Argument Corpora, and Argument Mining and Analytics

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(2b/4) Complex Argument Structures



Linguistic phenomena interwound with arguments

- argumentation schemes (Lawrence & Reed, 2016)
- rephrase relation which paraphrases parts of argument structures (Konat et al., 2016a; Visser et al. 2017)
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(1) Argumentation schemes

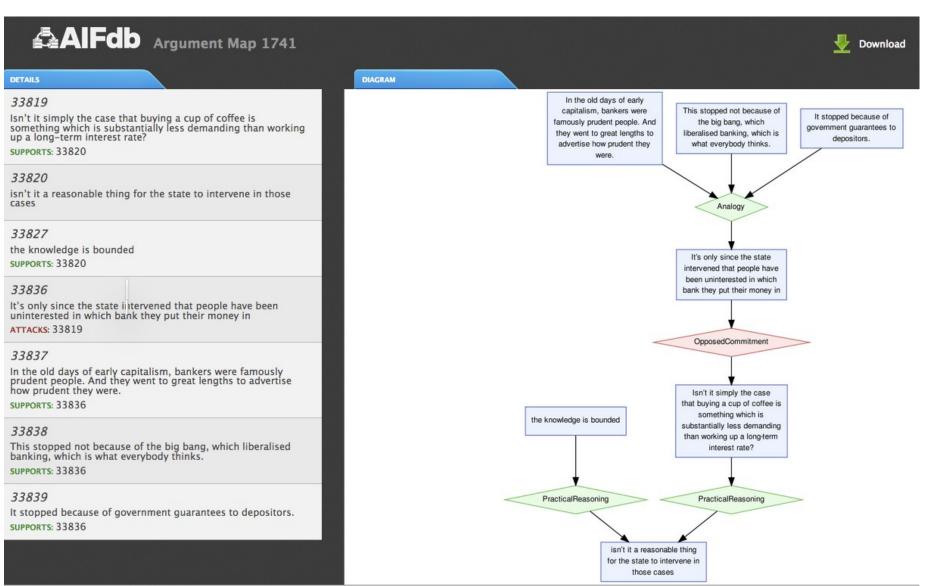
"Argumentation schemes" Corpus

- http://corpora.aifdb.org/schemes
- 288 ADUs; 127 supports; 32 conflicts

Matthew Taylor: But, hold on. Isn't it simply the case that buying a cup of coffee is something which is substantially less demanding than working up a long-term interest rate? Therefore isn't it a reasonable thing for the state to intervene in those cases, because the knowledge is bounded?

Jamie Whyte: It's only since the state intervened that people have been uninterested in which bank they put their money in. In the old days of early capitalism, bankers were famously prudent people. And they went to great lengths to advertise how prudent they were. This stopped not because of the big bang, which liberalised banking, which is what everybody thinks. It stopped because of government guarantees to depositors.

(1) Argumentation schemes



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"Citizen Dialogue in Public Consultations of US DOT" Corpus (Konat et al., 2016a)

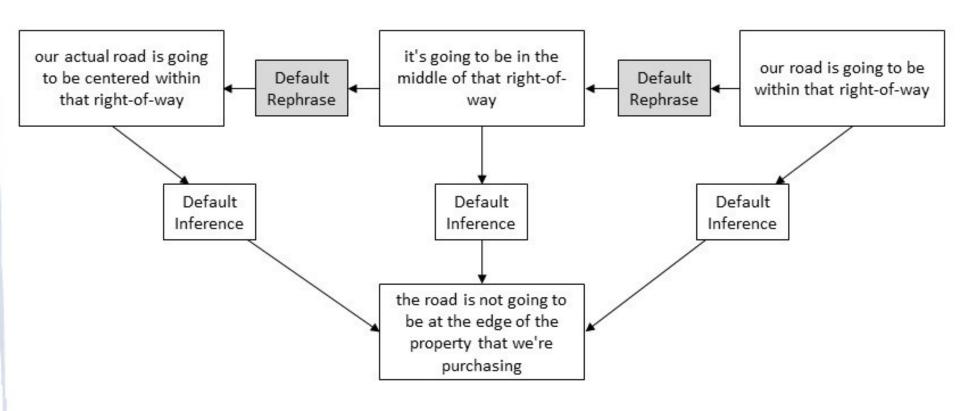
- http://arg.tech/cd
- 1,428 ADUs; 153 supports; 23 conflicts; 88 rephrases

CITIZEN: What impact is that [the road] going to have when it is so close to a house?

MR. GREG DYER: Yes, ma'am. So the right-of-way limits for the corridor is 250 feet, correct, but our actual road is going to be, you know, centered within that right-of-way. So the road is not going to be at the edge of the prop -- of the property that we're purchasing, it's going to be in the middle of that right-of-way. So we're not going to -- you know, maybe the land that we're purchasing is within ten feet of your property, but our road is going to be, you know, within that right-of-way.

CITIZEN: What impact is that [the road] going to have when it is so close to a house?

MR. GREG DYER: Yes, ma'am. So the right-of-way limits for the corridor is 250 feet, correct, but <u>our actual road is going to be, you know, centered within that right-of-way</u>. So the road is not going to be at the edge of the prop -- of the property that we're purchasing, <u>it's going to be in the middle of that right-of-way</u>. So we're not going to -- you know, maybe the land that we're purchasing is within ten feet of your property, but <u>our road is going to be, you know, within that right-of-way</u>.



- •Rephrase and **fallacies** (Visser et al., 2017)
- relation between rephrases and the fallacies of *straw man* and *ignoratio elenchi*
- •Rephrase and **fuzzy** concepts (Pereira Fariña et al., forthcoming)
- fuzzy modifiers as lack of commitment in rephrasing

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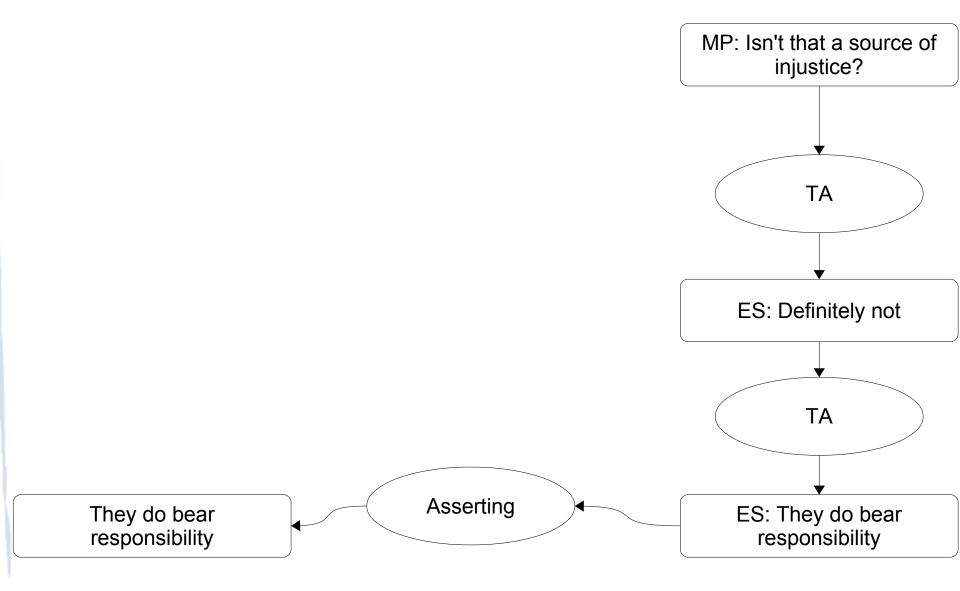
"BBC Radio 4 programme Moral Maze" Corpus

