Nominal Metaphor Generation with Multitask Learning

Make it creative!

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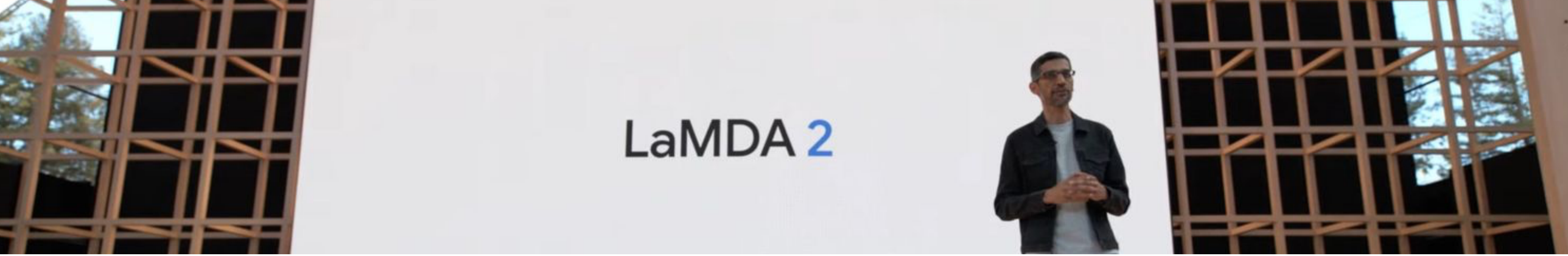
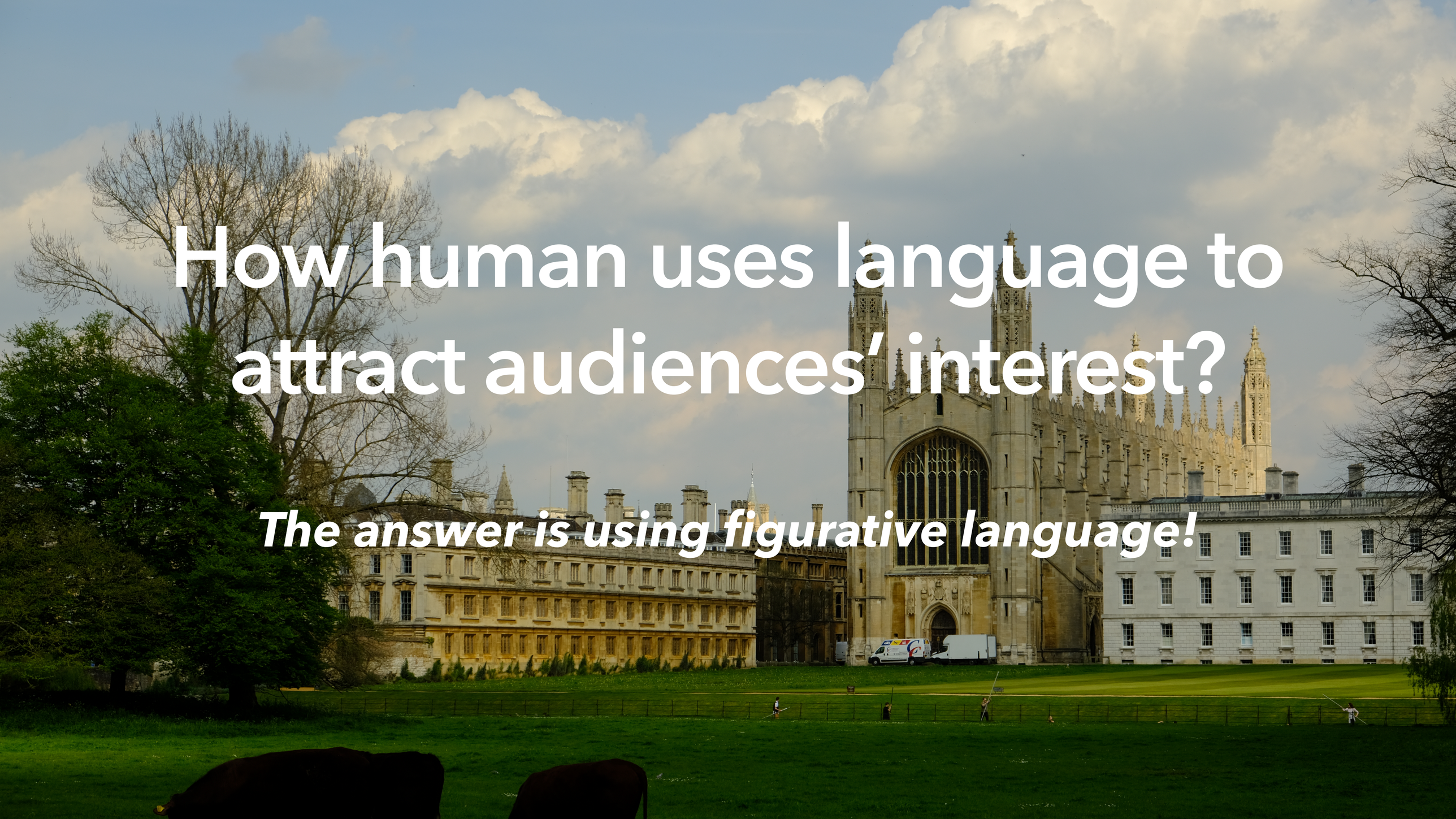
https://github.com/liyucheng09/Metaphor_Generator



