A Multi-layer Annotated Corpus of Argumentative Text: From Argument Schemes to Discourse Relations

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Motivation

- Advance our understanding of the correlations between discourse structure and argumentation structure (both argument relations and inference rules)

- Advance Argumentation Mining: datasets labeled with inferential relations ---argument schemes --- are scarce

Many people see proven relief of their symptoms and complaints by complementary medicine. However there is no substantiated data that this healing isn't simply due to the placebo effect. Besides many practices in this field are not regulated professions which means that quacks and phonies can practice these occupations unknown to the patients. That's why the statutory health insurance companies should not cover such treatments. It would be conceivable to invest more into the training and control of this occupation sector on the part of the state.

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[e1] Many people see proven relief of their symptoms and complaints by complementary medicine. **[e2]** However there is no substantiated data that this healing isn't simply due to the placebo effect. **[e3]** Besides many practices in this field are not regulated professions **[e4]** which means that quacks and phonies can practice these occupations unknown to the patients. **[e5]** That's why the statutory health insurance companies should not cover such treatments. **[e6]** It would be conceivable to invest more into the training and control of this occupation sector on the part of the state.

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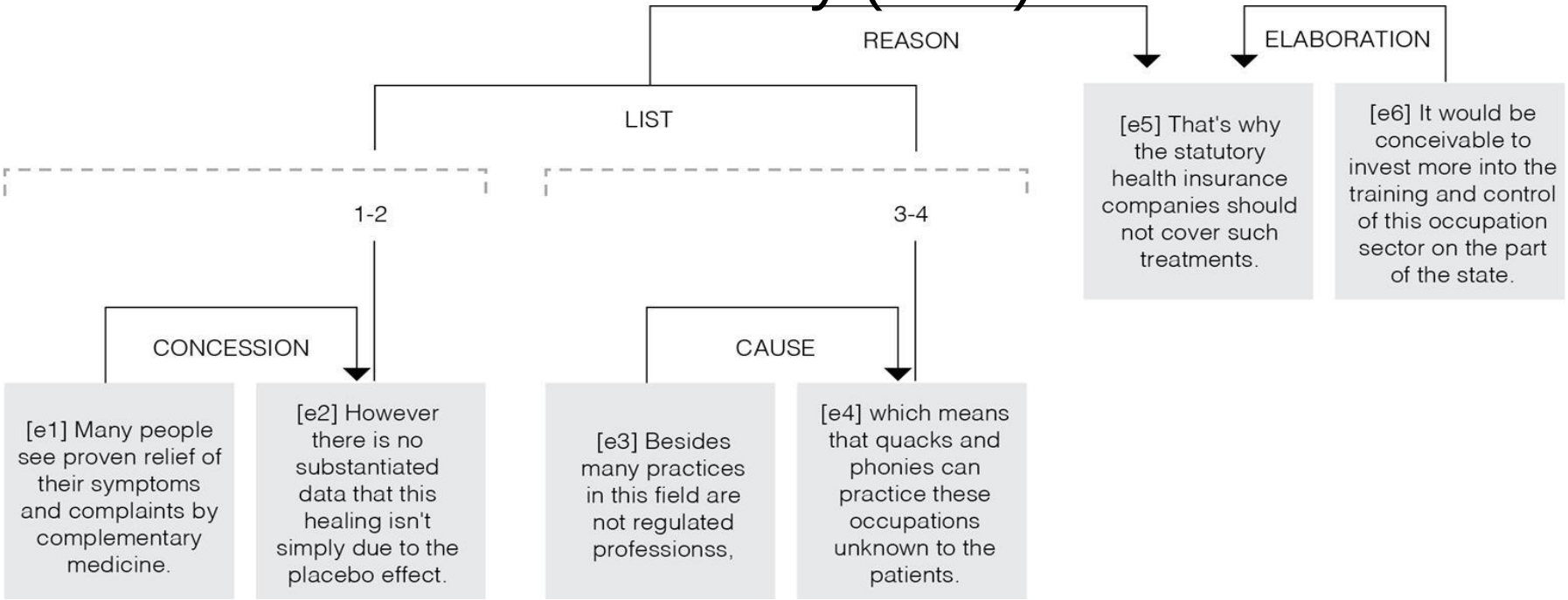
[e4] which means that quacks and phonies can practice these occupations unknown to the patients.

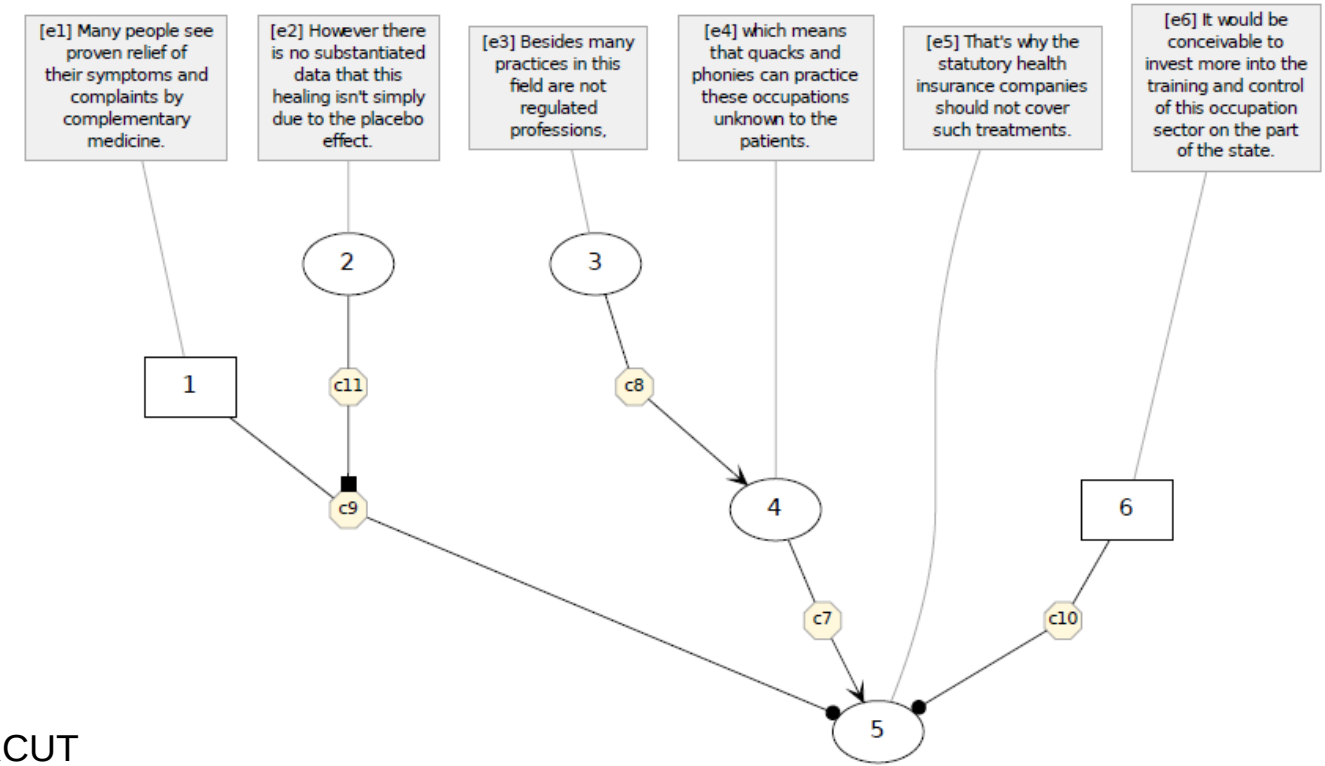
[e5] That's why the statutory health insurance companies should not cover such treatments.

