Part II: Mining arguments from dialogical context using Inference Anchoring Theory

Katarzyna (Kasia) Budzynska

Centre for Argument Technology (ARG-tech)
Institute of Philosophy & Sociology, Polish Academy of Sciences
University of Dundee, UK
ARG-tech (Warsaw & Dundee) & IRIT-CNRS in Toulouse

Kasia Budzynska (PL, UK)
Rory Duthie (UK)
Basia Konat (UK)
Marcin Koszowy (PL)
Olena Yaskorska (PL)

Chris Reed (UK)
Mathilde Janier (UK)
John Lawrence (UK)

Patrick Saint-Dizier (FR)
Juyeon Kang (FR)
Arguments and Dialogue: Theoretical Foundations (Budzynska and Reed, 2011)
DIALOGUE:

(a) Alexander Brown said, *If you're pointing to the phenomena of multiple or clustered disadvantage, if I were going to name one form of disadvantage as the key determiner it would be poverty, not lack of marriage.*

(b) Melanie Philips said, *Why?*

(c) Alexander Brown said, *Evidence shows that those who are in poverty are more likely to be facing all of these other forms of disadvantage.*
DIALOGUE:

(a) Alexander Brown said, *If you're pointing to the phenomena of multiple or clustered disadvantage, if I were going to name one form of disadvantage as the key determiner it would be poverty, not lack of marriage.*

(b) Melanie Philips said, *Why?*

(c) Alexander Brown said, *Evidence shows that those who are in poverty are more likely to be facing all of these other forms of disadvantage.*

ARGUMENTATION (INFERENCE):

(Arg1) *If you're pointing to the phenomena of multiple or clustered disadvantage, if I were going to name one form of disadvantage as the key determiner it would be poverty, not lack of marriage because Evidence shows that those who are in poverty are more likely to be facing all of these other forms of disadvantage.*
If you’re pointing to the phenomena of multiple or clustered disadvantage, if I were going to name one form of disadvantage as the key determiner it would be poverty, not lack of marriage.

Evidence shows that those who are in poverty are more likely to be facing all of these other forms of disadvantage.

Brown says, If you’re pointing to the phenomena of multiple or clustered disadvantage, if I were going to name one form of disadvantage as the key determiner it would be poverty, not lack of marriage.

Melanie Philips says, Why?

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Mining Dialogical Arguments
(Budzynska et al. 2014a,b; 2015; 2016; 20xx)
$p$

rule applic.
inst. #1

$q$
Bob said, $p$

Wilma said, Why $p$?

Bob said, $q$

asserting inst. #1

challenging inst. #1

rule applic. inst. #1

arguing inst. #1

transition inst. #1

transition inst. #2

asserting inst. #2
Bob said, "p"

Wilma said, "Why p?"

Bob said, "transition inst. #1"

Wilma said, "Why p?"

transition inst. #2

rule applic. inst. #1

asserting inst. #1

challenging inst. #1

asserting inst. #2

arguing inst. #1

transition inst. #2

Bob said, "q"
Bob said, $p$

Wilma said, Why $p$?

Bob said, $q$

asserting inst. #1
classifying inst. #1

arguing inst. #1

transition inst. #2

rule applic. inst. #1
Bob said, 

Wilma said, Why 

Bob said, 

Bob said, 

transition inst. #1

transition inst. #2

Rule applic. inst. #1

asserting inst. #1

asserting inst. #2

arguing inst. #1

challenging inst. #1
BBC Moral Maze: Challenges

(a) Michael Portillo: Isn’t that a source of injustice?
(b) Esther Stanford-Xosei: Definitely not. They do bear responsibility.

• Types of illocutionary forces
• Indexicality of locutions
• Transitions
MP: Isn't that a source of injustice?

TA

ES: Definitely not

TA

ES: They do bear responsibility

They do bear responsibility

Asserting
MP: Isn't that a source of injustice?

ES: Definitely not

They do bear responsibility

ES: They do bear responsibility

Assertive Questioning

Asserting
MP: Isn’t that a source of injustice?

TA

ES: Definitely not

TA

ES: They do bear responsibility

Assertive Questioning

Asserting

It is a source of injustice

They do bear responsibility

It is not a source of injustice

Asserting
MP: Isn't that a source of injustice?

ES: Definitely not.

It is a source of injustice.

CA

It is not a source of injustice.

RA

They do bear responsibility.

Asserting

TA

ES: They do bear responsibility.

Asserting

TA

ES: Definitely not.
It is a source of injustice

Assertive Questioning

MP: Isn't that a source of injustice?

