

"Ah, let me alone, let me alone!" she said, and going back to her bedroom she sat down in the same place as she had sat when talking to her husband, clasping tightly her thin hands with the rings that slipped down on her bony fingers, and fell to going over in her memory all the conversation. "He has gone! But has he broken it off with her?" she thought. "Can it be he sees her? Why didn't I ask him! No, no, reconciliation is impossible. Even if we remain in the same house, we are strangers—strangers forever!" She repeated again with special significance the word so dreadful to her. "And how I loved him! my God, how I loved him!.... How I loved him! And now don't I love him? Don't I love him more than before? The most horrible thing is," she began, but did not finish her thought, because Matrona Philimonovna put her head in at the door.


"Let us send for my brother," she said; "he can get a dinner anyway, or we shall have the children getting nothing to eat till six again, like yesterday."

"Very well, I will come directly and see about it. But did you send for some new milk?"

And Darya Alexandrovna plunged into the duties of the day, and drowned her grief in them for a time.

Stepan Arkadyevitch had learned easily at school, thanks to his excellent abilities, but he had been idle and mischievous, and therefore was one of the lowest in his class. But in spite of his habitually dissipated mode of life, his inferior grade in the service, and his comparative youth, he occupied the honorable and lucrative position of president of one of the government boards at Moscow. This post he had received through his sister Anna's husband, Alexey Alexandrovitch Karenin, who held one of the most important positions in the ministry to whose department the Moscow office belonged. But if Karenin had not got his brother-in-law this berth, then through a hundred other personages—brothers, sisters, cousins, uncles, and aunts—Stiva Oblonsky would have received this post, or some other similar one, together with the salary of six thousand absolutely needful for him, as his affairs, in spite of his wife's considerable property, were in an embarrassed condition.

Half Moscow and Petersburg were friends and relations of Stepan Arkadyevitch. He was born in the midst of those who had been and are the powerful ones of this world. One-third of the men in the government, the older men, had been friends of his father's, and had known him in petticoats; another third were his intimate chums, and the remainder were friendly acquaintances. Consequently the distributors of earthly blessings in the shape of places, rents, shares, and such, were all his friends, and could not overlook one of their own set; and Oblonsky had no need to make any special exertion to get a lucrative post. He had only not to refuse things, not to show jealousy, not to be quarrelsome or take offense, all of which from his characteristic good nature he never did. It would have struck him as absurd if he had been told that he would not get a position with the salary he required, especially as he expected nothing out of the way; he only wanted what the men of his own age and standing did get, and he was no worse qualified for performing duties of the kind than any other man.



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# NARRATIVE QA FRAMEWORK

Group 8  
John Maxwell  
Malavika Srinivas  
Sanjana Channabasappa Mallik



# Narrative QA

- Exploring the domain of Reading Comprehension for QA
- Previous datasets used multiple choice and spans of the context document
- RC requires integrating information and reasoning
- Annotators use Wikipedia summaries of the stories in NarrativeQA to generate question and answer pairs
- Unlike previous datasets, multiple choice answers and closure style QA are avoided.



# PROPOSED WORK

The NarrativeQA Reading Comprehension Challenge :

<https://arxiv.org/pdf/1712.07040.pdf>


- Solves the questions by understanding the underlying narrative rather than depending on the shallow matching pattern and picking out important words
- Seq2seq model with Luong Attention
- Full Text vs Wiki Summary



# NARRATIVEQA DATASET

- We make use of summaries from the Books dataset from Project Gutenberg

	train	valid	test
# documents	1,102	115	355
... books	548	58	177
... movie scripts	554	57	178
# question-answer pairs	32,747	3,461	10,557
Avg. #tok. in summaries	659	638	654
Max #tok. in summaries	1,161	1,189	1,148
Avg. #tok. in stories	62,528	62,743	57,780
Max #tok. in stories	430,061	418,265	404,641
Avg. #tok. in questions	9.83	9.69	9.85
Avg. #tok. in answers	4.73	4.60	4.72



Model	Validation / Test				
	Bleu-1	Bleu-4	Meteor	Rouge-L	MRR
<b>Oracle IR Models</b>					
Bleu-1 given answer (ans. length)	54.60/55.55	26.71/27.78	31.32/32.08	58.90/59.77	1.000/1.000
Rouge-L given answer (ans. length)	52.94/54.14	27.18/28.18	30.81/31.50	59.09/59.92	1.000/1.000
Cosine given answer (ans. length)	46.69/47.95	24.25/25.25	27.02/27.81	44.64/45.66	0.836/0.838
Human (given summaries)	44.24/44.43	18.17/19.65	23.87/24.14	57.17/57.02	—



# Preprocessing

- Narrowed dataset to Project Gutenberg books and who questions
  - ~1,500 docs → ~750 docs
  - ~46,000 question → ~5,700 questions
- Cleaned documents to remove Project Gutenberg text and html tags
- Anonymizing entities with tags (@entity123)
- IR processing:
  - Tf-idf between question and 200 word chunks
  - Word vector similarity between groups of 3 sentences and question





# Preprocessing

Training:

He passed the cup to Duncan and motioned for him to drink

Test:

“Who still needs a drink? Here, <unk> take this cup.”