Google: our chatbot is amazing!
Reality: users lose interest quickly![1]

Why people get bored of machine-generated language immediately?



How human uses language to attract audiences' interest?

The answer is using figurative language!

Metaphor we live by

- A key to attractive and engaged text generation

- Human uses metaphor a lot!
  - About 10-20% discourse are related to metaphors [2].
- Metaphors are used to make expression lucid, vivid, and attractive.
- Metaphor conveys stronger feeling and emotion [3].
- Sometime metaphor is the only way/most natural way to say something.
  - Like a classic example: “Atom is like the solar system.”

Nominal Metaphor

- One of the most dominant figurative language

- Nominal metaphors (NMs) are "A is like B", "A …, as B"-kind of metaphor.
  - Such as "She is sweet as candy", "Atom is like the solar system"
- Nominal metaphor is promising in NLG tasks:
  - [4,5] show users prefer machine-generated stories and poems after NM added.
  - [6] show users tend to have longer conversation with chatbot enabled with NM generation.
- NMs are especially crucial in Chinese. Since Chinese tends to express abstract concept via NM as Chinese has less vocabularies for abstract meaning [7].

NM components

- How NM is consisted

- She is sweet as candy.
  - She: Tenor🫐 is the subject.
  - As: Comparator🥭, can also be like.
  - Candy: Vehicle🍧 is the object.
  - ..is sweet..: Context🍅 is some information that explains the comparison between Tenor🫐 and Vehicle🍧 . Or we can say it is the context who makes sense of the metaphor.

NM components

- How NM is consisted

- She is sweet as candy.
  - She: Tenor🫐 is 本体.
  - As: Comparator🥭 is 比喻词.
  - Candy: Vehicle🍧 is 喻体.
  - ..is sweet..: Context🍅 is 语境.
- Context🍅 is crucial! imagine the sentence “life is like a journey”, without a context, we do not know what’s the purpose of the comparison.
  like can like a journey in plenty of ways.

NM Generation

- The Challenges

- Novelty: We want novel comparisons, not metaphors copying from the training set.
- Metaphoricity: We want the generated text metaphorical, not literal sentences seem like metaphor.
- Consistency: We want sound metaphor, not non-sense generation. This mainly requires the Context🍅 give a reasonable explanation.