[e6] It would be conceivable to invest more into the training and control of this occupation sector on the part of the state.

Discourse Structure
Rhetorical Strucuture Theory (RST)



Argument Structure

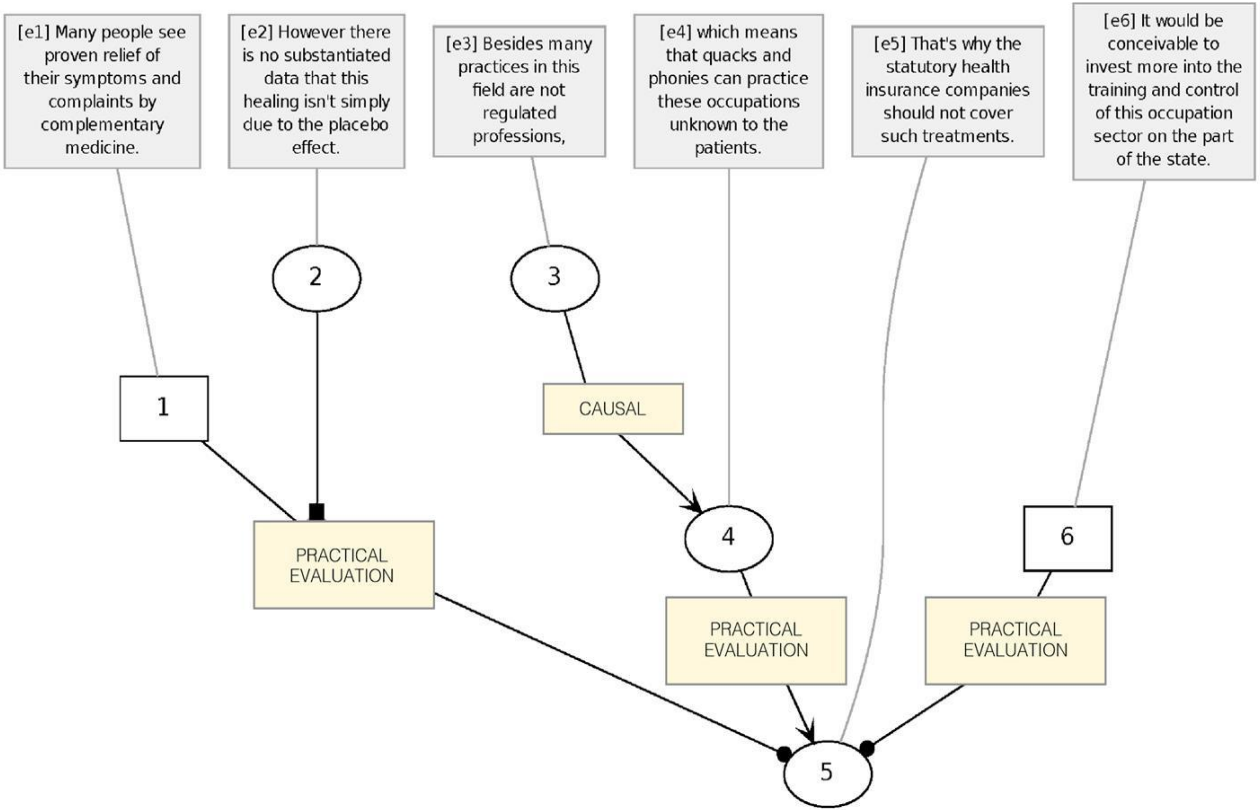


- ■ UNDERCUT
- ● REBUT
- ➤ SUPPORT

Freeman, J. B. (2011). Argument Structure: Representation and Theory.

Stede, M., Afantenos, S. D., Peldszus, A., Asher, N., & Perret, J. (2016). Parallel Discourse Annotations on a Corpus of Short Texts. In *LREC*.

