Exploring Argument Retrieval with Transformers

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The Task, the Data and the Results

(1) The Task: First Touché Shared Task on Argument Retrieval

(2) The Data:

- ❑ indexing: *387,740 documents* to index from the *args.me* corpus
- ❑ judging: *50 topics*; fully formed sentences in the interrogative mood

(3) The Results:

Model	nDCG@5	nDCG@10	nDCG	QrelCoverage@10
GPT-2	**0.808**	0.586	0.378	5.70
Baseline (DirichletLM)	0.756	—	—	—
BERT	0.755	0.538	0.337	5.36
Team Aragorn	0.684	—	—	—
USE (L2)	0.598	0.397	0.285	4.16
Team Zorro	0.573	—	—	—
USE (IP)	0.527	0.36	0.275	3.82

Query Expansion with Transformers

(1) Query expansion with GPT-2

(2) Query expansion with BERT

Common to both approaches:

- ❏ No task-specific pre-training or finetuning

- ❏ No preprocessing of the corpus

- ❏ Retrieval from the *args.me* corpus with DirichletLM

- ❏ **Original queries are discarded**

Query Expansion with GPT-2

Guiding thought: Use a transformer decoder trained on language modeling to hallucinate documents that read as though they might have come from the args.me corpus

Method: Augment the original query with argumentative context and use that to seed GPT-2

Positive Prompt	Negative Prompt	Neutral Prompt
- What do you think? **\<query\>** - Yes because . . .	- What do you think? **\<query\>** - No because . . .	- What do you think? **\<query\>** - I don't know . . .
- What do you think? **\<query\>** - The answer is yes . . .	- What do you think? **\<query\>** - The answer is no . . .	- What do you think? **\<query\>** - Not sure . . .

Query Expansion with GPT-2: Example

"Can alternative energy effectively replace fossil fuels?"

❏ **Yes, because** *it has proven to be a significant and lasting improvement in fuel efficiency, carbon neutrality. The only other thing that could possibly help this energy is the need for nuclear reactors at low cost which would require more than 20 percent of current generation electricity by 2030 (currently under construction), plus less renewable resources like wind or solar power as well but with sufficient amounts of coal/solar panels if there are enough* [sic]

❏ **No, because** *there is no evidence for that. There are a few possible alternative energy options available to people who would like to cut down fossil fuels, and I believe those include wind or solar power."The main thing we want in our future climate policies has to be better use of resources instead on these things than if they weren't used at the moment," said Kieferlein. "We need clean air* [sic]

❏ **Not sure.** *However, many scientists have made the point that alternative sources of power are already producing more carbon emissions than they would otherwise (and it seems like such a small number in our country). There has been some debate about whether this was actually true or if there simply wasn't much coal available at all to replace fossil fuels and other forms thereof as an environmentally sustainable form. . . In fact, recent studies suggest we* [sic]

Query Expansion with BERT

Guiding thought: Use a transformer encoder trained on masked language modeling to generate a list of thematically relevant keywords

Method: Augment the original query with argumentative context and have the MLM fill in the blanks with the *top k* most likely candidate words

Stance	Prompt
Positive	- What do you think? `<query>` - Yes, because of `[MASK]` and the benefits of `[MASK]`.
	- What do you think? `<query>` - Absolutely, I think `[MASK]` is good!
	- What do you think? `<query>` - Yes, `[MASK]` is associated with `[MASK]` during `[MASK]`.
Negative	- What do you think? `<query>` - No, because of `[MASK]` and the risk of `[MASK]` `[MASK]`.
	- What do you think? `<query>` - Absolutely not, I think `[MASK]` is bad!
	- What do you think? `<query>` - No, `[MASK]` is associated with `[MASK]` during `[MASK]`.
Neutral	- What do you think? `<query>` - What about `[MASK]` or `[MASK]`?
	- What do you think? `<query>` - Don't forget about `[MASK]`!

Query Expansion with BERT: Example

"Can alternative energy effectively replace fossil fuels?"

> *diesel, cost, nuclear, consumption, hydrogen, technologies, energy, future, electricity, pregnancy, coal, alternative, migration, emissions, efficiency, economics, technology, growth, wartime, earthquakes, green, environmental, accidents, costs, renewable, winter, development, pollution, new, stress, water, oil, accident, death, health, warming, sustainability, accidental, fires, competition*

Considerations and Takeaways

❏ **Theoretical:** Transformer models enable the understanding of a user query.

❏ **Experimental:**

  – Add argumentation awareness to the pipeline

  – Explore other architectures / pretraining tasks

❏ **Ethical:** Bias calcification