

融合知识的预训练语言模型

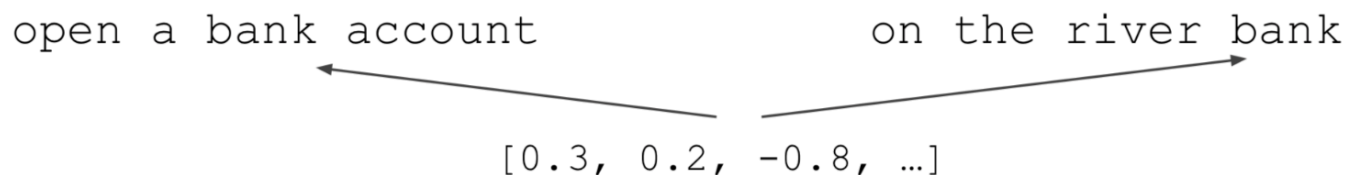
By im0qianqian

Outline

- PLMs
- PLMs with Knowledge
 - Motivation
 - Challenges
 - ENRIE (THU)、KEPLER、KnowBERT、WKLM、K-Adapter
- Conclusion
- SemEval 2020 Task 4
- SemEval 2021 Task 4 / 9

Feature-based PLMs

- ELMO
 - 早期的 Word2Vec、Glove 被广泛用于各类 NLP 任务
 - 但是信息单一，词汇在不同语境下的复杂语义难以体现



- 核心思路：用大规模语料训练双向语言模型，得到能根据上下文语境变换而改变的词向量

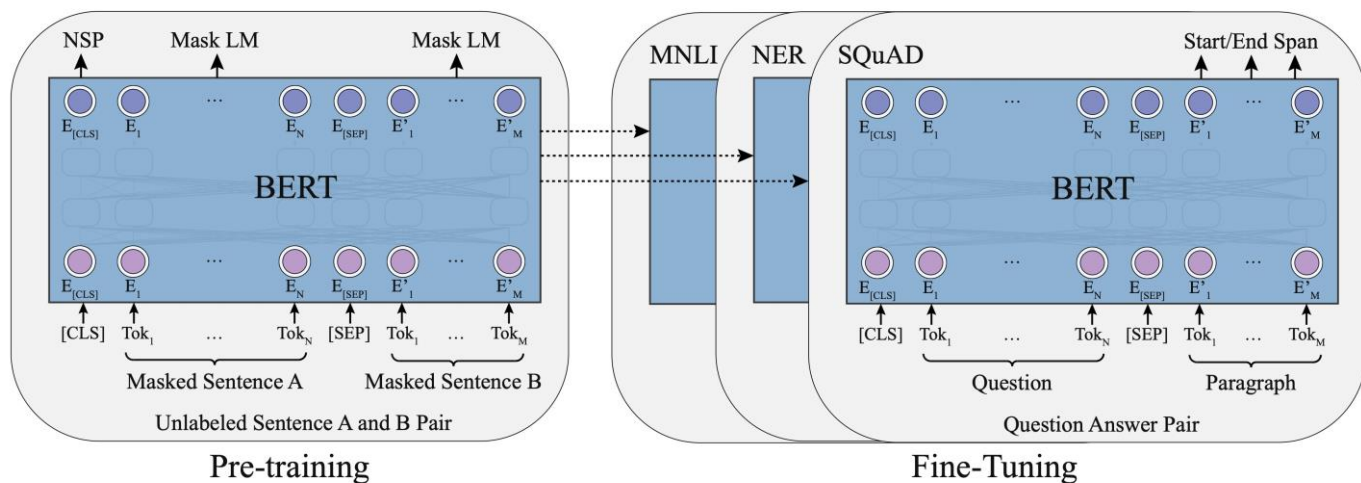
Fine-tuning-based PLMs

- BERT
 - 采用了 Transformer 来对文本进行编码
 - 提出 Masked Language Model 进行预训练
 - 在多数常见 NLP 任务上效果显著