Our approach: MetaGen

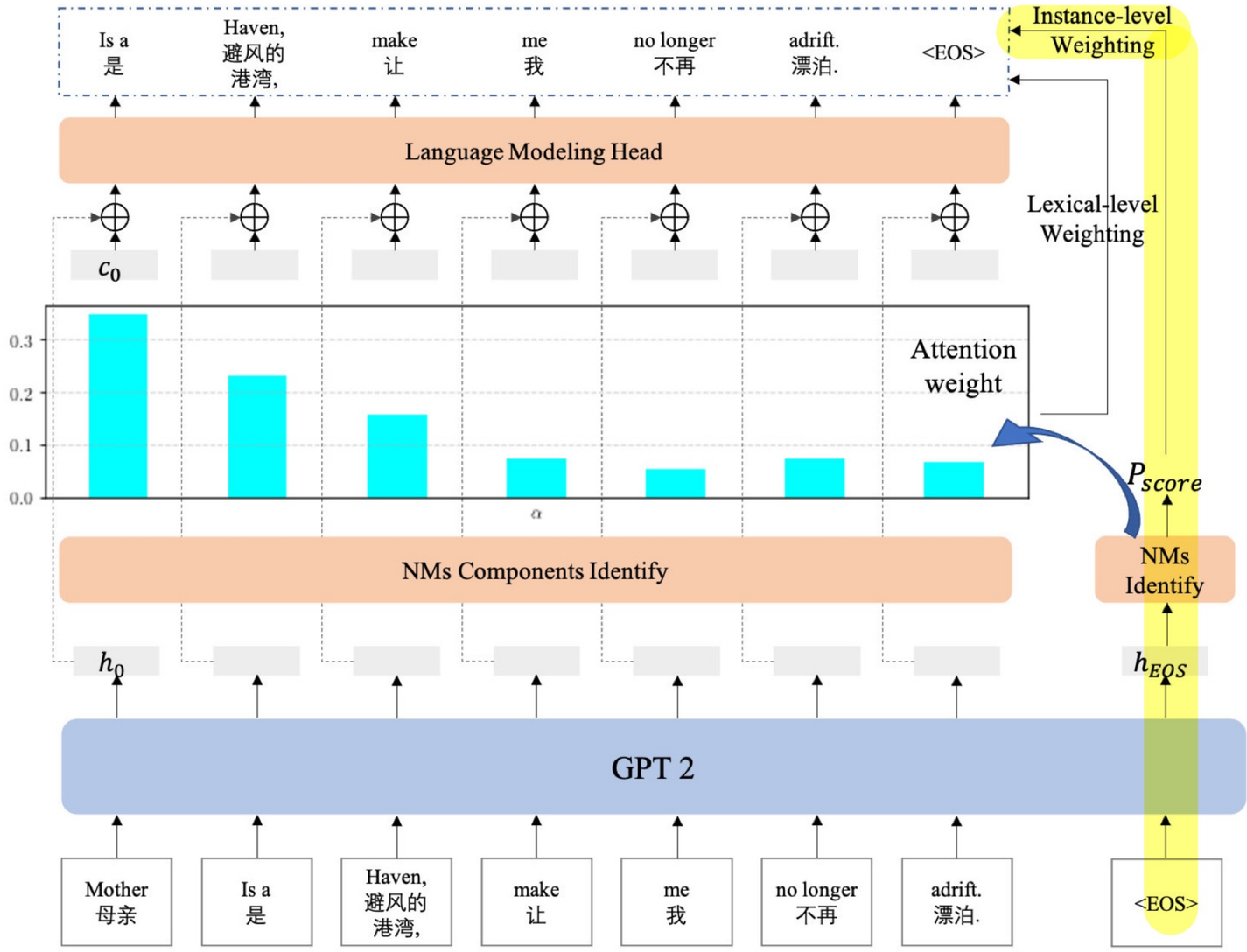
- A multi-task metaphor generator

- Three main techniques:
  - Self-training: to find a great deal of potential NMs from larger-scale unsupervised corpus. ☑ To enhance *novelty*.
  - Metaphor component identification: to find four NM components, so that we can enforce MetaGen to learn the NM comparison and the relation behind Tenor and Vehicle. ☑ To ensure the *metaphoricity*.
  - Conditioning: to condition the Context generation on Tenor and Vehicle, so that the Context dose give a sound explanation. ☑ To enhance the *consistency*.

