION</th>
<th>Positive reaction</th>
<th>Negative reaction</th>
</tr>
</thead>
</table>

AFFECT

<table>
<thead>
<tr>
<th>AFFECT</th>
<th>Satisfaction</th>
<th>Dissatisfaction</th>
<th>Security</th>
<th>Insecurity</th>
<th>Happiness</th>
<th>Sadness</th>
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JUDGEMENT

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<tr>
<th>JUDGEMENT</th>
<th>Negative social sanction</th>
<th>Positive social sanction</th>
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</table>
- Overall Sentiment - Australia;

- Sentiment towards Victims - Australia;

- Sentiment towards Islam - Australia;

- and Sentiment around #Illridewithyou - Australia.
Findings – Sentiment Australia

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<tr>
<td>JUDGEMENT</td>
<td>Negative social sanction</td>
<td>Positive social sanction</td>
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</table>
Findings – Sentiment Australia
Findings – Sentiment towards Victims, Australia

Next, news media tend to sensationalism and often implicitly help terrorists in the process of gaining sympathy and support. On the one hand, non-Muslims anticipate that people will try to demonize Muslims and communicate their disapproval of this. Exemplarily, the tweet “the people holding hostages in Sydney do not in anyway represent all Muslims, and hating on them for the act of a minority is wrong” (ashIeemeow, Dec 15, 9:12PM) shows this kind of disapproval. The second group constitute Muslims who distance themselves and their religion from the gunman. Potentially, they fear that the gunman’s faith would shed disgrace on their religion. Last, there is a group of people who direct their anger towards Islam and spread hate such as it can be seen from the tweet quoted earlier in this section. Tweets from these individuals often contain pervasive discrimination. At the same time, they try to make use of the Siege to support their pre-existing stigmatisation of ethnic groups based on commonalities with the terrorist. This type of an association fallacy, i.e. “the perpetrator is a Muslim, so all Muslims are potential terrorists”, is especially dangerous in the wake of an extreme event, when the atmosphere is heated.
Findings – Sentiment towards Victims, Australia

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<th>Negative reaction</th>
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<tr>
<td>JUDGEMENT</td>
<td>Negative social sanction</td>
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Findings – Sentiment towards Islam, Australia

APPRECIATION
- Positive reaction
- Negative reaction

AFFECT
- Satisfaction
- Dissatisfaction
- Security
- Insecurity
- Happiness
- Sadness

JUDGEMENT
- Negative social sanction
- Positive social sanction
Findings – Sentiment towards Islam, Australia
Findings - #illridewithyou in Australia

APPRECIATION
- Positive reaction
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AFFECT
- Satisfaction
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- Insecurity
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- Sadness

JUDGEMENT
- Negative social sanction
- Positive social sanction
Findings - #illridewithyou in Australia
Contributions

1. Functional Analysis
   Major Alternative to Informational and Formal Linguistics Approaches

   Dominant Approaches Statistical and Formal Linguistics

2. Appraisal System
   Semantic Social Media Sentiment Analysis

3. Semantic Tweet Visualisation System

4. Social Media Sentiment Analyses
Further Research

- Refining the Visualisation
- Real-time Analysis of Tweets
- Development of Event Fingerprints
About me

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