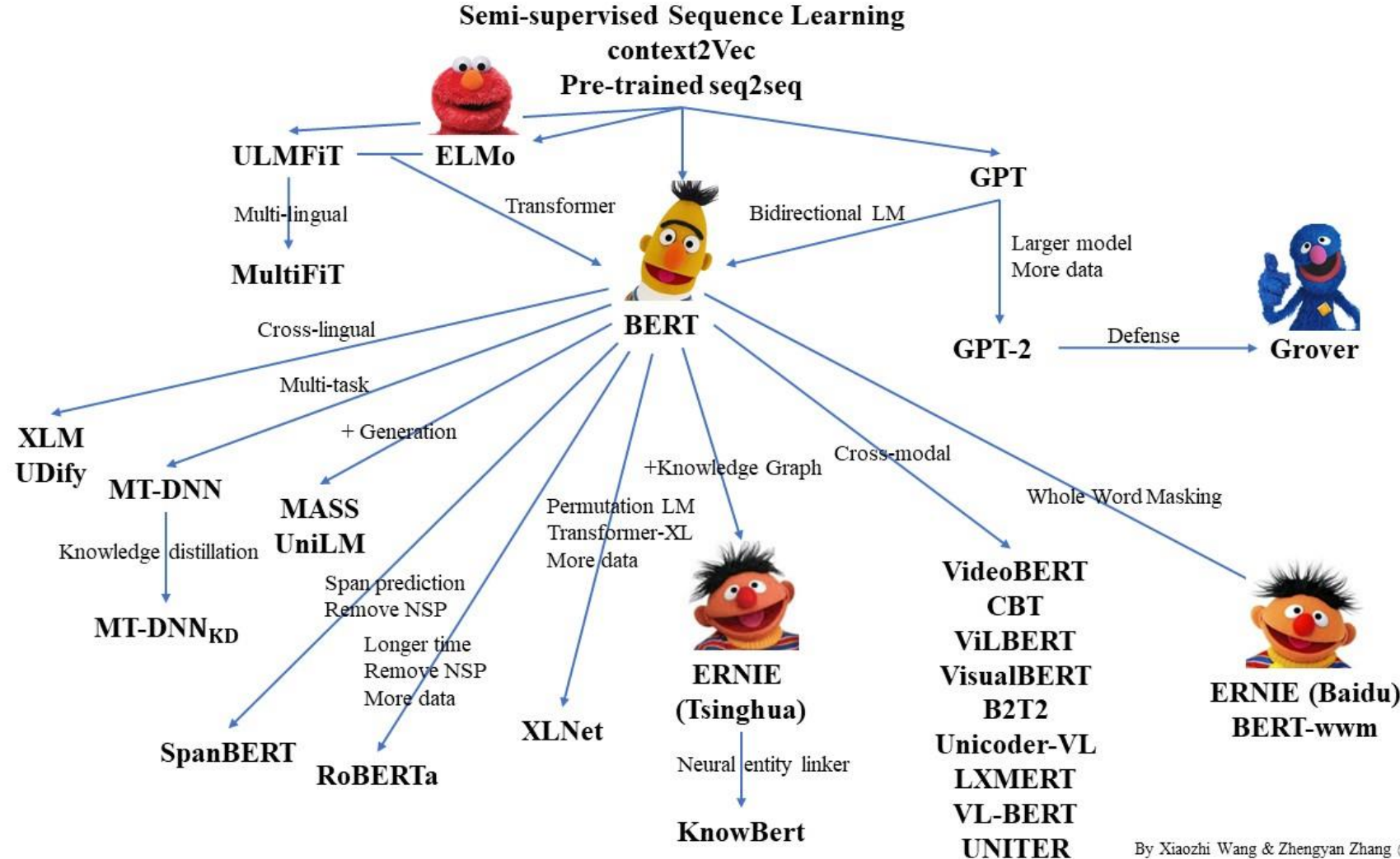
the man went to the [MASK] to buy a [MASK] of milk

store gallon

↑ ↑



Pre-trained Language Models (PLMs)



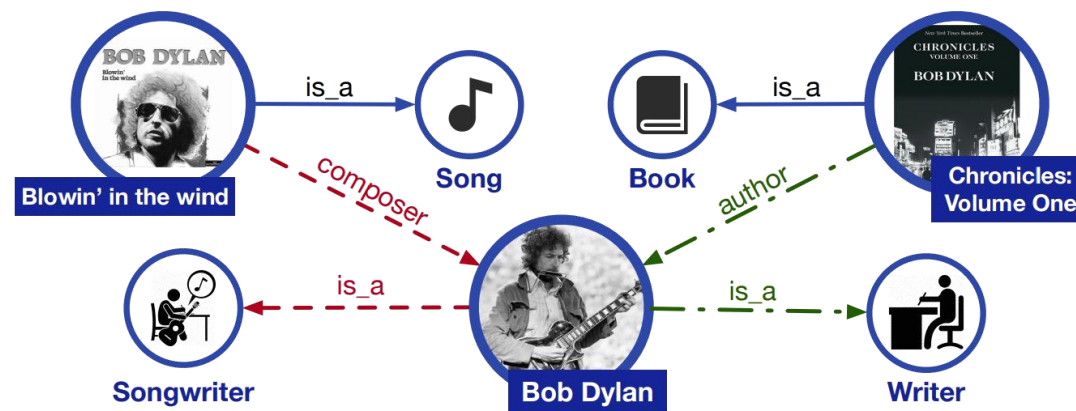
By Xiaozhi Wang & Zhengyan Zhang @THUNLP