Self-Training

- To tackle data scarcity

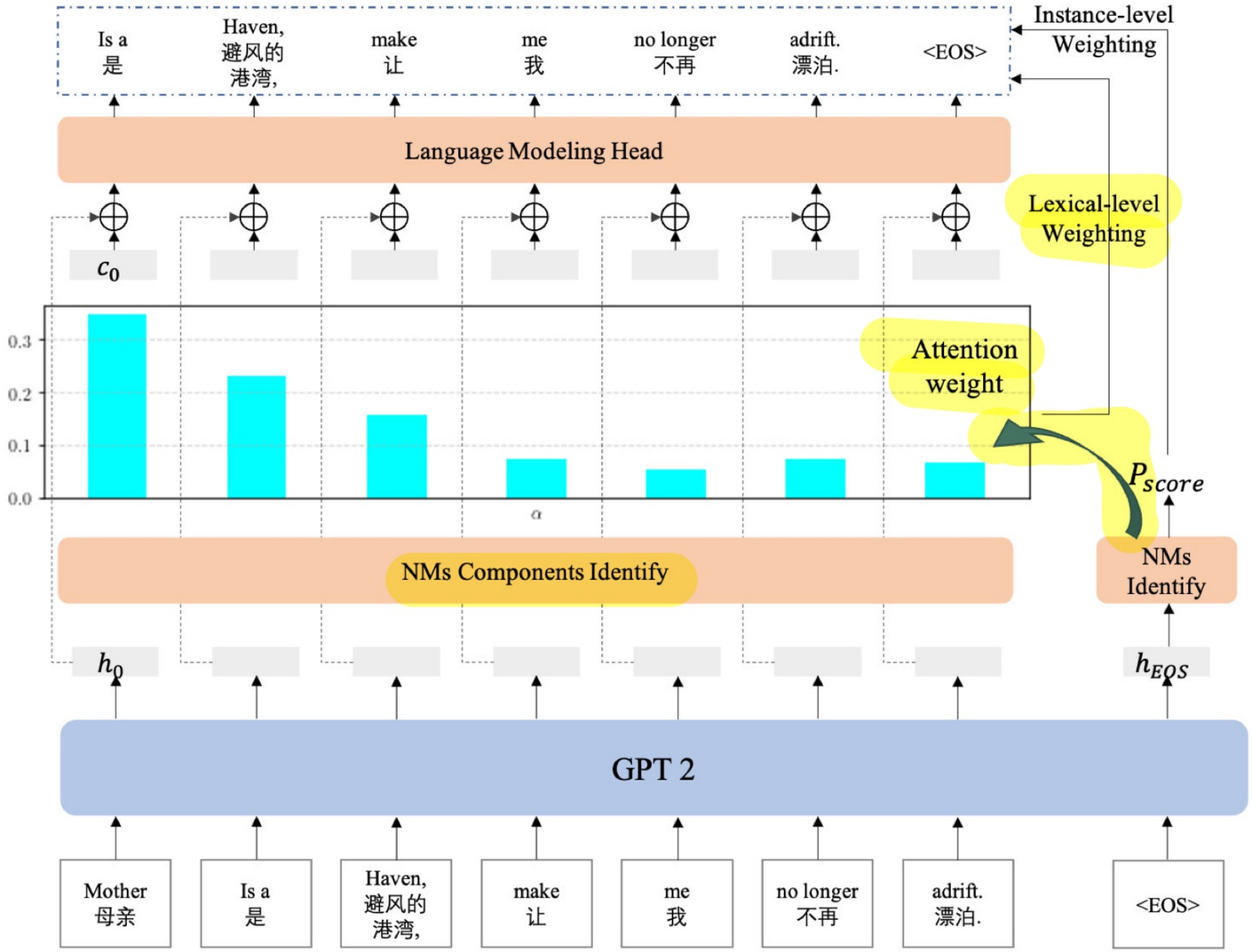
- We detect potential NMs from a large-scale unsupervised dataset C.
- For each unlabelled sentence $S \in C$. We compute the NMs score for S via $< EOS >$ token, and use the score to weight S in training.



