Semantic Network Analysis for Analysing Terrorism Coverage

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Research Questions

1. Which sources and actors are used?
   - position of experts, suspect groups

2. Information provided
   - "Verifiable information": sources and qualifications
   - attention for reasons and justification

3. Tone of coverage
   - esp. towards victims, suspect groups
   - labels used for perpetrators
Semantic Network Analysis

1. Identify source, actor, modal/causal statements
   - Semantic Role Labeling using grammatical analysis, machine learning

2. Identify tone of coverage
   - Dictionary, crowdcoding, machine learning?
   - Limit to words from semantic roles
Clause Analysis

1. Syntactic Parsing
2. Source detection
3. Clause identification
4. Extraction as tokens
Parsing

*Figure 1.* Parse tree of example sentences

(a) English

According to Mary,
she was attacked by John

(b) Dutch

Volgens Marie,
werd ze door Jan aangevallen
Source Detection (Dutch)

Figure 3. Syntax patterns for finding Dutch quotes and paraphrases
Source Detection (English)

(a) [source] said [quote]

(b) [quote], according to [source]

Figure 2. Syntax patterns for finding English quotes and paraphrases
Multiline quotes

Pattie [...] has been profoundly affected by her grandmother’s early tragedy. “Although my father was American-English and my schoolfriends were mainly Jewish, I totally identified as Armenian [...] It was part of being Armenian.”
(The Guardian, 2001-01-27, A People Killed Twice)

- Rule based approach based on quotation mark
- Source from previous sentence (source or subject)
Clauses

- Who does what to whom?
  - Semantic Role Labeling / verb subframe identification
- Identifying verbs and agents is easy
- Differentiating between object and predicate is hard
  - He shot a rocket at him
  - He shot him at dawn
- Clauses: subject/predicate tuples
Clauses

According to Mary, she was attacked by John

(a) English

Figure 4. Parse tree of example sentences

Volgens Marie, werd ze door Jan aangevallen

(b) Dutch
Extraction

- Extract information as annotations on tokens
  - "Annotated bag of words"
- Each role includes all descendants until new role found
  - Sources include clauses, not vice versa
  - No relations between clauses
Extraction

Table 1

Tokens enriched with quotation and clause columns

<table>
<thead>
<tr>
<th>Word</th>
<th>Lemma</th>
<th>POS</th>
<th>Quotation</th>
<th>clause</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>ID</td>
<td>Role</td>
</tr>
<tr>
<td>1 According</td>
<td>accord</td>
<td>VBG</td>
<td>1</td>
<td>source</td>
</tr>
<tr>
<td>2 to</td>
<td>to</td>
<td>TO</td>
<td>1</td>
<td>source</td>
</tr>
<tr>
<td>3 Mary</td>
<td>Mary</td>
<td>NNP</td>
<td>1</td>
<td>source</td>
</tr>
<tr>
<td>4 ,</td>
<td>,</td>
<td>,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 she</td>
<td>she</td>
<td>PRP</td>
<td>1</td>
<td>quote</td>
</tr>
<tr>
<td>6 was</td>
<td>be</td>
<td>VBD</td>
<td>1</td>
<td>quote</td>
</tr>
<tr>
<td>7 attacked</td>
<td>attack</td>
<td>VBN</td>
<td>1</td>
<td>quote</td>
</tr>
<tr>
<td>8 by</td>
<td>by</td>
<td>IN</td>
<td>1</td>
<td>quote</td>
</tr>
<tr>
<td>9 John</td>
<td>John</td>
<td>NNP</td>
<td>1</td>
<td>quote</td>
</tr>
</tbody>
</table>
Some results

Table 2: Performance of clause and source extraction using syntactic rules compared to word order baseline

<table>
<thead>
<tr>
<th>Method</th>
<th>Clause Extraction</th>
<th>Source Identification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pr</td>
<td>Re</td>
</tr>
<tr>
<td>Clause analysis</td>
<td>.70</td>
<td>.72</td>
</tr>
<tr>
<td>Baseline</td>
<td>.36</td>
<td>.35</td>
</tr>
</tbody>
</table>