PLMs with Knowledge

- ERNIE (THU)
- KEPLER
- KnowBERT
- WKLM
- K-Adapter

PLMs with Knowledge (Motivation)

- 现有预训练语言模型难以捕获**低频实体**信息
 - ELMo: Character CNN
 - BERT: sub-word
- 外部知识可以增强 PLMs
- 有助于一些**知识驱动**的下游任务
 - 关系分类 (Relation Classification)
 - 实体分类 (Entity Typing)

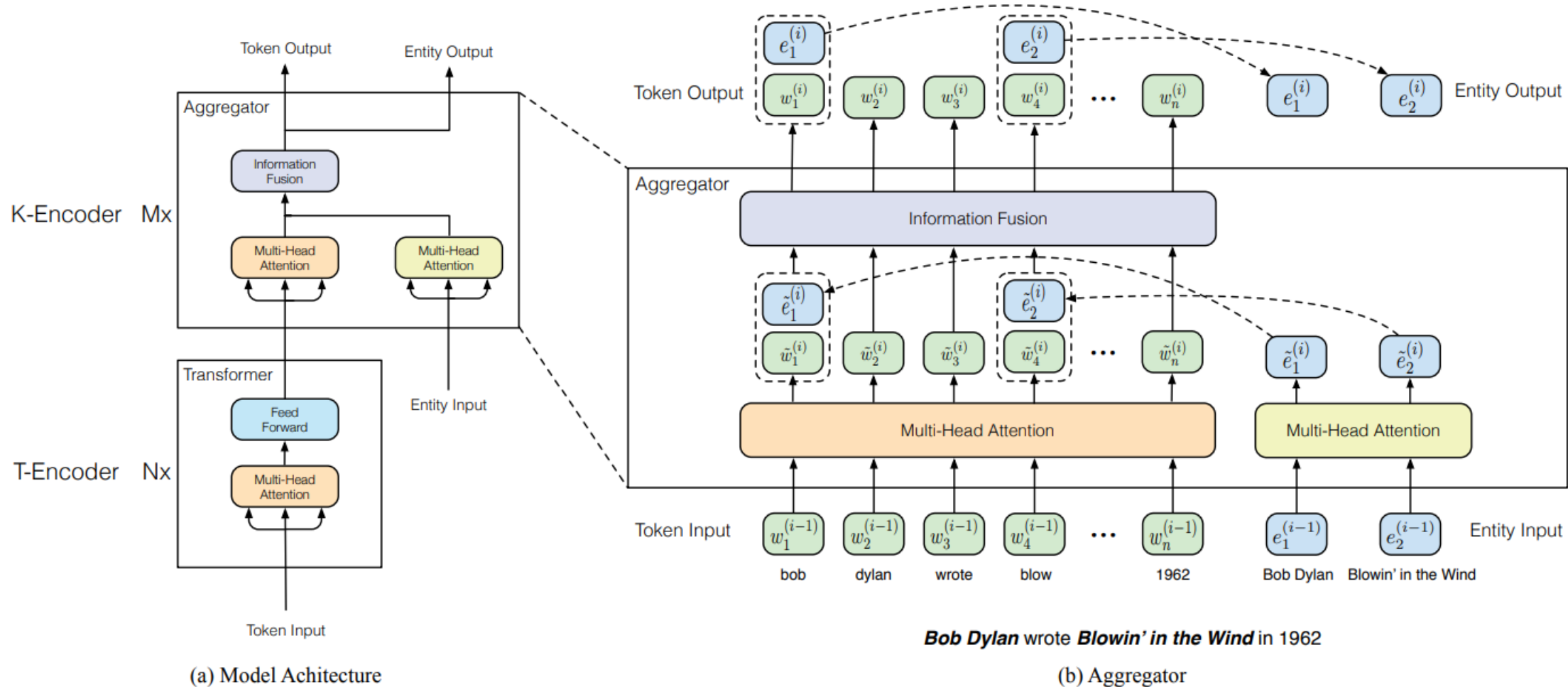


Bob Dylan wrote *Blowin' in the Wind* in 1962, and wrote *Chronicles: Volume One* in 2004.