NM Components Identification

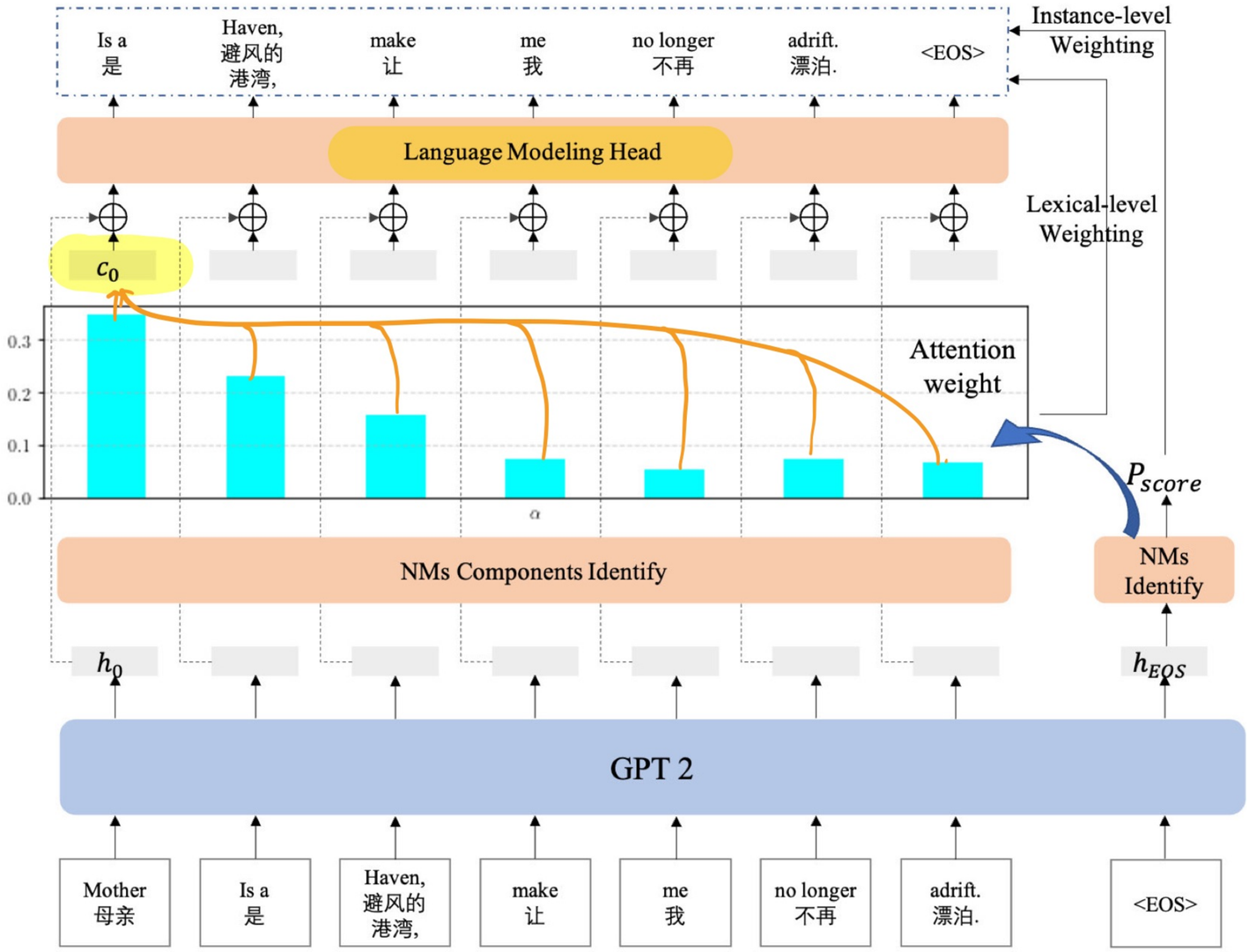
- Emphasis Components

- We find in the process of NM identification, NM components receive higher attention score in self-attention mechanism [8].
- We use attention score to find NM components, and use the score to emphasis generation steps of NM components.



NM Components Identification
- Context Conditioning

- To let the context generation give sound explanation for the comparison, we condition the context generation on other NM components, i.e., Tenor, Vehicle, and Comparator.
- We compute context vector c_i for each context step, where c_i is obtained via NM components attention score.



Chinese Metaphor Corpus

- The first Chinese NM corpus

- Prior NM dataset are neither too small [9] or focus on a specific type of NM [8].
- We release the first Chinese NM corpus (CMC) that containing multiply categories of NM patterns. CMC can be used in NM identification and generation.

Label	Examples
NM	瀑布注入水潭的一刹那,一朵朵白色的一浪一花腾空而起,像溅玉抛珠一般。 At the moment when the waterfall was poured into the pool, a white spray of flowers vacated, like a splash of jade beads.
NM	食堂开饭时，全校同学像热锅上的蚂蚁一样挤成一团。 When the dining hall opened, the whole school huddled together like ants on a hot pot.
Not NM	泛着银光的大海在他身后铺展开来。 The silver-filled sea spread out be-hind him.

Table 5: Examples of metaphor and not metaphor in the CMC.

Chinese Literature Corpus

- To power Self-Training

- We collect a large-scale Chinese corpus to power self-training. We choose literature as the data source, as we believe NMs are more common in literature.
- Statistics of CMC and CLC are shown in Table 2.

Category	#Books	#Tokens	#Sentences
Children	195	17M	0.58M
Chinese	336	64M	2.2M
Translated	854	121M	4.2M

Table 6: Summary of CLC.

	CMC	CLC
# Sentences	6257	6.98M
# NM	2787	-
# literal sentence	3554	-
# tokens	225K	202M
# tokens per sentence	35	29

Table 2: Statistics of CMC and CLC datasets

Results

- Automatic Evaluation

- Metrics: Meta is to measure the percentages of metaphorical text in all generated text. Novelty is the percentages of novel comparison among all generation.
- MetaGen performs well on almost all metrics.

