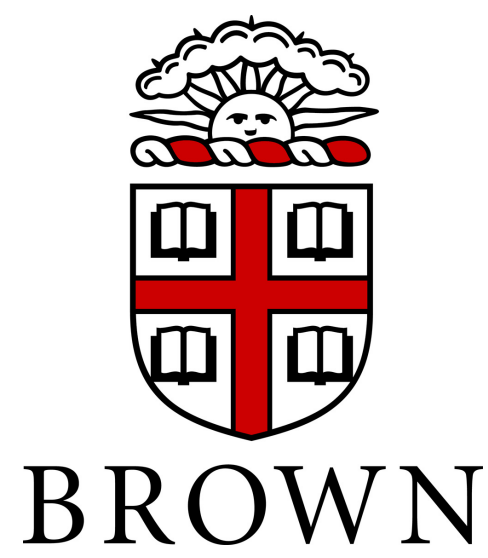


Parsing Paraphrases with Joint Inference



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Motivation

Hard to annotate syntax in domains requiring subject matter expertise.

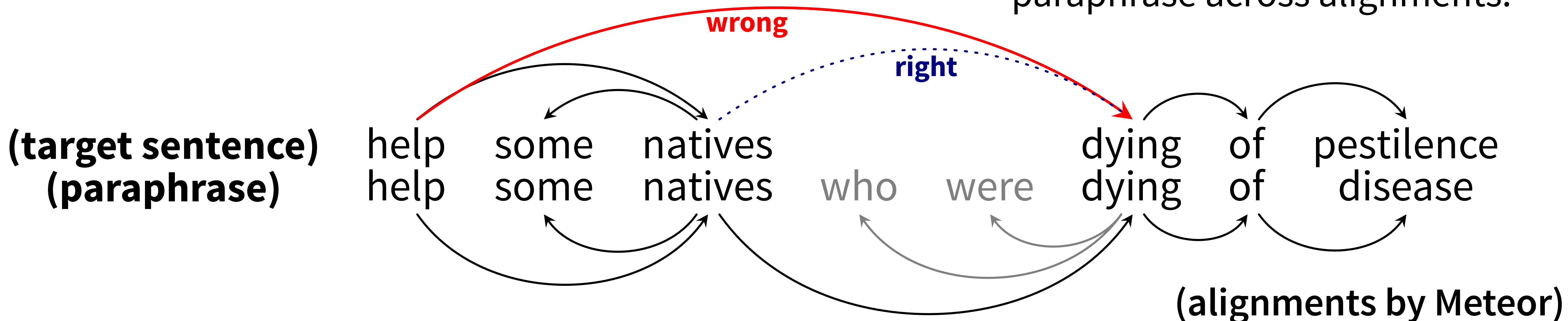
Paraphrases have similar syntax across alignments, easier to make than parse trees.

Task

Input: Sentence and paraphrase

Output: Parse of sentence

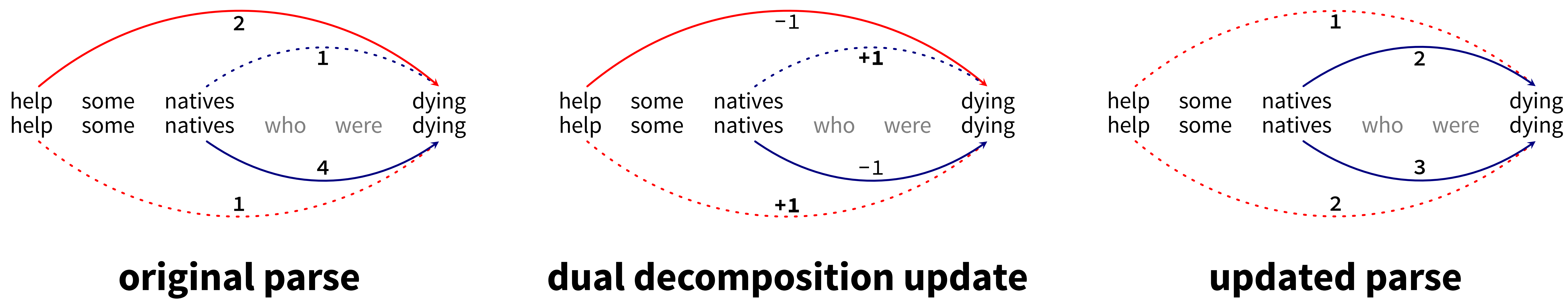
Approach: Encourage agreement between parses of sentence and paraphrase across alignments.