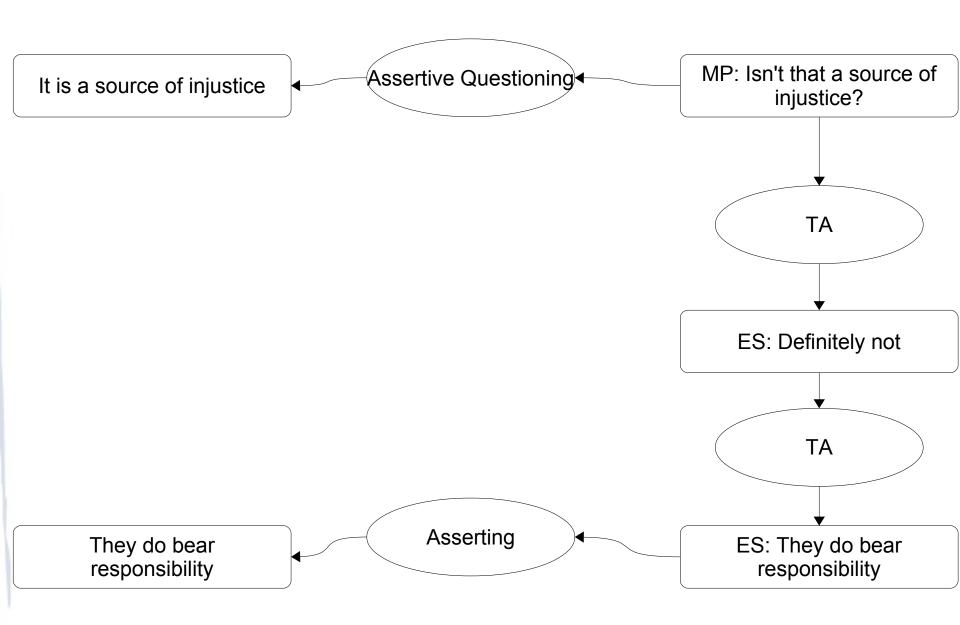
- http://corpora.aifdb.org/mm2012
- 3,213 ADUs; 869 supports; 215 conflicts; 161 rephrases

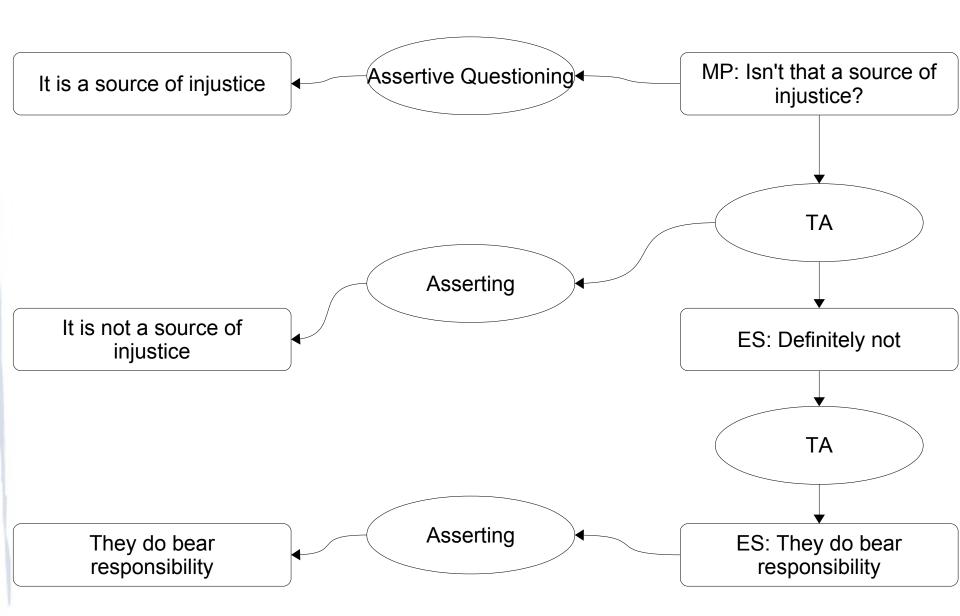
Michael Portillo: Isn't that a source of injustice? Esther Stanford-Xosei: Definitely not. They do bear responsibility.

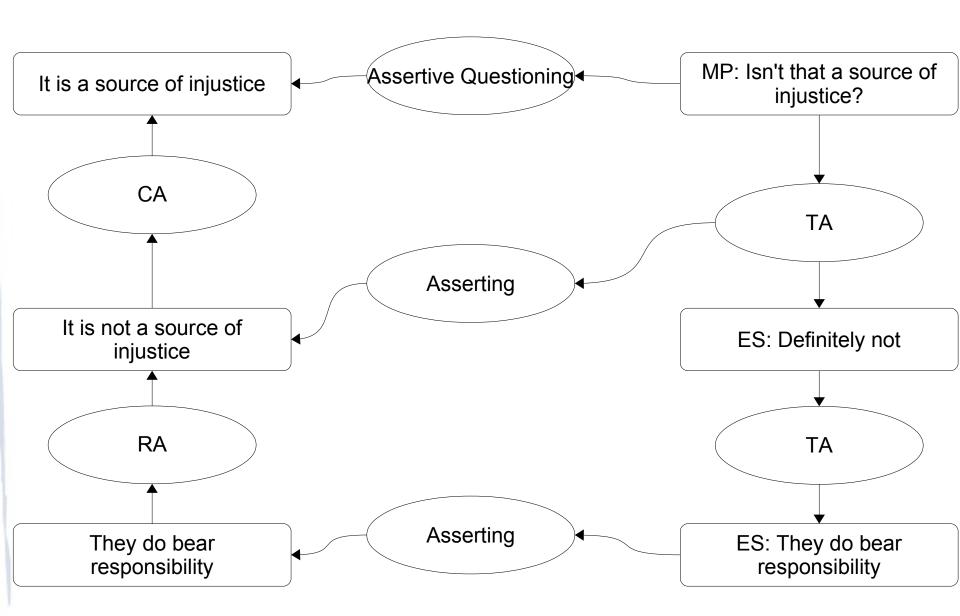
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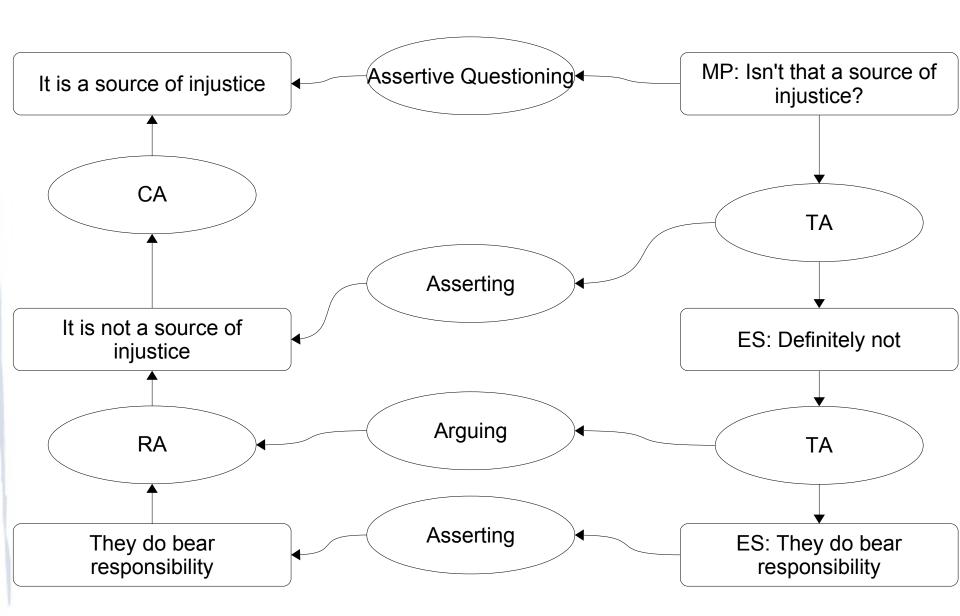
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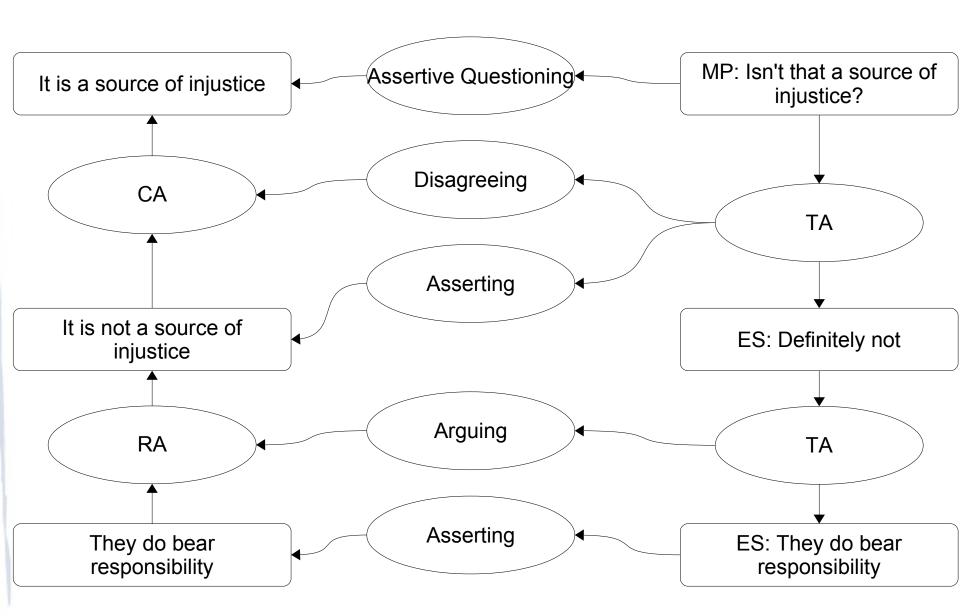