Methods	PPL	Dist-1	Dist-2	Meta	Novelty
SeqGAN	89.43	.00336	.0116	**.998**	.200
GPT2	57.88	.00916	.1154	.981	.800
BART	48.58	.00826	.0971	.978	.725
SCOPE	92.32	.00517	.0673	.910	.385
Our Method	**25.79**	**.01153**	**.1674**	.948	**.920**
w/o Self-training	62.54	.00674	.0906	.982	.785
w/o Emphasizing	25.58	.01150	.1529	.803	.900
w/o Conditioning	24.93	.01053	.1534	.875	.930

Results

- Human Evaluation

- Metrics: Three metric are all 1-5 scale. The inter-annotator agreement score are shown as well.
- We find creative and consistency are hard to for annotators to achieve an agreement.

Methods	Fluency	Consistency	Creativity
SeqGAN	3.33 (.51)	3.80 (.46)	1.67 (.34)
GPT2	4.00 (.62)	3.10 (.39)	2.60 (.31)
BART	4.35 (.54)	3.05 (.37)	2.30 (.32)
SCOPE	3.10 (.64)	2.70 (.44)	2.10 (.45)
Our Method	**4.65** (.58)	**4.40** (.45)	**3.80** (.36)
w/o Self-training	3.85 (.54)	3.87 (.42)	2.76 (.38)
w/o Emphasizing	4.50 (.63)	3.91 (.32)	3.41 (.43)
w/o Conditioning	4.25 (.61)	3.05 (.45)	3.24 (.39)

Results

- Compared to GPT2

- Generated metaphor are vivid, detailed and elegant.
- Let try metaphor in your system to enhance user satisfaction!

Methods	**Text** (Chinese)	**Text** (Translated)
GPT2	秋天是美丽的，让人赏心悦目。	Autumn is beautiful, and is delightful to the eye.
	秋天是个动情的音符，荡漾在夏日的清纯中。	Autumn is an emotional note, rippling in the purity of summer.
	秋天是最好的伴奏曲，让世界充满微笑。	Autumn is the best concertos, making the world full of smiles.
SCOPE	秋天象征春天，像一个月前。	Autumn is a symbol of spring, like a month ago.
	秋天象征热情，像一个情人。	Autumn is a symbol of passion, like a lover.
	秋天象征爱情，像一个女人。	Autumn is a symbol of love, like a woman.
Our method	秋天像一只彩笔画般的画笔，勾勒出一幅幅多彩多姿的画卷。	Autumn is like a multi-colored paintbrush, sketching out colorful pictures.
	秋天像小姑娘的脚，带着她那柔软的臂膀，在枝头翩翩起舞。	Autumn is like a little girl's feet with her softness. Arms, dancing in the branches.
	秋天像刚刚落地的苹果,在果园里露出个头。	Autumn is like an apple that has just fallen, showing its head in the orchard.
	秋天像刚落的蝉，婉转地鸣叫着，见证着树梢上金黄色的叶子慢慢向蓝天生长。	Autumn is like a cicada that has just fallen, chirping tactfully, seeing the golden leaves on the treetops grow towards the blue sky slowly.

Main Contribution

- We give a nice introduction of Chinese metaphors. If you have interests on Chinese metaphor, we sincerely recommend this to you.
- We give an effective metaphor generator.
- We give the first Chinese NM dataset.
- We propose an evaluation system for NM generation.

Thanks!

Reference

[1] https://venturebeat.com/2017/04/07/chatbots-dont-actually-have-an-engagement-problem/
[2] A method for linguistic metaphor identification: From MIP to MIPVU
[3] Metaphor as a medium for emotion: An empirical study
[4] Generating similes effortlessly like a pro: A style transfer approach for simile generation.
[5] Mermaid: Metaphor gen- eration with symbolism and discriminative decoding.
[6] Love is as complex as math: Metaphor generation system for social chatbot.
[7] Shuneng Lian. 1994. Contrastive Studies OF English and Chinese. Fudan University Press.
[8] Lizhen Liu, Xiao Hu, Wei Song, Ruiji Fu, Ting Liu, and Guoping Hu. 2018. Neural multitask learning for simile recognition. In Proceedings of the 2018 Con- ference on Empirical Methods in Natural Language Processing, pages 1543–1553.
[9] Chang Su, Jia Tian, and Yijiang Chen. 2016. Latent semantic similarity based interpretation of chinese metaphors. Engineering Applications of Artificial Intelligence, 48:18 203.