Building a QA System using Deep Learning Techniques

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https://www.limbo-project.org/
Linked Data
Unstructured Data

The Three Little Pigs

From Wikipedia, the free encyclopedia.
(Redirected from Three little pigs)

For other uses, see Three Little Pigs (disambiguation).

The Three Little Pigs is a fable about three pigs who build three houses of different materials. A big bad wolf blows down the first two pigs' houses, made of straw and sticks respectively, but is unable to destroy the third pig's house, made of bricks. Printed versions date back to the 1840s, but the story itself is thought to be much older. The phrases used in the story, and the various morals drawn from it, have become embedded in Western culture. Many versions of The Three Little Pigs have been recreated or have been modified over the years, sometimes making the wolf a kind character. It is a type 124 folktale in the Aarne–Thompson classification system.
Reading Comprehension

Jack is a seven year old boy who loves adventure. He likes to climb trees and find interesting bugs and leaves in his backyard. He also likes to play with his dog, Daisy. Daisy is a two year old yellow lab mix. Jack and Daisy are best friends.

1. How old is Jack?
   He is ________________ .

2. What does Jack like to do in his backyard?
   He likes to ________________ .

3. What kind of a dog is Daisy?
   She is a ________________ .

How is it done?
Why is it done?
Challenges?
Roadmap

1. Familiarize ourselves with available datasets
   a. Explore the selected dataset

2. Discuss intuitive NLP approaches

3. Dive into Deep Learning
   a. Some theory
   b. Approach Formulation
   c. Some code!

4. Research

   https://github.com/dice-group/EuroPython-2018
Available Datasets

- **DeepMind QA Dataset**: CNN/Daily Mail RC corpus
  - 1.5 million question and answer pairs
  - Cloze dataset
    - Goal: Predict the missing word (named entity) in the passage

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**Passage**

(@entity4) if you feel a ripple in the force today, it may be the news that the official @entity6 is getting its first gay character. According to the sci-fi website @entity9, the upcoming novel "@entity11" will feature a capable but flawed @entity13 official named @entity14 who "also happens to be a lesbian." The character is the first gay figure in the official @entity6 -- the movies, television shows, comics and books approved by @entity6 franchise owner @entity22 -- according to @entity24, editor of "@entity6" books at @entity28 imprint @entity26.

**Question**

characters in "@placeholder" movies have gradually become more diverse

**Answer**

@entity6

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**Table 2**: Accuracy of all models on the CNN and Daily Mail datasets. Results marked $^1$ are from (Hermann et al., 2015) and results marked $^2$ are from (Hill et al., 2016). Classifier and Neural net denote our entity-centric classifier and neural network systems respectively. The numbers marked with * indicate that the results are from ensemble models.
● Children’s Book Test (CBT)
  ○ 677,343 million context-query pairs
  ○ Context: first 20 sentences
  ○ Query: A word removed from the 21st sentence
  ○ Goal: Identify the answer word from 10 candidate answers appearing in the context sentences and the query

● Other Datasets: MCTest, MS Macro, etc

Context:
1 So they had to fall a long way.
2 So they got their tails fast in their mouths.
3 So they could n’t get them out again.
4 That ’ s all.
5 ’ ’ Thank you, ’ ’ said Alice, ’ ’ it ’ s very interesting.
6 I never knew so much about a whiting before. ’ ’
7 ’ ’ I can tell you more than that, if you like, ’ ’ said the Gryphon.
8 ’ ’ Do you know why it ’ s called a whiting? ’ ’
9 ’ ’ I never thought about it, ’ ’ said Alice.
10 ’ ’ Why? ’ ’
11 ’ ’ IT DOES THE BOOTS AND SHOES. ’ ’
12 the Gryphon replied very solemnly.
13 Alice was thoroughly puzzled.
14 ’ ’ Does the boots and shoes? ’ ’
15 she repeated in a wondering tone.
16 ’ ’ Why, what are YOUR shoes done with? ’ ’
17 said the Gryphon.
18 ’ ’ I mean, what makes them so shiny? ’ ’
19 Alice looked down at them, and considered a little before she gave her answer.
20 ’ ’ They ’ re done with blacking, I believe. ’ ’