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"BBC Radio 4 programme Moral Maze" Sub-Corpus (Yaskorska, 2016; Yaskorska & Janier, 2016)

• 3,213 ADUs; 412 supports; 145 conflicts

NL: We are talking about the violence which may have been perpetrated against Mau Mau suspects
NL: We know Kenya was a brutal war

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```
\mathbf{TS5}L_{x}^{b} \downarrow A_{k} (\phi)
L_{y}^{w} \downarrow PCon_{l} (\psi)
b = w;
T(L_{x}^{b}, L_{y}^{w}) \downarrow ARG_{m} (\psi \vdash \phi)
```

- 3 **mediation** dialogue games: critical discussion, bargain, therapeutic (Janier et al. 2015)
- Mining protocols from NL texts (Snaith & Reed 2016)

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"US 2016 presidential debates" Corpus

- http://corpora.aifdb.org/US2016
- 18,368 ADUs; 2,830 supports; 942 conflicts; 764 rephrases

CLINTON: Donald thinks that climate change is a hoax

perpetrated by the Chinese . I think it 's real.

TRUMP: I did not. I did not. I do not say that.

CLINTON: I think science is real.

TRUMP: I do not say that.

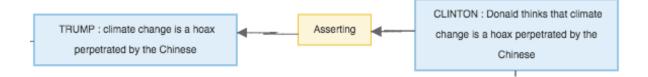
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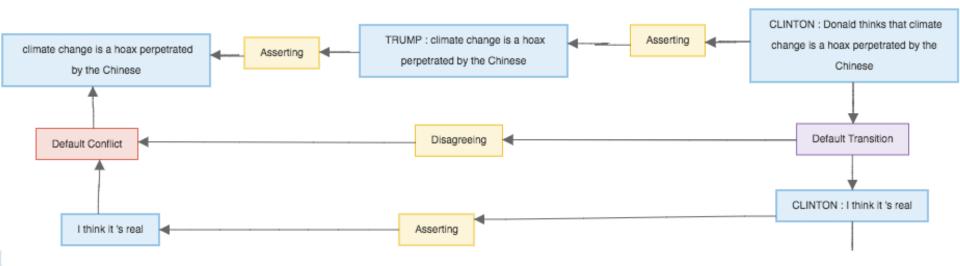
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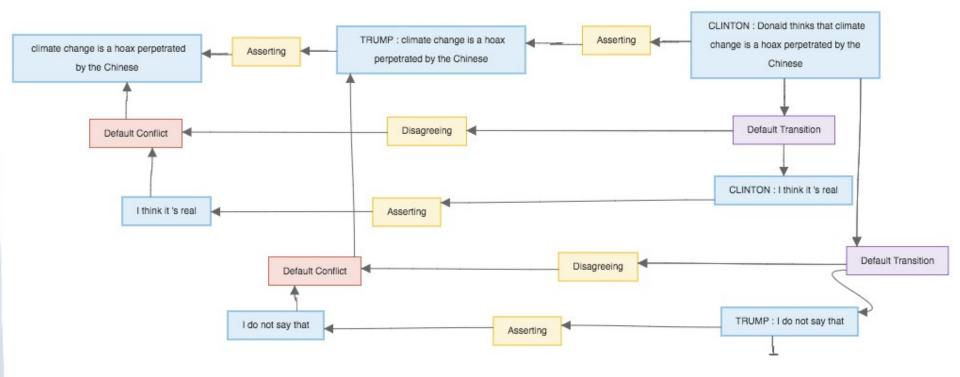
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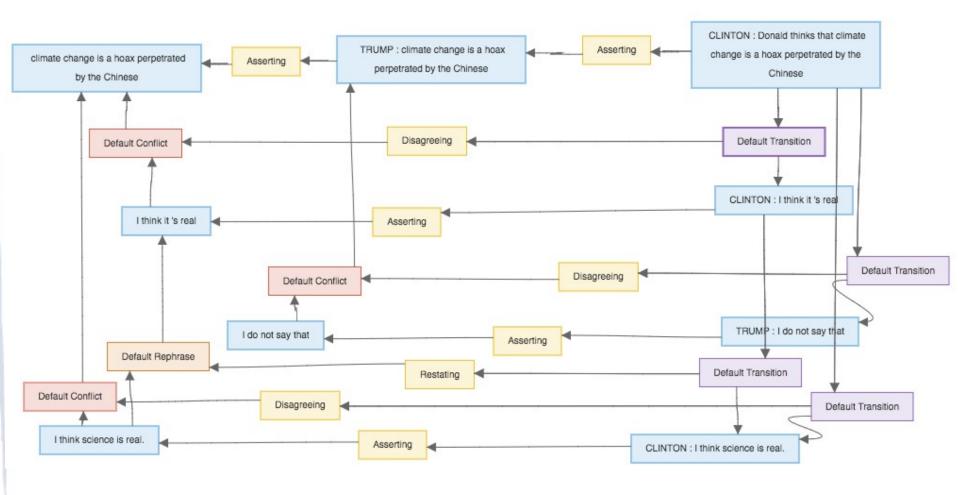
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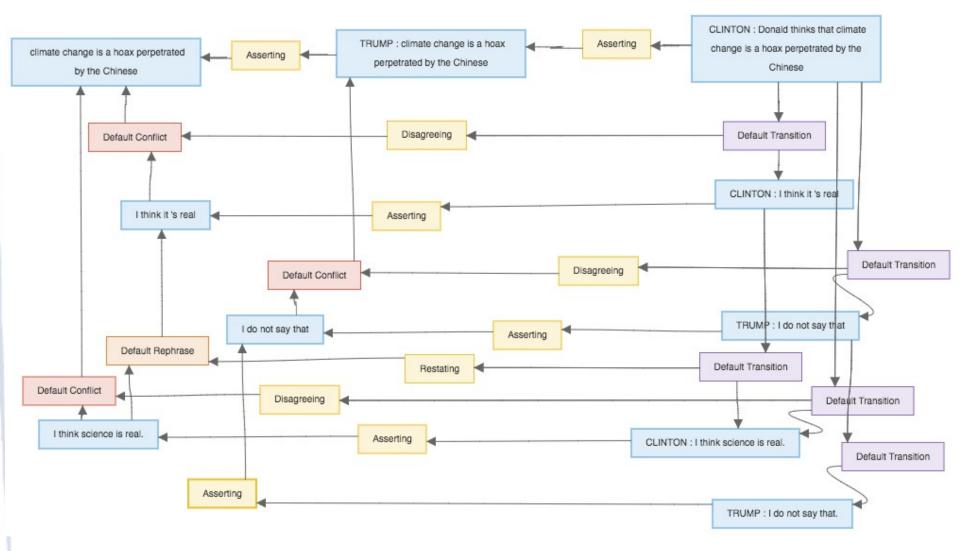












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(6) Ethos

"Hansard records of UK parliamentary debates" Corpus (Duthie et al., 2016)

- http://corpora.aifdb.org/Ethan3
- 608 ADUs; 155 supports; 453 ethos attacks

Map 11001

Mr. Nott: My hon. Friend (Mr. Henderson) is absolutely right.

Map 10986

Mr. Sedgemore: Can the right hon. Gentleman (Mr. Baker) confirm the message on the tapes today that he is running so scared, and so frit, and is sweating so profusely with fear, that he has cancelled all his engagements and left them to the office boy?

(6) Ethos

