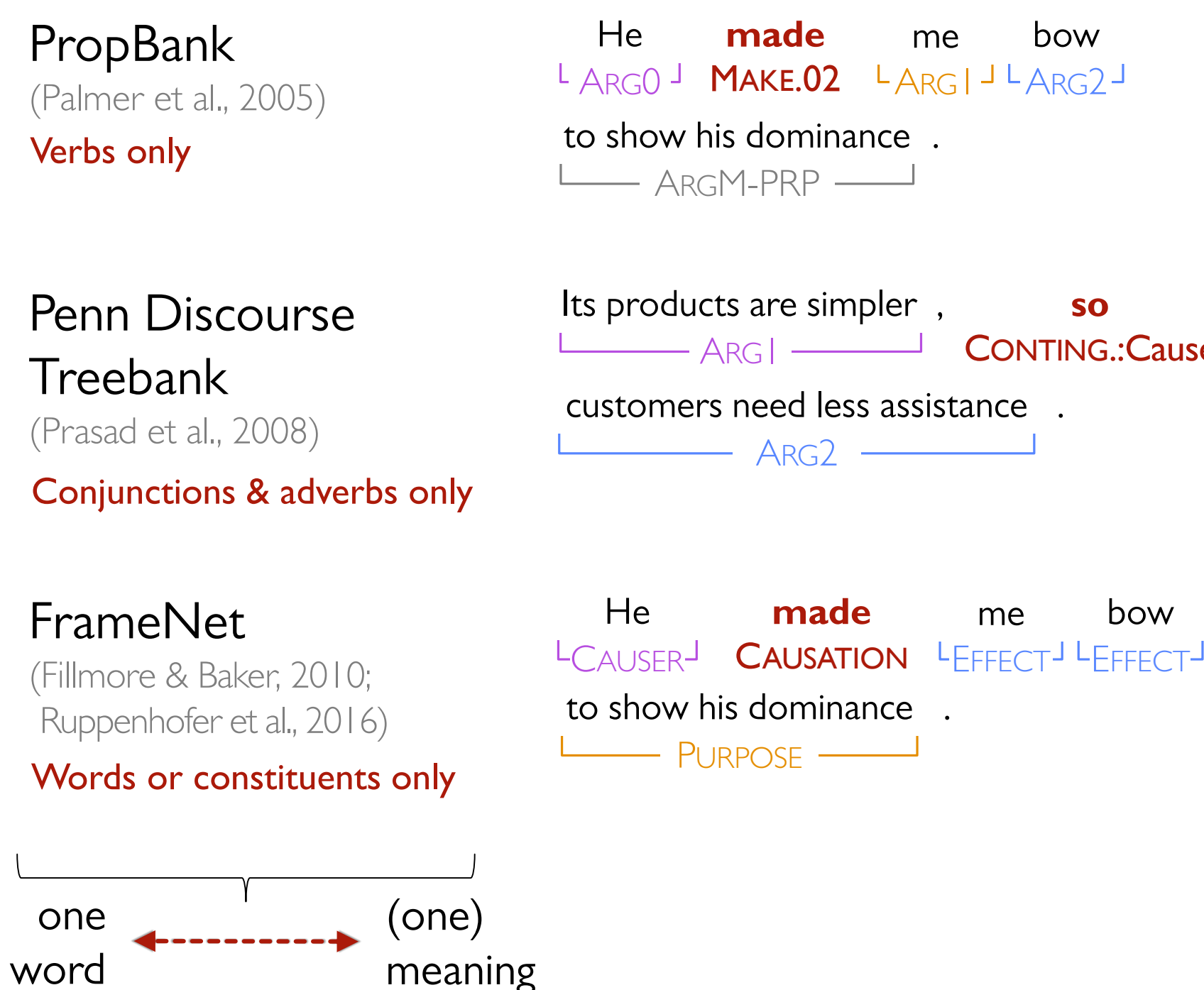


# DeepCx: A neural, transition-based approach for shallow semantic parsing with complex constructional triggers

Jesse Dunietz\*  
Lori Levin  
Jaime Carbonell  
\*jdunietz@cs.cmu.edu

## Motivation

Shallow semantic parsing traditionally focuses on lexical triggers of semantic relations.



