Question Answering Proposal 1

Team Name: REINFORCE

Team Members: Prashant Budania
Eti Rastogi

Research Questions: Building an end-to-end Question Answering model using a reward based approach for selecting(reformulating) questions and generating answers

- To implement a question generation model to boost the performance of an answer generation model.
- Question generation module is similar to Machine Translation like seq-to-seq model except the translation is from English to English

Datasets: SearchQA , WikiSuggest

Baseline1 :

The baseline model uses a sequence-to-sequence framework which learns a joint model that both asks and answers questions. The encoder encodes the document and generates a question given an answer as well as encodes the answer to generate a question.

The decoder employs the pointer-softmax mechanism. At each generation step, the decoder decides adaptively whether (a) to generate from a decoder vocabulary or (b) to point to a word in the source sequence (and copy over). Recurrence of the pointing decoder is implemented with two LSTM cells c1 and c2:

$$\begin{aligned} \mathbf{s}_1^{(t)} &= c_1(\mathbf{y}^{(t-1)}, \mathbf{s}_2^{(t-1)}) \\ \mathbf{s}_2^{(t)} &= c_2(\mathbf{v}^{(t)}, \mathbf{s}_1^{(t)}), \end{aligned}$$

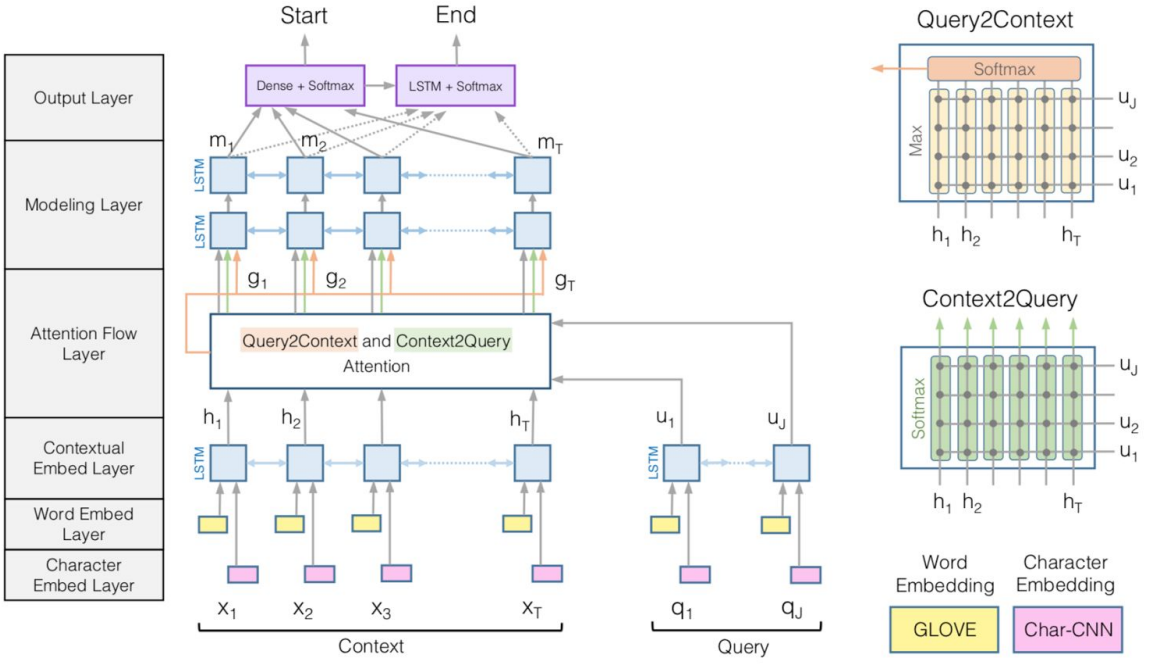
Here, v(t) is the context vector which is the sum of the document encoding weighted by the document attention.

Table 2. Examples of QA behaviour changes possibly induced by joint training. Gold answers correspond to text spans in green. In both the positive and the negative cases, the answers produced by the joint model are highly related (and thus presumably influenced) by the generated questions.

Positive	Document	*in the 1960 election to choose his successor , eisenhower endorsed his own vice president , republican richard nixon against democrat john f. kennedy .*
	Q_{gold}	*who did eisenhower endorse for president in 1960 ?*
	Q_{gen}	*what was the name of eisenhower 's own vice president ?*
	Answer	`A-gen:` *john f. kennedy* `JointQA:` *richard nixon*
Negative	Document	*in 1870 , tesla moved to karlovac , to attend school at the higher real gymnasium , where he was profoundly influenced by a math teacher martin sekulić*
	Q_{gold}	*why did tesla go to karlovac ?*
	Q_{gen}	*what did tesla do at the higher real gymnasium ?*
	Answer	`A-gen:` *to attend school at the higher real gymnasium* `JointQA:` *he was profoundly influenced by a math teacher martin sekulić*

(reference : [A Joint Model for Question Answering and Question Generation])

Baseline2 :



(reference : [BiDAF: BiDirectional Attention Flow for Machine Comprehension])

Proposed Hypothesis:

Eti :

- We propose a reinforcement learning based question generation model to improve the task of answer generation.
- Given a document d and an answer, we generate a question. This generated question is then fed to the question-answering system to get an answer.We will be using a off-the-shelf QA baseline model: BiDAF
- Answer is generated from this new generated question which is then fed to an evaluator model which gives a score by comparing the generated answer with the gold answer.
- This score is then used to train the question generation – answer generation model.
- If we are able to get the correct answer from the generated question, the question generation receives a reward of 1 and -1 otherwise.

Prashant :

- Current baseline model uses attention over documents to generate an answer(question).
- We propose a sentence selection method which can be used to further improve the current model.
- Given a document and a query, we can use a CNN based encoder model to get sentence embeddings and select a sentence (or multiple) using a neural attention model (soft/hard).
- We then train this model by combining loss with the reward generated from the QA model.
- After sentence selection, we can either use answer selection (if the answer is in the sentence) or a RNN based decoder for answer generation to give the final answer.

Plan:

1. **10th Feb - 25th Feb :** To implement baselines
2. **March:** to implement and run our proposed hypothesis
3. **April:** Fine tuning, error analysis, improvements and further work

References:

1. BiDAF: BiDirectional Attention Flow for Machine Comprehension
https://arxiv.org/pdf/1611.01603.pdf

2. Ask the Right Questions: Active Question Reformulation with Reinforcement Learning https://arxiv.org/pdf/1705.07830.pdf
3. Coarse-to-Fine Question Answering for Long Documents http://aclweb.org/anthology/P/P17/P17-1020.pdf