

Knowledge-Guided Linguistic Rewrites (KGLR) for Inference Rule Verification

Prachi Jain and Mausam

Indian Institute of Technology, Delhi

India



(X, be wounded in, Y)

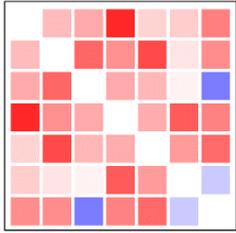
(X, be killed in, Y)

**Inference
Rule
Corpus**

(X, make a note of, Y)

(X, write down, Y)

Statistical Co-occurrence



(Schoenmackers et al., 2010)

Textual Patterns

Y such as X ((, X)* (, and|or) X)
such Y as X
Y including X
X and other Y

(Hearst et al., 1992)

(X, be wounded in, Y) *(X, be killed in, Y)*

Inference
Rule
Corpus

Low precision

(X, make a note of, Y) *(X, write down, Y)*

Knowledge Sources

WordNet

(Fellbaum, 1998)

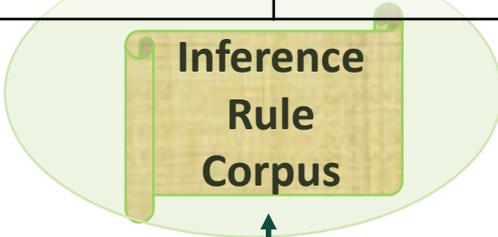
Foreign Language Translations



Paraphrase.org

(Pavlick et al., 2015)

(X, make a note of, Y) (X, write down, Y)



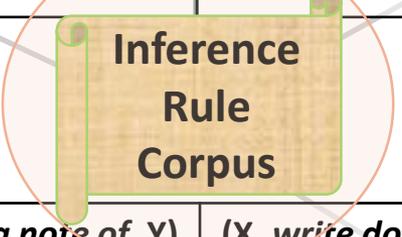
Linguistic Rules (KGLR)

Textual Patterns

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(Hearst et al., 1992)

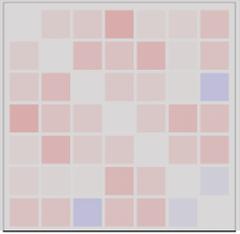
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Statistical Co-occurrence



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Knowledge Sources



(Fellbaum, 1998)

Foreign Language Translations



(Pavlick et al., 2015)

Antecedent	Consequent
<i>(X, offer wide range of, Y)</i>	<i>(X, offer variety of, Y)</i>
<i>(X, make a note of, Y)</i>	<i>(X, write down, Y)</i>
<i>(X, make full use of, Y)</i>	<i>(Y, be used by, X)</i>
<i>(X, be wounded in, Y)</i>	<i>(X, be killed in, Y)</i>
<i>(X, be director of, Y)</i>	<i>(X, be vice president of, Y)</i>
<i>(X, be a student at, Y)</i>	<i>(X, be enrolled at, Y)</i>

KGLR



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KGLR



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KGLR



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To verify



Operators: Knowledge-guided Linguistic Rewrites (KGLR)

Deverbal Nouns	WordNet
direct; be the director of	
be president of; chair	

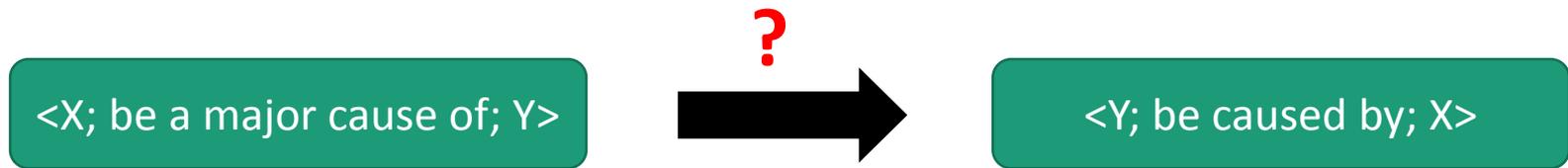
Light Verbs & Serial Verbs	
help protect → protect	
take a look at → look at	

Wordnet Hypernyms	WordNet
be the highlight of → be a component of	
audition for → perform for	