Pr – Precision (percentage of found items that were correct);
Table 3: Usage of Hamas and Israel as source and over-representation of Israel in all clauses and in clauses containing aggression; in U.S. and Chinese media coverage of the 2008–09 Gaza War

<table>
<thead>
<tr>
<th>Source</th>
<th>U.S. Media</th>
<th>Chinese Media</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All</td>
<td>Aggr.</td>
</tr>
<tr>
<td>Israel</td>
<td>8,224</td>
<td>4,126</td>
</tr>
<tr>
<td>Hamas</td>
<td>1,824</td>
<td>704</td>
</tr>
<tr>
<td>Overrepresentation</td>
<td>4.5</td>
<td>5.9</td>
</tr>
<tr>
<td>Israel</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Grammatical Analysis: Clauses

(a) Israel subject, U.S. media

(b) Israel subject, Chinese media

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Why is sentiment analysis difficult?

- Evaluations are inherently subjective
- Evaluative language is creative and context-sensitive
- Evaluation inherently relational, but most data/tools undirected
- Sentiment value of words is context dependent
- Choice of words is context dependent
- Goal is often task dependent
### Possible techniques

- **Dictionaries**
  - Sparseness, context-insensitive
- **Machine Learning**
  - Need training material
  - Word embeddings, re-using neural components may help?
- **Manual coding**
  - Expensive, cumbersome, unreliable
  - ("I wish you many employees")
Crowd sourcing 101

- Design (simple) task and instructions
- Upload units to e.g. crowdflower
- Random people code your units for e.g. $.02 per unit
- Can use 'gold questions' to filter coders
Crowd sourcing for sentiment analysis

Achievement

You can do anything you set your mind to when you have vision, determination, and an endless supply of expendable labor.

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Why would the crowd be good at sentiment?

- Task is "simple"
- We are (mostly) looking for a "gut feeling" response
- Subjective nature favours multiple codings
  - Spread as well as point estimate

(e.g. Benoit ea 2016; Haselmayer/Jenny 2016; Socher ea 2013)
Relational sentiment coding as 'simple' task?

- We want to code relational sentiment
  - target: Sentiment about someone
  - holder: Sentiment from someone
- What are the nodes?
- How to explain difference between sentiment, target, and holder to the crowd?
Aside: creating the gold standard

![Semantic Network Analysis for Analysing Terrorism Coverage](http://vanatteveldt.com)
Attempt 1: let crowd pick target word(s)

(1) Carefully read the following sentence:

We do not want to intimidate others, nor force our ideas on them.

(2) Please **indicate who or what the opinion is about** by highlighting these words in the box below.

In a sentence like “David Cameron defended his announcement”, Cameron has an opinion about “his announcement”, so highl
Don't highlight the opinion itself and don't highlight the person who expresses the opinion, so do not highlight the words “c example.

We do not want to intimidate others, nor force our ideas on them.
### Crowd sourcing for sentiment analysis

#### Attempt 1: Problems

<table>
<thead>
<tr>
<th>n</th>
<th>- holder sentiment target</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>271 41 50 33</td>
</tr>
<tr>
<td>2</td>
<td>159 34 41 21</td>
</tr>
<tr>
<td>3</td>
<td>86 14 24 14</td>
</tr>
<tr>
<td>4</td>
<td>57 8 24 20</td>
</tr>
<tr>
<td>5</td>
<td>53 3 12 13</td>
</tr>
<tr>
<td>6</td>
<td>34 0 10 18</td>
</tr>
<tr>
<td>7</td>
<td>26 0 9 13</td>
</tr>
<tr>
<td>8</td>
<td>11 1 2 10</td>
</tr>
<tr>
<td>9</td>
<td>23 0 5 9</td>
</tr>
<tr>
<td>10</td>
<td>4 0 5 7</td>
</tr>
</tbody>
</table>

- Coders could not distinguish target, holder, sentiment

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Attempt 2: select target from NPs

- Identify all NPs in the sentence
- Let crowd coder select from NP:

Please read the following sentence about the longer-term future:

Then there is the question of the longer-term future for Europe.

