

Have We Solved The Hard Problem? It's Not Easy!

Contextual Lexical Contrast as a Means to Probe Neural Coherence

Wenqiang Lei, Yisong Miao, Runpeng Xie, Bonnie Webber,
Meichun Liu, Tat-Seng Chua and Nancy F. Chen

Introduction

Contextual Lexical Contrast (CLC)

Definition of CLC (a new NLP task):

Two words are understood as contrast in order to understand the coherence of context.

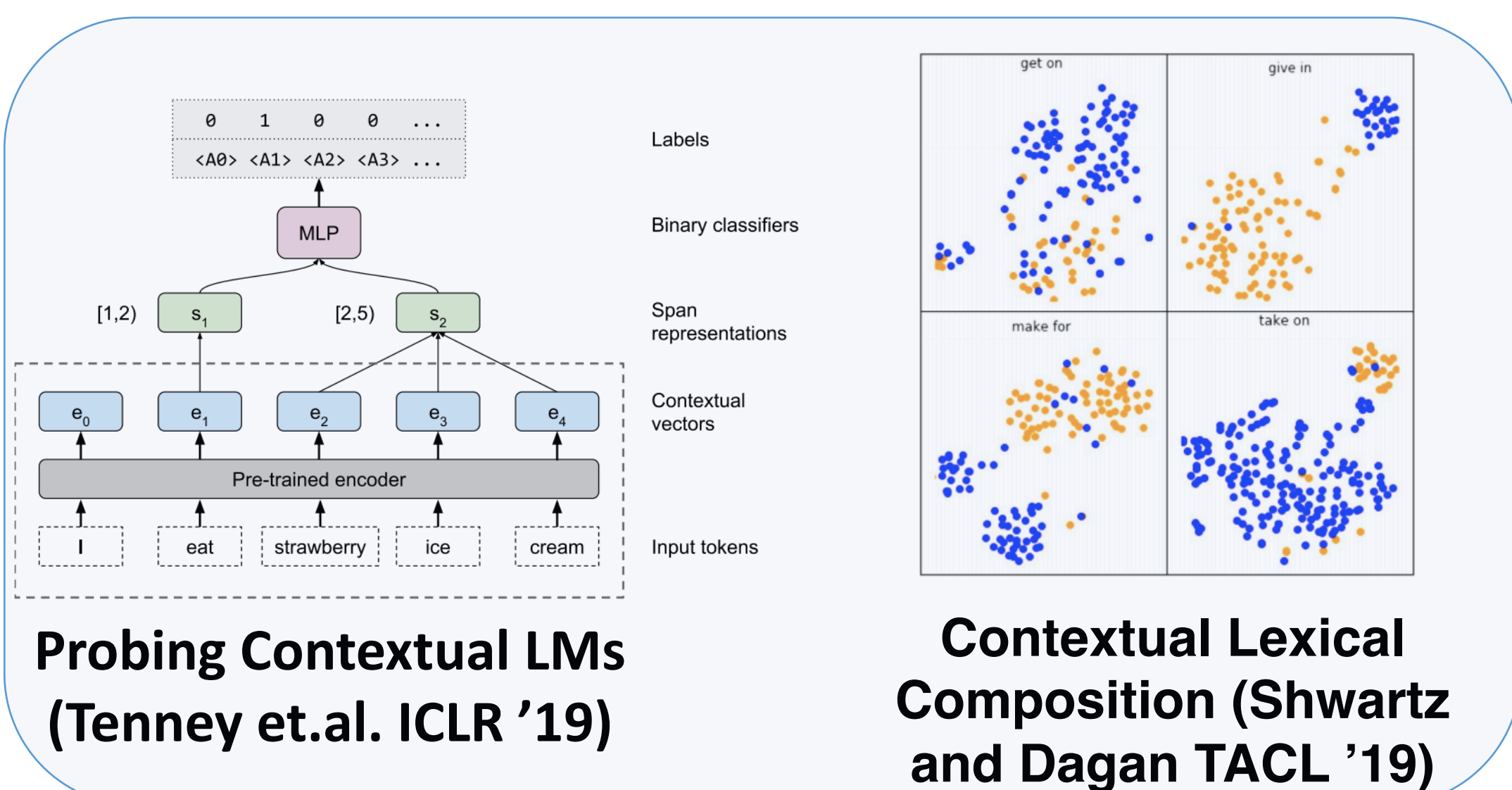
Example 1 (Pos.): A positive attitude helps you relax and ace the exams, and a negative mental status will however make you nervous and sleepless.

Example 2 (Neg.): The reviewers are rather positive about this paper. They are nominating it for the Best Paper for its discovery of a negative finding that dispels conventional wisdom.

Background

- Text Coherence
- Discourse (esp Comparison Relation)
- Humor and Contradiction Detection

Natural Language Processing (NLP)



Deep Learning

Cont²Lex Corpus

- **Problem Formalization:** Given w^+ and w^- in context c (a sequence of words w_1, w_2, \dots, w_n), a human (or a machine) needs to indicate a binary *tag* for CLC.
- **Corpus Statistics:**
 - Total 6,316 instances.
 - Positive ratio: 35.7 (Adj. and Adv. have higher ratio)
 - Inter-Annotator Agreement: 75.3%

Benchmark and Experiments

	BiLSTM	Attention	None
Glove	65.3	64.9	65.3
Word2Vec	65	65.7	64.7
FastText	66.2	65.5	66.3
ELMo	65.6	65.6	65.7
GPT.Lex	65.8	64.8	64.8
GPT	66.8	67.0	66.9
BERT.Lex	66.4	66.2	66.4
BERT	70.0	69.2	69.1
Majority	64.3		

Static embeddings are weaker!

Contextual embeddings are better than their Lex Version!

Table 1: Main Experiment (Acc Score)

Glove	Word2Vec	fastText	ELMo	GPT	BERT
79.7	82.6	84.1	83.5	81.2	79.5

Table 2: Out-of-context Lexical Contrast (Acc Score)

- Possible Confounding Factors:
1. w^+ and w^- in same sentence (S)
 2. w^+ and w^- is surrounded by repetitive words (R)

	S	¬S	R	¬R
Glove	+4.2	-2.0	+7.2	-3.1
BERT.Lex	+3.6	-0.1	+5.0	-0.4
BERT	+10.3	+1.5	+14.9	+0.3
Majority	57.1	69.9	53.7	70.4

Table 3: Fine-grained Acc Scores

Conclusion

- CLC is a challenging semantic representation task.
- Contextual embeddings perform better, but their advantages are largely due to capturing surface patterns.