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.

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.

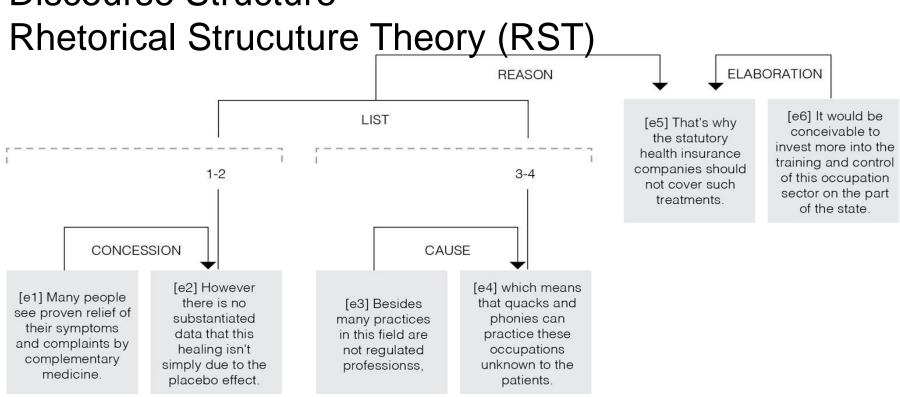
[e1] Many people see proven relief of their symptoms and complaints by complementary medicine. [e2] However there is no substantiated data that this healing isn't simply due to the placebo effect. [e3] Besides many practices in this field are not regulated professions [e4] which means that quacks and 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.

[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.

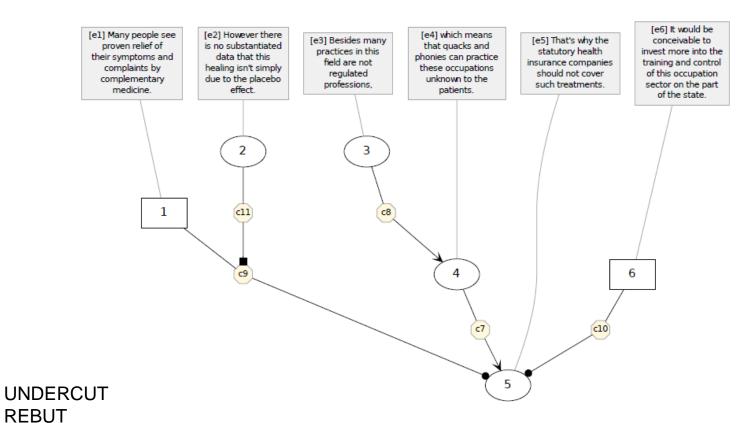
[e3] Besides many practices in this field are not regulated professionss, [e4] which means that quacks and phonies can practice these occupations unknown to the patients.

[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

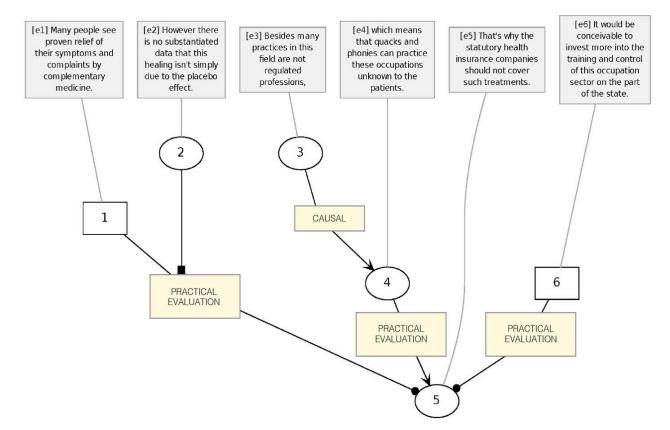


Argument Structure



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

Argument Schemes



Stede et al. 2016 [e3] Besides many [e5] That's why the conceivable to that quacks and proven relief of is no substantiated practices in this statutory health data that this their symptoms and phonies can practice field are not healing isn't simply complaints by these occupations due to the placebo regulated unknown to the should not cover of this occupation professions such treatments sector on the part Many people see proven relief of their symptoms and conceivable to the statutory invest more into the complaints by complementary medicine. However there is no training and control of this occupation substantiated data that this healing isn't simply due to the sector on the part of the state. placebo effect. Besides many practices in this field are not regulated professions which means that quacks and phonies CONCESSION can practice these occupations unknown to the patients. [e1] Many people That's why the statutory health insurance companies should see proven relief o substantiated their symptoms data that this not cover such treatments. It would be conceivable to invest and complaints by healing isn't simply due to the unknown to the more into the training and control of this occupation sector placebo effect on the part of the state. [e6] It would be proven relief of is no substantiated that quarks and practices in this their symptoms and data that this obonies can practice field are not insurance companies training and control healing isn't simply these occupations regulated should not cover of this accupation due to the placebo unknown to the complementary professions. such treatments sector on the part of the state. **Annotation Study Correlation Study** PRACTICAL EVALUATION