Query: ” Boots and shoes under the sea, ” the XXXXX went on in a deep voice, ”

Candidates: Alice|BOOTS|Gryphon|SHOES|answer|fall|mouhs|tone|way|whiting

Answer: gryphon
SQuAD-v1.1 / v2.0

- 100,000 questions on Wikipedia articles
- 50,000 questions added
- Determine when no answer is supported

**Passage Segment**

...The European Parliament and the Council of the European Union have powers of amendment and veto during the legislative process...

**Question**

Which **governing bodies** have veto power?
### SQuAD1.1 Leaderboard

Since the release of SQuAD1.0, the community has made rapid progress, with the best models now rivaling human performance on the task. Here are the ExactMatch (EM) and F1 scores evaluated on the test set of v1.1.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Model</th>
<th>EM</th>
<th>F1</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>QANet (ensemble)</td>
<td>84.454</td>
<td>90.490</td>
</tr>
<tr>
<td>2</td>
<td>r-net (ensemble)</td>
<td>84.003</td>
<td>90.147</td>
</tr>
<tr>
<td>3</td>
<td>MARS (ensemble)</td>
<td>83.982</td>
<td>89.796</td>
</tr>
<tr>
<td>4</td>
<td>QANet (ensemble)</td>
<td>83.877</td>
<td>89.737</td>
</tr>
<tr>
<td>5</td>
<td>MARS (single model)</td>
<td>83.122</td>
<td>89.224</td>
</tr>
<tr>
<td>6</td>
<td>QANet (ensemble)</td>
<td>82.744</td>
<td>89.045</td>
</tr>
<tr>
<td>7</td>
<td>MARS (single model)</td>
<td>82.587</td>
<td>88.880</td>
</tr>
</tbody>
</table>

### Leaderboard

SQuAD2.0 tests the ability of a system to not only answer reading comprehension questions, but also abstain when presented with a question that cannot be answered based on the provided paragraph. How will your system compare to humans on this task?

<table>
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<tr>
<th>Rank</th>
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<th>EM</th>
<th>F1</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>YS^3-NET (single model)</td>
<td>68.438</td>
<td>71.282</td>
</tr>
<tr>
<td>2</td>
<td>KACTEIL-MRC(GFN-Net) (single model)</td>
<td>68.224</td>
<td>70.871</td>
</tr>
<tr>
<td>3</td>
<td>KakaoNet2 (single model)</td>
<td>65.708</td>
<td>69.369</td>
</tr>
<tr>
<td>4</td>
<td>abcNet (single model)</td>
<td>65.256</td>
<td>69.198</td>
</tr>
<tr>
<td>5</td>
<td>BSAE AddText (single model)</td>
<td>63.383</td>
<td>67.478</td>
</tr>
</tbody>
</table>
Let’s explore, SQuAD!
Baseline Approach

Given: context, question, answer and answer’s start index/answer span

1. Generate answer candidates: Only use spans which are constituents in the constituency parse
2. Use sliding window based approach - keep all candidates that have the maximal (unigram/bigram) overlap - select the best one!
3. Logistic Regression
1. Preprocess the Dataset
   a. Convert text input into a numeric representation
   b. Word Representation can be
      i. One-hot Encoding - sparse representation
      ii. Word Embeddings - dense representation of words and their relative meanings
         1. Map semantic meaning into a geometric space
         2. Geometric space - Embedding space
         3. Word2Vec, gloVe

2. Encoder - Decoder
RNNs
LSTMs

Long-Short Term Memory module: LSTM

long-short term memory modules used in an RNN

http://colah.github.io/posts/2015-08-Understanding-LSTMs/
Let’s look into the code!
Thank You for your Attention!

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Feedback form : https://goo.gl/forms/4Cg4p3AqVIp17Lon2

Github repo : https://github.com/dice-group/EuroPython-2018

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