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Benchmarking Knowledge-Enhanced Commonsense Question Answering via Knowledge-to-Text Transformation

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1. Introduction

Commonsense Question Answering (**CQA**): Answering questions whose answers rely on commonsense knowledge.

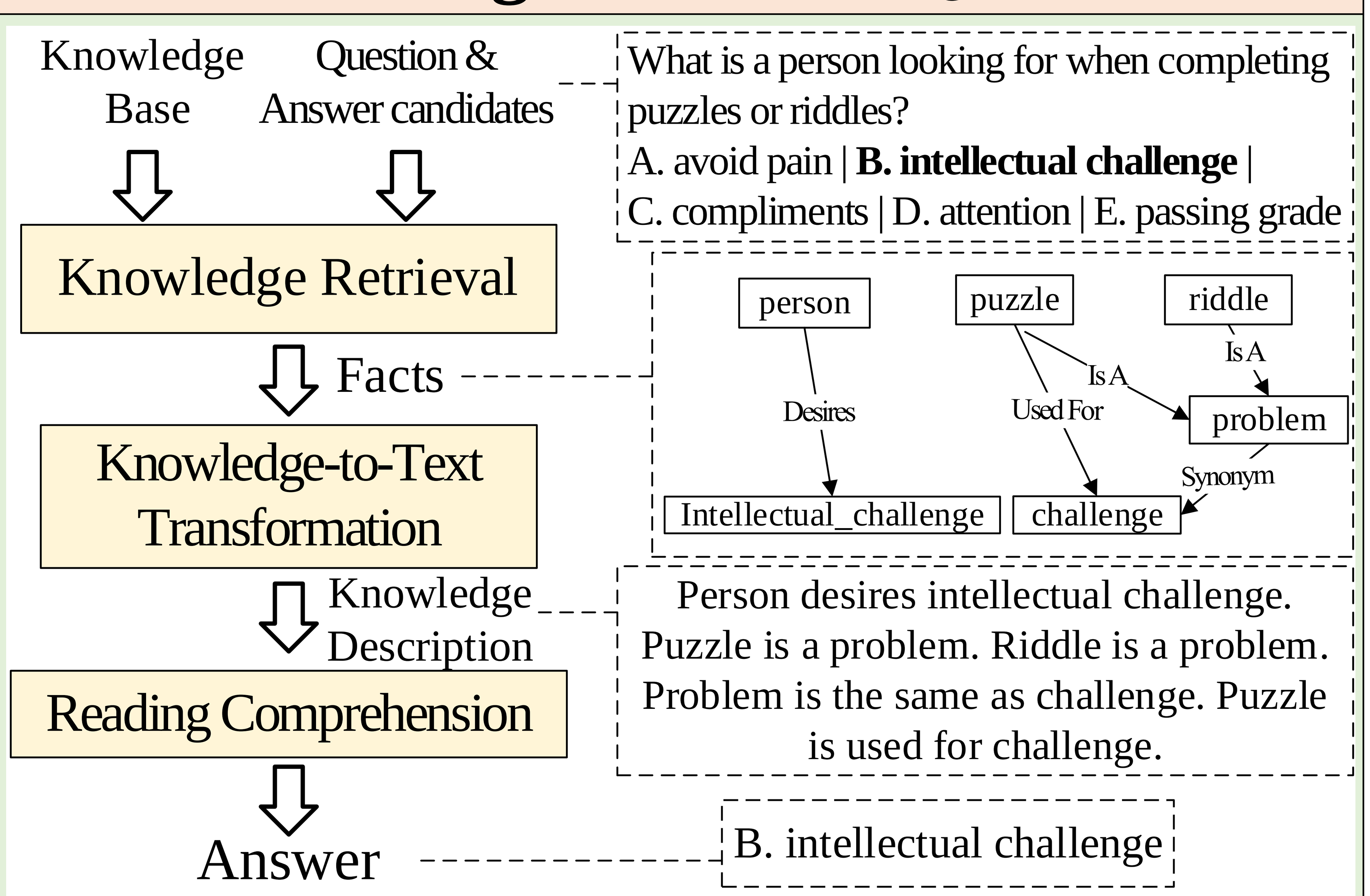
Try to Answer Three Important Questions:

Q1: How far can we get by exploiting external knowledge for CQA?

Q2: How much potential of knowledge has been exploited in current CQA models?

Q3: Which are the most promising directions for future CQA?

2. Knowledge-to-Text CQA Model



Answer to Q1: By incorporating golden external knowledge, CQA can be significantly improved and can achieve close-to-human performance.

Model	Knowledge Source	BERT	XLNet	RoBERTa	ALBERT
Human	--	88.9	88.9	88.9	88.9
Golden Knowledge	Human Explanations	81.1	85.1	84.7	83.7
Knowledge-to-Text					
Template-based	ConceptNet	67.9	77.5	78.1	81.1
Paraphrasing-based	ConceptNet	67.2	74.9	77.8	79.3
Retrieval-based	ConceptNet	65.0	75.0	77.1	79.4
Full	ConceptNet	**70.4**	**80.3**	**80.8**	**83.3**
Best Knowledge-enhanced System with Different PLMs	ConceptNet	69.0 (Ma et al. 2019)	79.3 (Lv et al. 2019)	80.8 (KEDGN)	(No available model so far)
Base Model	No knowledge	63.6	68.9	76.2	78.6

← Accuracies on CommonsenseQA

Knowledge-to-text transformation is effective and robust for knowledge-enhanced CQA.

3. Benchmarking Experiments

Answer to Q2: The potential of knowledge is still far from being fully exploited by current knowledge-enhanced CQA methods:

1) Current knowledge-enhanced CQA methods only exploit knowledge to a limited extent.

2) Despite the effectiveness of our method, there is still great potential in generating accurate question-relevant knowledge descriptions.

3) The commonsense knowledge embedded in current pretrained language models is still not enough for CQA.

Models	WSC	HellaSWAG	SOCIAL IQa
BERT	66.0	42.3	66.2
+Knowledge	**68.1**	**44.2**	**68.8**
RoBERTa	81.4	82.5	74.3
+Knowledge	**82.5**	**83.0**	**75.0**
ALBERT	84.9	86.1	77.2
+Knowledge	**87.0**	**86.9**	**77.8**
Human	92.1	94.5	86.9

← Accuracies on other CQA datasets

4. Conclusions (Answer to Q3)

(1) Context-sensitive knowledge selection is critical for knowledge-enhanced CQA.

(2) The knowledge-text heterogeneity is a critical bottleneck for exploiting the information from both knowledge and text.

(3) It is valuable to incorporate more commonsense in pretrained language models.

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