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

Alternatives

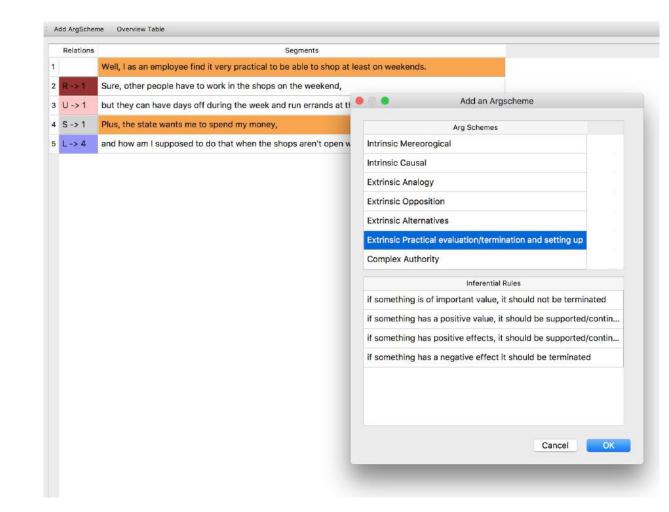
TOP LEVEL MIDDLE LEVEL LOW LEVEL 2 tasks: given a SUPPORT or Definitional Efficient cause REBUT relation, identify the Intrinsic Mereological argument scheme among Material cause the 8 middle level schemes Causal Final cause Analogy Argument Formal cause schemes identify the associated Extrinsic Opposition inference rule Practical evaluation

Complex

(Authority)

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

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

Annotation Results

	DEFINITIONAL	MEREOROGICAL	CAUSAL	ANALOGY	OPPOSITION	PRACTICAL_EVALUATION	ALTERNATIVES	А∪ТНОВІТУ	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	1 0		1		8	5	3	3	3
PRACTICAL_EVALUATION						218	10	8	29
ALTERNATIVES							4	0	4
AUTHORITY								24	0
NONE									6

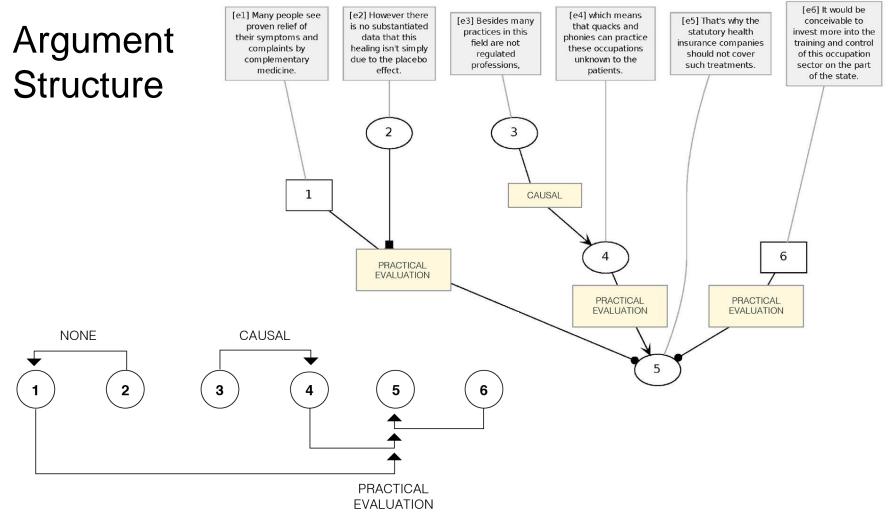
Argument Schemes and Rhetorical Relations

