

Neural Generative Question Answering

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Motivation

Combing the KB and Common VB can imporve the answer generation's accuracy and fluency

Task

Simple factoid question task

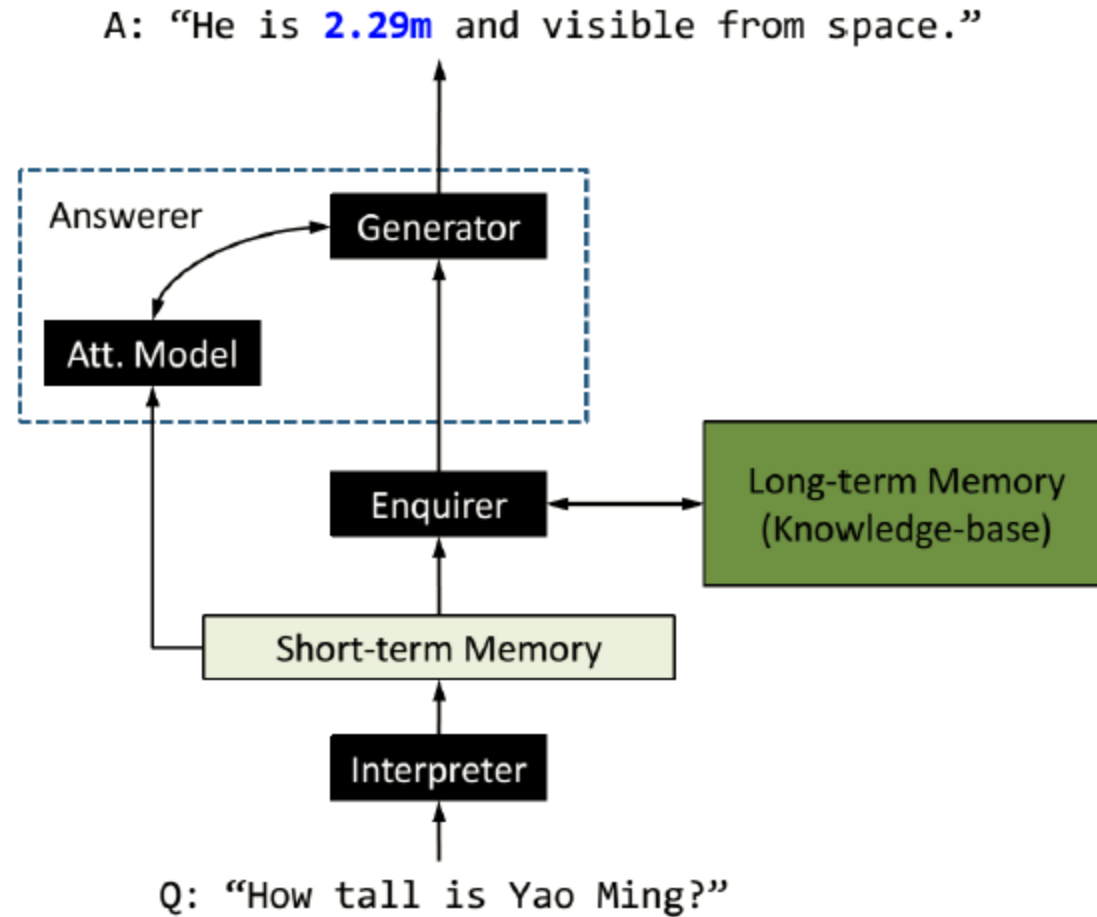
GENQA Model

Let $Q = (x_1, \dots, x_{T_Q})$ and $Y = (y_1, \dots, y_{T_Y})$ denote question and answer.

The KB is organized as a set of triples $(subject, predicate, object)$, each denoted as $\tau = (\tau_s, \tau_p, \tau_o)$

GENQA Model: Interpreter, Enquirer, Answerer and an external knowledge base.

System diagram



Interpreter

Conduct bi-lstm encoding for question

Enquirer

- Retriving the candidate triples from KB about question.
- Scoring for these candidates.

The scores are represented in a K_Q – *dimensional* vector r_Q where k^{th} element of r_Q is defined as

$$r_{Q_k} = \frac{e^{S(Q, \tau_k)}}{\sum_{k'=1}^{K_Q} e^{S(Q, \tau_{k'})}}$$

Score Model

+Bilinear Model

+CNN-based Matching Model

Answerer

The P of generating the answer $Y = (y_1, y_2, \dots, y_{T_Y})$ is

$$p(y_1, \dots, y_{T_Y} | \mathbf{H}_Q, \mathbf{r}_Q; \theta) = p(y_1 | \mathbf{H}_Q, \mathbf{r}_Q; \theta) \prod_{t=2}^{T_Y} p(y_t | y_1, \dots, y_{t-1}, \mathbf{H}_Q, \mathbf{r}_Q; \theta)$$