CA

It is not a source of injustice

Asserting

ES: Definitely not

RA

It is not a source of injustice

Arguing

ES: They do bear responsibility

Asserting

ES: They do bear responsibility

They do bear responsibility

Asserting
MP: Isn't that a source of injustice?

ES: Definitely not

They do bear responsibility

CA

It is a source of injustice

Disagreeing

Assertive Questioning

Arguing

TA

ES: They do bear responsibility

RA

It is not a source of injustice

Asserting

Asserting

TA

ES: Definitely not
OVA+ (http://ova.arg-tech.org/)
Mining with IAT

Steps:

(1) Segmentation
(2) IC $\downarrow$ in locutions
(3) IC $\uparrow$ in transitions
(4) Arguments pro- & con- (for free-ish)
BBC Radio 4 programme  
*Moral Maze*

<table>
<thead>
<tr>
<th></th>
<th>Transcripts</th>
<th>Maps</th>
<th>Dialogue turn</th>
<th>Segments</th>
<th>Words</th>
<th>Location</th>
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<td>202</td>
<td>812</td>
<td>3,227</td>
<td>41,926</td>
<td>arg.tech/mm2012c</td>
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## Illocutionary Connections in Locutions (2)

<table>
<thead>
<tr>
<th>IC type</th>
<th>A</th>
<th>Q</th>
<th>Ch</th>
<th>PCn</th>
<th>TOTAL</th>
</tr>
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<tbody>
<tr>
<td>Occurrences</td>
<td>1,786 (83%)</td>
<td>322 (15%)</td>
<td>16 (1%)</td>
<td>30 (1%)</td>
<td>2,154 (100%)</td>
</tr>
<tr>
<td>IC subtype</td>
<td>PQ</td>
<td>AQ</td>
<td>RQ</td>
<td>PCh</td>
<td>ACh</td>
</tr>
<tr>
<td>Occurrences</td>
<td>92</td>
<td>138</td>
<td>92</td>
<td>9</td>
<td>7</td>
</tr>
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</table>

Kappa $\kappa$ = .55
IC in transitions (3): Arguing & Inference

Diagram:

- No parent in the family is in work
- Asserting
- Ruth: No parent in the family is in work
  - Default Inference
  - Arguing
  - Default Transition
- we have a huge problem with unemployment
  - Asserting
  - Ruth: we have a huge problem with unemployment
Disagreeing & Conflict

- the issue is one of poverty, and resources
- the issue is not one of poverty, and resources
- Asserting
- Disagreeing
- Default Conflict
- Default Transition
- Kenan: So the issue is one of poverty, and resources.
- Melanie: No it's not.
Agreeing

the right to intervene is around well being of children

Asserting

Helene: I think the right to intervene is around well being of children.

Agreeing

Default Transition

Kenan: Sure.
## Annotation

<table>
<thead>
<tr>
<th>IC type</th>
<th>Agreeing</th>
<th>Disagreeing</th>
<th>Arguing</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occurrences</td>
<td>119 (10%)</td>
<td>219 (18%)</td>
<td>853 (72%)</td>
<td>1,191 (100%)</td>
</tr>
<tr>
<td>Kappa $\kappa$</td>
<td></td>
<td></td>
<td></td>
<td>.76</td>
</tr>
</tbody>
</table>
Linguistic model: Arguing

\[ L^b_x \downarrow asserting_k (\phi) \]
\[ L^w_y \downarrow assertivechallenging_l (\psi) \]
\[ b \neq w; \]
\[ T(L^b_x, L^w_y) \downarrow arguing_m (\phi \leftarrow \psi) \]
Linguistic model: Arguing

- **epistemic verbs**: think, mean, believe, insist, want, approve, support, recognise
- typical **cause-consequence** forms: because, entails, follows, in addition, furthermore, then, indeed followed by a proposition
- **affirmations** of the form: Noun IS/MODAL Property/Event, where modal is e.g. should, would, must, want
- **discourse organisers** such as the point is, the challenge is then, may be, the fact is, well it must, etc.
- **confirmation** of a previous statement by using quite similar terms, possibly by adding some information.
Linguistic model: Disagreeing

\[ L^b_x \downarrow \text{asserting}_k (\phi) \]

\[ L^w_y \downarrow \text{assertivequestioning}_l (\psi) \]

\[ b \neq w; \]

\[ T(L^b_x, L^w_y) \downarrow \text{disagreeing}_m (\psi \not\models \phi) \]
Linguistic model: Disagreeing