Lexical unit triggers do not fully capture relations like **causality, concession, and comparison**, which can be expressed by single words, fixed MWEs, gappy MWEs, or even grammatical patterns.

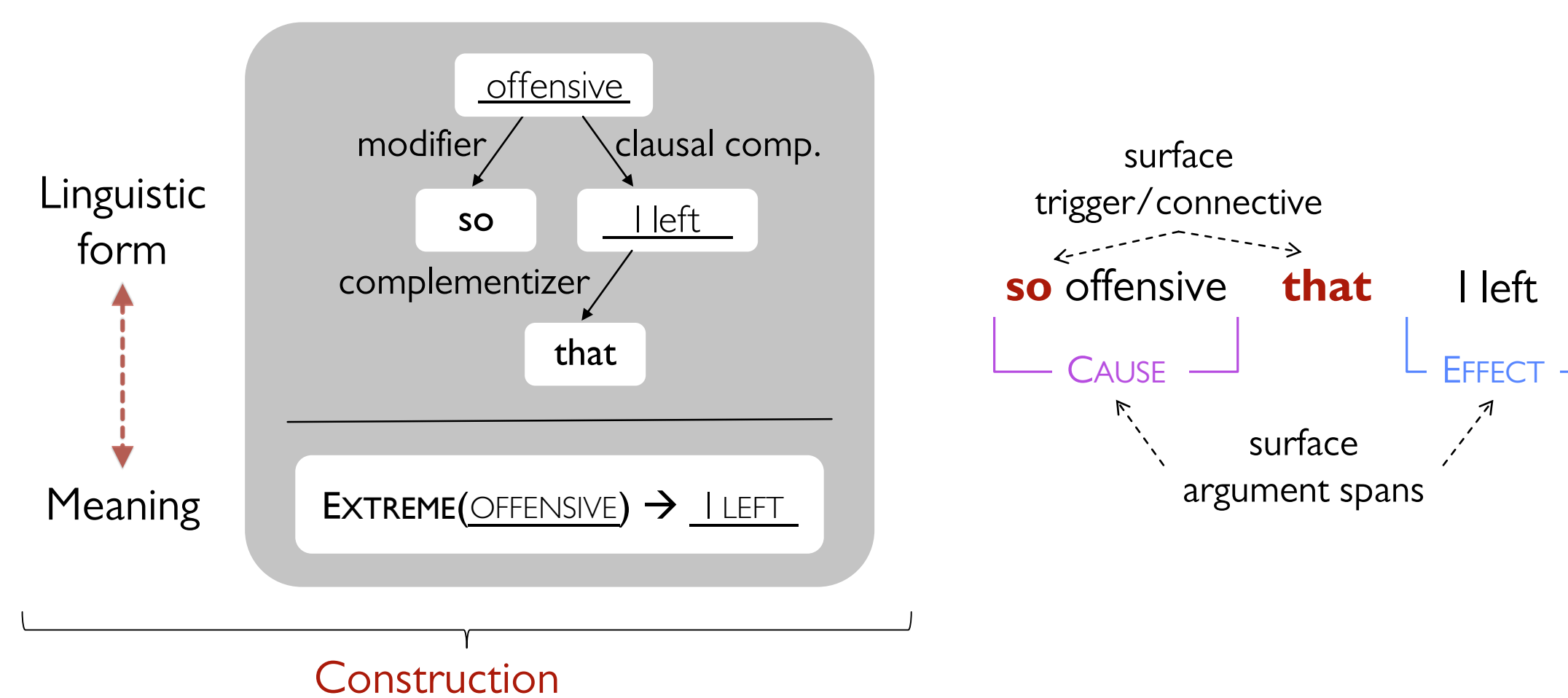
- Causal: We must regulate to **inhibit** unsound practices. **After** a drink, she felt much better. This **opens the way for** broader regulation. Judy's comments were **so** offensive **that** I left.
- Concessive: We headed out **in spite of** the weather. We value any contribution, **no matter** its size. Strange **though** it **may** seem, there's been a run of crazy dreams!
- Comparative: **More** boys wanted to play **than** girls. Andrew is **as** annoying **as** he is useless. I'm **poorer than** I'd like.