Is someone (or the author) positive or negative about the longer-term future in this sentence?

- No, no one is no positive or negative about the longer-term future
- Yes, someone is positive about the longer-term future
- Yes, someone is negative about the longer-term future
Attempt 2: problems

- Most NPs are not potential targets
- Overall kappa .62
- Agreement mostly on what wasn’t a target
- First filter pass to throw out ‘junk’ didn’t yield enough
Attempt 3: select holder from NEs

- Can use named entity recognition to ’filter’ NPs
- Agents, organizations, locations (=countries)

Then there is the question of the longer-term future for Europe.

The country is outside the euro zone but about 40 percent of its exports go to the single currency bloc.

Two of the largest foreign investors in India are British - Vodafone and BP.

Among ministers, there was fury at the way Labour had, in their view, switched position to outflank the Government on its most vul

They speak about this shift in Brussels and Paris and certainly in Athens, Rome and Madrid.

President FranÃ§ois Hollande also said that France could be willing to supply arms at some point.

Mr Hollande’s first official foreign trip will be to Berlin for a meeting with Ms Merkel after his inauguration on May 15.

I am not a British isolationist but I do want a better deal for Britain,” he said.

Regional and Western governments have expressed growing concern about the security threat from extremists and organised crime.

- Recall of gold standard holders/targets:

<table>
<thead>
<tr>
<th>type</th>
<th>holder</th>
<th>sentiment</th>
<th>target</th>
</tr>
</thead>
<tbody>
<tr>
<td>NER</td>
<td>0.67</td>
<td>0.01</td>
<td>0.51</td>
</tr>
<tr>
<td>NP</td>
<td>0.96</td>
<td>0.45</td>
<td>0.88</td>
</tr>
</tbody>
</table>
Please read the following sentence about India:

Two of the largest foreign investors in India are British - Vodafone and BP.

Is India positive or negative about something or someone in this sentence?

- No, India is not positive or negative about something or someone in this sentence
- Yes, India is positive about something or someone in this sentence
- Yes, India is negative about something or someone in this sentence
Crowd sourcing for sentiment analysis
Coverage/kappa for holder-sentiment

Coverage

Kappa

RQs
Syntax: clauses and roles
Sentiment
Conclusion
Crowd sourcing for sentiment analysis

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Dynamic judgments

- Some sentences are harder than others
- Crowdflower can automatically add covers if confidence is low
- Can we use this to save money?
Performance with dynamic judgments

Average coders per sentence

kappa

0.60 0.65 0.70 0.75 0.80 0.85

2 4 6 8 10
Second step: select target from NPs

Please read the following sentence in which France expresses a positive opinion:

President François Hollande also said that France could be willing to supply arms at some point.

About who or what is France positive?

- President François Hollande
- arms
- some point
- NONE: France is not positive about any of these
Second step: select target from NPs

- Informal evaluation: most correct, others reasonable
  - Problems often non-NP target ("to supply arms")
- Need to include non-NP targets
Conclusion

- Sentiment is (still) hard :)
- Crowd sourcing is (still) a promising technique
- Lessons:
  - Task needs to be simple multiple choice
  - Gold questions are very important
  - Work needs to be done on generating potential holders/targets
- Plans:
  - Run larger scale evaluation
  - Crowd code larger corpus
  - Experiment with dictionary / ML
Bonus: resteco amcat server

- [http://resteco-amcat.clinecenter.illinois.edu](http://resteco-amcat.clinecenter.illinois.edu)
- Possible benefits
  - Easier overview of corpora
  - Query texts without full text access
  - Standardize multi-lingual processing
  - API access from python/R
Conclusion

- Lots of work to do!
- Find useful combinations of techniques
  - Dictionary / rule based methods
  - Syntactic methods
  - Crowdcoding
  - Machine learning
- Define good gold standards, case studies
- Maybe do some sort of ’shared task’ for ICA?
  - Copyright issues :-(