Linguistic Properties Matter for Implicit Discourse Relation Recognition:
Combining Semantic Interaction, Topic Continuity and Attribution

Wenqiang Lei, Yuanxin Xiang, Yuwei Wang, Qian Zhong, Meichun Liu, Min-Yen Kan

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1st Half

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Discourse Relations

[Citibank could not raise $73 billion.]$_{arg1}$ [However]$_{conn}$
[Chase has raised $100 billion.]$_{arg2}$

Explicit Comparison

[The CEO set growth as his first objective.]$_{arg1}$ [He took the company public in an offering that netted his company about $12.6 million.]$_{arg2}$

Implicit Contingency

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Discourse Relations

[Citibank could not raise $73 billion.]$_{arg1}$ [However]$_{conn}$
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Explicit Comparison

State of the Art:
No difference from other text classification tasks which takes a pair of sentence as an input.

Implicit Contingency

Unique Linguistic Properties of Discourse Relation

- Discourse relation = <u>Cohesion Device</u> + Semantic interactions

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Topic Continuity

[Phil Harms, a software engineer, was an eager customer for massage.]$_{arg1}$[He says:]$_{Attr2}$ [“You build up a lot of tension working at a terminal all day,”]$_{arg2}$

Attribution

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(Comparison)

[Citibank could   raise $73 billion.]$_{arg1}$ [Chase has raised $100 billion.]$_{arg2}$

Negation interaction + topic continuity

[Citibank could not raise $73 billion.]$_{arg1}$ [It's raining hard.]$_{arg2}$

Only negation interaction is not enough

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[Citibank could not raise $73 billion.]$_{arg1}$ [Chase has raised $100 billion.]$_{arg2}$

Negation interaction & topic continuity

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topic continuity and attribution

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Intention interaction & topic continuity and attribution

Discourse relation = Cohesion Device + <u>Semantic interactions</u>
(Contingency)

[Phil Harms, a software engineer, was an eager customer for massage.]$_{arg1}$ [He says:]$_{Attr2}$ [''You build up a lot of tension working at a terminal all day,'']$_{arg2}$

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Intention interaction & topic continuity and attribution

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Feature Engineering

A cohesion device feature set

A semantic interaction feature set

Feature Engineering

Cross product ($\otimes$) between

A cohesion device feature set

A semantic interaction feature set

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Experiment Results

	Comp.	Cont.	Exp.	Temp.	4-way
1. Baseline	38.41	53.88	72.22	27.46	44.93
2. Baseline + All features	**43.24 (+4.83)**	**57.82 (+3.94)**	72.88	**29.10 (+1.54)**	**47.15 (+2.19)**

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Experiment Results

	Comp.	Cont.	Exp.	Temp.	4-way
1. (Qin et al., 2017)	41.55	57.32	71.50	35.43	-
2. Baseline + All features	**43.24**	**57.82**	**72.88**	29.10	47.15

Top-ranked Features by Chi-square Significance

ID	Feature Description	Correlation
Comp.1	Arg2Neg⊗Arg2Subj-Coref	Positive
Comp.2	Arg2Neg⊗Arg2Predi-Rep	Positive
Comp.3	Arg2Neg⊗Arg1Predi-Rep	Positive
Comp.4	Arg2Neg⊗Arg2Subj-Rep	Positive
Comp.5	Arg1Neg⊗Arg1Subj-Rep	Positive
Cont.1	Arg1Subjtiv⊗RelAttr	Positive
Cont.2	Arg2Intent⊗Arg1SubjArg2Subj2-Coref	Positive
Cont.3	Attr1Subjtiv	Positive
Cont.4	Arg2Intent⊗Attr2SubjArg1Subj-Coref	Positive
Cont.5	ParaConti	Negative
Exp.1	Arg2Neg⊗Arg2Subj-Coref	Negative
Exp.2	Arg2Intent⊗Arg1SubjArg2Subj2-Coref	Negative
Exp.3	Arg2Intent⊗Attr2SubjArg1Subj-Coref	Negative
Exp.4	ParaConti	Positive
Exp.5	Arg2Neg⊗Arg2Subj-Rep	Negative
Temp.1	RelAttr	Negative
Temp.2	Arg2Neg⊗Arg2Subj-Coref	Negative
Temp.3	Arg2Neg⊗Arg2Predi-Rep	Negative
Temp.4	Attr1Subjtiv	Negative
Temp.5	Arg1Subjtiv⊗RelAttr	Negative

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Most top ranked features are actually cross product features!

ID	Feature Description	Correlation
Comp.1	Arg2Neg⊗Arg2Subj-Coref	Positive
Comp.2	Arg2Neg⊗Arg2Predi-Rep	Positive
Comp.3	Arg2Neg⊗Arg1Predi-Rep	Positive
Comp.4	Arg2Neg⊗Arg2Subj-Rep	Positive
Comp.5	Arg1Neg⊗Arg1Subj-Rep	Positive
Cont.1	Arg1Subjtiv⊗RelAttr	Positive
Cont.2	Arg2Intent⊗Arg1SubjArg2Subj2-Coref	Positive
Cont.3		Positive
Cont.4	Arg2Intent⊗Attr2SubjArg1Subj-Coref	Positive
Cont.5		Negative
Exp.1	Arg2Neg⊗Arg2Subj-Coref	Negative
Exp.2	Arg2Intent⊗Arg1SubjArg2Subj2-Coref	Negative
Exp.3	Arg2Intent⊗Attr2SubjArg1Subj-Coref	Negative
Exp.4		Positive
Exp.5	Arg2Neg⊗Arg2Subj-Rep	Negative
Temp.1		Negative
Temp.2	Arg2Neg⊗Arg2Subj-Coref	Negative
Temp.3	Arg2Neg⊗Arg2Predi-Rep	Negative
Temp.4		Negative
Temp.5	Arg1Subjtiv⊗RelAttr	Negative