- **variants of negation:** I do not, I cannot, can never
- negatively oriented **propositional attitudes:** I disagree, I cannot accept
- **contrastive connectors** between Lx and Ly: however, but
- negatively oriented **lexical terms:** sluggish, bad, wrong
- **contextually** negative terms: coercive, peculiar, warnings, dangerous; or negative **judgement terms:** unwanted, undesired, hazardous
- **antonyms** in Lx and Ly, bipolar or continuous: expensive/cheap, moral/immoral, or via the negation: coercive / not coercive
Linguistic model: Agreeing

\[ L_x^b \downarrow assertivequestioning_k(\phi) \]

\[ L_{\text{yes}'}^w \]

\[ b \neq w; \]

\[ T(L_x^b, L_{\text{yes}'}^w) \downarrow agreeing_m(\phi) \]
Linguistic model: Agreeing

- typical **forms of approving**: yes, OK, I’m happy
- verbs expressing an **opinion that approves Lx content**: I think, they are right, I agree, I like
- typical **positive evaluative expressions**: sympathetic, interesting, powerful point
- typical **positive binders** between Lx and Ly: as you say, your own experience; not followed by any negative expression
Implementation: <TextCoop>
(Saint-Dizier 2012)

<utterance speaker = "lj" illoc = "standard
assertion"> <textunit nb = "215"> it was a ghastly
aberration </textunit> </utterance> .

<utterance speaker = "cl" illoc = "RQ"> <textunit nb="216"> or was it in fact typical ? </textunit>
</utterance> .

<utterance speaker = "cl" illoc = "RQ-AQ"> <textunit nb = "217"> was it the product of a policy that was
unsustainable that could only be pursued by
increasing repression? </textunit> </utterance> .
Results

Table VIII. Automatic identification of illocutionary connections anchored in transitions

<table>
<thead>
<tr>
<th>IC type</th>
<th>Correct</th>
<th>Incorrect</th>
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</thead>
<tbody>
<tr>
<td>Agreeing (Agr)</td>
<td>85%</td>
<td>15%</td>
</tr>
<tr>
<td>Disagreeing (Disagr)</td>
<td>82%</td>
<td>18%</td>
</tr>
<tr>
<td>Arguing (Arg)</td>
<td>95%</td>
<td>5%</td>
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<tr>
<td>TOTAL</td>
<td>87%</td>
<td>13%</td>
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</table>

Table IX. Automatic identification of argument structures

<table>
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<tr>
<th>Type of argument structure</th>
<th>Correct</th>
<th>Incorrect %</th>
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</thead>
<tbody>
<tr>
<td>Inference</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td>Conflict</td>
<td>88%</td>
<td>12%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>94%</td>
<td>6%</td>
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Exploration and navigation
Arvina (www.arg-tech.org/arvina)
Debate Analytics

NodeSet 732 – Dialogue

<table>
<thead>
<tr>
<th>LOCUTIONS</th>
<th>PARTICIPANTS</th>
<th>YA NODES</th>
<th>TA NODES</th>
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</thead>
<tbody>
<tr>
<td>62</td>
<td>6</td>
<td>62</td>
<td>0</td>
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</tbody>
</table>

**Turns**

Time →

**Participation**

<table>
<thead>
<tr>
<th>Name</th>
<th>Count</th>
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<tbody>
<tr>
<td>Melanie Phillips</td>
<td>10</td>
</tr>
<tr>
<td>Claire Fox</td>
<td>3</td>
</tr>
<tr>
<td>Clifford Longley</td>
<td>6</td>
</tr>
<tr>
<td>Anon User</td>
<td>16</td>
</tr>
<tr>
<td>Matthew Taylor</td>
<td>1</td>
</tr>
<tr>
<td>Jan Macvarish</td>
<td>23</td>
</tr>
</tbody>
</table>

**Stimulating?**

Anon User Matthew Taylor Jan Macvarish

**Sway**

Melanie vs Claire
Claire vs Clifford
Clifford vs Anon
Anon vs Matthew
Matthew vs Jan
Jan vs Melanie

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Centre for Argument Technology
Mining Ethos in Political Debate
(Duthie, Budzynska & Reed 2016)
Alliances and Enmities

Example 1 Mr. Chris Patten said, *The hon. Member for Falkirk, East (Mr. Ewing)* in his admirable speech, put the position much more clearly than I could.