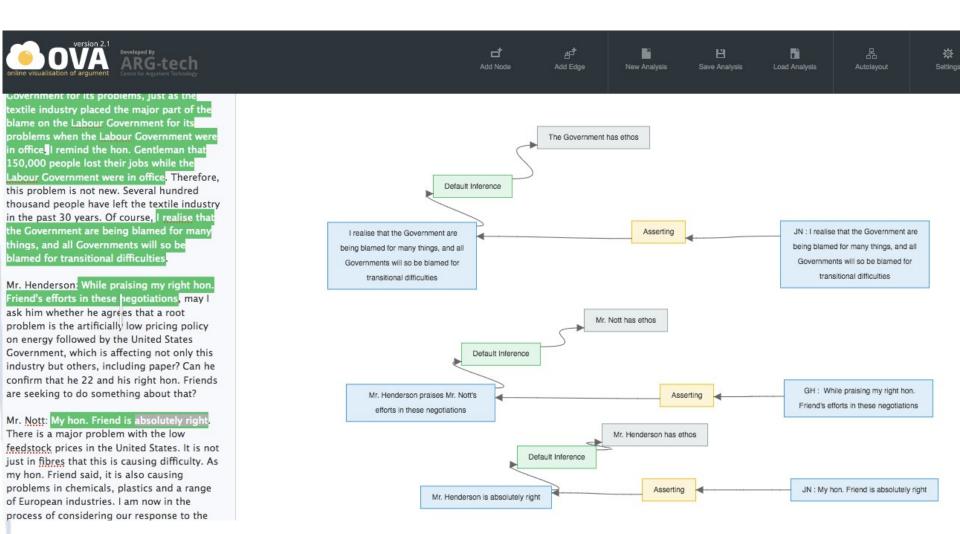
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(6) Ethos (support)



(6) Ethos (attack)



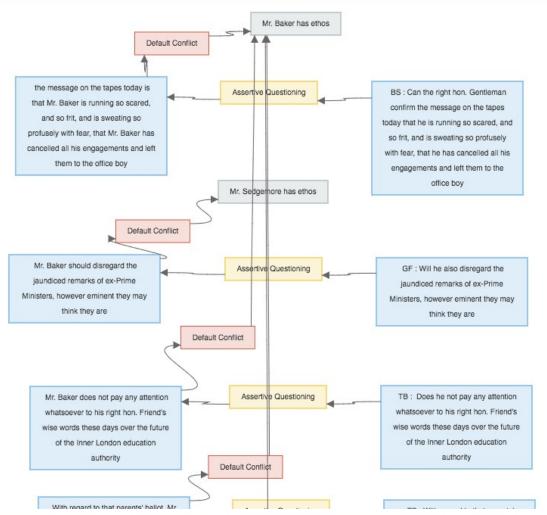
Mr. Sedgemore: To ask the Secretary of State for Education and Science what recent representations he has received about the future of education in inner London; and if he will make a statement.

Mr. Kenneth Baker: Since my announcement on 4 February my Department has received many comments from many sources.

Mr. Sedgemore: Can the Secretary of State give the House an assurance that, if the House of Lords stiffens its spine and decides that there should be a review of ILEA before any decision on abolition, he will recommend that the House accepts that decision? Can the right hon. Gentleman confirm the message on the tapes today that he is running so scared, and so frit, and is sweating so profusely with fear, that he has cancelled all his engagements and left them to the office boy?

Mr. Baker: I do not appear at the Dispatch Box as a trembling, blushing violet. I understand that the House of Lords has just started, or will shortly start, a debate on ILEA. We shall all watch the outcome with great interest.

Sir Geoffrey Finsberg: Will my right hon. Friend bear in mind that there are 20 times as many residents in inner London as those who took part in the so-called phoney parents' ballot? Will he also disregard the jaundiced remarks of ex-Prime Ministers,



(3/4) Argument Mining



(3a/4) Mining Arguments from Dialogue (Budzynska et al. 2014b; 2015; 2016)







BBC Radio 4 programme Moral Maze





	Transcripts	Maps	Dialogue turn	Segments	Words	Location
MM2012c	5	202	812	3,227	41,926	arg.tech/mm2012c



Illocutionary Connections **1** in Locutions (2)

IC type	Α		Q			Ch		PCn	TOTAL
Occurrences	1,786 (83%)	3	22 (15%)		16 (1%)		30 (1%)	2,154 (100%)
IC subtype		PQ	AQ	RQ	PCh	ACh	RCh		
Occurrences		92	138	92	9	7	0		
Карра к									.55

Annotation

IC type	Agreeing	Disagreeing	Arguing	TOTAL
Occurrences	119 (10%)	219 (18%)	853 (72%)	1,191 (100%)
Карра к				.76

Linguistic model: Arguing

