IEERG Research Briefing

Sydney Siege, December 2014:

A Semantic Social Media Sentiment Analysis

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Team

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Agenda

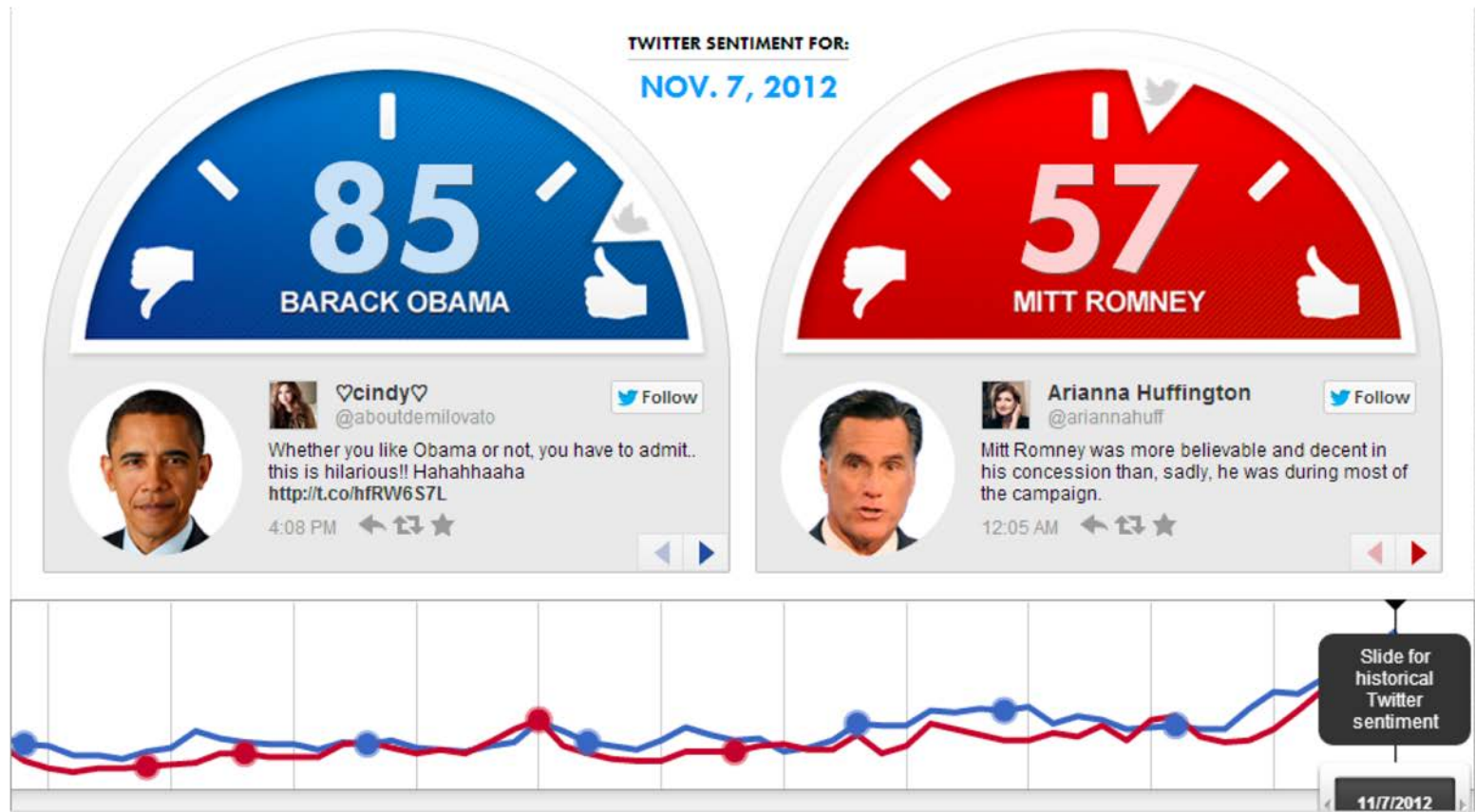Sentiment Analysis Approaches

Research Design

Case – 2014 Sydney Siege

Sentiment Patterns during 2014 Sydney Siege

Sentiment Analysis Approaches

Example of Sentiment Analysis Approaches
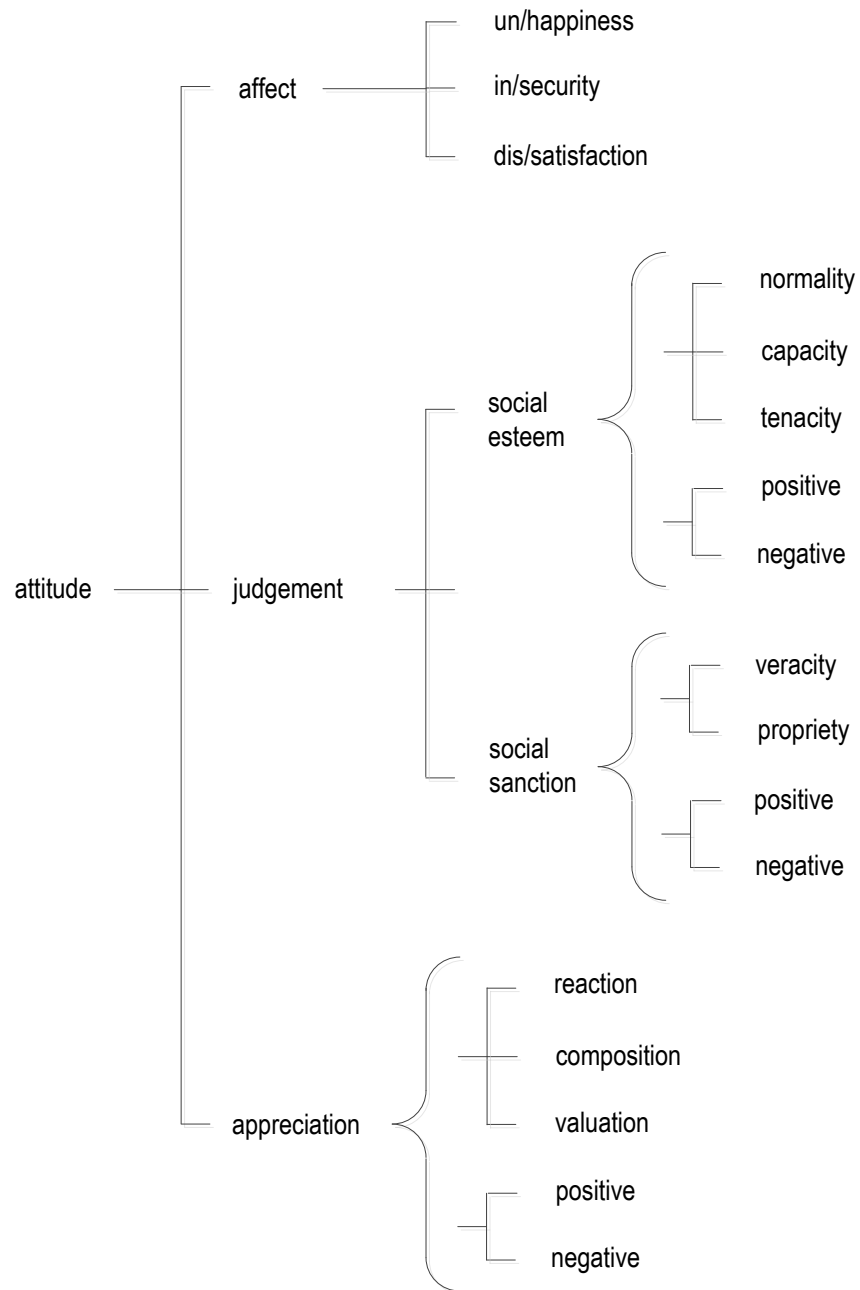