# Preprocessing

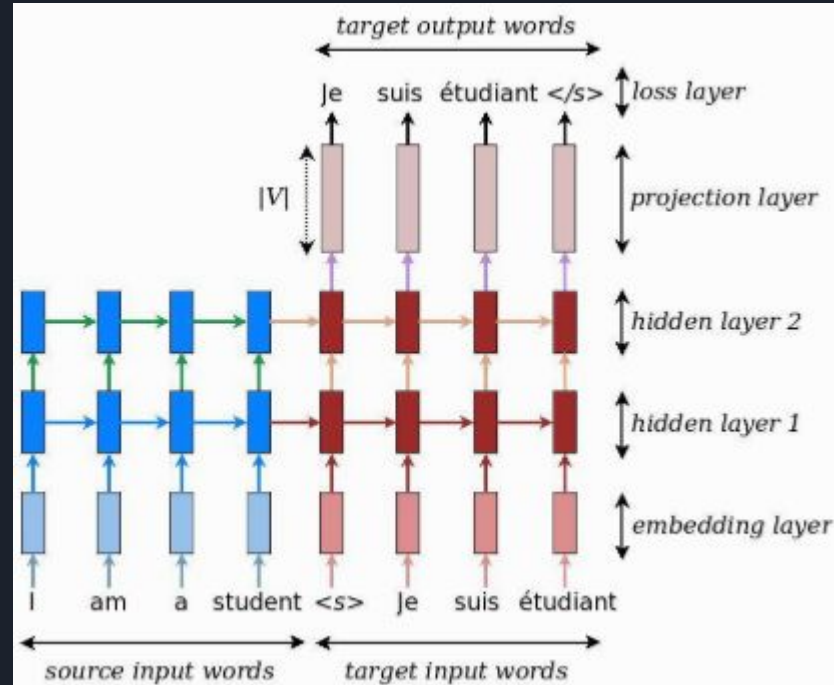
Training:

He passed the cup to @entity24 and motioned for him to drink

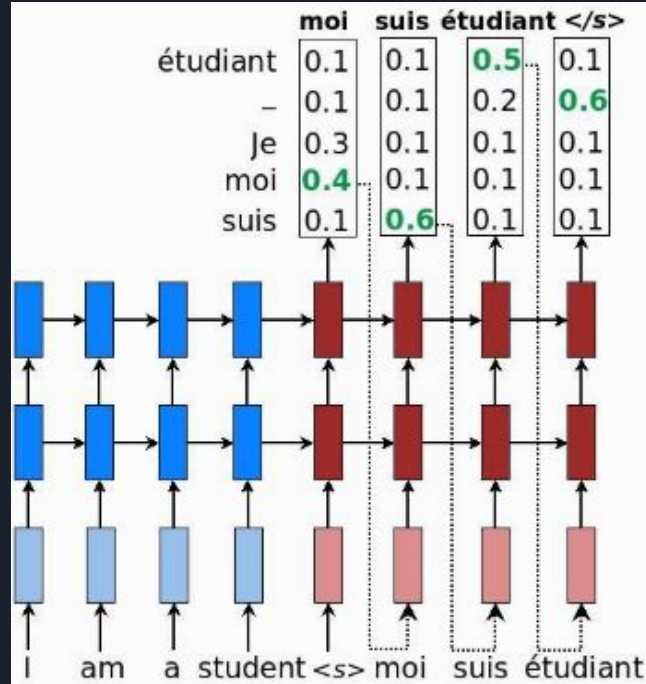
Test:

“Who still needs a drink? Here, @entity24 take this cup.”