Argument Schemes



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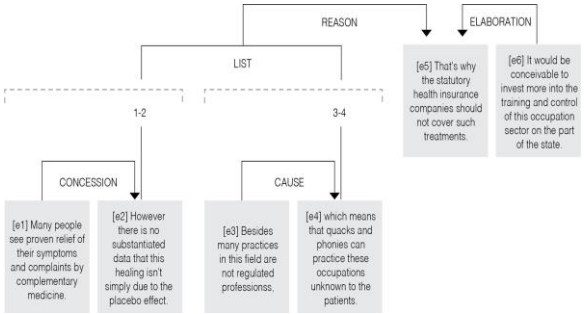
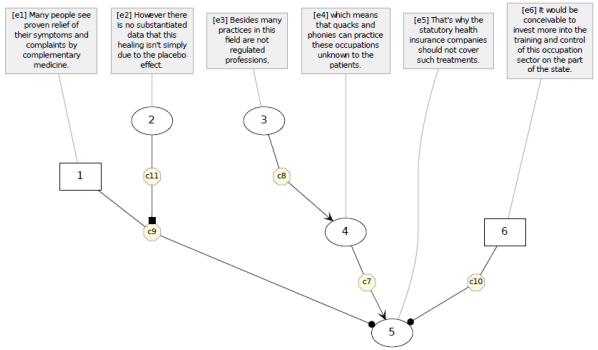
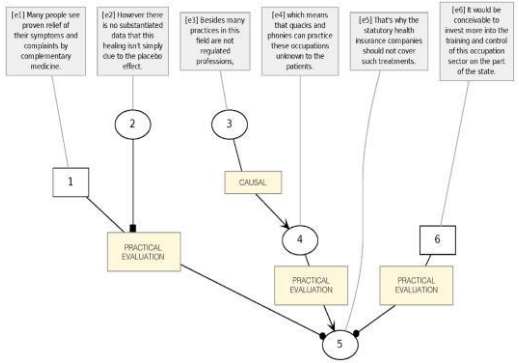
Stede et al. 2016



Many people see proven relief of their symptoms and complaints by complementary medicine. However there is no substantiated data that this healing isn't simply due to the placebo effect. Besides many practices in this field are not regulated professions which means that quacks and phonies can practice these occupations unknown to the patients. That's why the statutory health insurance companies should not cover such treatments. It would be conceivable to invest more into the training and control of this occupation sector on the part of the state.



Correlation Study



Annotation Study

Aim of the study

- Propose guidelines for the annotation of argument schemes for both SUPPORT and REBUT relations
  - using the *Argumentum Model of Topics*

- Report an annotation project of inferential rules (argument schemes) on microtext corpus that already has
  - argument structure
  - discourse structure based on both RST and Segmented Discourse Representation Theory (SDRT)

- A multi-layer resource for correlating different levels of discourse and argumentative analysis

- Present a new annotation tool for argument schemes

Outline

- Corpus
- Annotation guidelines
- Annotation results
- Argument schemes and rhetorical discourse relations
  - Mapping the two theories
  - Correlation analysis
- Discussion
- Conclusion

Corpus

- Argumentative microtext corpus: 112 short texts created through a text generation experiment (Peldszus and Stede, 2016)

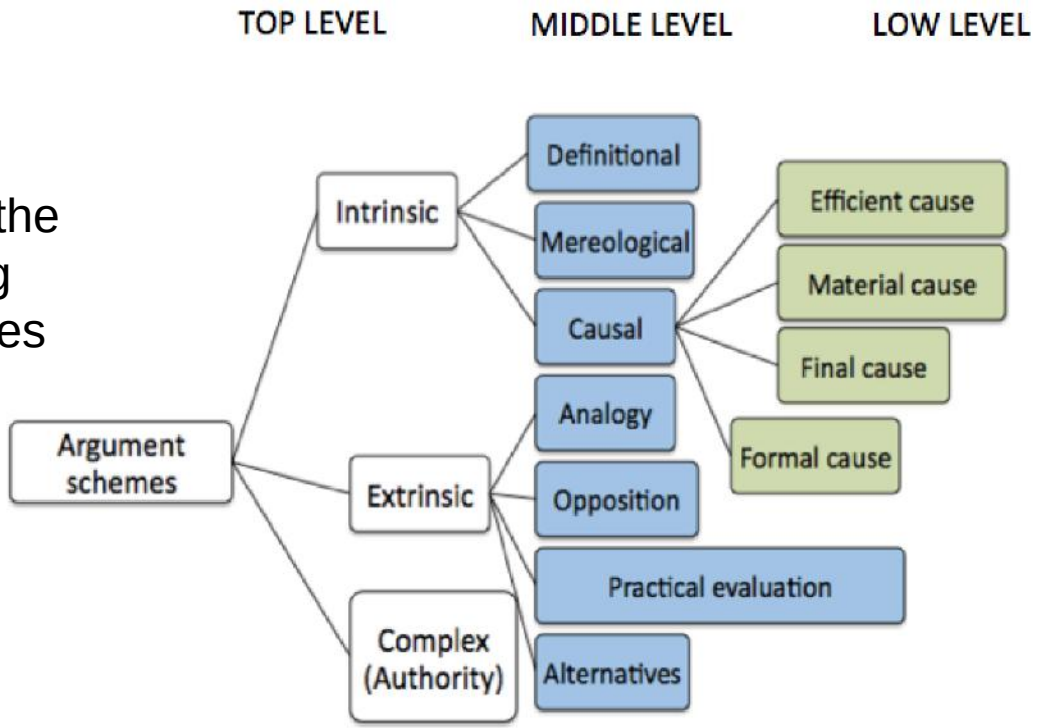
- Supported levels of annotation:
  - Argument structure
  - Discourse structure (both according to RST and SDRT)