http://okhin.com/blog/sentiment-analysis-methods/

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

attitude

- affect
  - un/happiness
  - in/security
  - dis/satisfaction
- judgement
  - social esteem
    - normality
    - capacity
    - tenacity
    - positive
    - negative
  - social sanction
    - veracity
    - propriety
    - positive
    - negative
- appreciation
  - reaction
  - composition
  - valuation
  - positive
  - negative

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 chose an appraised item. Otherwise just categorize the appraisal items.
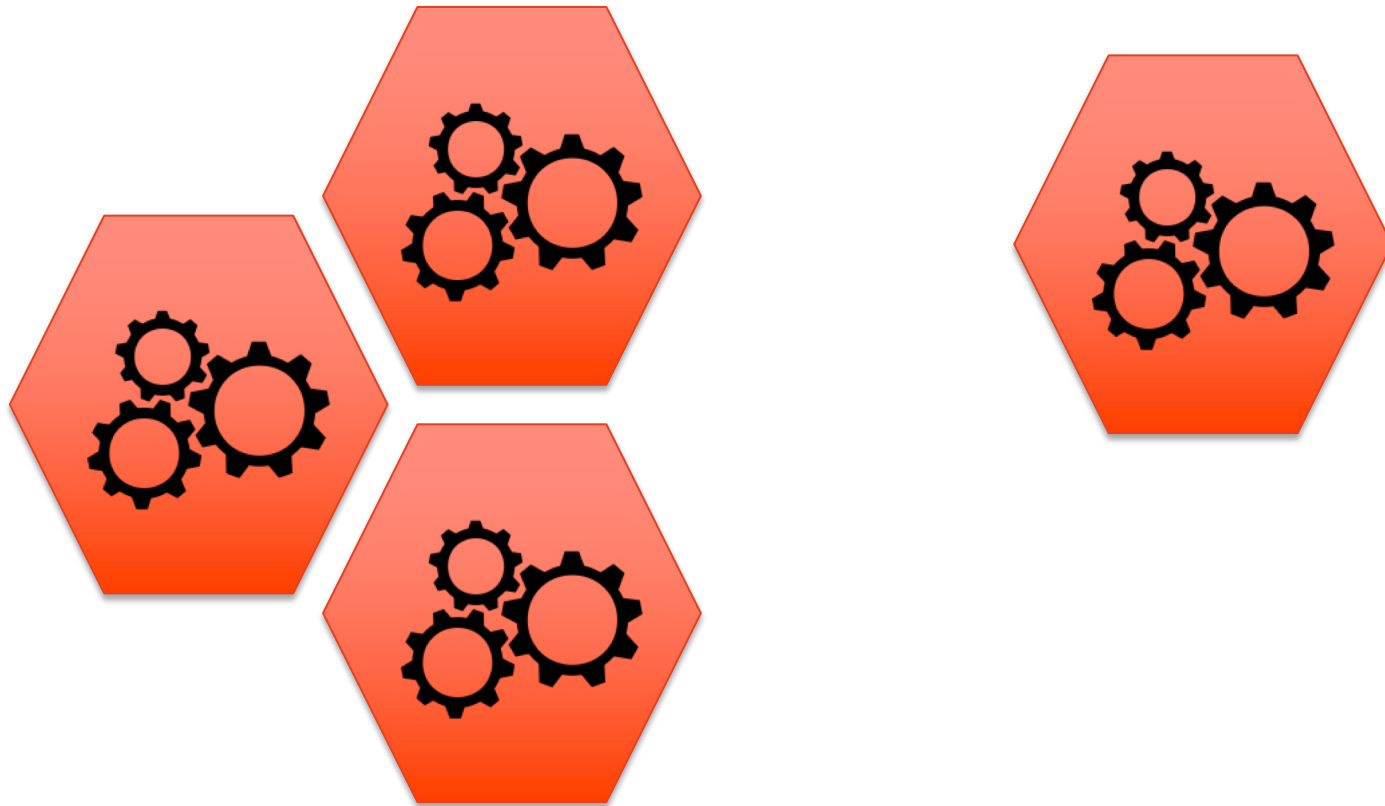
(!) By clicking on the classifier proposals, you can accept them.

	clause	appraisal item	appraised item
🐦	Thinking of the hostages	hostages	
🐦	at this terrible and frightening time	terrible	
🐦	at this terrible and frightening time	frightening	

Classify HOSTAGES

Appreciation	Affect	Judgement	Amplification

Machine Learning Classifier

Machine Learning Classifier

| Setting	Base Classifier	Feature Type	Appraisal Boost	MAP
Setting 1	Naïve Bayes	binary	X	46.59%
Setting 2	Naïve Bayes	TF/IDF	X	45.53%
Setting 3	Naïve Bayes	frequency	X	49.26%
Setting 4	Naïve Bayes	TF/IDF	1.7	45.98%
Setting 5	Naïve Bayes	frequency	1.7	49.72%
Setting 6	Logistic Regression	binary	X	48.59%
Setting 7	Logistic Regression	TF/IDF	X	44.63%
Setting 8	Logistic Regression	frequency	X	50.24%
Setting 9	Logistic Regression	TF/IDF	1.7	48.92%
Setting 10	Logistic Regression	frequency	1.7	51.46%