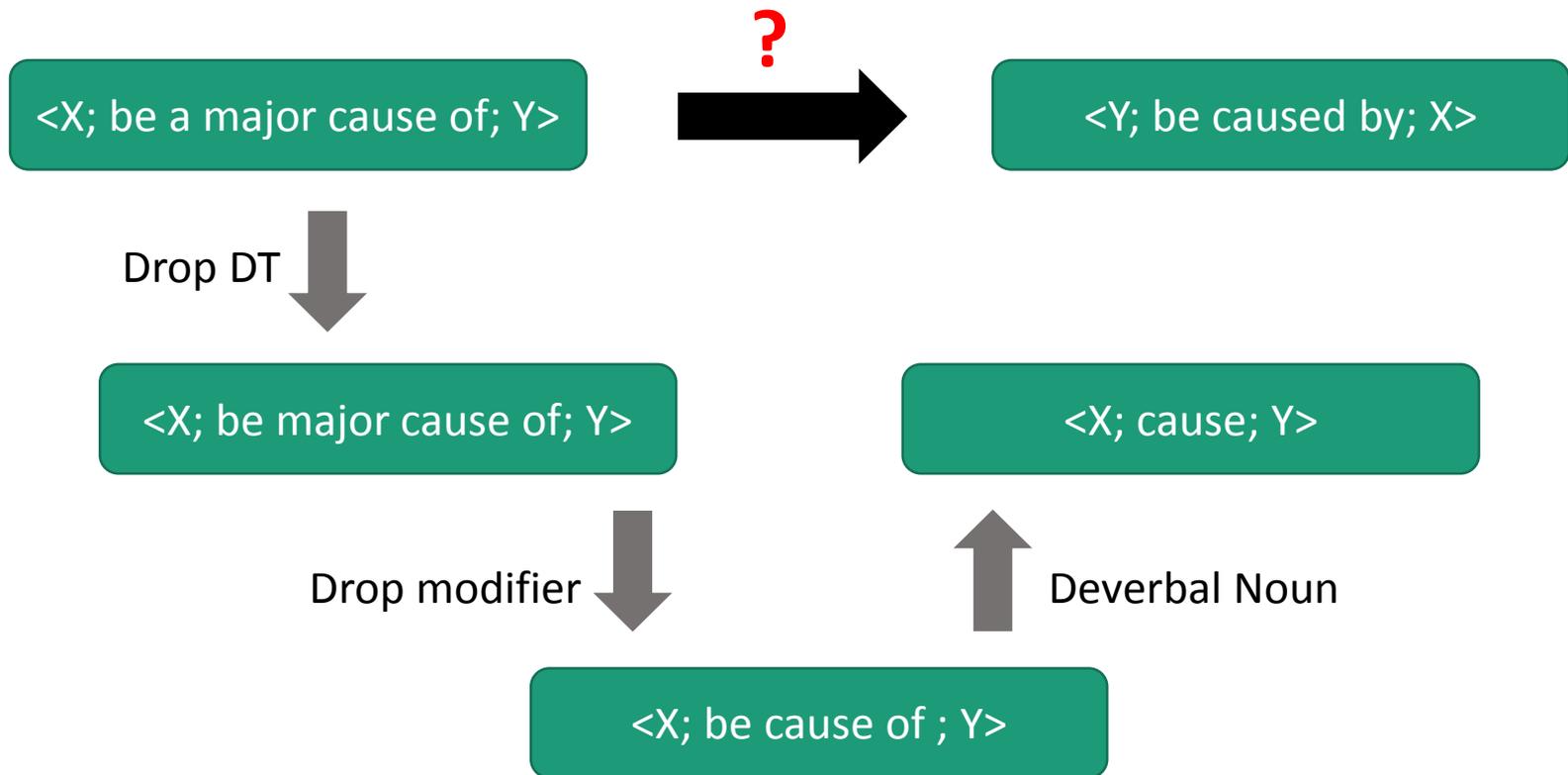
Operators: Knowledge-guided Linguistic Rewrites (KGLR)

Gerund-Infinitive Equivalence	WordNet
start to drink → start drinking	
Redundant Prepositions	
<X; be absorbed in; Y> → <Y; absorbs; X>	
Thesaurus Synonyms	
provide a wide variety of → offer a vast variety of	
Preposition Synonyms	
translated into → translated to	
'be'-words and Determiners	
<i>be</i> sick of → tire of	
be <i>all</i> about → be about	
Dropping adjectives/adverbs/superlatives	WordNet 
Active Passive	WordNet

