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

TEAM REINFORCE (Prashant and Eti)

Baseline Model Experiment Results

1. ***SQuAD***

	Accuracy(EM)(Ours) *	Accuracy(EM)(Ours) **	Accuracy(EM)(Original)
With character embeddings / byte encodings		64.2	67.7
No Bidirectional LSTM + No char embeddings	32.4	-	-
Bidirectional LSTM + No char embeddings	38.6	62.3	65.0
Reducing Vocabulary size	-	63.0	-

*⅓ dataset
** complete dataset

Error Analysis

Question	Predicted	Gold Answer	Reason for Error	% error
Which articles of the Free Movement of Workers Regulation set out the primary provisions on equal treatment of workers?”	1 to 7	articles 1 to 7	-	53
What year did BSkyB acquire Sky Italia ?	2014	2014	Wrong span	12
when did French and Indian war ended ?	1754–1763	1763	Splitting on space	3

Things to do

2. ***SearchQA***

	Accuracy(EM)(Ours)
Bidirectional LSTM + char embeddings + Reduced Vocabulary size	
Bidirectional LSTM + No char embeddings + Reduced Vocabulary size	

Passage Ranking

- SearchQA has multiple passages/snippets
- Correct answer can also be in multiple passages
- Using Reinforcement Learning/ reward based objective for passage selection
- **Task:** Select one of the passages from which answer is selected

Why Reinforcement Learning?

- Multiple passages for each query and correct/gold passage not given
- Using RL:
  - Action: Passage Selection
  - Goal: Select a passage that leads to high expected reward
  - Reward: Can use REINFORCE algorithm

REINFORCE Algorithm

- Objective Function: Maximize expected reward

$$J(\theta) = \sum_{p_k \in \text{passages}} p_\theta(p = p_k | \text{query, passages}) R_\theta(p_k)$$

Where R is the reward that the agent gets after selecting passage p_k

REINFORCE Algorithm

- Reward Function: It can simply be the log probability of correct answer given passage p_k

$$R_\theta(p_k) = \log p_\theta(y = y^* | \text{query}, p_k)$$

- This log probability term is the output of BiDAF model

Timeline

March 03 - March 12	March 13 - March 30	March 31 - April 15	April 16 - April 30
~~Implementation and training of own BiDAF model in dynet~~	~~- Perform experiments on SQuAD dataset~~ - Analyze model on SearchQA Dataset	- Analyze model on SearchQA Dataset - Implement the passage ranking functionality	Error Analysis and further improvement