Causal language is a valuable domain to explore as a test case for SSP with complex constructions.

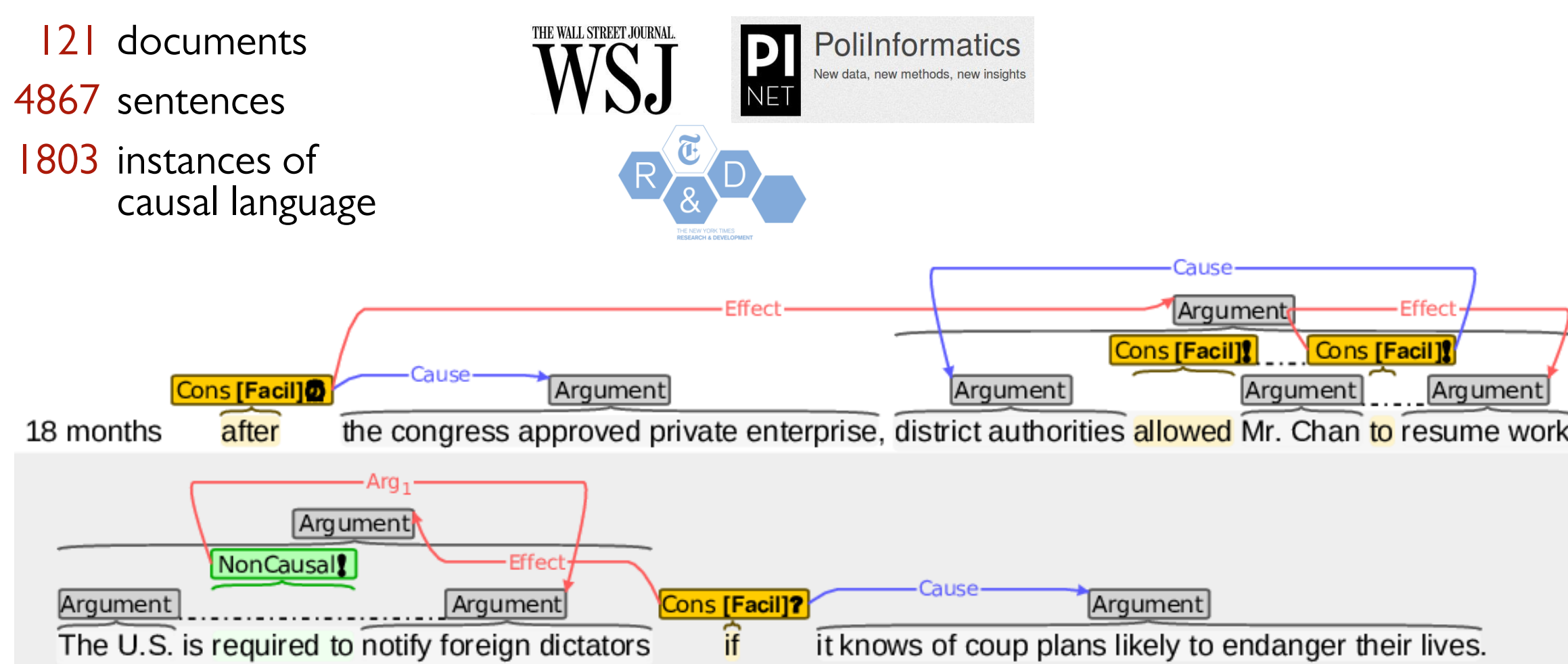
- 33% of explicit relations between French verbs (Conrath et al. 2011)
- 12% of explicit discourse connectives in Penn Discourse Treebank (Prasad et al., 2008)
- >5% of questions asked to question-answering systems, and among the most complex (Verberne et al., 2010)