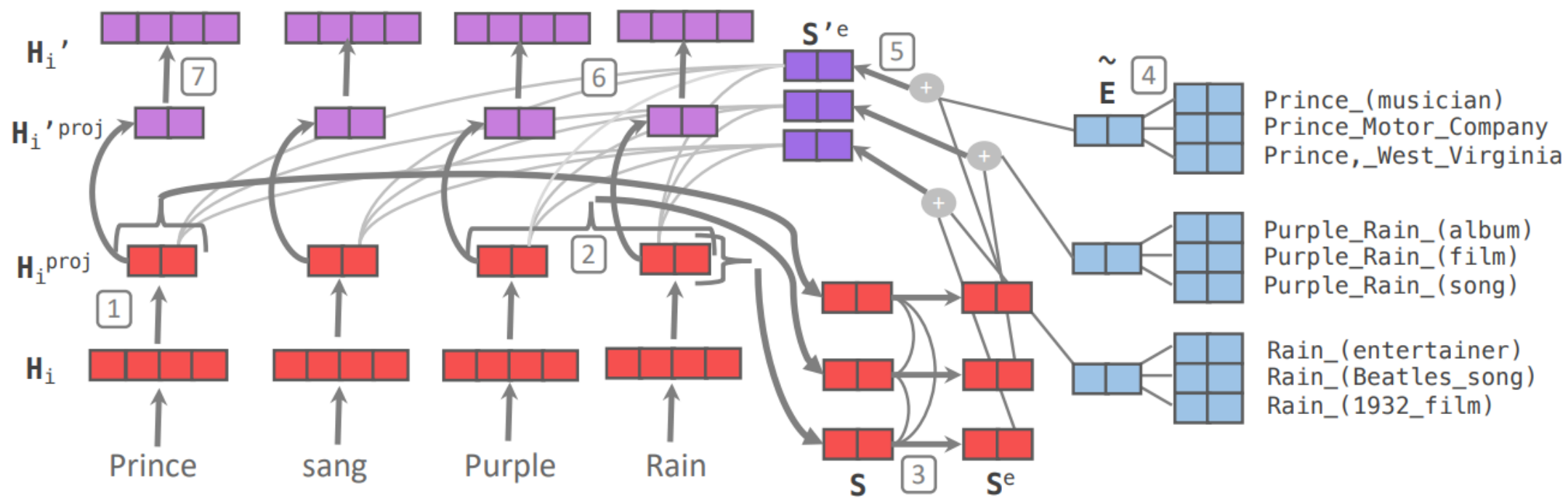
PLMs with Knowledge (Challenges)

- **结构化知识表示 (Structured Knowledge Encoding)**
 - 根据文本从知识图谱中检索相关知识
 - 将结构化信息表示为低维向量
- **异质信息融合 (Heterogeneous Information Fusion)**
 - 自然语言：词法、句法、语义
 - 知识图谱：实体、关系

ERNIR (THU)