Annotation Theory and Task

Argumentum
Model of Topics

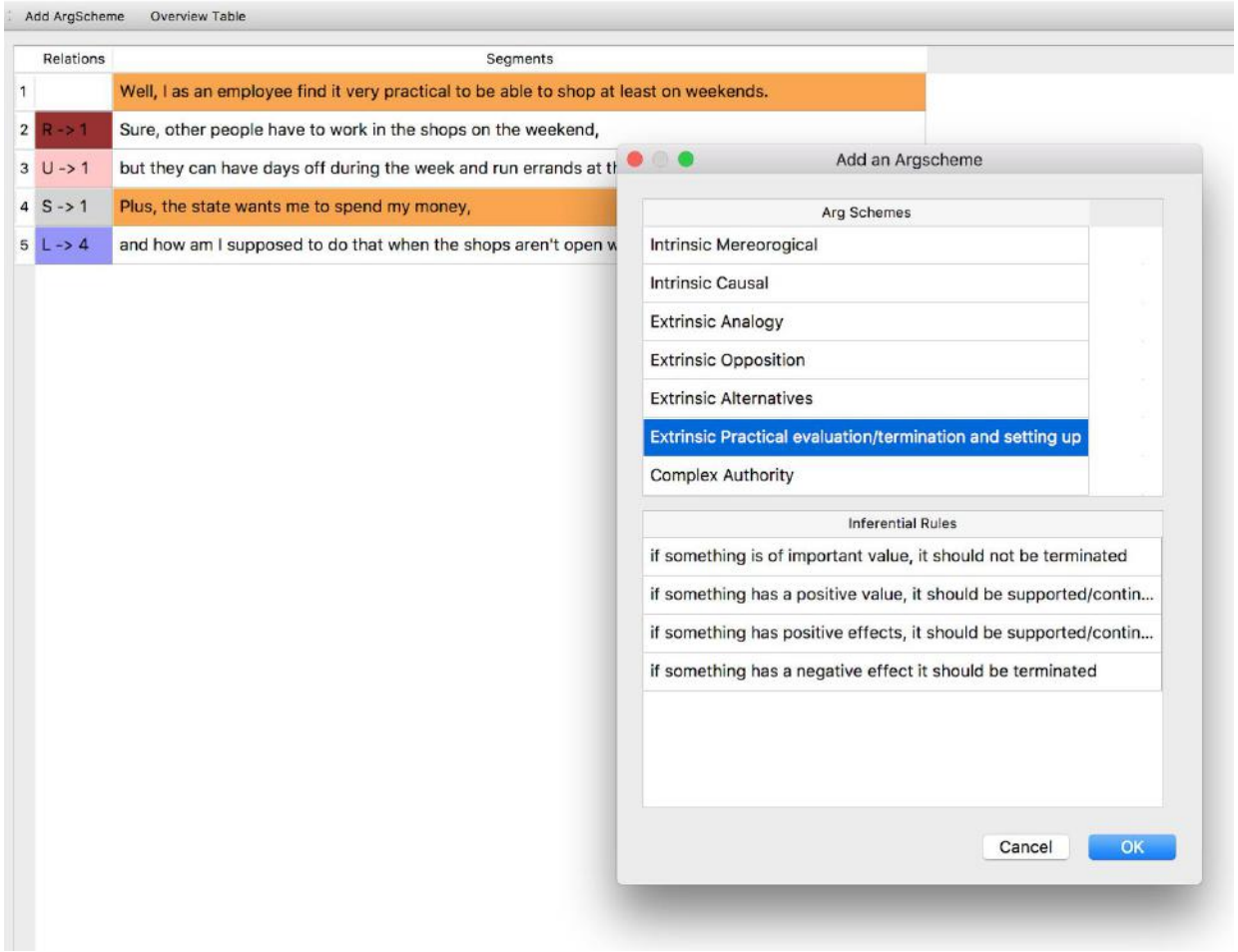
2 tasks:

- given a SUPPORT or REBUT relation, identify the argument scheme among the 8 middle level schemes
- identify the associated inference rule



Musi, E., Ghosh, D., and Muresan, S. (2016). Towards feasible guidelines for the annotation of argument schemes. In Proceedings of the third workshop on argument mining (ArgMining2016), pages 82–93.

Annotation Tool



Inter-Annotator Agreement

Annotators	k (1st Set)
1, 2	0.404
2, 3	0.231
1, 3	0.231

Annotators	k (2nd Set)
4, 5	0.213
5, 6	0.260
4, 6	0.409

Annotation Results

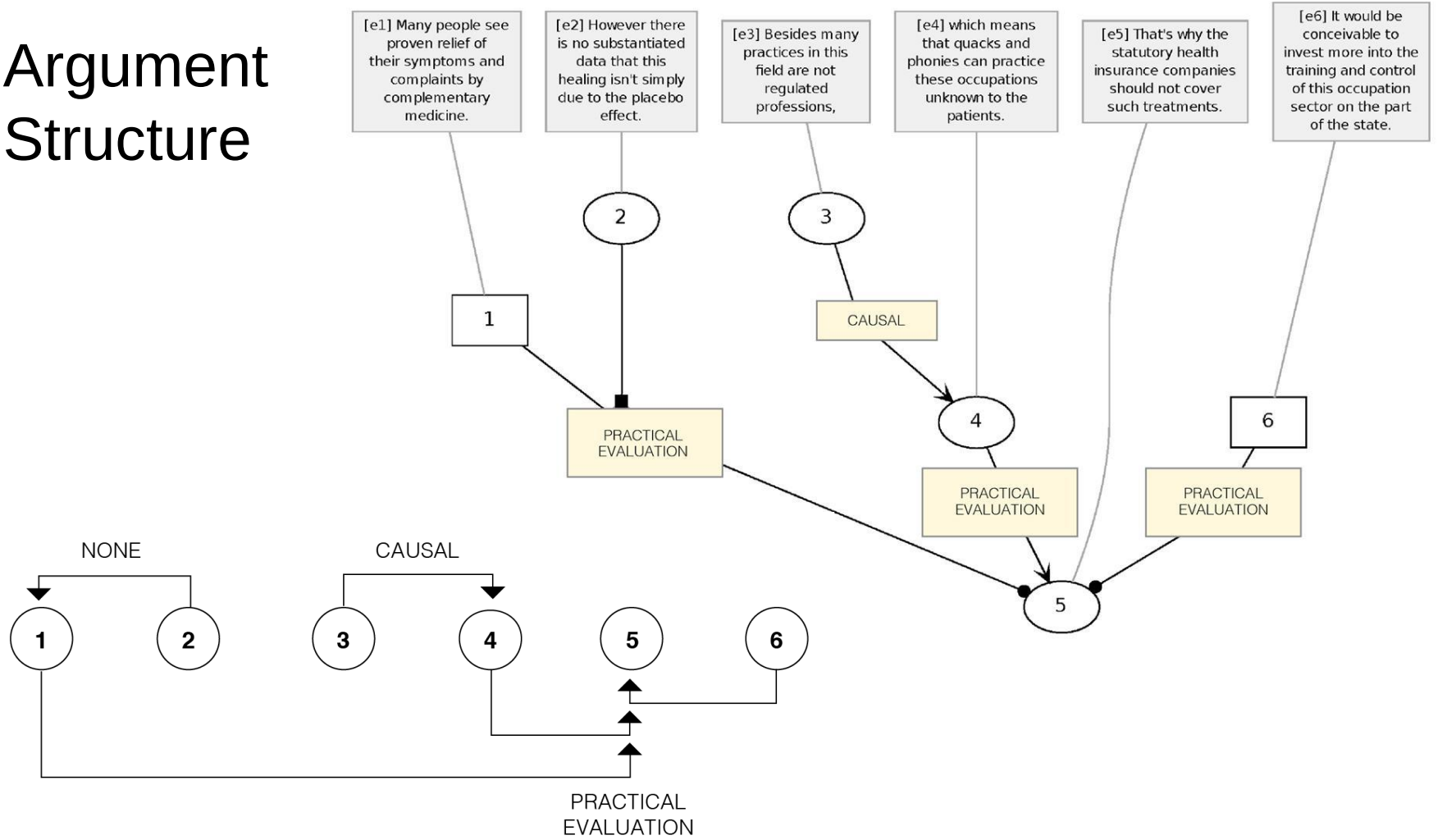
	DEFINITIONAL	MEREOROGICAL	CAUSAL	ANALOGY	OPPOSITION	PRACTICAL_EVALUATION	ALTERNATIVES	AUTHORITY	NONE
DEFINITIONAL	8	1	10	0	2	14	1	0	16
MEREOROGICAL		42	6	2	2	15	0	0	6
CAUSAL			60	1	12	42	2	1	8
ANALOGY				12	0	3	0	0	2
OPPOSITION					8	5	3	3	3
PRACTICAL_EVALUATION						218	10	8	29
ALTERNATIVES							4	0	4
AUTHORITY								24	0
NONE									6