## Approach

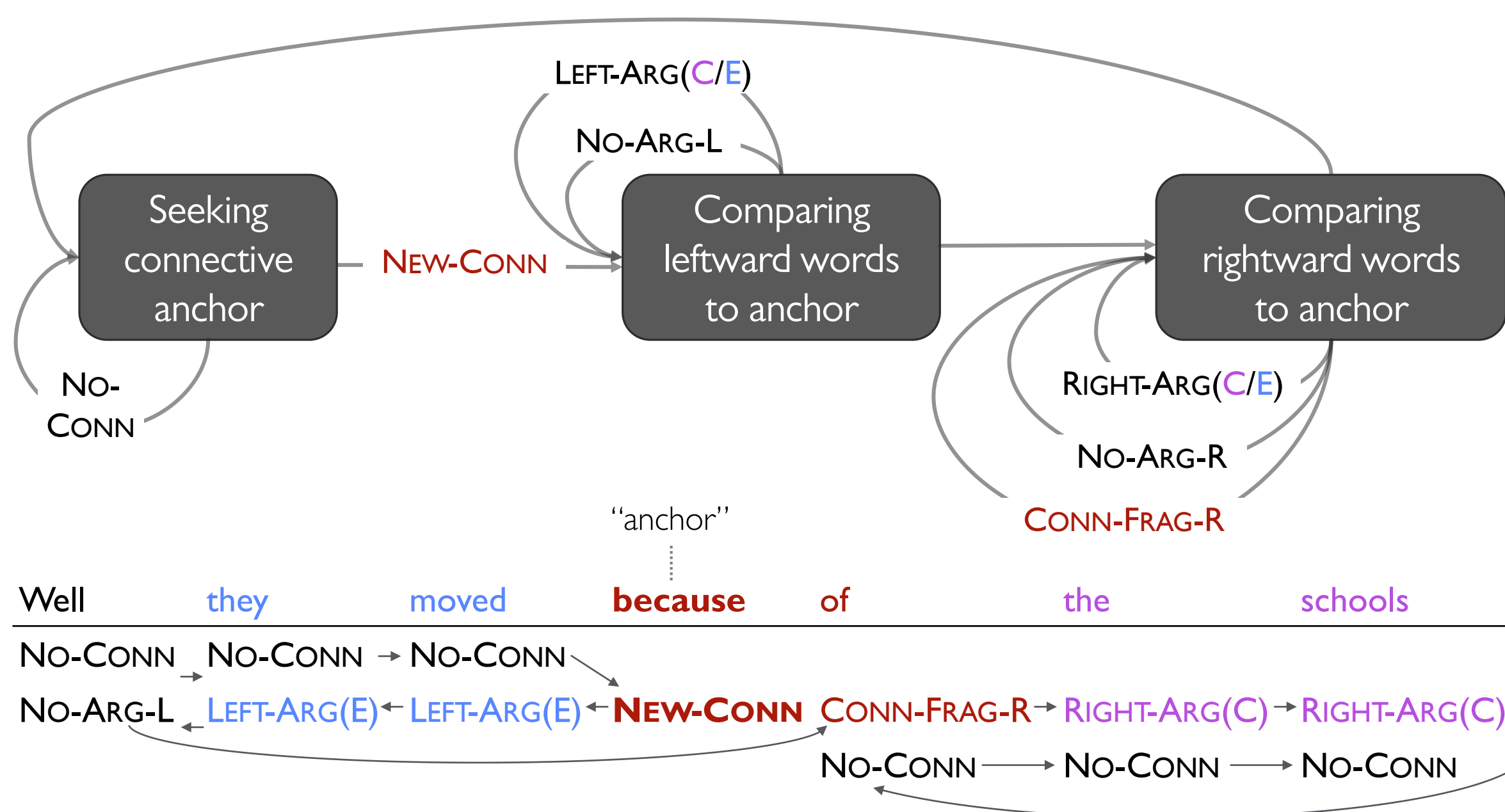
“Surface construction labeling” (SCL) allows tagging complex causal constructions and their arguments.