```
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```

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_x^b \downarrow asserting_k(\phi)

L_y^w \downarrow assertive questioning_l(\psi)

b \neq w;

T(L_x^b, L_y^w) \downarrow disagreeing_m(\psi \mapsto \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 assertive questioning_{k}(\phi)

L_{yes'}^{w}

b \neq w;

T(L_{x}^{b}, L_{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

IC type	Correct	Incorrect
Agreeing (Agr)	85%	15%
Disagreeing (Disagr)	82%	18%
Arguing (Arg)	95%	5%
TOTAL	87%	13%

Table IX. Automatic identification of argument structures

Type of argument structure	Correct	Incorrect %
Inference	100%	0%
Conflict	88%	12%
TOTAL	94%	6%

(3b/4) Mining Ethos in Political Debate (Duthie et al. 2016a; Duthie & Budzynska 20xx)







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.*

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UK parliamentary record (Hansard)





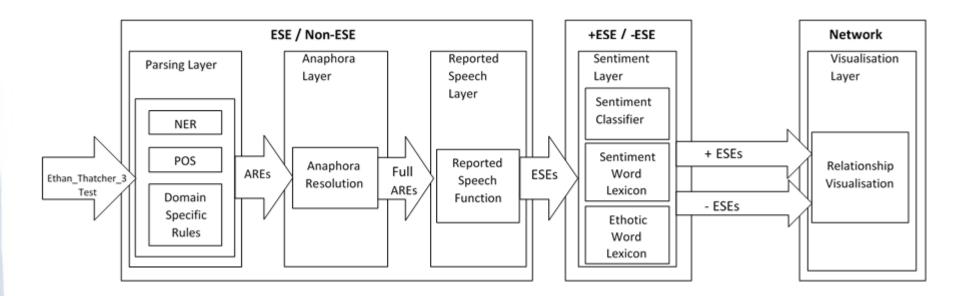
Corpus	Sessions	Words	Segments	Speakers	Location
Train	30	40,939	387	127	http://arg.tech/Ethan3Train
Test	30	29,178	352	126	http://arg.tech/Ethan3Test
TOTAL	60	70,117	739	253	



Annotation

	Occurrences	Kappa
Source-person	243	1
Target-person	212	.84
Ethos support	179	.95 (out of .67)
Ethos attack	560	.95 (out of .67)
TOTAL	1,194	

Automation

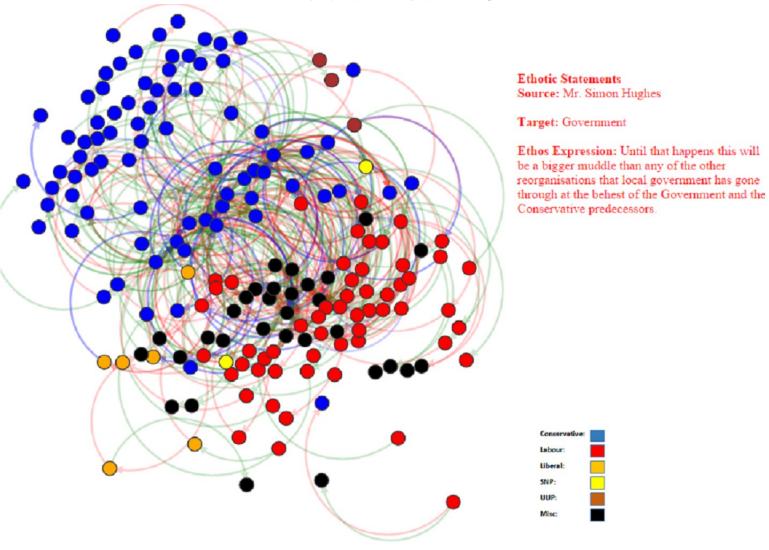


Results

ESE/Non-ESE	Precision	Recall	F-score
Baseline	0.29	1	0.45
SVM	0.30	0.30	0.30
NB	0.20	0.94	0.32
ME	0.46	0.27	0.34
NER, POS, DSR, AnaR, RSF	0.62	0.77	0.69*
POS, DSR, AnaR, RSF	0.64	0.76	0.70*

+/- ESE	Precision	Recall	F-score
Baseline	0.50	1	0.67
NB, SWL	0.58	0.57	0.57
ME, SWL	0.6	0.65	0.62
SVM, SWL	0.64	0.59	0.62
NB, SWL, EWL	0.74	0.67	0.71*
ME, SWL, EWL	0.71	0.73	0.72*
SVM, SWL, EWL	0.78	0.78	0.78*

Visualisation



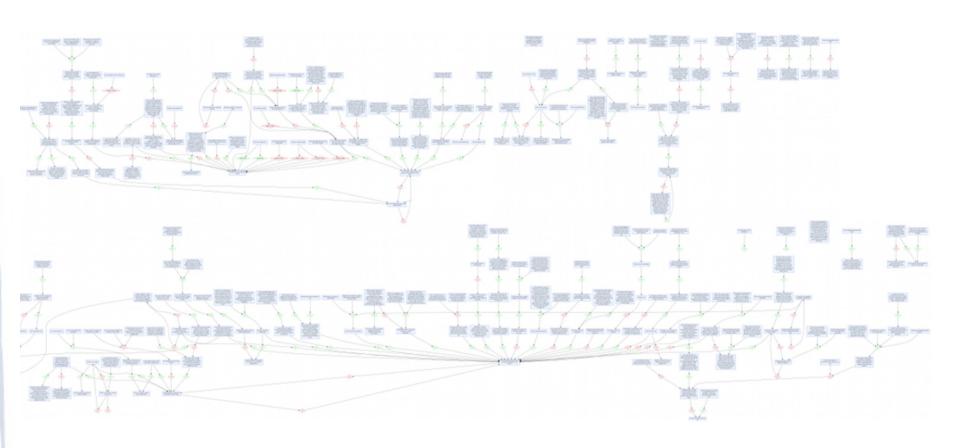
(4/4) Argument Analytics (Konat et al. 2016b; Lawrence et al. 2016; 2017a)