KnowBERT

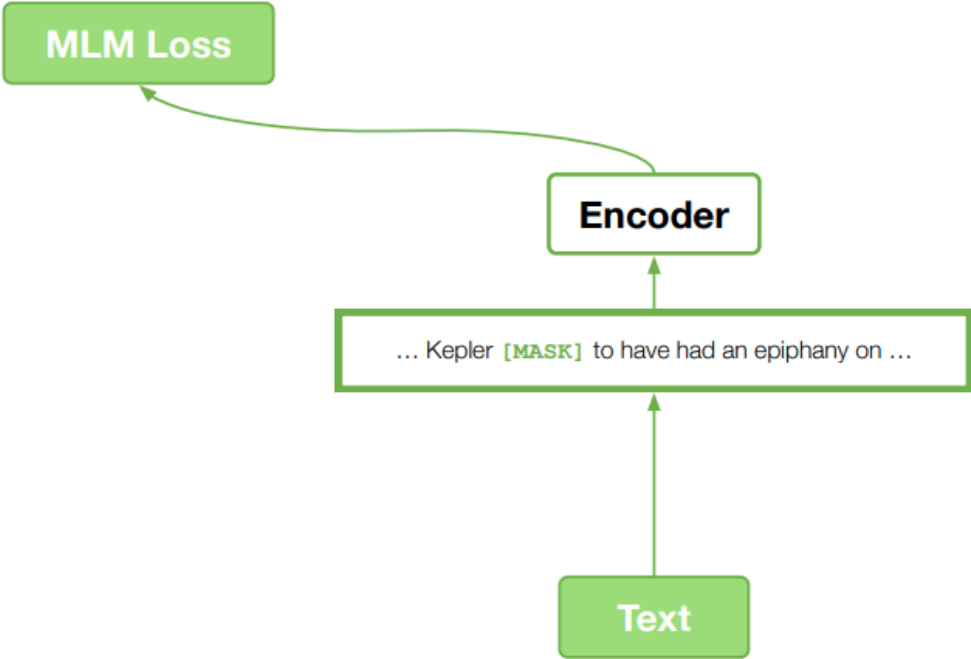


A Different Direction

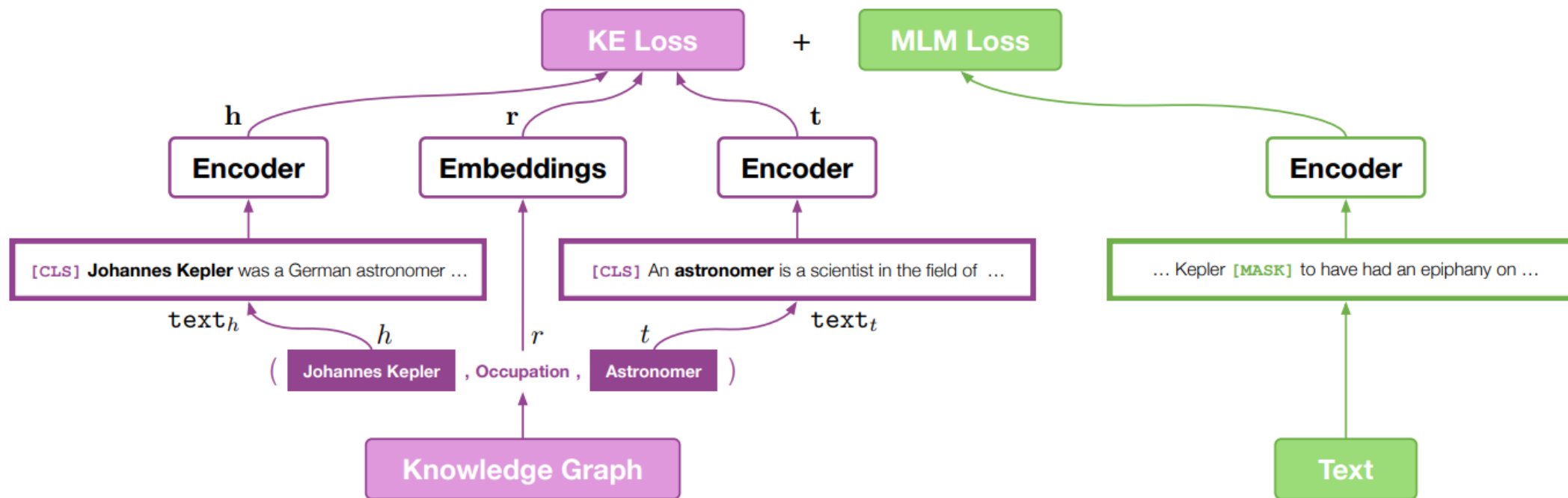
- 使用训练好的图谱表示作为输入存在问题
 - 图谱表示空间难以和语言表示空间融合
 - 需要实体链接工具，带来额外开销以及可能链接错误

