## **End-to-End Non-Factoid**

# **Question Answering with an Interactive Visualization of Neural Attention Weights**



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A modular, extensible framework to visualize and compare attention mechanisms in (nonfactoid) question answering

### Non-Factoid Question Answering

- Questions that do not necessarily ask about facts; can often be answered with opinions, experiences, descriptions...
- We search for *existing* content on the web that can answer the question (e.g. by searching in CQA platforms)

#### **Task: Answer Selection**

- Given a question and a set of candidate answers, we rank the candidates for relevancy according to the question
- Attention-based models achieve state-of-the-art results

#### Challenge

- Understanding strengths and weaknesses of particular attention mechanisms is important
- Researchers usually plot attention weights for a number of predefined Q/A pairs within a dataset
- This is not interactive and makes the direct comparison of different approaches time-consuming



### Approach

- We use ElasticSearch to index all answers of a dataset
- For an input question we query this index to obtain a set of candidate answers

#### Extensibility

- Our service implementation can easily be extended with new datasets through public interfaces
- We include readers for InsuranceQA and Stack-Exchange

#### **Candidate Ranking** (4)

#### Approach

- We re-rank all candidates with (attention-based) NNs
- The results include attention weights for *every Q/A pair*
- $\rightarrow$  Question attention can be different for each answer

#### Extensibility

• The service implementation includes an extensible answer

selection framework based on TensorFlow

YAML files (see the example on the right)

(dataset, model, training, evaluation)

#### **YAML Configuration:**

- data-module: data.insuranceqa.v2
- model-module: model.ap\_lstm
- training-module: training.dynamic
- evaluation-module: evaluation.default
- data:
  - embeddings: data/glove.6B.100d.txt

#### **Our Contributions**

- 1. We present a framework for the **interactive exploration** of different attention-based models
  - By transforming models to end-to-end QA systems
  - Supports one-way-, two-way-, and self-attention
- 2. Our UI allows **comparing** different approaches side by side

## **Software Release**

- The source code of our framework is **pub**licly available on GitHub
- Includes a short documentation and an **API** reference

https://github.com/UKPLab/acl2017-non-factoid-qa



insuranceqa: data/insuranceQA lowercased: true • All components can freely be swapped and combined 1011 model: 12• The framework is highly configurable through external lstm\_cell\_size: 141 13margin: 0.2 14trainable\_embeddings: true 1517training: 18 batchsize: 20 epochs: 100 2021save\_folder: checkpoints/ap\_lstm 22dropout: 0.3 23optimizer: adam 24initial\_learning\_rate: 0.001 25scorer: accuracy 262728evaluation: skip: true



	Choose between models	
	QA with Attention Visualization	
	is it possible to deduct health insurance from tax ?	<b>A</b> ****
	✓ Transparency Sensitivity (0.5):	
***	SELECTED ANSWER       Importance:         0.25908803939819336         that is a great question ! there are circumstances that will allow you to deduct your health insurance         premiums on your taxes . being self employed , medical payments that are a significant portion of your         income , being a couple . with any question about taxes , i strongly encourage you to seek the advice of a tax professional who can give you the right advice for you . thank you for asking !         Compare weights ▼	
	OTHER TOP-RANKED CANDIDATES	
	in some situations you are allowed to deduct health insurance premiums on your tax return. the most common method is for those with self employed income and it they file a schedule c. there is a place on the form to enter your health insurance premiums and deduct them from your self employed income.	
	<mark>generally a self employed</mark> person is able to <mark>deduct health insurance</mark> if he or she pays the premium . there are other circumstances where health insurance can be deductible, such as a person paying there	

Is it possible to deduct health insurance from tax ?			
✓ Transparency Sensitivity (0.5): ● Threshold	(0.5):		
WEIGHT COMPARISON × CLOSE			
LW-BiLSTM (Rücklé & Gurevych, IWCS 2017)	Attentive Pooling (Dos Santos et al. Apylin 2016) Importance: 0.12973786890506744		
is it possible to deduct health insurance from tax ?	is it possible to deduct health insurance from tax ?		
that is a great question ! there are circumstances that will allow you to deduct your health insurance premiums on your taxes . being self employed , medical payments that are a significant portion of your income , being a couple . with any question about taxes , i strongly encourage you to seek the advice of a tax professional who can give you the right advice for you . thank you for asking !	that is a great question ! there are circumstances that will allow you to deduct your health insurance premiums on your taxes . being self employed , medical payments that are a significant portion of your income , being a couple . with any question about taxes , i strongly encourage you to seek the advice of a tax professional who can give you the right advice for you . thank you for asking !		

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