Analysis and Visualisation Tool
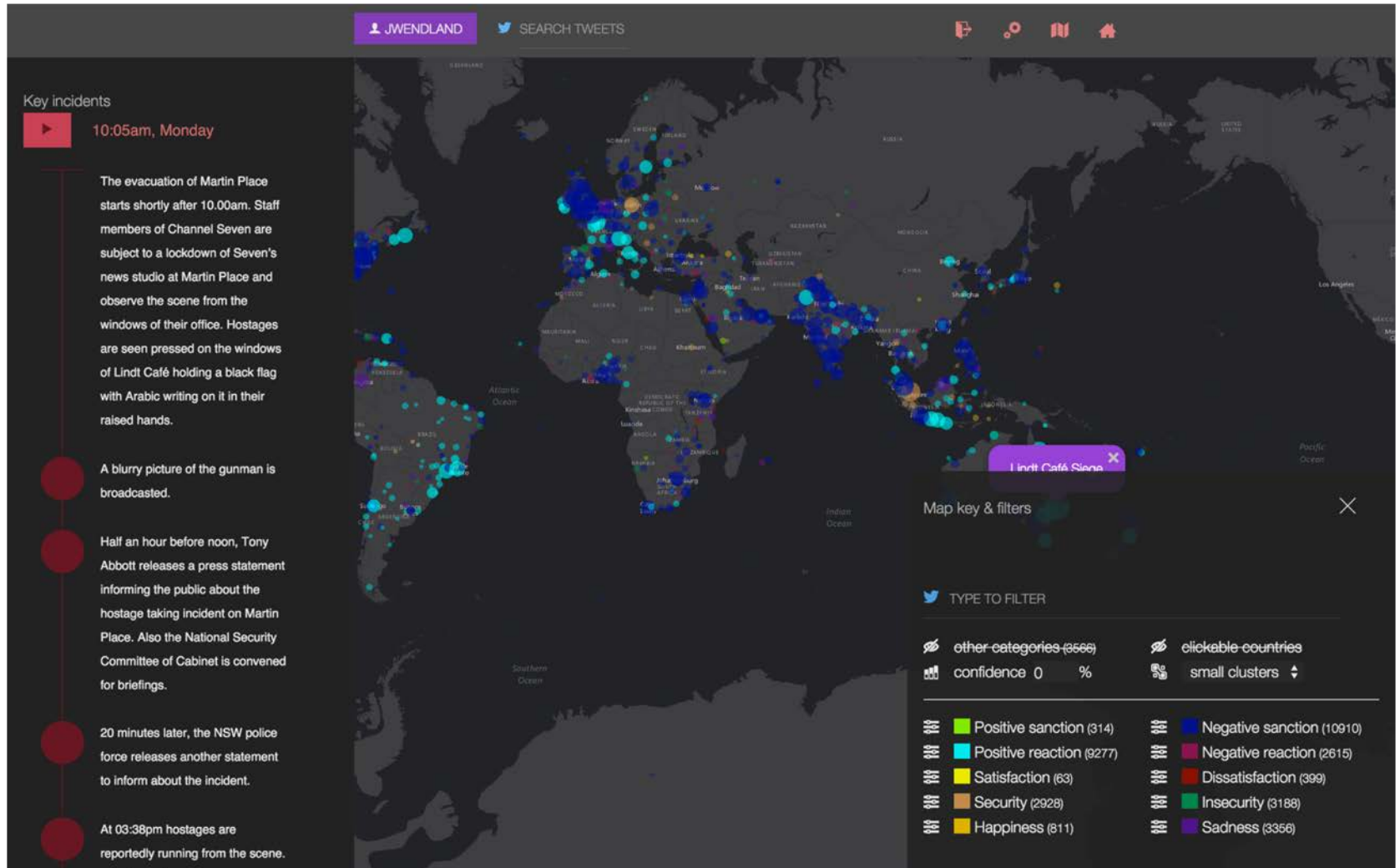
Analysis and Visualisation Tool