KEPLER

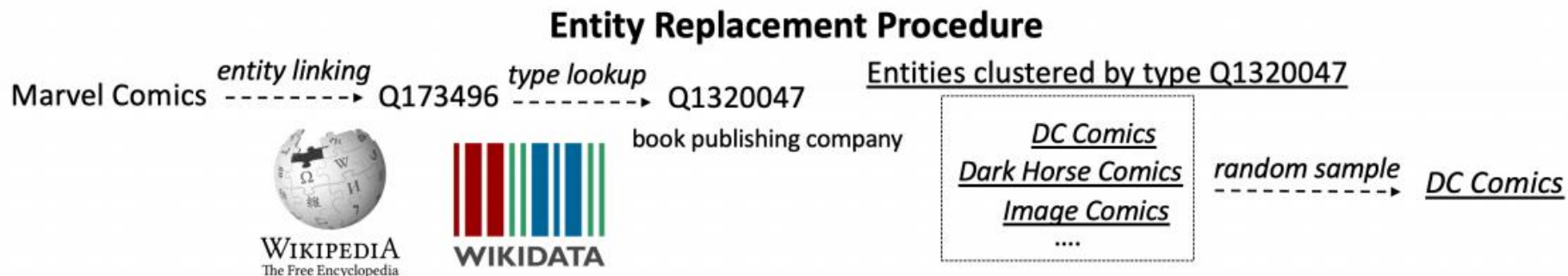
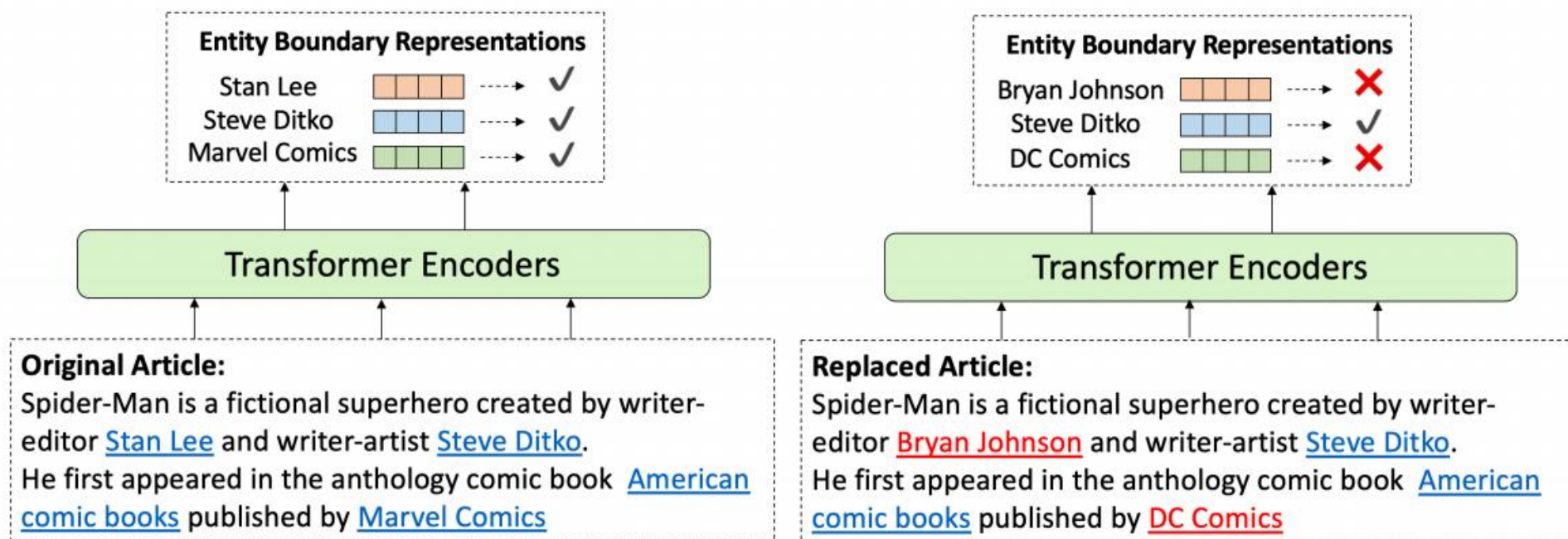
普通的 PLMs