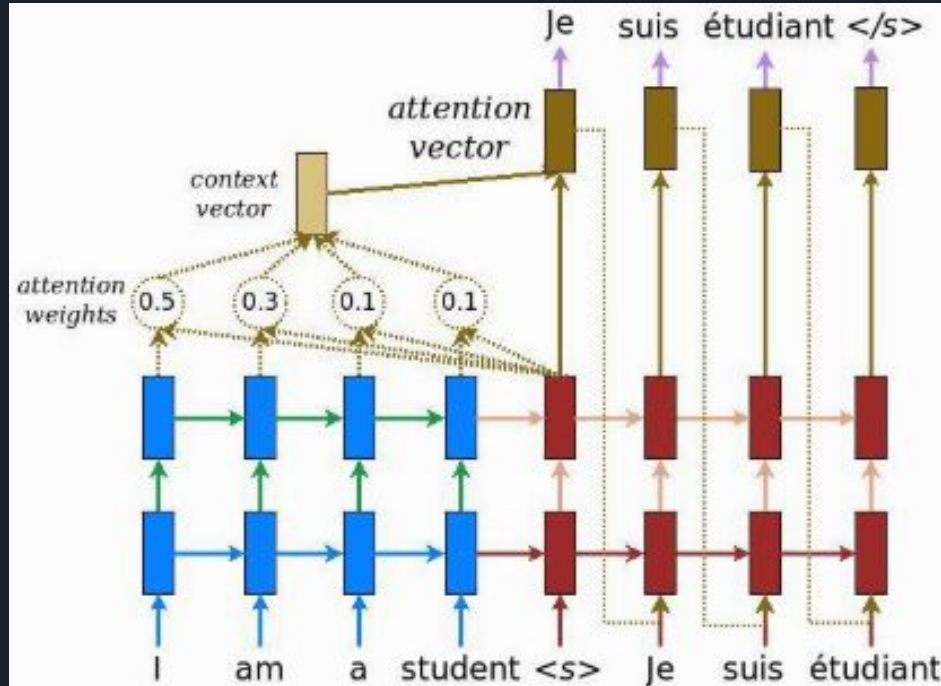
# Seq2Seq - Training



# Seq2Seq - Inference



# Seq2Seq - Attention mechanism



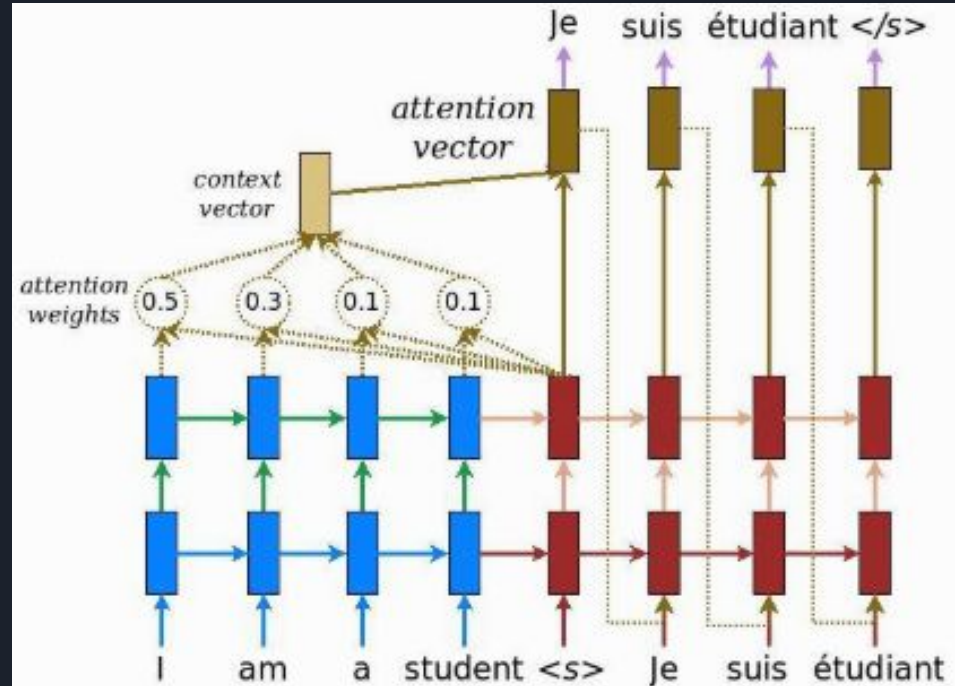
# Seq2Seq - Attention mechanism

$$\alpha_{ts} = \frac{\exp(\text{score}(h_t, h_s))}{\sum_{s'} \exp(\text{score}(h_t, h_{s'}))}$$