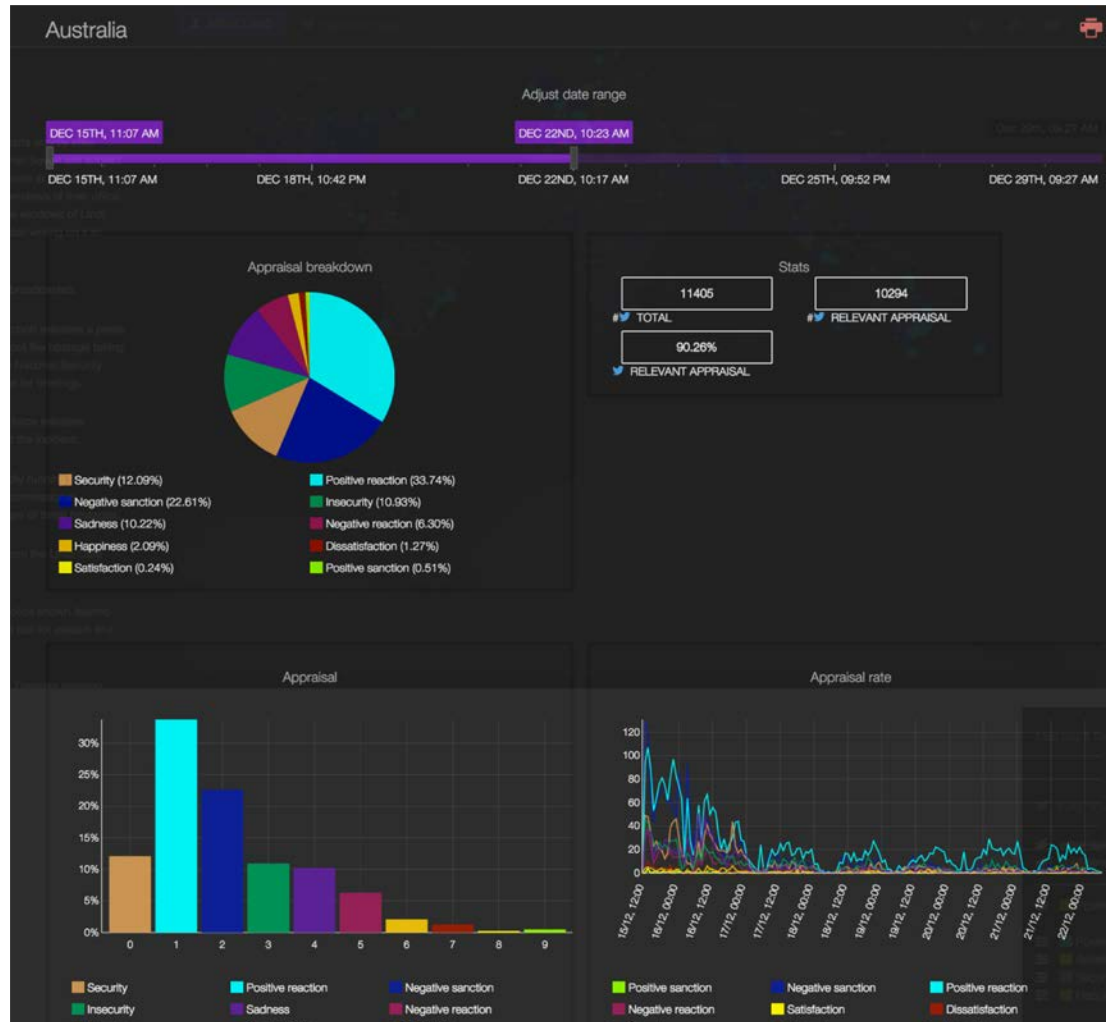
Analysis and Visualisation Tool
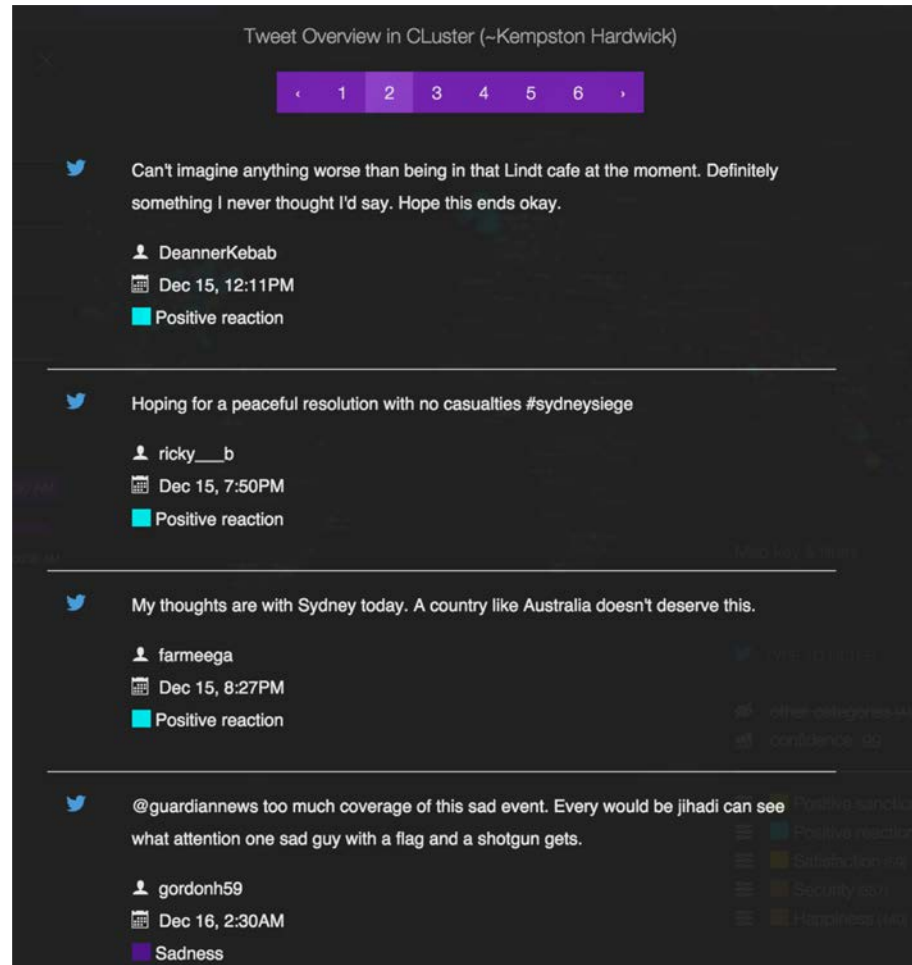
Sydney Siege 2014 – Timeline