argums claim they were britand in one of the last imperial campaigns against the munderout Mat. Mat. upraing rebellion in the 1950s. In coart his week the government accepted they have been instructed in Britain cadeby; it was a dirty wer on both sizes. The Britain hanged more than 1,000 been rists and declared beins of thousands of suspects who even in all supposessed in the time and thousands of official documents only recovered monthly in have been systematically in britain to present the first based and is argued that we will not be reliable. It is a focused legal argument to over whome of better, includation and the success of the time of the supposessed in the time and the suppose supposessed in the time and the suppose supposessed in the time and the suppose supposessed in the time and the supposessed in the time and the suppose supposessed in the time and the suppose suppose suppose supposessed in the time and the suppose suppos he assume and implications are wader than that is 1 singli to make more updaywish about the past through the print of our modern seriables 25 hours of the Economics. The California is not a source of the Califo insex Anni Michaely (You said the Ching. You seld the Unit agent as very different species. As in this well gained to a wind a specie is a wind part of the contract of the Ching. The said is a contract of the Said is a is flurrantly. My understanding of international law is that there is no statute of instances, it has a work beloadly different if the survivors had all ded. But actually, you have a tyrup victims. I understand your point and of course there are living victims and no one would danny that they were treated in an appaiding way. This is my point, if there are specific perspectable, if you have a group of military offices who are accussed of committing a war or the living of instance in presentable and instance in presentable and instances in presentable. If you have a group of military offices who are accussed of committing a war or the survivors that is a current of required perspectable. Which happened the presentable and a business of presentable and a source of required perspectable. Which happened the in the presentable and a source of required perspectable. Which happened the presentable and a source of required perspectable. Which happened the presentable and a source of required as source of required as sourced of required as sourced of required perspectable. The Bettier Covernment, centarry that would not be the Bettien Covernment's view, but that would be the view of the claimants and their representatives. And also the current government of Kenya, You say you want to set the record state, and that - shraight and contest for but one out-of-control to the contest of the allowage and the set that would be the contest of the state of the contest of the state of the contest of the state nation of the production of the design of the production of the pr but the nature of the British Empare? Is it an accreation, which I think it was, it was a ghasty absention, or does it represent something that is at the heart of the Empire, and the imperial system? Well, it terms of the case of these individuals, do you accospt that they have a perfect right to pursue the clean that they are made they have the significant or the accreasing the pursues in the specific case. The judgment is represented to the substance in the past, in the specific case. The judgment is pursue that they have the right to make the or case and they are proceeding with. It is never to proceed in a few to interest in the specific case. The judgment is not to the accretion to the past, and the past is not to the past is not t 18/07/2012 - The British Empire ordermoonly rotate of section, in terms of global write superiority, security for the same flow to be account, with a count of section, in terms of global write superiority, security for the same flow to be account, with a count of section, in the same flow to be account, with a count of section in the United Registration County flow to be account, ordermoon flow to be account, ordermoon flow to be account, ordermoon flow to be account or section or section and the United Registration flow to be account or section or section flow to be acco separations deputed and content in the factor of the second of the secon An approximate the product of the pr properties of the production o and the Mark September of the September u know, six years before the start of the Kenya emergency, the British Army in India is being harmened because it's not brotal enough, by the national six and the Muslims, they say you are not shooting people or controlling the population, you are basically letting us die. So if you have an army it has a responsibility to protect its citizens and protect but knows, but years before the start of the Kenyus emergency, the other to be compared to the control of the Kenyus emergency, the other to be compared to the control of the Kenyus emergency, the other to be control of the Kenyus emergency, the other to be control of the Kenyus emergency, the other to be control of the Kenyus emergency, the other to be control of the Kenyus emergency to the control of the Kenyus emergency the Kenyus emergency to the control of the kenyus emergency to the control of the kenyus emergency to the control of the kenyus emergency to the kenyus emergency to the control of the kenyus emergency to the k ar position. Lost Take that, and then you go n'the more judgments which are guide positions, and so you go n'the more judgments which are guide positions. If no not y default artering their it's not writing for a country is not where it is not writing for a country is not write in a country and take I over. There are guide and this in a miscroor and their in a country is not writing in a country is not write in a country is not write in a country. In it is written it is not you go not in a country in its writer in a country is not writer in a country. In its writer is not in a country in its writer in a country is not writer in a country in its writer in a country. In its writer is not in a country in its writer in a country in its writer in a country in its writer in a country. In its writer is not in a country in its writer in a country in its writer in a country. In its writer is not in a country in its writer in a country. In its writer is not in a country in its writer in a country in its writer in a country in its writer in a country. 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It is still typing to give ny head cann't that is a lapage, we fact a monthly fooding proposition that one way, pushed book of the coverable from Line we have book. It is still typing to give ny head cann't that is a lapage of the still a still that the still typing to give ny head cann't that is a still typing to give ny head cann't that is a still typing to find that is a still typing to give ny head cann't that is a still typing to find a still typing typin





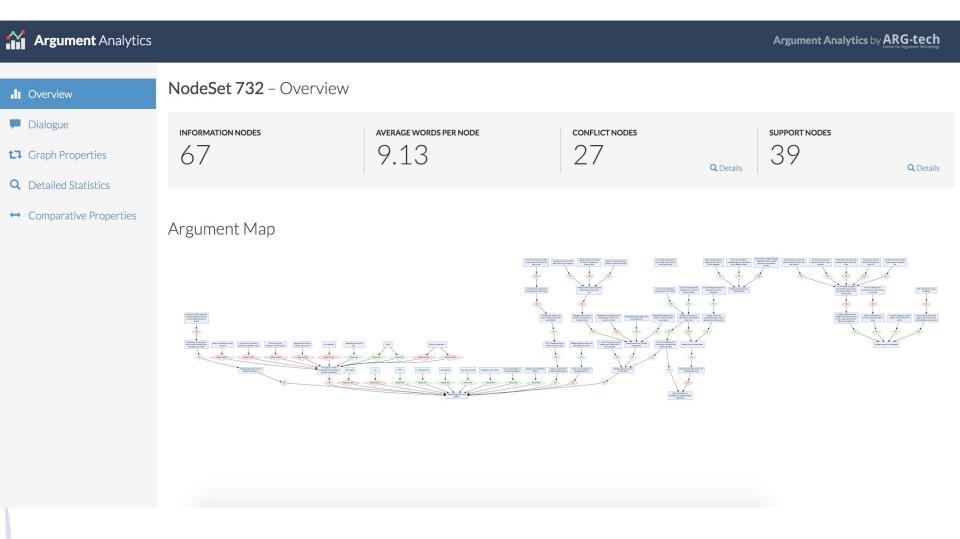
- Present details of an argumentative structure in a format easily digested by a general audience
- Automatically **calculate detailed statistics** about argumentative structures for in-depth analysis
- Provide an overview of the **participants** and their interactions in a dialogue
- Calculate the **similarity between argument maps** (interannotator agreement and performance of automatic approaches)
- Work with existing argument resources and real-time arguments as they are being created





NodeSetID or Corpus Name

(1) Simple statistics: Overview



(1) Simple statistics: Pattern counts

Argument Analytics by ARG-tech

cd - Detailed Statistics

cd - Detailed Statistics

Dialogue Counts

Graph Properties

Q Detailed Statistics

← Comparative Properties

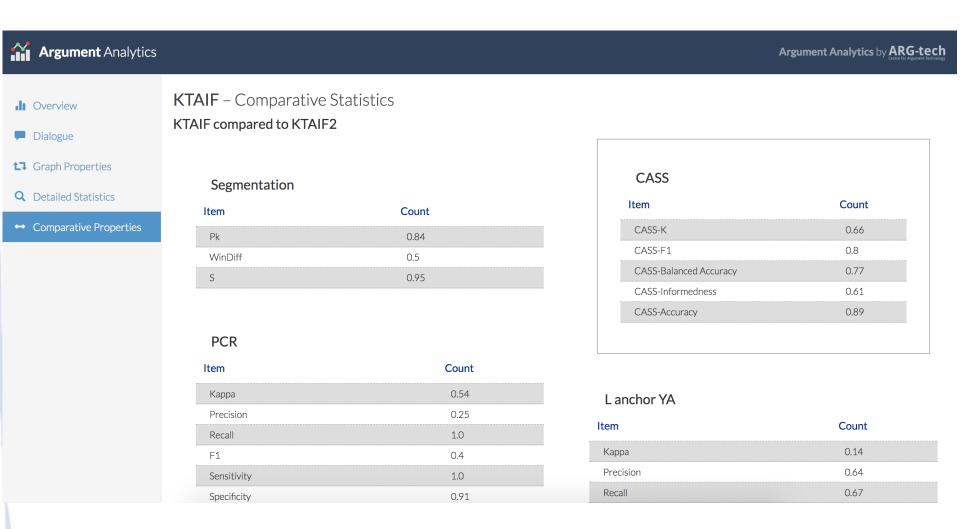
Counts

Item	Count
Asserting	551
Asserting in Transition	2
Asserting in Locution	543
Assertive Questioning	54
Assertive Questioning in Transition	0
Assertive Questioning in Locution	53
Pure Questioning	30
Pure Questioning in Transition	0
Pure Questioning in Locution	30
Arguing	151
Arguing in Transition	151
Arguing in Locution	0
Default Illocuting	24
Default Illocuting in Transition	23
Default Illocuting in Locution	1