Argument Schemes and Rhetorical Relations

- Mapping the two theories
  - Representing argument structure along with the annotated argument schemes in one common format with RST discourse structure
  - Using a dependency structure (Stede et al., 2016)

- Correlation Analysis
  - Overlap between RST relations and argument schemes for SUPPORT and REBUT relations

Argument Structure



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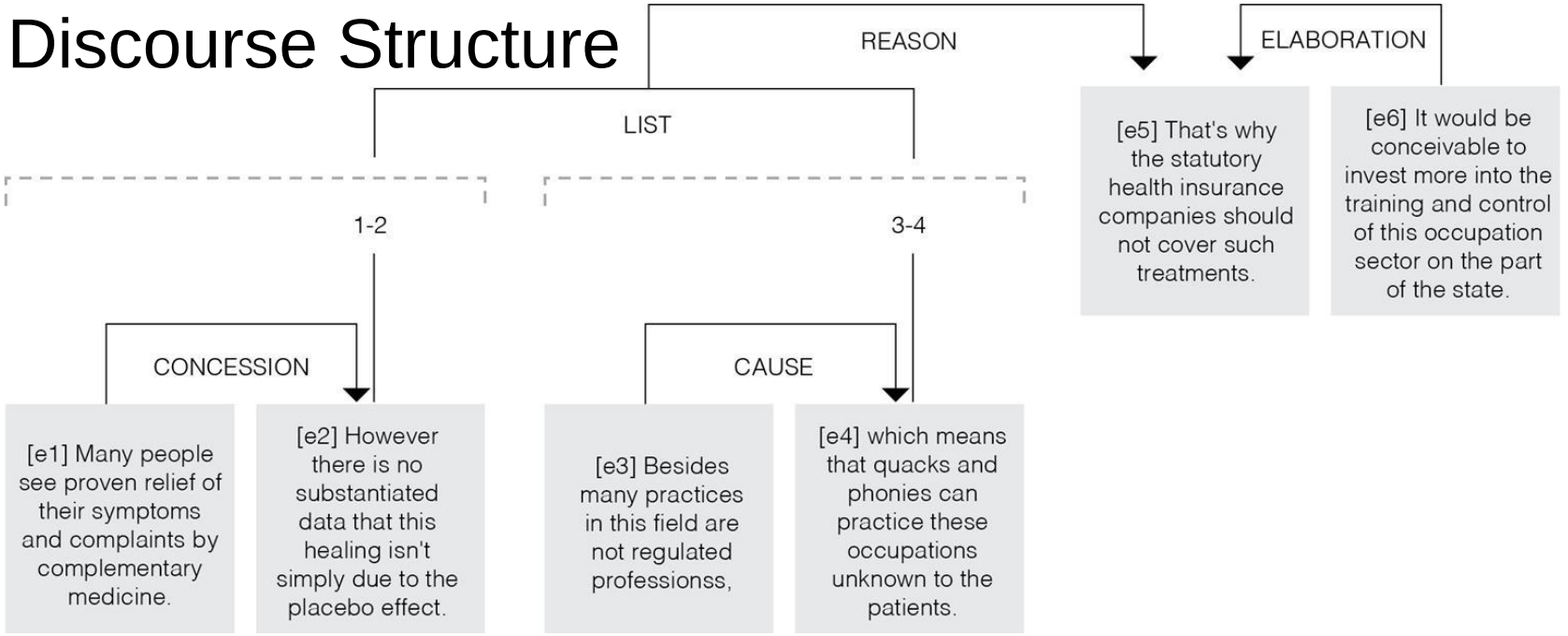
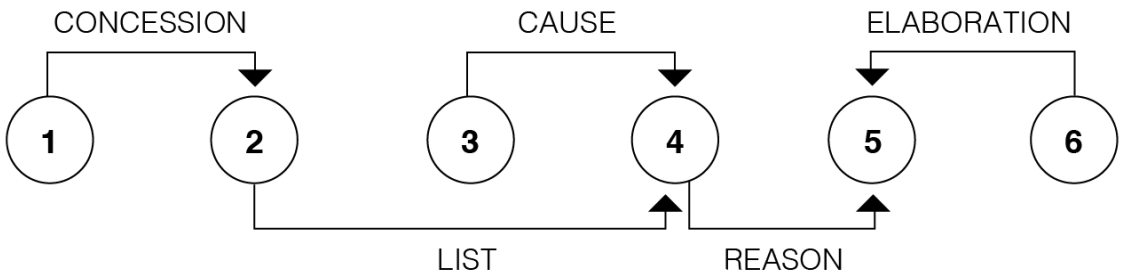
Discourse Structure