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

Overview Dataset

Dataset Overview	
Collected Keywords:	"sydneysiege","martinplace", "sydney", "lindt"
Timeframe:	15th – 29th of December 2014
Collected Tweets:	5,429,345
Geotagged Tweets:	50,670

Hourly Tweet rate - Australia
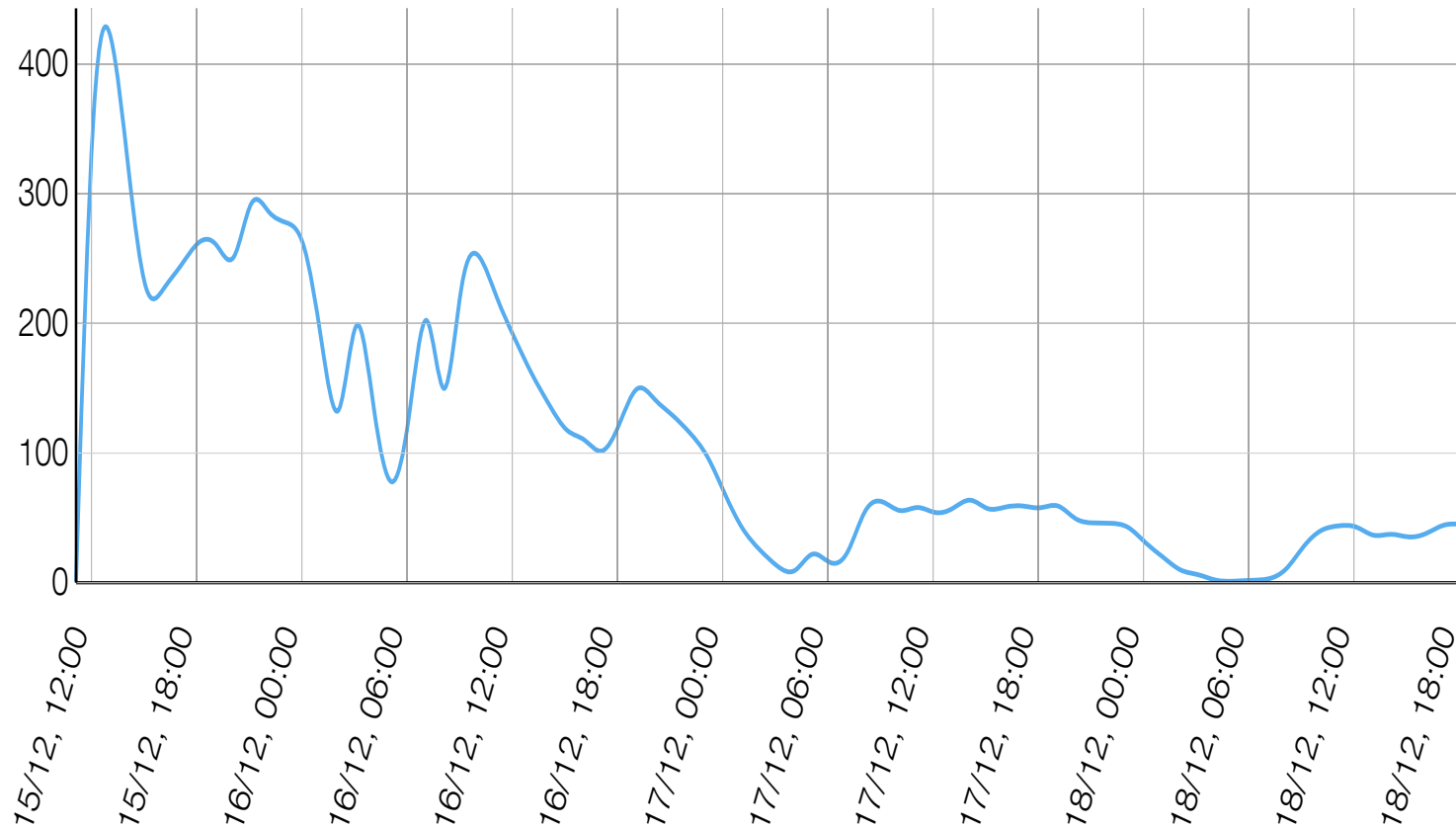
Findings – Overview

APPRECIATION	■ Positive reaction			■ Negative reaction		
AFFECT	■ Satisfaction	■ Dissatisfaction	■ Security	■ Insecurity	■ Happiness	■ Sadness
JUDGEMENT	■ Negative social sanction			■ Positive social sanction		

- Overall Sentiment - Australia;

- Sentiment towards Victims - Australia;

- Sentiment towards Islam - Australia;

- and Sentiment around #Illridewithyou - Australia.

Findings – Sentiment Australia
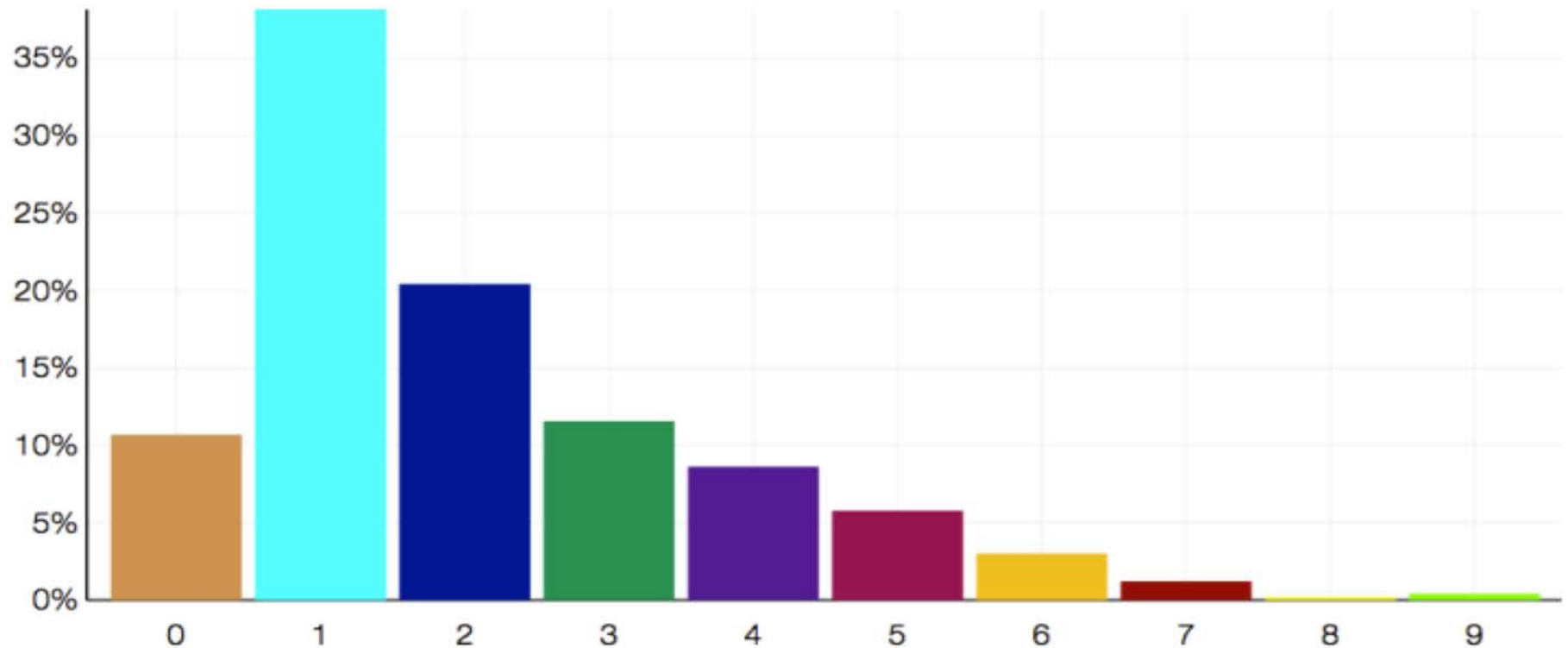
APPRECIATION	Positive reaction				Negative reaction	
AFFECT	Satisfaction	Dissatisfaction	Security	Insecurity	Happiness	Sadness
JUDGEMENT	Negative social sanction				Positive social sanction	