Mapping the two theories

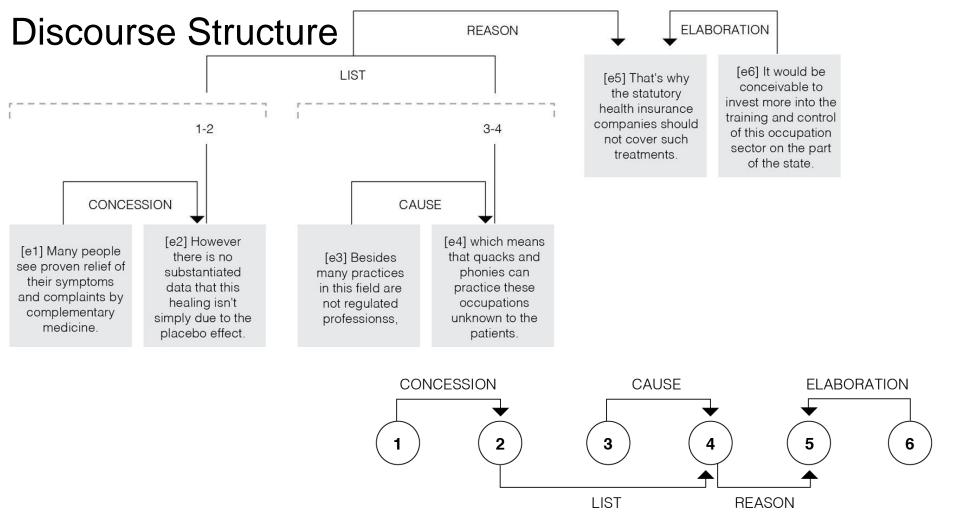
- Representing argument structure along with the annotated argument schemes in one common format with RST discourse structure
- Using a dependency structure (Stede et al., 2016)

Correlation Analysis

 Overlap between RST relations and argument schemes for SUPPORT and REBUT relations



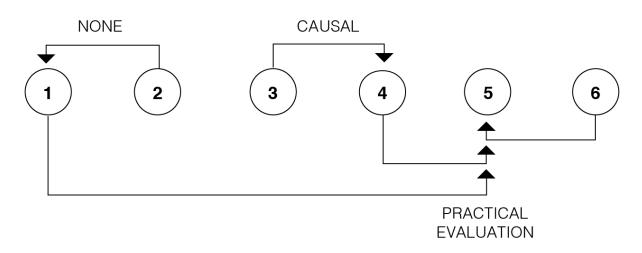
Stede, M., Afantenos, S. D., Peldszus, A., Asher, N., & Perret, J. (2016). Parallel Discourse Annotations on a Corpus of Short Texts. In LREC.



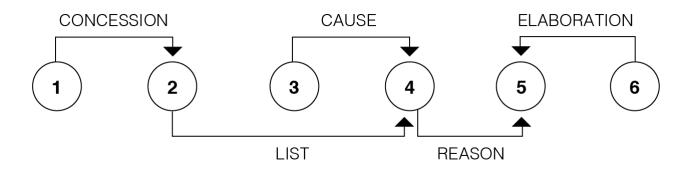
Stede, M., Afantenos, S. D., Peldszus, A., Asher, N., & Perret, J. (2016). Parallel Discourse Annotations on a Corpus of Short Texts. In LREC.

Dependency Structure

Argument Schemes



RST relations



	АUTHORITY	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

		I			Z					
	А∪ТНОВІТУ	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

SUPPORT

	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	U	U	U	U	U	1	1	U	U	U
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

	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	U	Ü	Ü	Ü	Ü	Ü	U	U	U	U
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

SUPPORT

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

	AUTHORITY	ALTERNATIVES	ANALOGY	OPPOSITION	PRACTICAL_EVALUATION	CAUSAL	DEFINITIONAL	MEREOROGICAL	No Scheme	Vone
ANTITHESIS	1	0	0	1	2	3	2	1	0	1
BACKGROUND	0	U	0	0	0	0	0	0	U	U
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	0
DISJUNCTION	0	0	0	0	0	0	0	0	0	0
E-ELABORATION 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	ő	0	0	1	0	0	0	0	0
MOTIVATION	0	ő	0	o	0	0	0	0	o	ő
REASON	ő	ő	ő	ő	3	0	ő	0	ő	0
RESTATEMENT	ő	ő	ő	ő	0	ő	ő	ő	ő	ő
RESULT	ő	ő	ő	ő	ő	ő	ő	ő	ő	ő
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

SUPPORT

	AUTHORITY	ALTERNATIVES	ANALOGY	OPPOSITION	PRACTICAL EVALUATION	CAUSAL	DEFINITIONAL	MEREOROGICAL	No Scheme	None
ANTITHESIS	0	1	0	0	0	0	0	0	0	0
CAUSE	0	0	0	0	1	8	2	1	0	o O
CIRCUMSTANCE	0	0	0	0	0	0	0	0	0	0
CONCESSION	ő	o	ő	0	ő	0	o	ő	ő	ő
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

	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

SUPPORT

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