Building end-to-end QA model with reward based objective

TEAM REINFORCE (Prashant and Eti)

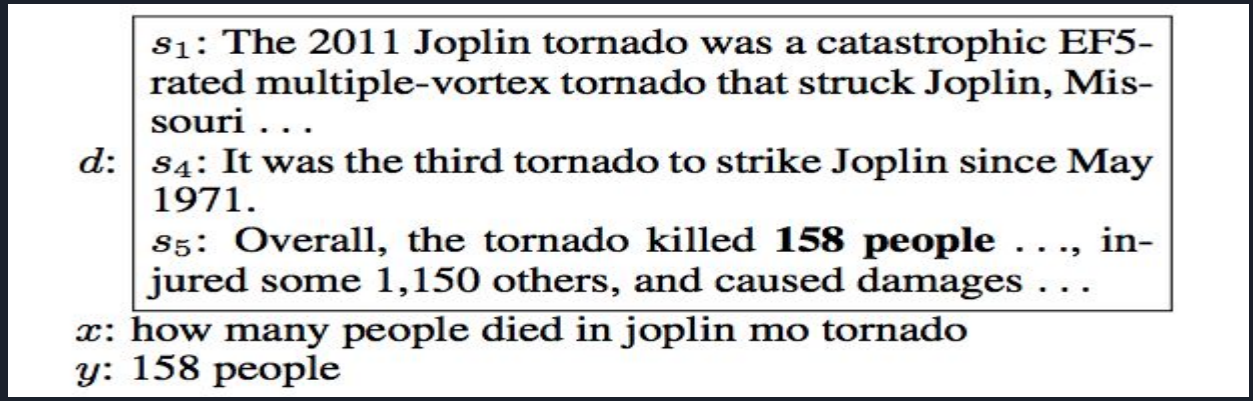
Exploring Data: SearchQA

- 140k+ QA pairs, 6.9M snippets
- 49.6 snippets on average
- Each snippet is 37.3 tokens long on average
- Answers are on average 1.47 tokens long
- 1.2M unique tokens
- Additional Meta-Data:
  - Category, Dollar value, Show number and Air date
  - From Google: URL, Title and a set of related links (often none) for each snippet


```
[
  {
    "category": "HISTORY",
    "air_date": "2004-12-31",
    "question": "'For the last 8 years of his life, Galileo was under house arrest for espousing this man's theory'",
    "value": "$200",
    "answer": "Copernicus",
    "round": "Jeopardy!",
    "show_number": "4680"
  },
  {
```

Exploring Data: WikiSuggest

- ***# of unique queries, # of examples:*** 3.47M
- ***# of words / query:*** 5.03
- ***# of tokens / doc:*** 5962.2
- ***% answer string exists:*** 100
- ***avg # of answer match:*** 13.95
- ***% match first sent:*** 33.6



Vocabulary

Some options:

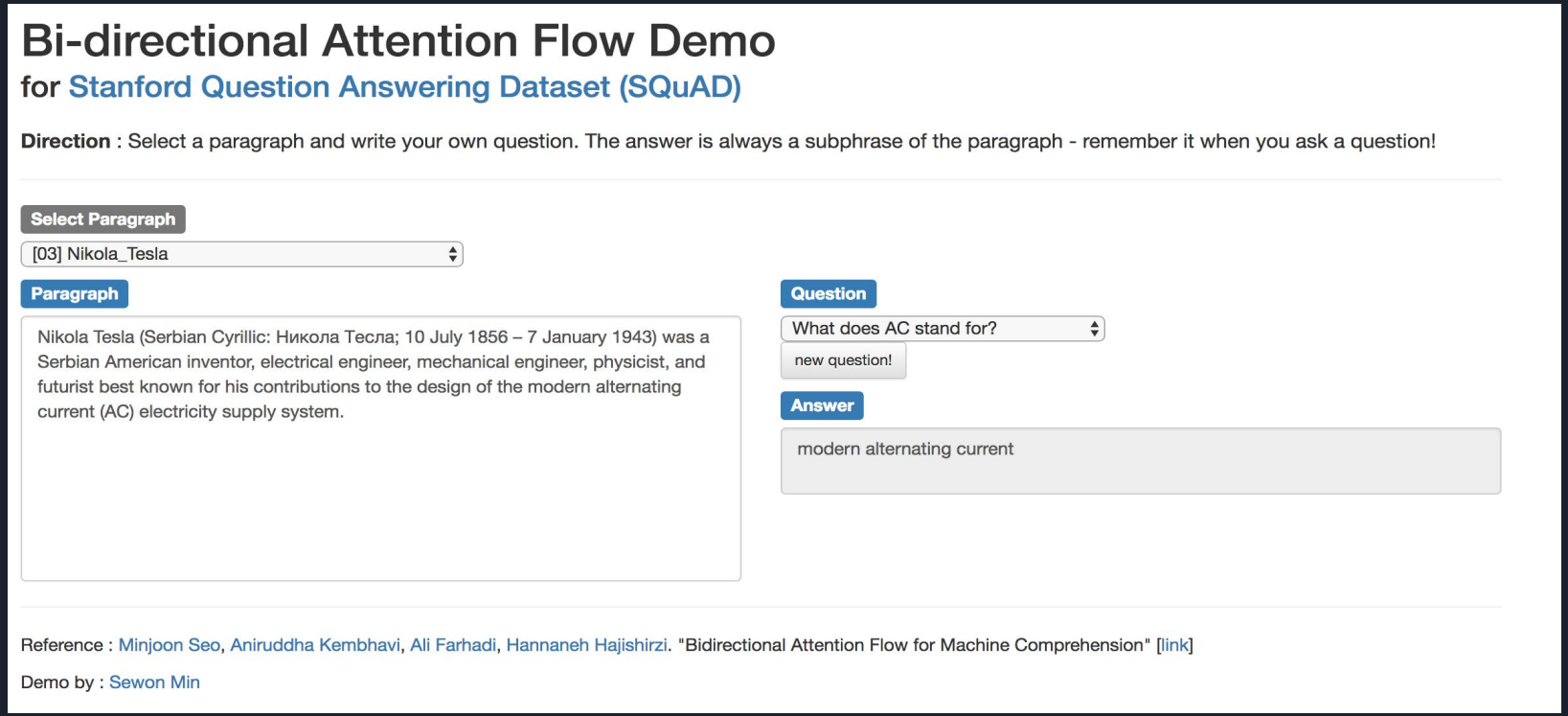
- Use pre-trained embeddings (eg. Glove)
- Use pre-trained embeddings (which were trained on a similar task/dataset)
- Use word-2-vec to do unsupervised training of word embeddings on these datasets