Findings – Sentiment Australia

Findings – Sentiment towards Victims, Australia

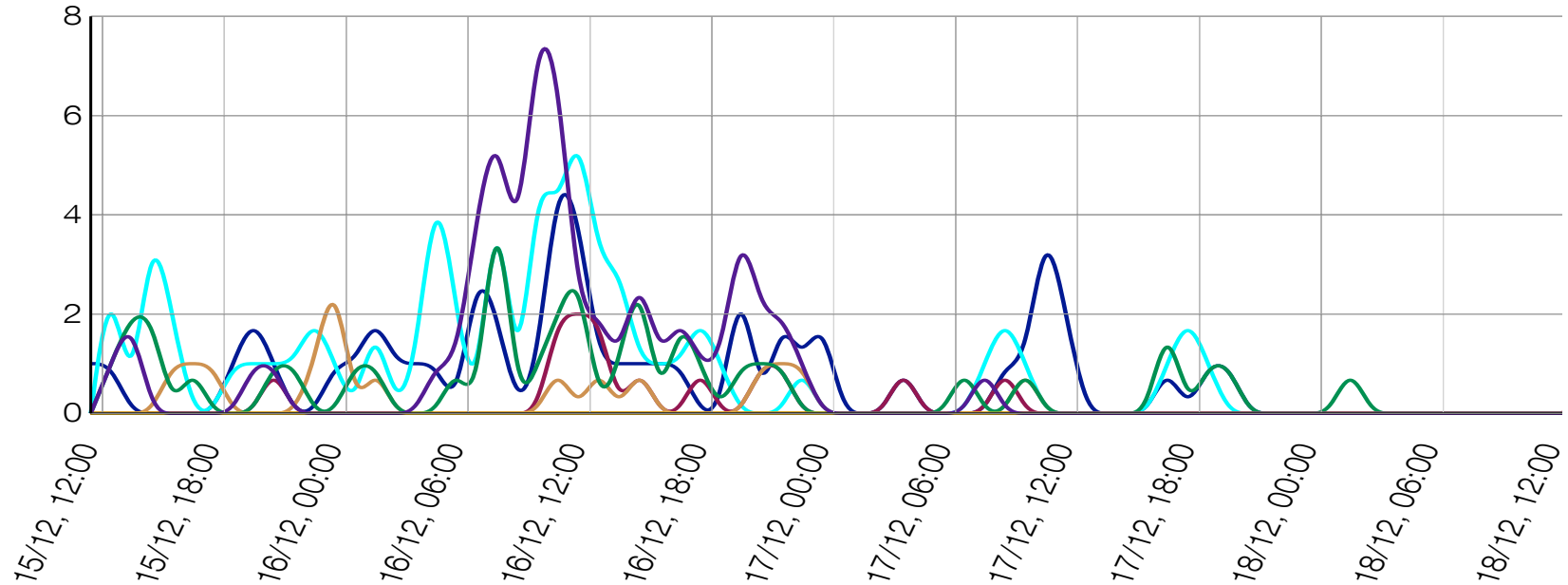| APPRECIATION	Positive reaction				Negative reaction	
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Findings – Sentiment towards Victims, Australia

APPRECIATION	Positive reaction			Negative reaction	
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Findings – Sentiment towards Islam, Australia

