

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

Wenqiang Lei, Yuanxin Xiang, Yuwei Wang, Qian  
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Combining Semantic Interaction, Topic Continuity and Attribution

1st Half

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2<sup>nd</sup> Half

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# Discourse Relations

[Citibank could not raise \$73 billion.]<sub>arg1</sub> [However]<sub>conn</sub>  
[Chase has raised \$100 billion.]<sub>arg2</sub>

*Explicit Comparison*

[The CEO set growth as his first objective.]<sub>arg1</sub> [He took  
the company public in an offering that netted his company  
about \$12.6 million.]<sub>arg2</sub>

*Implicit Contingency*

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[Chase has raised \$100 billion.]<sub>arg2</sub>

*Explicit Comparison*

## State of the Art:

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

*Implicit Contingency*

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- Discourse relation = Cohesion Device + Semantic interactions

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Topic Continuity

[Phil Harms, a software engineer, was an eager customer for massage.]<sub>arg1</sub> [He says:]<sub>Attr2</sub> ["You build up a lot of tension working at a terminal all day,"]<sub>arg2</sub>

Attribution



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Discourse relation = Cohesion Device + Semantic interactions  
(Comparison)

[Citibank could **raise** \$73 billion.]<sub>arg1</sub> [Chase has  
**raised** \$100 billion.]<sub>arg2</sub>

→ negation interaction is **topic continuity**

[Citibank could not raise \$73 billion.]<sub>arg1</sub> [It's raining  
hard.]<sub>arg2</sub>

Only negation interaction is not enough

Discourse relation = Cohesion Device + Semantic interactions  
(Comparison)

[Citibank could **not raise** \$73 billion.]<sub>arg1</sub> [Chase has  
**raised** \$100 billion.]<sub>arg2</sub>

**Negation interaction** & **topic continuity**

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[Phil Harms, a software engineer, was an  customer for massage.]<sub>arg1</sub> [He says:]<sub>Attr2</sub> [“You build up a lot of tension working at a terminal all day,”]<sub>arg2</sub>

[The CEO set growth as his first objective.]<sub>arg1</sub> [He took the company public in an offering that netted his company about \$12.6 million.]<sub>arg2</sub>

implicit interaction & topic continuity and attribution

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Intention interaction & topic continuity and attribution

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Intention interaction & topic continuity and attribution

# Feature Engineering

Crisscrossed between

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

# Experiment Results

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

# 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	<b>43.24</b>	<b>57.82</b>	<b>72.88</b>	29.10	47.15

## Top-ranked Features by Chi-square Significance

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

Most top ranked features are actually cross product features!

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