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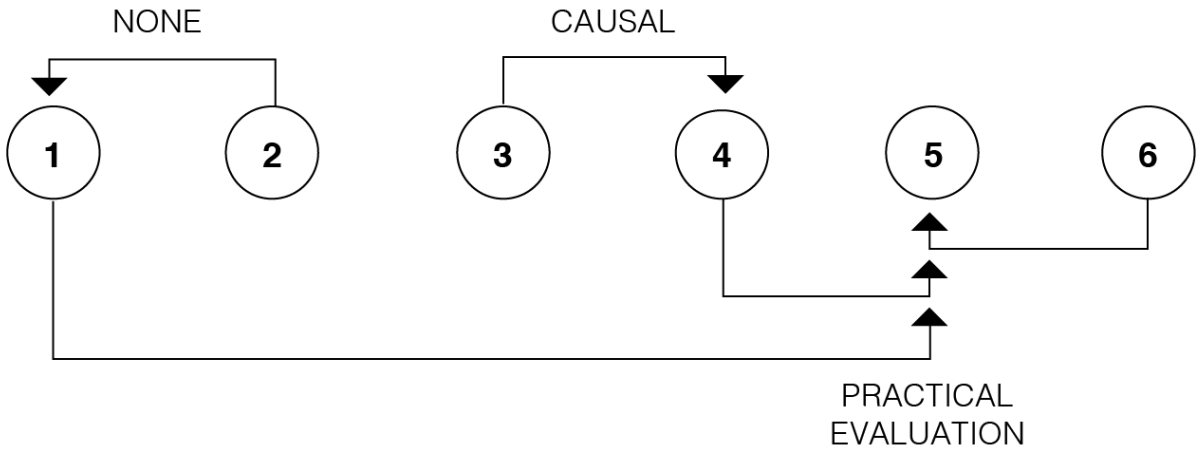
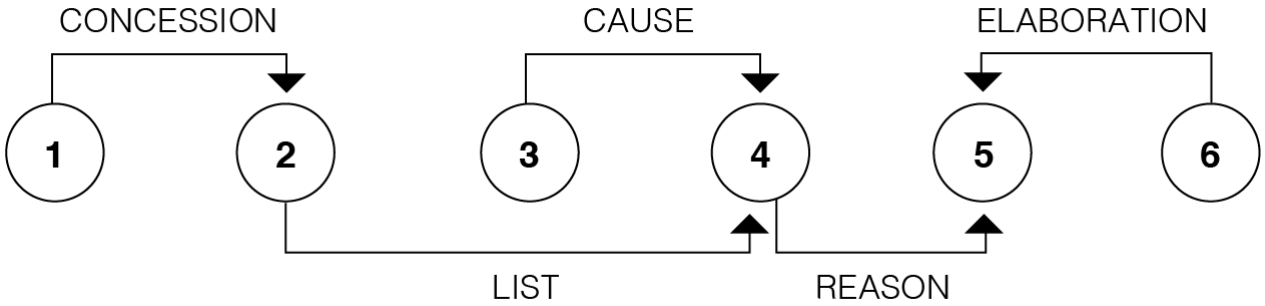
Dependency Structure

Argument Schemes



RST relations



Overlap between RST and argument schemes

	Authority	Alternatives	Analogy	Opposition	Practical_evaluation	Causal	Definitional	Mereorogical	No Scheme	None
ANTITHESIS	0	1	0	0	0	0	0	0	0	0
BACKGROUND	1	0	0	1	1	3	0	0	0	0
CAUSE	0	0	0	0	1	8	2	1	0	0
CIRCUMSTANCE	0	0	0	0	0	0	0	0	0	0
CONCESSION	0	0	0	0	0	0	0	0	0	0
CONDITION	0	0	0	0	0	1	0	0	0	0
CONJUNCTION	0	0	0	0	0	0	0	0	0	0
CONTRAST	0	0	0	0	0	0	0	0	0	0
DISJUNCTION	0	0	0	0	0	0	0	0	0	0
E-ELABORATION	0	0	0	0	0	0	0	0	0	0
ELABORATION	0	0	0	0	0	1	0	3	0	0
EVIDENCE	0	0	0	0	1	2	1	4	0	0
INTERPRETATION	0	0	0	0	0	0	0	0	0	0
JOINT	0	1	0	0	2	1	0	0	0	0
JUSTIFY	0	0	0	0	4	0	0	0	0	0
LIST	0	0	0	0	1	1	0	0	0	0
MOTIVATION	0	0	0	0	2	0	0	0	0	0
REASON	3	6	4	4	52	29	5	4	1	0
RESTATEMENT	0	0	0	0	0	1	1	0	0	0
RESULT	0	0	0	0	1	0	0	0	0	0
SAMEUNIT	0	0	0	0	1	0	0	0	0	0
SOLUTIONHOOD	0	0	0	0	0	0	0	0	0	0
UNLESS	0	0	0	0	0	0	0	0	0	0
NONE	3	1	3	0	45	17	6	4	1	1

SUPPORT

	Authority	Alternatives	Analogy	Opposition	Practical_evaluation	Causal	Definitional	Mereorogical	No Scheme	None
ANTITHESIS	1	0	0	1	2	3	2	1	0	1
BACKGROUND	0	0	0	0	0	0	0	0	0	0
CAUSE	0	0	0	0	0	0	0	0	0	0
CIRCUMSTANCE	0	0	0	0	0	0	0	0	0	0
CONCESSION	1	0	0	1	3	0	1	1	0	0
CONDITION	0	0	0	0	1	0	0	0	0	0
CONJUNCTION	0	0	0	0	0	0	0	0	0	0
CONTRAST	0	0	0	1	0	0	0	0	0	0
DISJUNCTION	0	0	0	0	0	0	0	0	0	0
E-ELABORATION	0	0	0	0	0	0	0	0	0	0
ELABORATION	0	1	0	0	1	0	0	0	0	0
EVIDENCE	0	0	0	0	0	0	0	0	0	0
INTERPRETATION	0	0	0	0	0	0	0	0	0	0
JOINT	1	0	0	0	0	0	0	0	0	0
JUSTIFY	0	0	0	0	0	0	0	0	0	0
LIST	0	0	0	0	1	0	0	0	0	0
MOTIVATION	0	0	0	0	0	0	0	0	0	0
REASON	0	0	0	0	3	0	0	0	0	0
RESTATEMENT	0	0	0	0	0	0	0	0	0	0
RESULT	0	0	0	0	0	0	0	0	0	0
SAMEUNIT	0	0	0	0	0	1	0	0	0	0
SOLUTIONHOOD	0	0	0	0	0	0	0	0	0	0
UNLESS	0	0	0	0	1	0	0	0	0	0
NONE	2	3	3	6	33	11	6	5	1	0