Dual Decomposition

(works with any arc-factored parser)

Idea: Parse sentence and paraphrase simultaneously, encourage agreement across aligned arcs using hard or soft dual decomposition.



Pair-finding

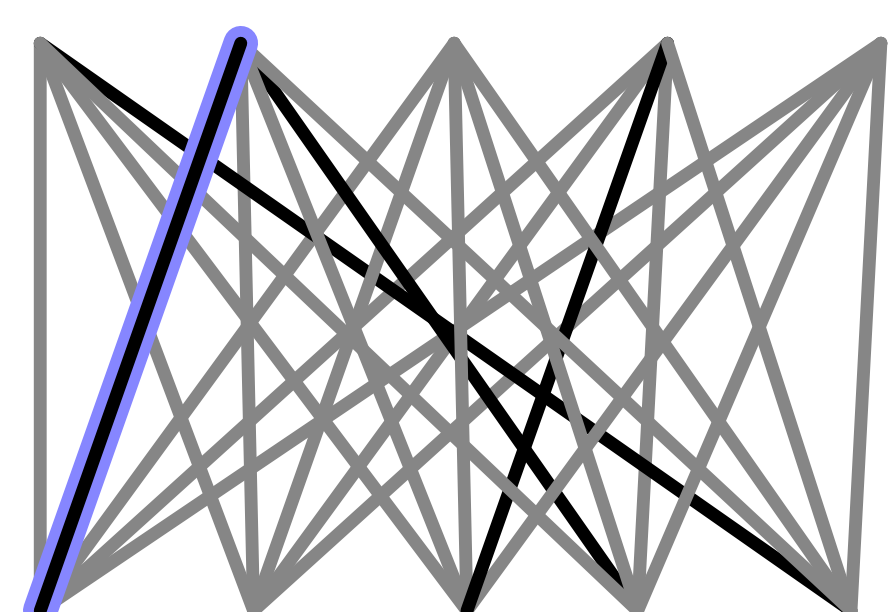
(works with any n-best parser)

Idea: Within pairs with smallest alignment cost, maximize the sum of parse scores.

n-best parse scores

(sentence)

1.7	1.4	1.3	0.9	0.5
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Key:
selected
cost = 2
cost = 3+

(paraphrase)

2.3	2.2	1.7	1.2	0.9
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Classifier

Idea: Pick between original and joint parse to better handle bad alignments.

Features: # crossing arcs, % non-proj. arcs, sentence lengths, word overlap, and parse structure templates

	Labeled attachment score				
	Avg.	BNC	Brown	QB	WSJ
RBGParser	81.3	83.7	84.1	71.0	89.9
+ Soft DD	81.7	83.8	84.6	71.8	90.2
+ Classifier	81.6	83.9	84.5	71.7	89.9
BLLIP	86.1	87.2	87.9	79.9	91.6
+ Pair-finding	86.5	87.3	88.4	80.7	91.6
+ Classifier	86.8	87.2	88.1	81.7	91.7
BLLIP (ST)	87.0	88.3	89.0	81.2	91.4
+ Pair-finding	87.1	87.6	89.1	81.8	91.4
+ Classifier	87.6	88.0	89.3	82.9	91.4

Evaluation details:
Parsers: Lei et al. (2014), Charniak and Johnson (2005), McClosky et al. (2006)

Corpora: 2,000 sentences annotated with their paraphrases.

Blue indicates significant improvement ($p < 0.01$) over parser baseline.