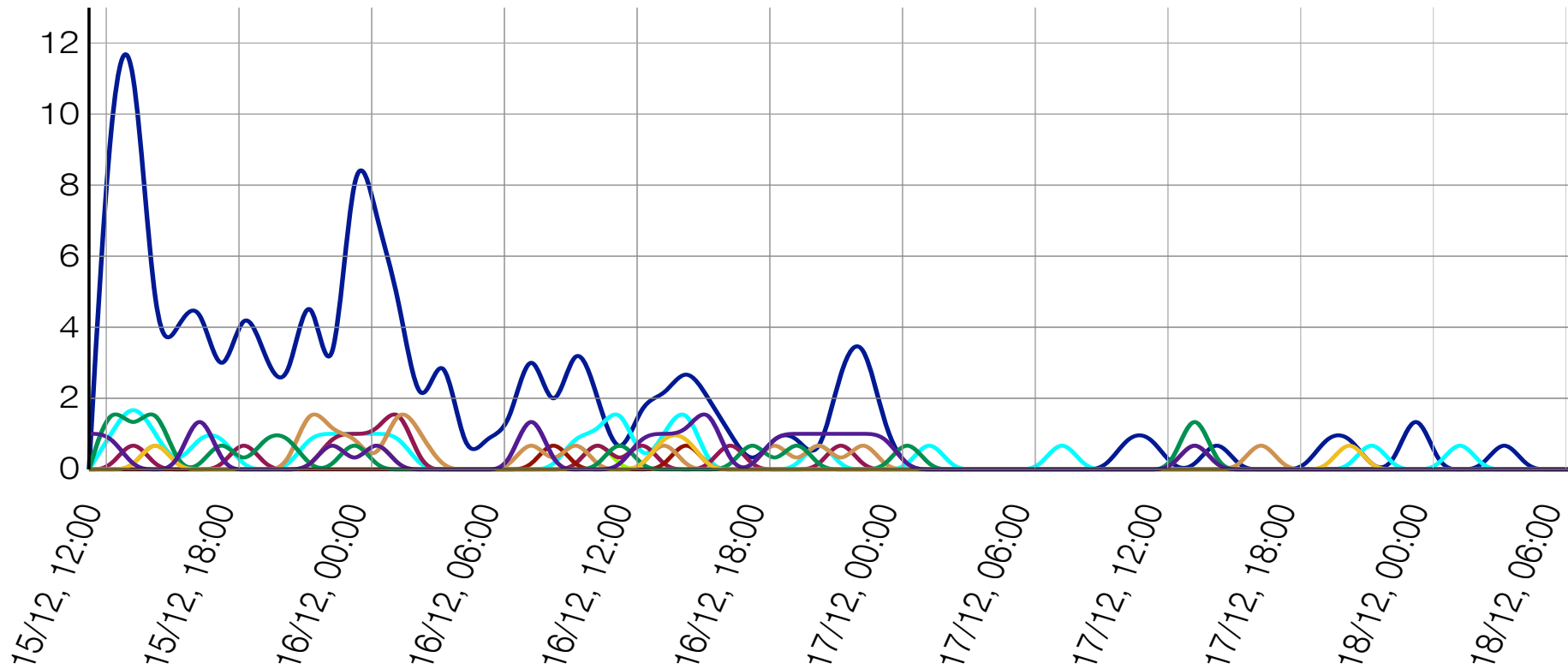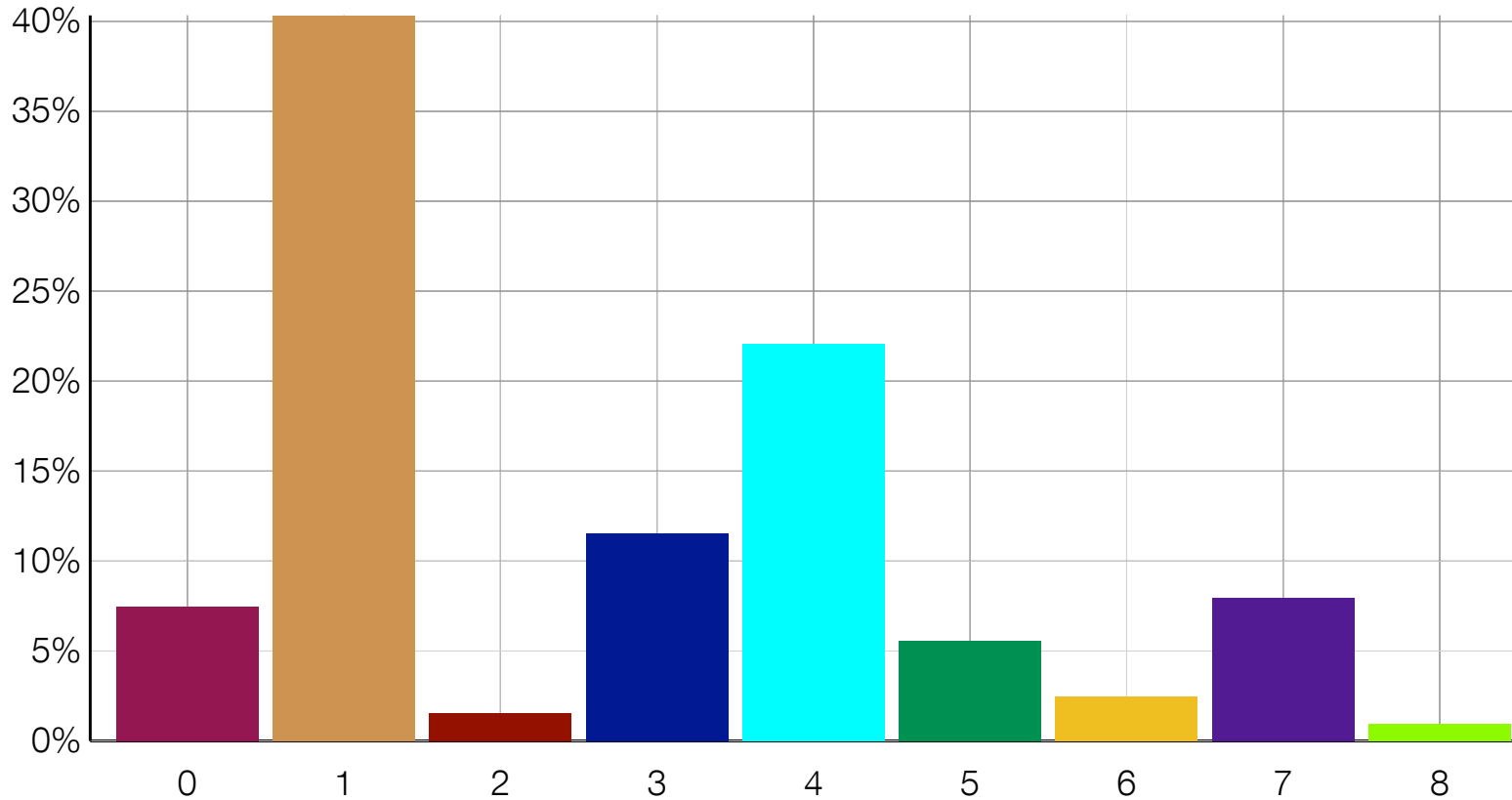| APPRECIATION	Positive reaction			Negative reaction	
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Findings – Sentiment towards Islam, Australia