Item	Count
Restating	65
Restating in Transition	65
Restating in Locution	0
Agreeing	35
Agreeing in Transition	29
Agreeing in Locution	6
Disagreeing	25
Disagreeing in Transition	24
Disagreeing in Locution	1
Pure Challenging	1
Pure Challenging in Transition	0
Pure Challenging in Locution	1
Assertive Challenging	2
Assertive Challenging in Transition	0
Assertive Challenging in Locution	2

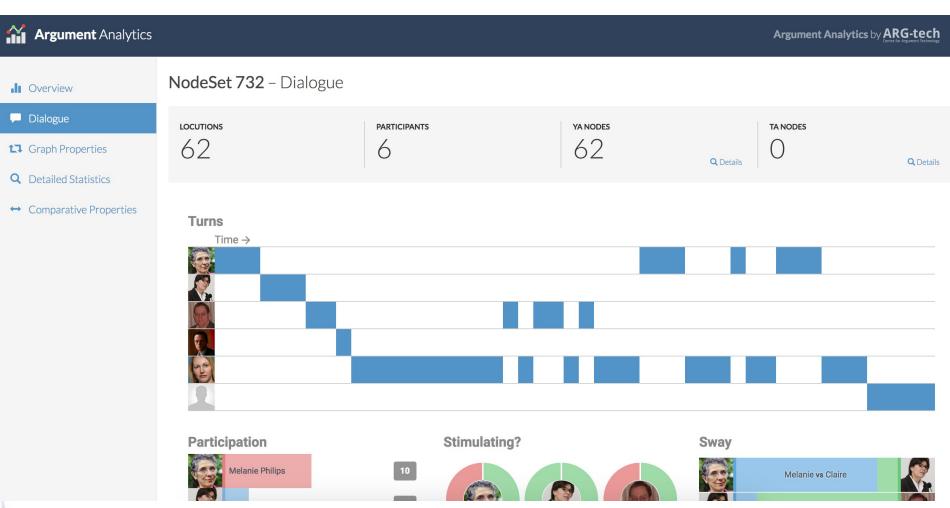
Item	Count
Default Inference	153
Default Rephrase	88
Default Conflict	23
RA Total	153
CA Total	23
MA Total	88
Default Transition	563
TA Total	563
Locutions	672
YA in Locution	637
Locution with NO YA	35
YA in Transition	294
Transition with NO YA	269
Reported Speech	1

(2) Comparative statistics

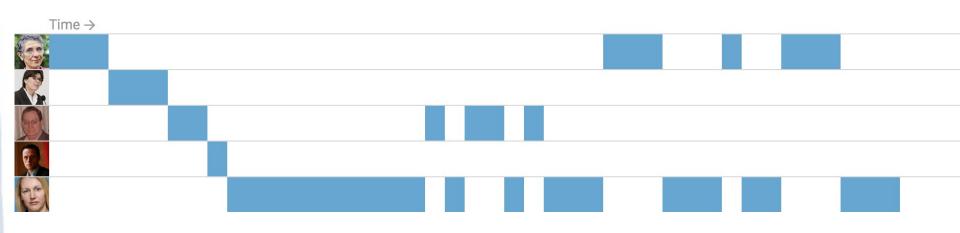


CASS metrics (Duthie et al. 2016b)

(3) Dialogically oriented statistics



(3) Dialogically oriented statistics: Turn structure



(3) Dialogically oriented statistics: Participants details

Participation Stimulating? Melanie Philips 10 Claire Fox Clifford Longley Melanie Philips Claire Fox Clifford Longley 16 Anon User Matthew Taylor Jan Macvarish 23

Anon User

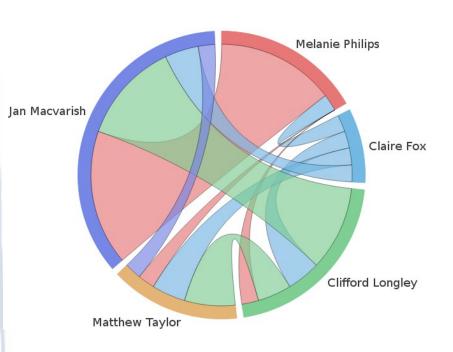
Matthew Taylor

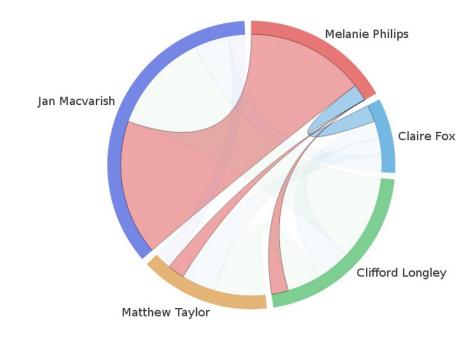
Jan Macvarish

(3) Dialogically oriented statistics: Sway

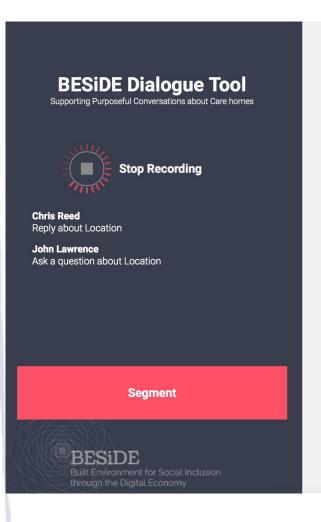


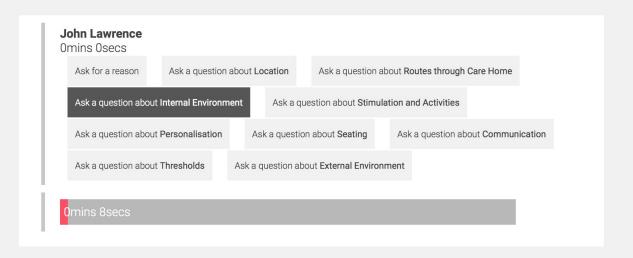
(3) Dialogically oriented statistics: Interactions