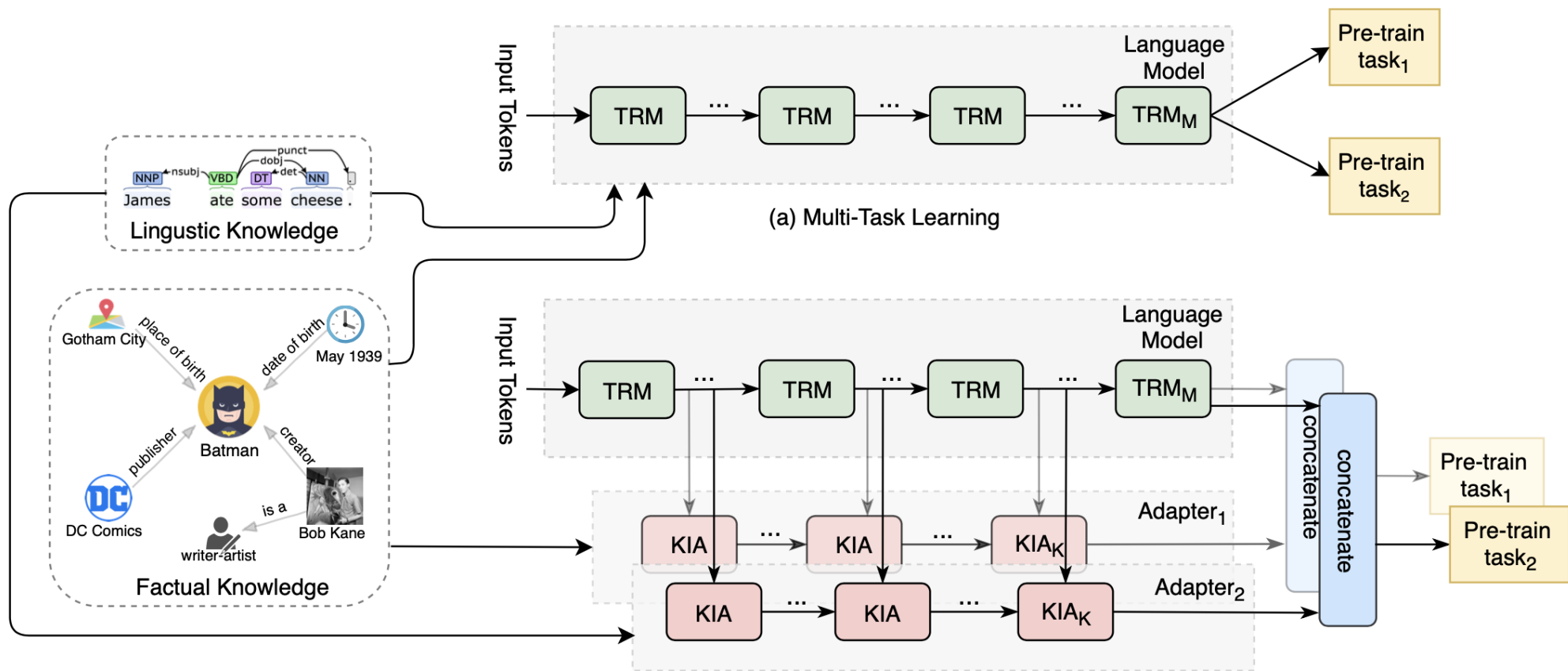
KEPLER



WKLM (Pretrained Encyclopedia)



K-Adapter



以往的任务：

- 无法 continual learning
- 不同类型知识注入之间是耦合的

Conclusion

- 将图谱表示向量作为特征输入 (ERNIE、KnowBERT)
- 设计新的预训练任务 (KEPLER、WKLM)
- 增加额外的模块 (K-Adapter)

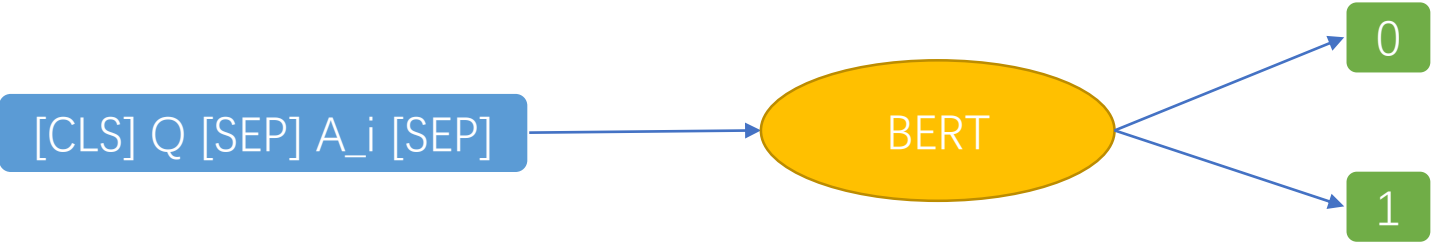
SemEval 2020 Task 4 Description

Task	Examples
Subtask A	Which statement of the two is against commonsense? S1: he put an elephant into the fridge. × S2: he put a turkey into the fridge. ○
Subtask B	Why is “he put an elephant into the fridge” against commonsense? A. an elephant is much bigger than a fridge. ✓ B. elephants are usually gray while fridges are usually white. × C. an elephant cannot eat a fridge. ×