Example 2 Mr. Giles Radice said, *In doing so he (Mr. Pawsey) failed to face up to his responsibility both to the House and to the schools of England, Scotland and Wales.*
Alliances and Enmities

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UK parliamentary record (Hansard)

<table>
<thead>
<tr>
<th>Corpus</th>
<th>Sessions</th>
<th>Words</th>
<th>Segments</th>
<th>Speakers</th>
<th>Location</th>
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<td>387</td>
<td>127</td>
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<tr>
<td>Test</td>
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<td>29,178</td>
<td>352</td>
<td>126</td>
<td><a href="http://arg.tech/Ethan3Test">http://arg.tech/Ethan3Test</a></td>
</tr>
<tr>
<td>TOTAL</td>
<td>60</td>
<td>70,117</td>
<td>739</td>
<td>253</td>
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</table>
all right-thinking people in Northern Ireland will fully endorse what Mr. Prior said today in sympathy to those recent victims of IRA atrocities and all victims in Northern Ireland

Mr. Prior has ethos

Default Inference

Assertive Questioning

IP: Does the right hon. Gentleman accept that all right-thinking people in Northern Ireland will fully endorse what he said today in sympathy to those recent victims of IRA atrocities and all victims in Northern Ireland
Ethos Attack

They are so utterly disgraceful that, in a distinguished parliamentary career, Mr. Powell does himself no credit.

Mr. Powell has ethos

Default Conflict

Asserting

JP: They are so utterly disgraceful that, in a distinguished parliamentary career, he does himself no credit
# Annotation

<table>
<thead>
<tr>
<th></th>
<th>Occurrences</th>
<th>Kappa</th>
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</thead>
<tbody>
<tr>
<td>Source-person</td>
<td>243</td>
<td>1</td>
</tr>
<tr>
<td>Target-person</td>
<td>212</td>
<td>.84</td>
</tr>
<tr>
<td>Ethos support</td>
<td>179</td>
<td>.95 (out of .67)</td>
</tr>
<tr>
<td>Ethos attack</td>
<td>560</td>
<td>.95 (out of .67)</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>1,194</strong></td>
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Automation
## Results

<table>
<thead>
<tr>
<th>ESE/Non-ESE</th>
<th>Precision</th>
<th>Recall</th>
<th>F-score</th>
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</thead>
<tbody>
<tr>
<td>Baseline</td>
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<td>1</td>
<td>0.45</td>
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<tr>
<td>SVM</td>
<td>0.30</td>
<td>0.30</td>
<td>0.30</td>
</tr>
<tr>
<td>NB</td>
<td>0.20</td>
<td>0.94</td>
<td>0.32</td>
</tr>
<tr>
<td>ME</td>
<td>0.46</td>
<td>0.27</td>
<td>0.34</td>
</tr>
<tr>
<td>NER, POS, DSR, AnaR, RSF</td>
<td>0.62</td>
<td>0.77</td>
<td>0.69*</td>
</tr>
<tr>
<td>POS, DSR, AnaR, RSF</td>
<td>0.64</td>
<td>0.76</td>
<td>0.70*</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>+/- ESE</th>
<th>Precision</th>
<th>Recall</th>
<th>F-score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>0.50</td>
<td>1</td>
<td>0.67</td>
</tr>
<tr>
<td>NB, SWL</td>
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<td>0.57</td>
<td>0.57</td>
</tr>
<tr>
<td>ME, SWL</td>
<td>0.60</td>
<td>0.65</td>
<td>0.62</td>
</tr>
<tr>
<td>SVM, SWL</td>
<td>0.64</td>
<td>0.59</td>
<td>0.62</td>
</tr>
<tr>
<td>NB, SWL, EWL</td>
<td>0.74</td>
<td>0.67</td>
<td>0.71*</td>
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<tr>
<td>ME, SWL, EWL</td>
<td>0.71</td>
<td>0.73</td>
<td>0.72*</td>
</tr>
<tr>
<td>SVM, SWL, EWL</td>
<td>0.78</td>
<td>0.78</td>
<td>0.78*</td>
</tr>
</tbody>
</table>
Visualisation

Ethos Statements
Source: Mr. Simon Hughes

Target: Government

Ethos Expression: Until that happens this will be a bigger muddle than any of the other reorganisations that local government has gone through at the behest of the Government and the Conservative predecessors.
Related work

- (Boegel et al. 2014) annotate spans of causal argumentation in transcribed natural speech in German
- (Walker et al. 2012) mine arguments from the Internet Argument Corpus created for Internet discussion fora
- (Park and Cardie 2014) automatically identify arguments in a corpus developed for an online platform, RegulationRoom, used by the US government to consult with citizens proposals of new policy regulations
Summary

- Theoretical framework (Inference Anchoring Theory) capturing argument, dialogue, ethotic structures
- Transitions in dialogue allow for the recognition of arguing, disagreeing and agreeing
- Ethos support and ethos attack allow for the recognition of alliances and enmities
Thank you

Find out more at http://arg.tech

Come to the ACL 2016 Workshop on Argument Mining (in Berlin)

Investigate the datasets at http://aifdb.org

kasia@arg.tech