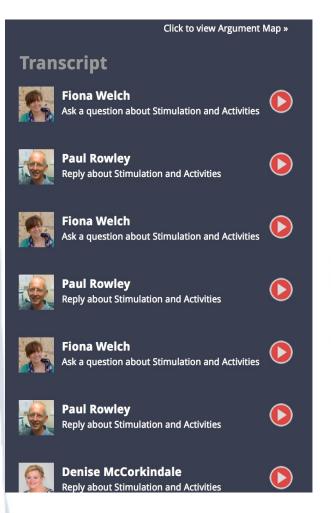


(4) Real-time statistics



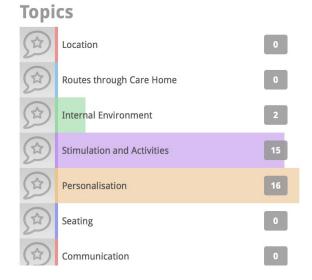


(4) Real-time statistics



Current Topic: External Environment X Location X Routes through Care Home X Seating X Communication X Thresholds Y Internal Environment Y Stimulation and Activities Y Personalisation Y External Environment





Summary

- Foundations:
 - → Inference Anchoring Theory: Dialogical context of arguments
 - → Argument Web: Online ecosystem of argument technologies
- **Argument corpora:** Recognising complex argument structures in NL is hard
- **Argument mining:** Automatic identification of argument structure
 - → From dialogue
 - → Related with speakers' ethos
- **Argument analytics:** Automatic sense-making of argument structure



Thank you



Find out more at http://arg.tech



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COMMA 2018
In Warsaw

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REFERENCES (1/3)

- (Budzynska 2013) Circularity in Ethotic Structures. Synthese 190(15): 3185-3207.
- (Budzynska & Reed, 2011) Whence inference, Technical Report.
- (Budzynska & Villata, 2017) Processing Argumentation in Natural Language Texts, *Handbook of Formal Argumentation*, accepted for publication.
- (Budzynska et al., 2014a) Budzynska, Janier, Reed, Saint-Dizier, Stede & Yakorska. A Model for Processing Illocutionary Structures and Argumentation in Debates. *Proc. of the 9th edition of the Language Resources and Evaluation Conference (LREC 2014)*, Calzolari et al. (Eds.), pp. 917-924.
- (Budzynska et al. 2014b) Budzynska, Janier, Kang, Reed, Saint-Dizier, Stede & Yaskorska. Towards Argument Mining from Dialogue, *Proc. of 5th International Conference on Computational Models of Argument COMMA 2014*, (266): 185-196.
- (Budzynska et al. 2015) Budzynska, Janier, Konat, Kang, Reed, Saint-Dizier, Stede & Yaskorska. Automatically identifying transitions between locutions in dialogue, *Studies in Logic and Argumentation*, King's College Publication.
- (Budzynska et al. 2016) Budzynska, Janier, Reed & Saint-Dizier. Theoretical Foundations for Illocutionary Structure Parsing, *Argument and Computation*, IOS Press, vol. 7, no. 1, pp. 91-108.
- **(CACM 2013)** Bex, Lawrence, Snaith, & Reed. Implementing the Argument Web, *Communications of the ACM*, 56 (10), pp66-73.
- (Duthie & Budzynska, 20xx) Ethos Mining, in review.
- **(Duthie et al., 2016a)** Duthie, Budzynska & Reed. Mining Ethos in Political Debate, *Proc. of 6th International Conference on Computational Models of Argument (COMMA 2016)*, vol. 287, IOS Press, pp. 299-310.
- **(Duthie et al., 2016b)** Duthie, Lawrence, Budzynska & Reed. The CASS Technique for Evaluating the Performance of Argument Mining, *Proc. of 3rd ArgMin workshop at Association of Computational Linguistics*, *ACL*, pp. 40-49.

REFERENCES (2/3)

- (Janier & Reed, 2016a) Corpus resources for dispute mediation discourse. *Proceedings of the 10th Language Resources and Evaluation Conference (LREC 2016).*
- •(Janier & Reed, 2016b) Towards a Theory of Close Analysis for Dispute Mediation Discourse. *Argumentation*.
- (Janier & Reed, 2017) I didn't say that! : Uses of SAY in mediation discourse. *Discourse Studies*, 19(5), 2017.
- (Janier et al. 2015) Janier, Aakhus, Budzynska & Reed. Modeling argumentative activity with Inference Anchoring Theory: The case of impasse, *Studies in Logic and Argumentation*, King's College Publication.
- (Janier et al. 2016) Janier, Snaith, Budzynska, Lawrence & Reed, A System for Dispute Mediation: The Mediation Dialogue Game, *Proceedings of the Sixth International Conference on Computational Models of Argument (COMMA 2016)*.
- **(Konat et al., 2016a)** Konat, Budzynska & Saint-Dizier. Rephrase in Argument Structure, *Foundations of the Language of Argumentation 6th International Conference on Computational Models of Argument (COMMA 2016)*, 32-39.
- **(Konat et al., 2016b)** Konat, Lawrence, Park, Budzynska & Reed. A Corpus of Argument Networks: Using graph properties to analyse divisive issues, *Proc. of the 10th edition of the Language Resources and Evaluation Conference (LREC 2016)*.
- **(Koszowy & Budzynska, 2016)** Towards a Model for Ethotic Structures in Dialogical Context. *Foundations of the Language of Argumentation the workshop at the 6th International Conference on Computational Models of Argument (COMMA 2016)*, 40-47.
- **(Lawrence & Reed, 2016)** Argument Mining using Argumentation Scheme Structures. *Proceedings of the Sixth International Conference on Computational Models of Argument (COMMA 2016)*.

REFERENCES (3/3)

- (Lawrence et al. 2016) Lawrence, Duthie, Budzynska & Reed. Argument Analytics, Proc. of 6th International Conference on Computational Models of Argument (COMMA 2016), vol. 287, pp. 371-378.
- •(Lawrence et al. 2017a) Lawrence, Park, Konat, Budzynska, Cardie & Reed. Mining Arguments for Mapping Controversies in Online Deliberative Democracy and eRulemaking, Association for Computing Machinery's Transactions on Internet Technology (ACM TOIT).
- (Lawrence et al. 2017b) Lawrence, Snaith, Konat, Budzynska & Reed. Debating Technology for Dialogical Argument: Sensemaking, Engagement and Analytics. Special issue on "Argumentation in Social Media", Association for Computing Machinery's Transactions on Internet Technology (ACM TOIT).
- (Moens, Boiy, Palau, & Reed 2007) Automatic Detection of Arguments in Legal Texts. *Int. Conference on AI & Law (ICAIL-2007)*, Stanford, CA, pp225-230.
- (Rahwan et al. 2007) Rahwan, Zablith & Reed. Laying the Foundations for a World Wide Argument Web, *Artificial Intelligence*, 171, pp897-921.
- (Reed et al., 2017) Reed, Budzynska, Duthie, Janier, Konat, Lawrence, Pease & Snaith. The Argument Web: An online ecosystem of tools, systems and services for argumentation, *Philosophy and Technology*.
- (Snaith & Reed, 2016) Dialogue Grammar Induction. Studies in Logic and Argumentation, King's College Publication, pp. 665—681.
- (Visser et al. 2017) Visser, Koszowy, Konat, Budzynska, Koszowy & Reed. Straw man and ignoratio elenchi as misuses of rephrase, 2nd European Conference on Argumention.
- (Yaskorska, 2016) Structures of Dialogue in Debate and Financial Discourse: Modelling an 'Ore' for Argument Mining. *Unpublished PhD thesis*, *IFiS PAN*.
- **(Yaskorska & Janier, 2016)** Applying Inference Anchoring Theory for the analysis of dialogue structure in debate, *Studies in Logic and Argumentation*, King's College Publication.