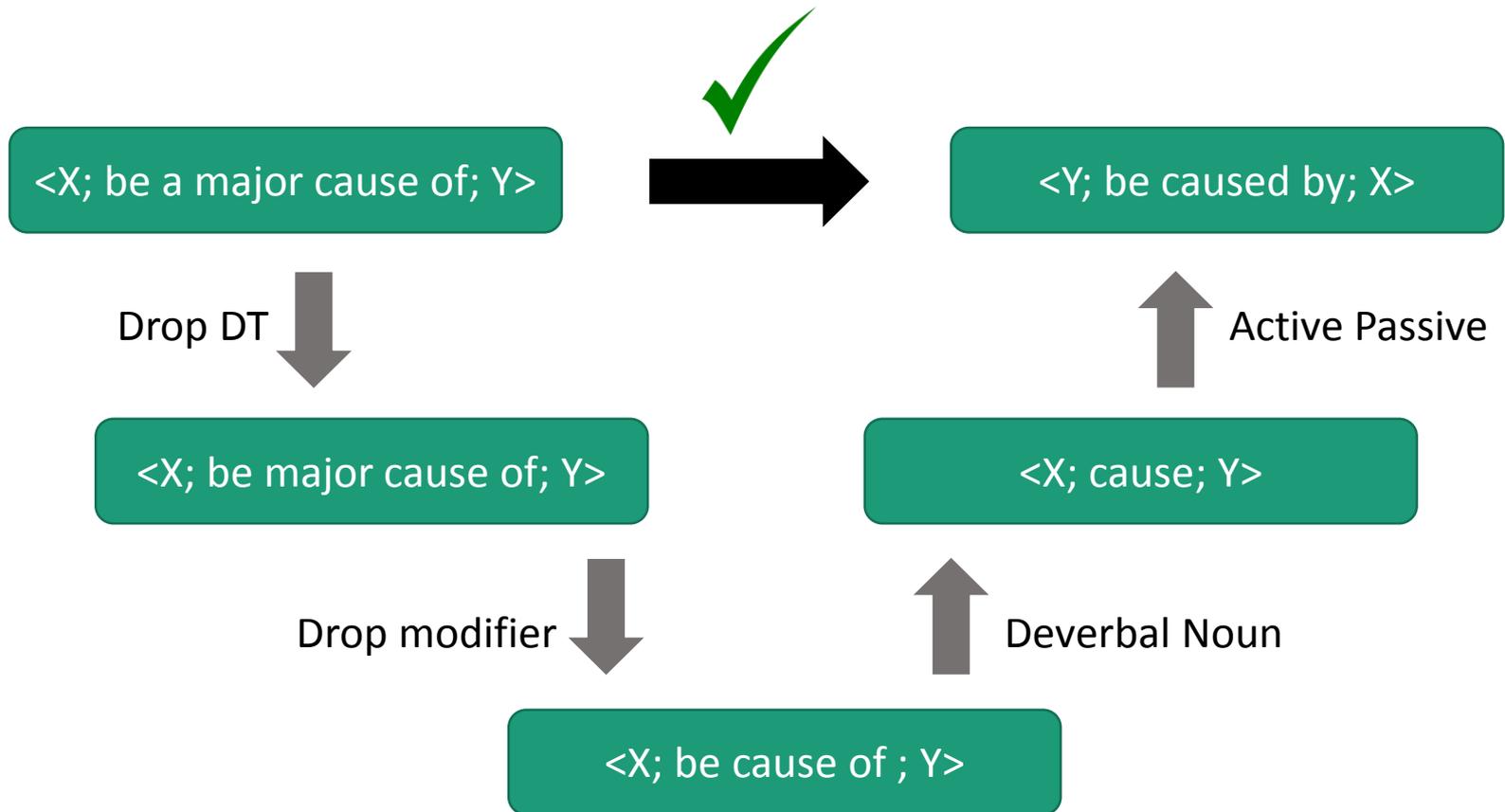
To verify



Verification chain



Verification chain



Experiments



Metric

Precision of rules

Precision of generated facts

Datasets

PPDB _e (Pavlick et al., 2015)	CLEAN (Berant et al., 2012)
Confidence score w/t rule	No Confidence score w/t rule
80% of PPDB _e relation phrases are of length 1 or 2	50% of CLEAN relation phrases are of length ≥ 3

Performance: Inference rules & Inferred facts

System	PPDB _e (0.342)	KGLR(PPDB _e) = VPPDB _e
Size	85,272	85,261
Rule Precision	44.2%	71.4%
Rule Yield	37,690	60,876
Fact Precision	22.2%	51.3%
Fact Yield	41 million	35 million

Performance: Inference rules & Inferred facts

System	CLEAN	KGLR(CLEAN) = VCLEAN
Size	102,565	36,229
Rule Precision	48.9%	82.5%
Rule Yield	50,154	29,889
Fact Precision	49.1%	81.6%
Fact Yield	7 million	4.5 million

(Berant et al., 2012)

Summary

Knowledge-Guided Linguistic Rewrites

Independent rule verification

Compositional

Guided by existing knowledge sources

😊 High precision

☹️ No rule to capture common sense knowledge

Antecedent	Consequent	Y/N?
(X, be a student at, Y)	(X, be enrolled at, Y)	N

Code & Data: <https://github.com/dair-iitd/kglr>

Thank You

<https://github.com/dair-iitd/kglr>



Bloomberg