REBUT

Overlap between RST and argument schemes

	Authority	Alternatives	Analogy	Opposition	Practical_evaluation	Causal	Definitional	Mereorogical	No Scheme	None
ANTITHESIS	0	1	0	0	0	0	0	0	0	0
BACKGROUND	1	0	0	1	1	3	0	0	0	0
CAUSE	0	0	0	0	1	8	2	1	0	0
CIRCUMSTANCE	0	0	0	0	0	0	0	0	0	0
CONCESSION	0	0	0	0	0	0	0	0	0	0
CONDITION	0	0	0	0	0	1	0	0	0	0
CONJUNCTION	0	0	0	0	0	0	0	0	0	0
CONTRAST	0	0	0	0	0	0	0	0	0	0
DISJUNCTION	0	0	0	0	0	0	0	0	0	0
E-ELABORATION	0	0	0	0	0	0	0	0	0	0
ELABORATION	0	0	0	0	0	1	0	3	0	0
EVIDENCE	0	0	0	0	1	2	1	4	0	0
INTERPRETATION	0	0	0	0	0	0	0	0	0	0
JOINT	0	1	0	0	2	1	0	0	0	0
JUSTIFY	0	0	0	0	4	0	0	0	0	0
LIST	0	0	0	0	1	1	0	0	0	0
MOTIVATION	0	0	0	0	2	0	0	0	0	0
REASON	3	6	4	4	52	29	5	4	1	0
RESTATEMENT	0	0	0	0	0	1	1	0	0	0
RESULT	0	0	0	0	1	0	0	0	0	0
SAMEUNIT	0	0	0	0	1	0	0	0	0	0
SOLUTIONHOOD	0	0	0	0	0	0	0	0	0	0
UNLESS	0	0	0	0	0	0	0	0	0	0
NONE	3	1	3	0	45	17	6	4	1	1

SUPPORT

	Authority	Alternatives	Analogy	Opposition	Practical_evaluation	Causal	Definitional	Mereorogical	No Scheme	None
ANTITHESIS	1	0	0	1	2	3	2	1	0	1
BACKGROUND	0	0	0	0	0	0	0	0	0	0
CAUSE	0	0	0	0	0	0	0	0	0	0
CIRCUMSTANCE	0	0	0	0	0	0	0	0	0	0
CONCESSION	1	0	0	1	3	0	1	1	0	0
CONDITION	0	0	0	0	1	0	0	0	0	0
CONJUNCTION	0	0	0	0	0	0	0	0	0	0
CONTRAST	0	0	0	1	0	0	0	0	0	0
DISJUNCTION	0	0	0	0	0	0	0	0	0	0
E-ELABORATION	0	0	0	0	0	0	0	0	0	0
ELABORATION	0	1	0	0	1	0	0	0	0	0
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JOINT	1	0	0	0	0	0	0	0	0	0
JUSTIFY	0	0	0	0	0	0	0	0	0	0
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REASON	0	0	0	0	3	0	0	0	0	0
RESTATEMENT	0	0	0	0	0	0	0	0	0	0
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SAMEUNIT	0	0	0	0	0	1	0	0	0	0
SOLUTIONHOOD	0	0	0	0	0	0	0	0	0	0
UNLESS	0	0	0	0	1	0	0	0	0	0
NONE	2	3	3	6	33	11	6	5	1	0

REBUT

Overlap between RST and argument schemes

	AUTHORITY	ALTERNATIVES	ANALOGY	OPPOSITION	PRACTICAL_EVALUATION	CAUSAL	DEFINITIONAL	MEREOROGICAL	NO SCHEME	NONE
ANTITHESIS	0	1	0	0	0	0	0	0	0	0
BACKGROUND	1	0	0	1	1	3	0	0	0	0
CAUSE	0	0	0	0	1	8	2	1	0	0
CIRCUMSTANCE	0	0	0	0	0	0	0	0	0	0
CONCESSION	0	0	0	0	0	0	0	0	0	0
CONDITION	0	0	0	0	0	1	0	0	0	0
CONJUNCTION	0	0	0	0	0	0	0	0	0	0
CONTRAST	0	0	0	0	0	0	0	0	0	0
DISJUNCTION	0	0	0	0	0	0	0	0	0	0
E-ELABORATION	0	0	0	0	0	0	0	0	0	0
ELABORATION	0	0	0	0	0	1	0	3	0	0
EVIDENCE	0	0	0	0	1	2	1	4	0	0
INTERPRETATION	0	0	0	0	0	0	0	0	0	0
JOINT	0	1	0	0	2	1	0	0	0	0
JUSTIFY	0	0	0	0	4	0	0	0	0	0
LIST	0	0	0	0	1	1	0	0	0	0
MOTIVATION	0	0	0	0	2	0	0	0	0	0
REASON	3	6	4	4	52	29	5	4	1	0
RESTATEMENT	0	0	0	0	0	1	1	0	0	0
RESULT	0	0	0	0	1	0	0	0	0	0
SAMEUNIT	0	0	0	0	1	0	0	0	0	0
SOLUTIONHOOD	0	0	0	0	0	0	0	0	0	0
UNLESS	0	0	0	0	0	0	0	0	0	0
NONE	3	1	3	0	45	17	6	4	1	1