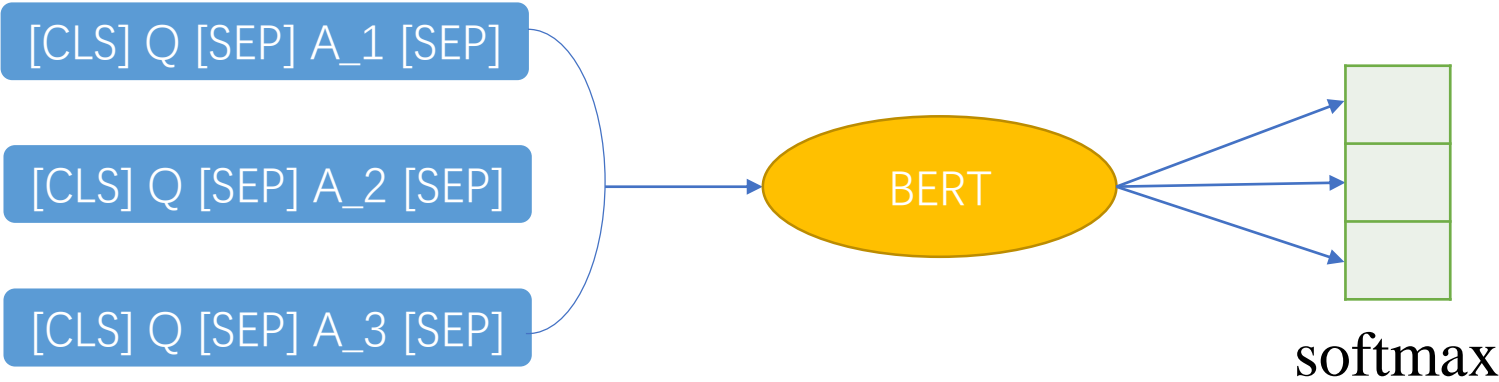
Subtask C, 生成 Subtask B 的正确选项.....

Network Infrastructure

Solo:



Pair:



Experiments

Model	Task A	Task B
Random	50.0%	33.3%
ELMO	69.4%	33.4%
BERT	70.4%	45.6%
Fine-tuned ELMO	74.1%	34.6%
GPT-2 small	76.3%	45.7%
GPT-2 large	81.17%	47.2%
XLNet	55.8%	35.6%
Human	99.1%	97.8%

Subtask B	Solo	pair
BERT	83.73%	87.43%
GPT-2		85.77%
RoBERTa		88.3%

finetuned

SemEval 2021 Task 4 ReCAM

Subtask 1: Imperceptibility

Passage	... observers have even named it after him, “Abenomics”. It is based on three key pillars – the ”three arrows” of monetary policy, fiscal stimulus and structural reforms in order to ensure long-term sustainable growth in the world’s third-largest economy. In this weekend’s upper house elections,
Question	Abenomics: The <i>@placeholder</i> and the risks
Answer	(A) chances (B) prospective (C) security (D) objectives (E) threats

Subtask 2: Nonspecificity

Passage	..There are sample tables outside of the entrance sometimes. I walk over and I pump a little too much lotion in my hands. No big deal. I rub it on my hands, my arms, my neck. I had to pull up my pant legs and try to distribute it. I kind of go into this....
Question	Lathering conditioner all over my <i>@placeholder</i> in public.
Answer	(A) audience (B) body (C) food (D) hair (E) head

SemEval 2021 Task 9 SEM-TAB-FACT

Statement	Label
The polarity score of the opinion word that follows the downtoner “quite” is multiplied by the factor (0.75)	Supported
“New version Always crashes” is an example for “Quite”	Refuted
The “Extremely” term has the highest factor.	Supported
The polarity score of the opinion word that follows the intensifier “very” is multiplied by the factor (1.25)	Unknown

Term	Type	Factor	Example
Extremely	Intensifier	2.0	Made me settle very quickly. <u>Extremely</u> reliable application
			<u>Extremely</u> slow loading and shows database connection error.
Absolutely	Intensifier	1.75	<u>Absolutely</u> useless app. The app is useless, never works properly.
			An <u>absolutely</u> useful and friendly application!
Quite	Downtoner	0.75	<u>Quite</u> useful app for Dubai residents.
			It's <u>quite</u> frustrating as I am unable to use the app
			Great interface. The app is <u>quite</u> slow but has good functionalities.
Pretty	Downtoner	0.50	<u>Pretty</u> good but some bugs
			Poorly designed app. <u>Pretty</u> much useless and probably just a media stunt.
Always	Intensifier	1.5	App doesn't work. It <u>always</u> shows error in login.
			New version <u>Always</u> crashes.

Table 1: Sample statements and Labels for Subtask A with table in Figure 3

Figure 3: A sample table that shows the correct results for subtask B for the bolded statement in Table 1. **green** = relevant, **red** = irrelevant, **purple** = ambiguous.

THANKS