Literature Review

Bi-DAF for Machine Comprehension (Seo et al 2017):

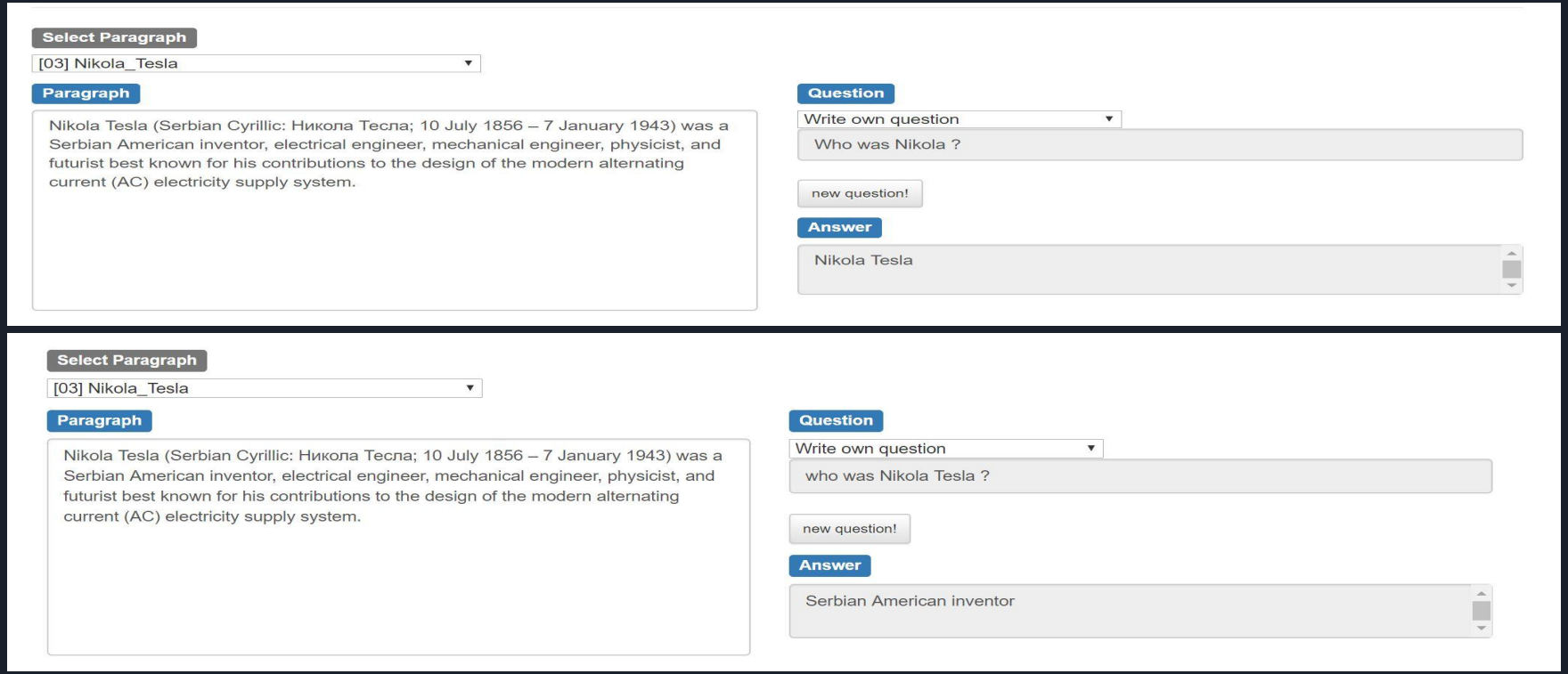
- Word + Char embeddings passed to an LSTM to get representations of context and query words
- Query2Context: Signifies which context words are most similar to one of the query words and hence important for answering the query
- Context2Query: Calculates relevance of each query word with respect to each context word
- Finally, the hidden representations and the two module scores are fused and inputted to an LSTM network (Modelling layer)
- Span selection in final output layer