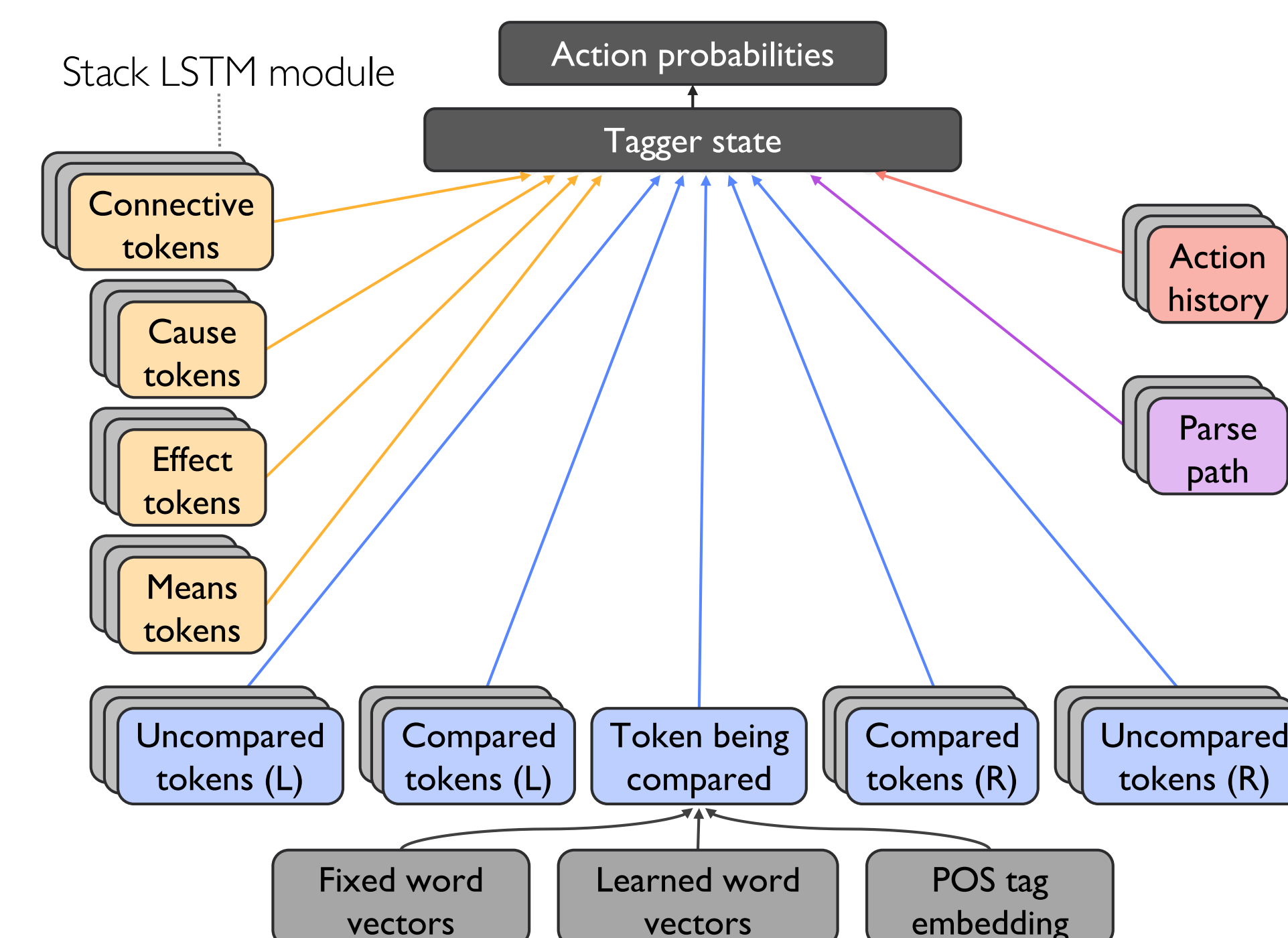
We use the **BECAUSE** dataset of causal language (Dunietz et al. 2016), a diverse corpus annotated for explicit causal relations in an SCL-compatible way.



**DeepCx**, our tagger, uses a **new transition system** that can handle discontinuous and even overlapping trigger, cause, and effect spans, building up instances of causal language as it scans tokens one by one.