SUPPORT

	AUTHORITY	ALTERNATIVES	ANALOGY	OPPOSITION	PRACTICAL_EVALUATION	CAUSAL	DEFINITIONAL	MEREOROGICAL	NO SCHEME	NONE
ANTITHESIS	1	0	0	1	2	3	2	1	0	1
BACKGROUND	0	0	0	0	0	0	0	0	0	0
CAUSE	0	0	0	0	0	0	0	0	0	0
CIRCUMSTANCE	0	0	0	0	0	0	0	0	0	0
CONCESSION	1	0	0	1	3	0	1	1	0	0
CONDITION	0	0	0	0	1	0	0	0	0	0
CONJUNCTION	0	0	0	0	0	0	0	0	0	0
CONTRAST	0	0	0	1	0	0	0	0	0	0
DISJUNCTION	0	0	0	0	0	0	0	0	0	0
E-ELABORATION	0	0	0	0	0	0	0	0	0	0
ELABORATION	0	1	0	0	1	0	0	0	0	0
EVIDENCE	0	0	0	0	0	0	0	0	0	0
INTERPRETATION	0	0	0	0	0	0	0	0	0	0
JOINT	1	0	0	0	0	0	0	0	0	0
JUSTIFY	0	0	0	0	0	0	0	0	0	0
LIST	0	0	0	0	1	0	0	0	0	0
MOTIVATION	0	0	0	0	0	0	0	0	0	0
REASON	0	0	0	0	3	0	0	0	0	0
RESTATEMENT	0	0	0	0	0	0	0	0	0	0
RESULT	0	0	0	0	0	0	0	0	0	0
SAMEUNIT	0	0	0	0	0	1	0	0	0	0
SOLUTIONHOOD	0	0	0	0	0	0	0	0	0	0
UNLESS	0	0	0	0	1	0	0	0	0	0
NONE	2	3	3	6	33	11	6	5	1	0

REBUT

Overlap between RST and argument schemes

	Authority	Alternatives	Analogy	Opposition	Practical_evaluation	Causal	Definitional	Mereorogical	No Scheme	None
ANTITHESIS	0	1	0	0	0	0	0	0	0	0
BACKGROUND	1	0	0	1	1	3	0	0	0	0
CAUSE	0	0	0	0	1	8	2	1	0	0
CIRCUMSTANCE	0	0	0	0	0	0	0	0	0	0
CONCESSION	0	0	0	0	0	0	0	0	0	0
CONDITION	0	0	0	0	0	1	0	0	0	0
CONJUNCTION	0	0	0	0	0	0	0	0	0	0
CONTRAST	0	0	0	0	0	0	0	0	0	0
DISJUNCTION	0	0	0	0	0	0	0	0	0	0
E-ELABORATION	0	0	0	0	0	0	0	0	0	0
ELABORATION	0	0	0	0	0	1	0	3	0	0
EVIDENCE	0	0	0	0	1	2	1	4	0	0
INTERPRETATION	0	0	0	0	0	0	0	0	0	0
JOINT	0	1	0	0	2	1	0	0	0	0
JUSTIFY	0	0	0	0	4	0	0	0	0	0
LIST	0	0	0	0	1	1	0	0	0	0
MOTIVATION	0	0	0	0	2	0	0	0	0	0
REASON	3	6	4	4	52	29	5	4	1	0
RESTATEMENT	0	0	0	0	0	1	1	0	0	0
RESULT	0	0	0	0	1	0	0	0	0	0
SAMEUNIT	0	0	0	0	1	0	0	0	0	0
SOLUTIONHOOD	0	0	0	0	0	0	0	0	0	0
UNLESS	0	0	0	0	0	0	0	0	0	0
NONE	3	1	3	0	45	17	6	4	1	1

SUPPORT

	Authority	Alternatives	Analogy	Opposition	Practical_evaluation	Causal	Definitional	Mereorogical	No Scheme	None
ANTITHESIS	1	0	0	1	2	3	2	1	0	1
BACKGROUND	0	0	0	0	0	0	0	0	0	0
CAUSE	0	0	0	0	0	0	0	0	0	0
CIRCUMSTANCE	0	0	0	0	0	0	0	0	0	0
CONCESSION	1	0	0	1	3	0	1	1	0	0
CONDITION	0	0	0	0	1	0	0	0	0	0
CONJUNCTION	0	0	0	0	0	0	0	0	0	0
CONTRAST	0	0	0	1	0	0	0	0	0	0
DISJUNCTION	0	0	0	0	0	0	0	0	0	0
E-ELABORATION	0	0	0	0	0	0	0	0	0	0
ELABORATION	0	1	0	0	1	0	0	0	0	0
EVIDENCE	0	0	0	0	0	0	0	0	0	0
INTERPRETATION	0	0	0	0	0	0	0	0	0	0
JOINT	1	0	0	0	0	0	0	0	0	0
JUSTIFY	0	0	0	0	0	0	0	0	0	0
LIST	0	0	0	0	1	0	0	0	0	0
MOTIVATION	0	0	0	0	0	0	0	0	0	0
REASON	0	0	0	0	3	0	0	0	0	0
RESTATEMENT	0	0	0	0	0	0	0	0	0	0
RESULT	0	0	0	0	0	0	0	0	0	0
SAMEUNIT	0	0	0	0	0	1	0	0	0	0
SOLUTIONHOOD	0	0	0	0	0	0	0	0	0	0
UNLESS	0	0	0	0	1	0	0	0	0	0
NONE	2	3	3	6	33	11	6	5	1	0

REBUT

Discussion

- **Presentational RST relations:**

  ANTITHESIS and CONCESSION ← → REBUT relations (e.g.“Although IBM s numbers haven’t been staggering recently. You should buy IBM shares if you want to invest”)

  REASON ← → SUPPORT relations
  e.g. REASON ← → PRACTICAL EVALUATION argument schemes (e.g. “Actually only those people should pay a TV and radio licence fee who really watch ARD, ZDF, Arte etc. It is in fact good to support sophisticated programming through fees”)

- **Subject-matter RST relations:**

  CAUSE ← → Argument schemes of the CAUSAL type (“Fees result in longer durations of studies” supported by the premise “That’s costly!”)

Conclusion

- We provided a multilayer annotated corpus that allowed us to study the correlation between different levels of discourse and argumentative relations
- Presentational RST relations correlates with either SUPPORT or REBUT relations but do not select a specific scheme
- It seems that Subject-matter RST relations select one top-level type of scheme (intrinsic or extrinsic).
- This was done on small scale, so we need to do it on a larger dataset next

Thank You