

The Role of Context and Uncertainty in Shallow Discourse Parsing

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Introduction

- Discourse parsing allows us to make high-level inferences across sentence boundaries
- The goal of discourse parsing is to label **relations** between multiple text units
- Discourse models have been shown to improve results for multiple tasks
- However, discourse parsing is a difficult task
- We want to see whether:
 - Annotators benefit from access to additional context
 - Models benefit from access to data about annotation accuracy/confidence with and without context

Annotations

Datasets

- Penn Discourse Treebank (PDTB)
 - Wall Street Journal news articles
 - We use version 2.0 and 3.0
- Ted Multilingual Discourse Bank
 - Transcribed TED talks
 - We use the English set

Task

- Goal: annotate implicit discourse relations (no discourse connective in text)
- Two setups
 - **Without context** - annotator sees the two arguments
 - **With context** - annotator sees the two arguments, two sentence before, and one sentence after
- Annotation task
 1. Insert a connective
 2. Choose a discourse relation
 3. Rate confidence (1-5)

Results

How does exposure to context impact implicit discourse relation classification models?

- Context access DOES make a difference for humans
- Human confidence informs model performance and calibration

Where does context help?

Arg 1: the fund's 25% leverage has jacked up its interest income

Arg2: As long as I am borrowing at 9.9% and each {bond} yields over that, it enhances the yield

Context:

But when the market moves against the fund, investors lose more than other junk holders because the market decline is magnified by the amount the fund is leveraged. Fund managers, for their part, defend their use of leverage. Carl Ericson, who runs the Colonial Intermediate High Income Fund, says **the fund's 25% leverage has jacked up its interest income.** "As long as I am borrowing at 9.9% and each {bond} yields over that, it enhances the yield," he maintains. Mr. Ericson says he tries to offset the leverage by diversifying the fund's portfolio.

Before context: **Expansion.Conjunction**

After context: **Contingency.Cause**

After seeing the context, the annotator understood the relation between the income/fund and the yield enough to identify a causal relation

Does context improve annotations?

Accuracy			Confidence		
Corpus	Raw	Context	Corpus	Raw	Context
PDTB-2	.197	.231	PDTB-2	3.70	4.81
PDTB-3	.345	.363	PDTB-3	3.56	4.71
TED-MDB	.296	.355	TED-MDB	3.63	4.84

What improves model accuracy?

Model	PDTB-2	PDTB-3	TED-MDB
Baseline	.5527	.6326	.5381
+Correctness	.5694*	.6452*	.5347
+Confidence	.5648*	.6518*	.5035*
+Correctness & Confidence	.5642*	.6428*	.4931*
+Reweighting	.5719*	.6419*	.4861*

What improves model calibration (Brier Score)?

Model	PDTB-2	PDTB-3	TED-MDB
Baseline	.6780	.5787	.7214
+Temp Change	.5922*	.5295*	.6477*

Examples

- Two examples, marked with their **relation**, are below:
 - While the earnings picture **confuses**, observers say *the major forces expected to shape the industry in the coming year are clearer.* **Contrast**
 - *Just as the 1980s bull market transformed the U.S. securities business,* **so too will the more difficult environment of the 1990s,** says Christopher T. Mahoney, a Moody's vice president. **Similarity**

Argument 1 is in italics, *argument 2* is in bold, and the connective is underlined

Modeling

- **Baseline:** XLNet-large model used by Kim et al (2020)
- **Correctness** – Binary prediction; whether the annotator is likely to get the example correct when given access to context
- **Confidence** – Decimal prediction of annotator confidence when given access to context
- **Reweighting** -reweight training examples based on predicted confidence score
- **Temperature Adjustment** – adjust the temperature of the softmax function based on predicted confidence score

Takeaways

- Having access to annotation accuracy and confidence can improve the performance of discourse parsers
- Giving annotators to context can improve their accuracy and confidence