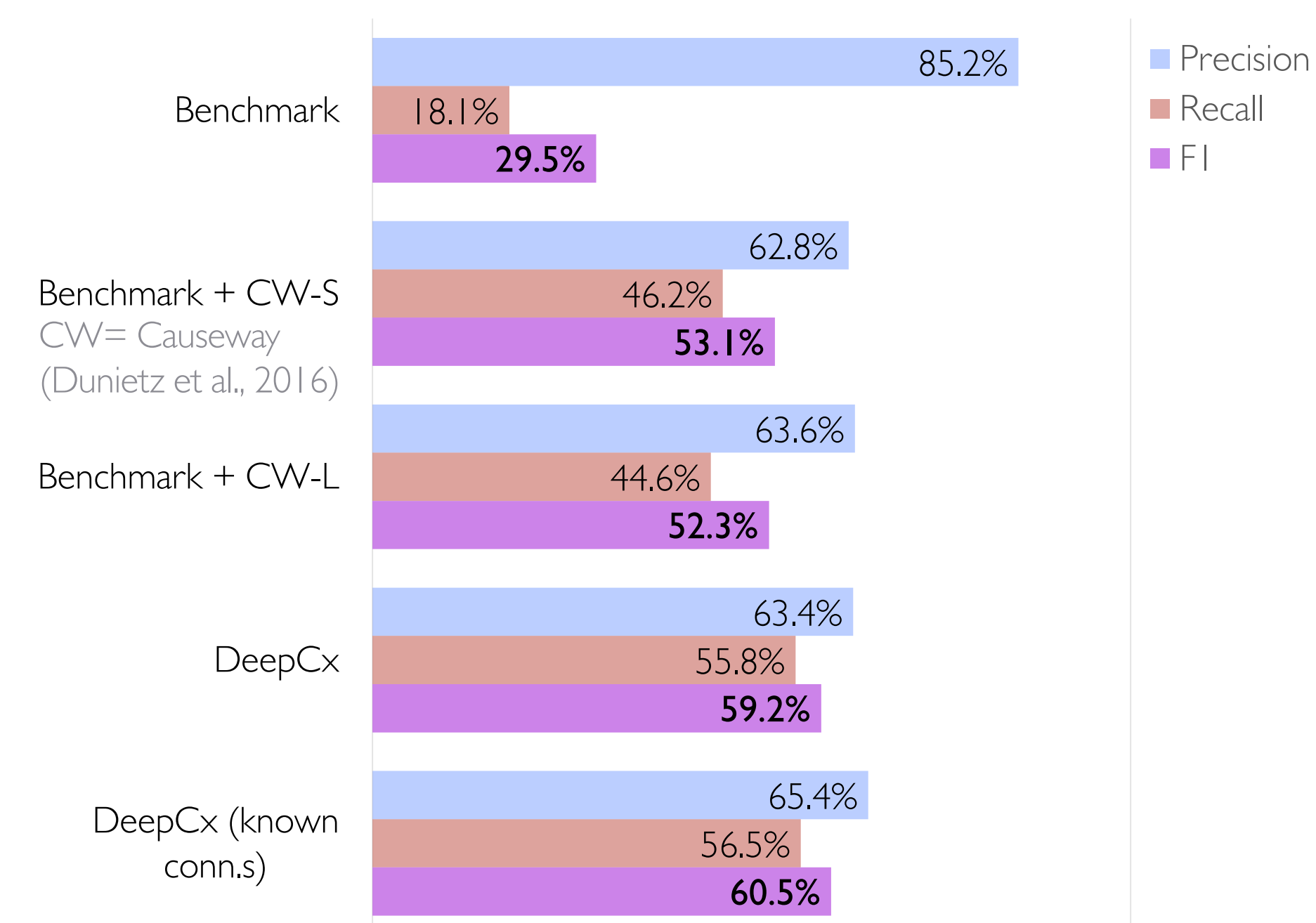


DeepCx is a recurrent neural network that uses stack LSTMs (Dyer et al., 2015) to embed lists.



## Results

Results are promising, and substantially exceed previous work on BECAUSE.



When allowed to propose novel connectives, the network learns compelling generalizations, though also some strange and spurious ones.

Plausible proposed connectives	Less plausible proposals
catalyst for	is insanity
fuel (verb)	eight
	\$