$$c_t = \sum_s \alpha_{ts} h_s$$

$$a_t = \tanh(W_c[c_t; h_t])$$

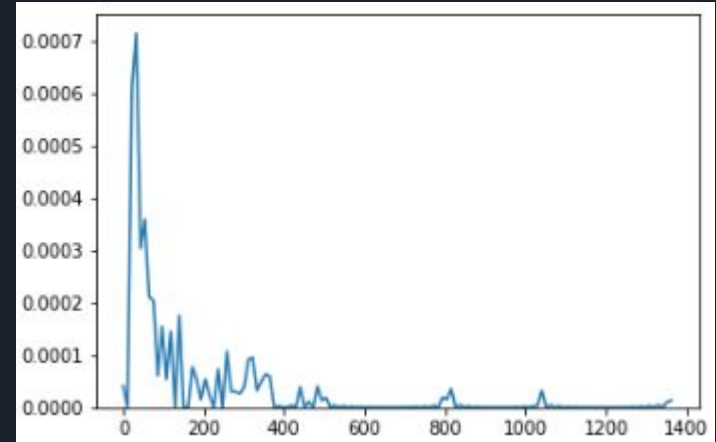
$$\text{score}(h_t, h_s) = h_t^T W h_s$$



# Seq2seq - Best Practices

Each batch must be the same length to use tensors

```
batched_dataset = dataset.apply(  
    tf.contrib.data.group_by_window(  
        key_func,  
        reduce_func,  
        batch_size))
```





# RESULTS AND METRICS

- Bleu measures precision: how much the words (and/or n-grams) in the machine generated answers appeared in the human reference answers.
- Rouge measures recall: how much the words (and/or n-grams) in the human reference answers appeared in the machine generated answers.





## Results (validation / test)

	Bleu-1	Bleu-4	Rouge-L
Seq2seq (no context)	16.10 / 15.89	1.40 / 1.26	13.29 / 13.15
Attention Sum Reader	<b>23.54 / 23.20</b>	<b>5.90 / 6.39</b>	<b>23.28 / 22.26</b>
Oracle IR - Rouge-L given answer and length	52.94 / 54.14	27.18 / 28.18	59.09 / 59.92
Humans	44.24 / 44.43	18.17 / 19.65	57.17 / 57.02
Seq2seq with Luong attention and 3 sentence context	11.01 / 8.50	0.0 / 0.0	9.9 / 8.30

Code!





# Google Cloud

```
tf.gfile.GFile("gs://my_bucket/data/train.csv")
```

```
tensorboard --logdir=gs://my_bucket/model/train_logs
```

Load code as a python package to Google cloud storage

All input and output is accessed by gcs buckets

Can automate hyperparameter tuning



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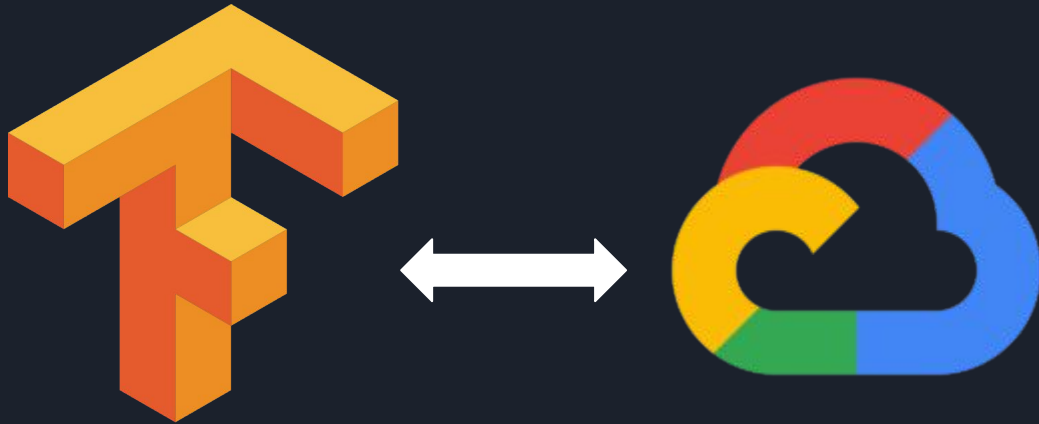
Can automate hyperparameter tuning

```
{  
  "goal": enum(GoalType),  
  "params": [  
    {  
      object(ParameterSpec)  
    }  
  ],  
  "maxTrials": number,  
  "maxParallelTrials": number,  
  "hyperparameterMetricTag": string,  
  "resumePreviousJobId": string,  
  "enableTrialEarlyStopping": boolean,  
  "algorithm": enum(Algorithm)  
}
```



# Lessons learned

~50 failed models





# Future Experiments

Span prediction methods

Better IR preprocessing

paper's best performing models used 2,000 / 4,000 word contexts

Character and narrative vector representations

Feuding Families and Former Friends: Unsupervised Learning for Dynamic  
Fictional Relationships : <https://www.aclweb.org/anthology/N16-1180>

Coreference resolution of named entities

Knowledge graph of story