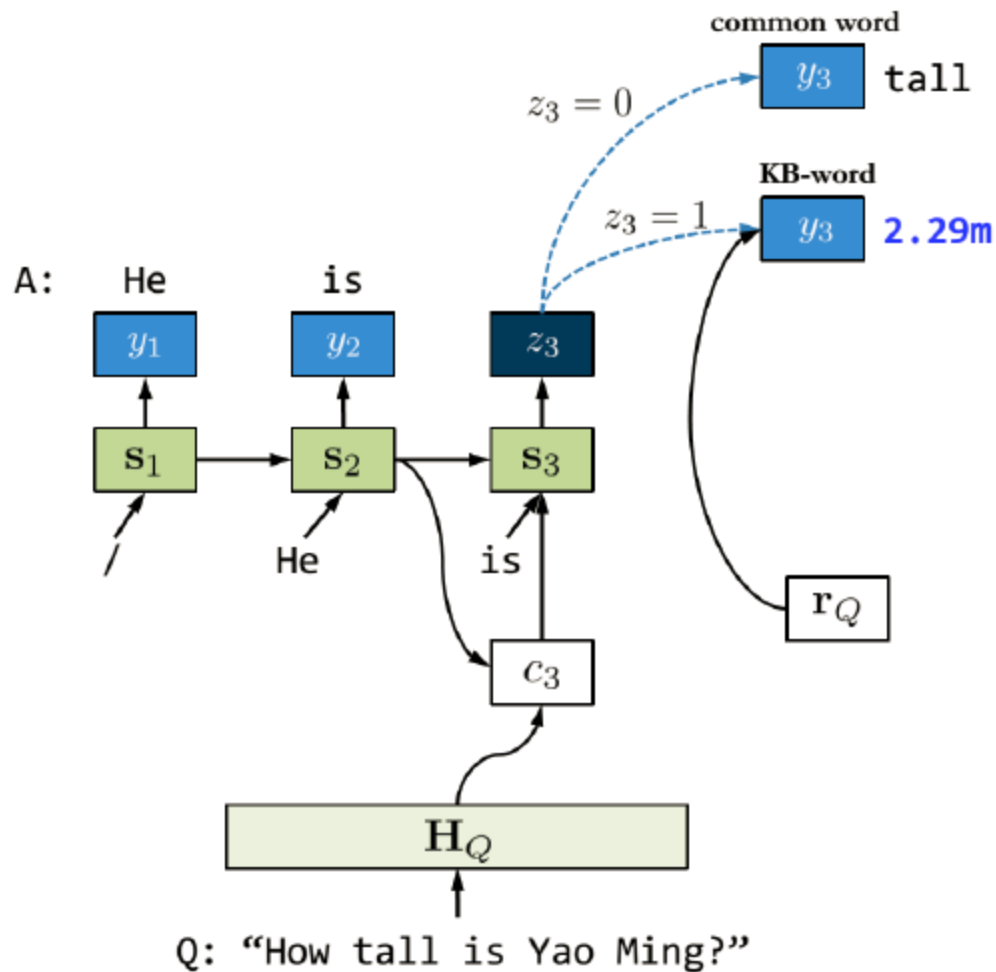
where θ represents the parameters in the GENQA model. The conditional probability in the RNN model (with hidden states $\mathbf{s}_1, \dots, \mathbf{s}_{T_Y}$) is specified by

$$p(y_t | y_1, \dots, y_{t-1}, \mathbf{H}_Q, \mathbf{r}_Q; \theta) = p(y_t | y_{t-1}, \mathbf{s}_t, \mathbf{H}_Q, \mathbf{r}_Q; \theta).$$

In generating the t^{th} word y_t in the answer, the probability is given by the following mixture model

$$p(y_t | y_{t-1}, \mathbf{s}_t, \mathbf{H}_Q, \mathbf{r}_Q; \theta) = p(z_t = 0 | \mathbf{s}_t; \theta) p(y_t | y_{t-1}, \mathbf{s}_t, \mathbf{H}_Q, z_t = 0; \theta) + p(z_t = 1 | \mathbf{s}_t; \theta) p(y_t | \mathbf{r}_Q, z_t = 1; \theta),$$

which sums the contributions from the "language" part and the "knowledge" part, with the coefficient $p(z_t | \mathbf{s}_t; \theta)$ being realized by a LR model.



- In generating KB-words, answer simply employs the model $p(y_t = k | r_Q, z_t = 1; \theta) = r_{Q_k}$. The better a triple matched with the question, the more likely the object of the triple is selected.

Table 4: Test accuracies

Models	Test
Retrieval-based QA	36%
NRM ^[13]	19%
Embedding-based QA ^[7]	45%
GENQA	47%
GENQA _{CNN}	52%

ID	Questions	Generated Answers
1	三国演义谁写的? Who wrote the Romance of the Three Kingdoms?	明朝的 <u>罗贯中</u> 。 <u>Luo Guanzhong</u> in Ming dynasty.
2	项羽是哪国人? Which state does Xiang Yu belong to?	<u>楚国</u> 的皇帝。 King of the <u>Chu State</u> .
3	还珠格格多少集? How many episodes does My Fair Princess have?	一共 <u>24</u> 集。 <u>24</u> episodes in total.
4	泰戈尔是哪国作家? Which country is the writer Tagore from?	泰戈尔是 <u>印度</u> 著名的作家。 Tagore is a famous <u>Indian</u> writer.
5	孙燕姿今年多大啊? How old is Stefanie Sun this year?	<u>32</u> 岁，他出生于 <u>1978年7月23日</u> 。 Thirty-two, he was born on <u>July 23, 1978</u> .
6	《格列佛游记》的作者是谁? Who is the author of Gulliver's Travels?	法国作家 <u>斯威夫特</u> 。 The French writer, <u>Swift</u> .
7	怪物史莱克4什么时候上映呀? When will Shrek Forever After be released?	上映日期: <u>梦工厂电影发行公司</u> 。 Release date: <u>DreamWorks Pictures</u> .
8	凤凰卫视是哪里的电视台? Which place is phoenix television located at?	总部在 <u>刘长乐</u> 。 The headquarters is at <u>Liu Changle</u> .