Literature Review

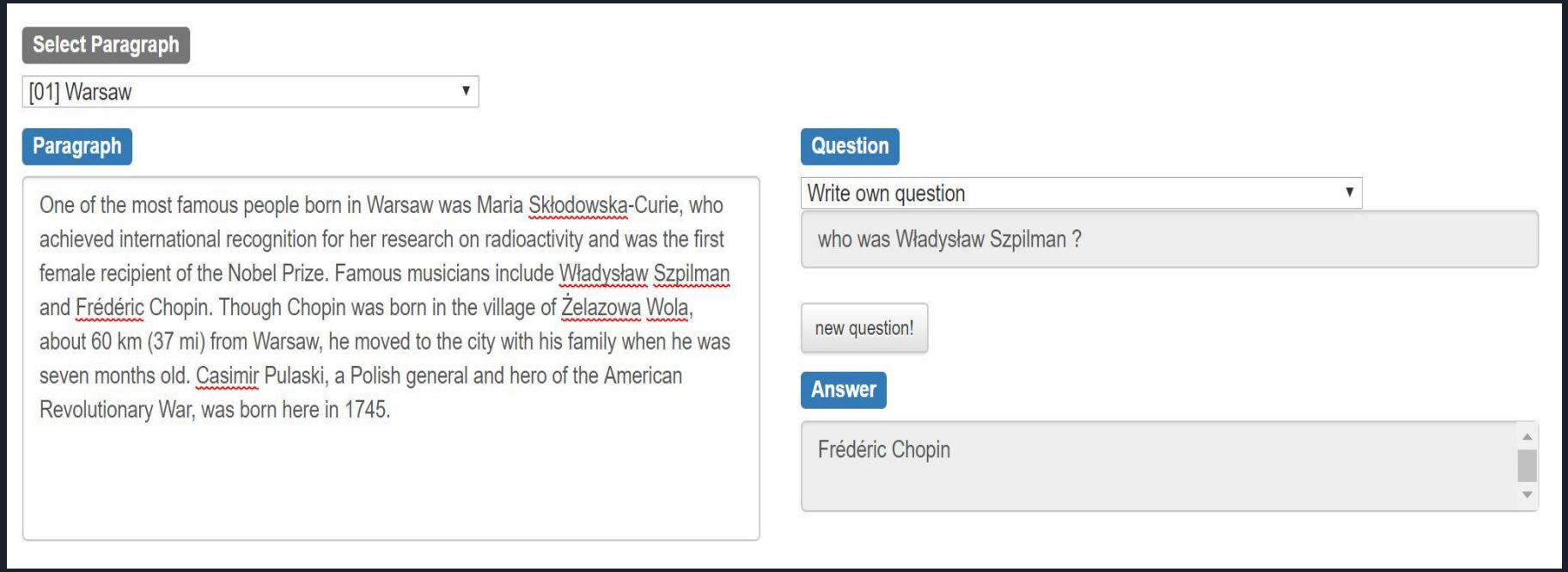


Ref: https://allenai.github.io/bi-att-flow/

Bi-DAF Failure Cases



Bi-DAF Failure Cases

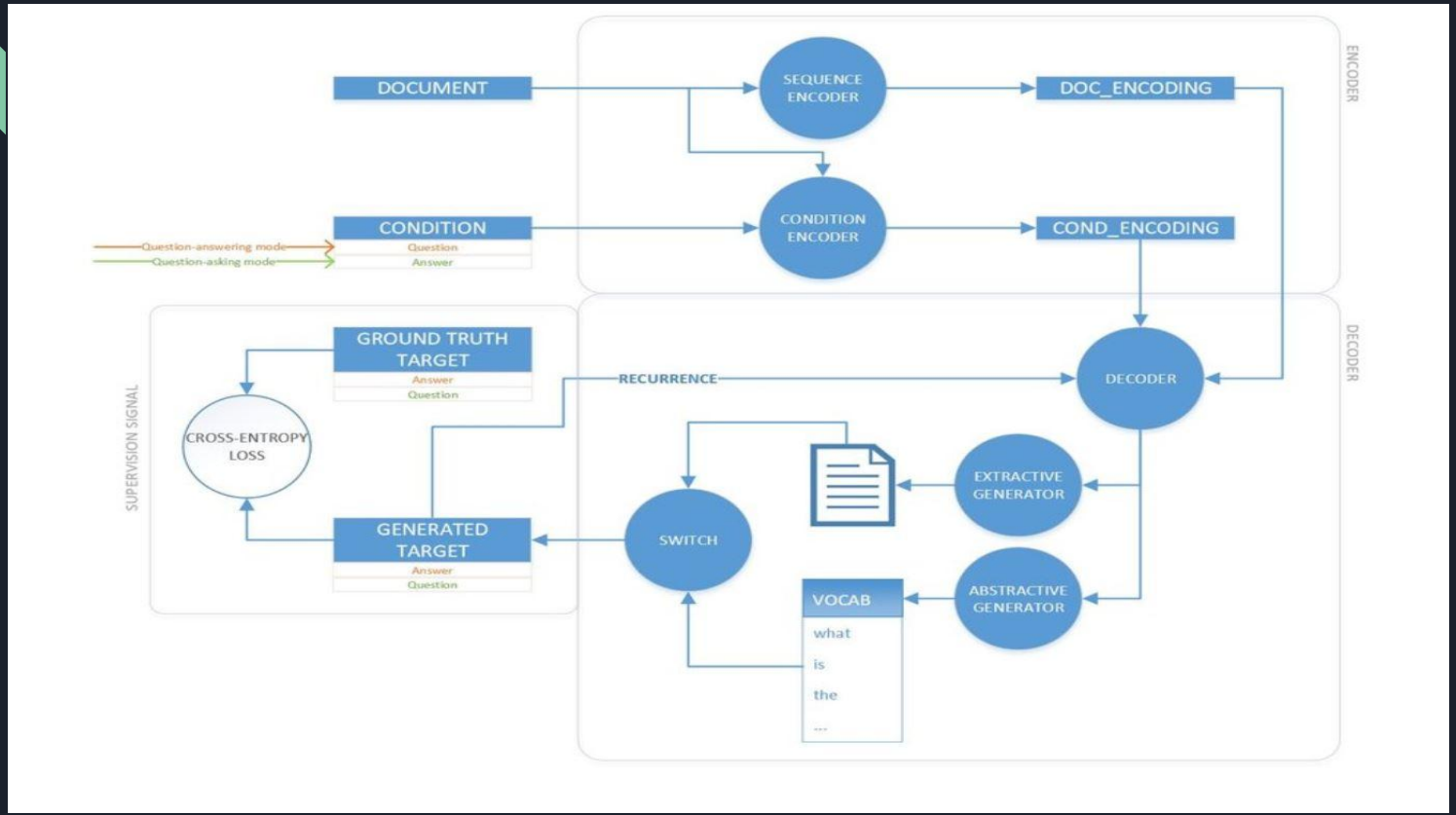


Literature Review

A Joint Model for Question Answering and Question Generation (Wang et al. 2017)

- Encoder :
  - A word is represented as a concatenation of word and character embeddings
  - They are encoded with another BiLSTM into annotation vectors h^d_i and h^c_j (for the document and the condition sequence, respectively)
  - To better encode the condition, the encodings of the document words that appear in the condition sequence are also fed to the conditional encoder.

- Decoder :
  - 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).
  - Uses attention over entire document to improve the performance of the decoder


ENCODER
DOCUMENT
SEQUENCE ENCODER
DOC_ENCODING
CONDITION
CONDITION ENCODER
COND_ENCODING
Question-answering mode
Question-asking mode
Question
Answer
DECODER
GROUND TRUTH TARGET
Answer
Question
RECURRENCE
DECODER
SUPERVISION SIGNAL
CROSS-ENTROPY LOSS
EXTRACTIVE GENERATOR
SWITCH
GENERATED TARGET
Answer
Question
ABSTRACTIVE GENERATOR
VOCAB
what
is
the
...

Next Steps (for the upcoming week)

Prashant:

- Implement the baseline Bi-DAF model
- Use pre-trained Glove embeddings to train the model
- Get baseline metric scores on both the datasets
- Do preliminary error analysis to figure out the shortcomings of the baseline model and common error types

Eti:

- Implement the Joint Model
- Get baseline metric scores on both the datasets
- Do preliminary error analysis to figure out the shortcomings of the baseline model and common error types