Findings – #illridewithyou in Australia

Findings - #illridewithyou in Australia

Contributions

1

Functional Analysis

Major Alternative to Informational and Formal Linguistics Approaches

2

Appraisal System

Semantic Social Media Sentiment Analysis

4

3

**Dominant Approaches
Statistical and Formal Linguistics**

Social Media
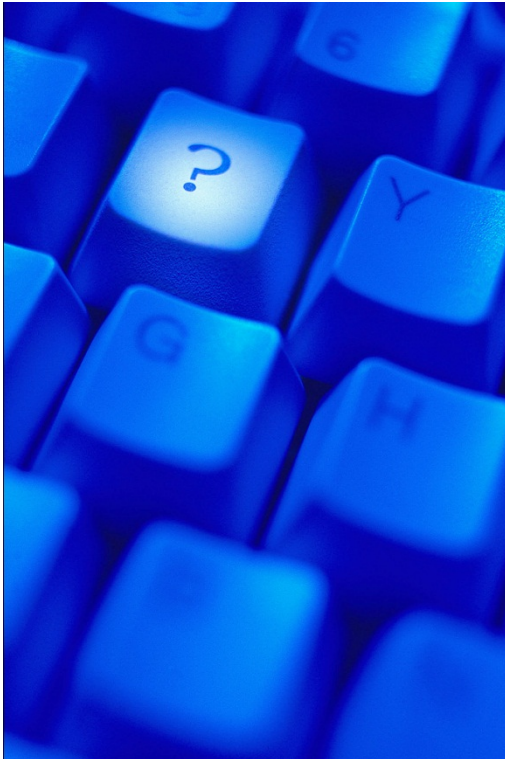Sentiment Analyses

**Semantic Tweet
Visualisation System**
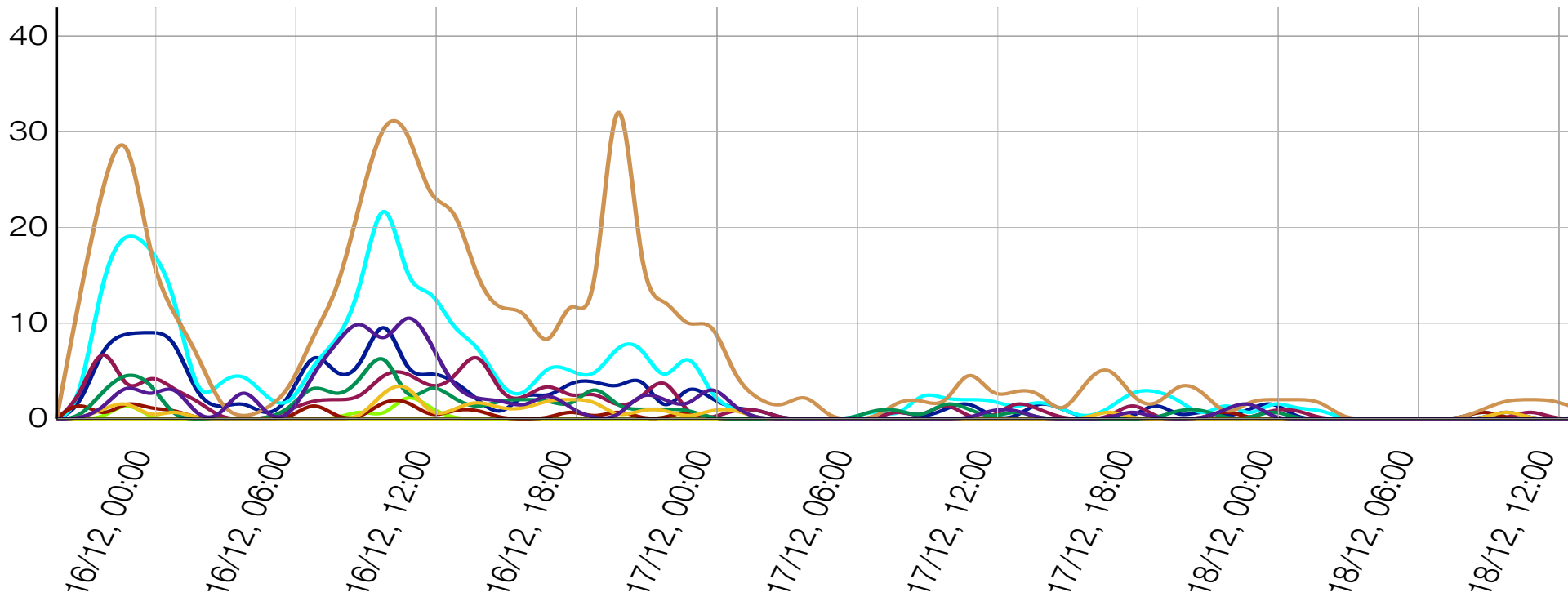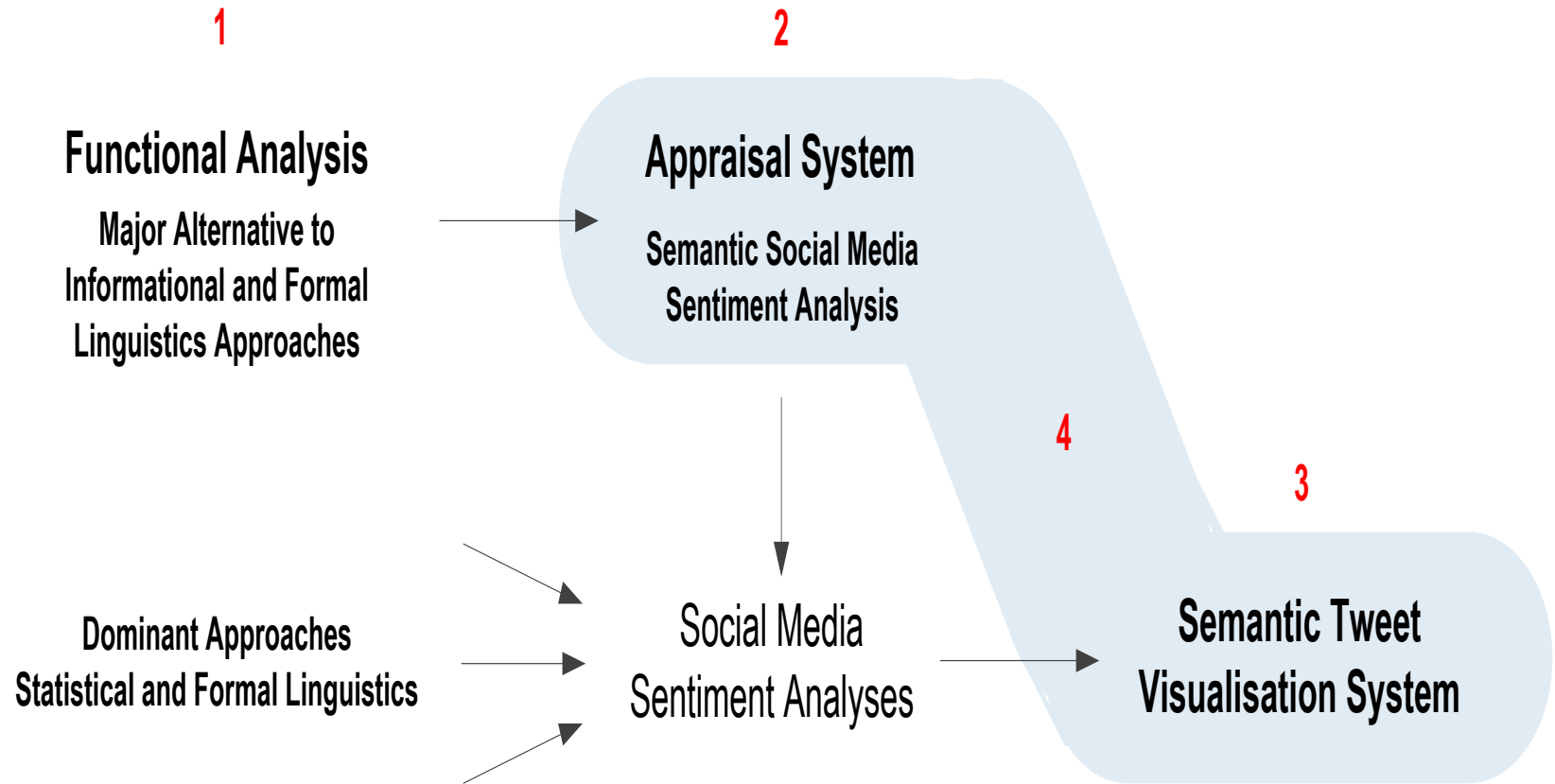
Further Research

- – Refining the Visualisation

- – Real-time Analysis of Tweets

- – Development of Event Fingerprints

Questions?

Wendland, J., Ehnis, C., Clarke, R., and Bunker, D. 2018. "Sydney Siege, December 2014: A Visualisation of a Semantic Social Media Sentiment Analysis," *15th International Conference on Information Systems for Crisis Response and Management (ISCRAM)*, Rochester, NY.

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