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COUGH: A Challenge Dataset and Models for COVID-19 FAQ Retrieval

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Information Retrieval & FAQ Retrieval

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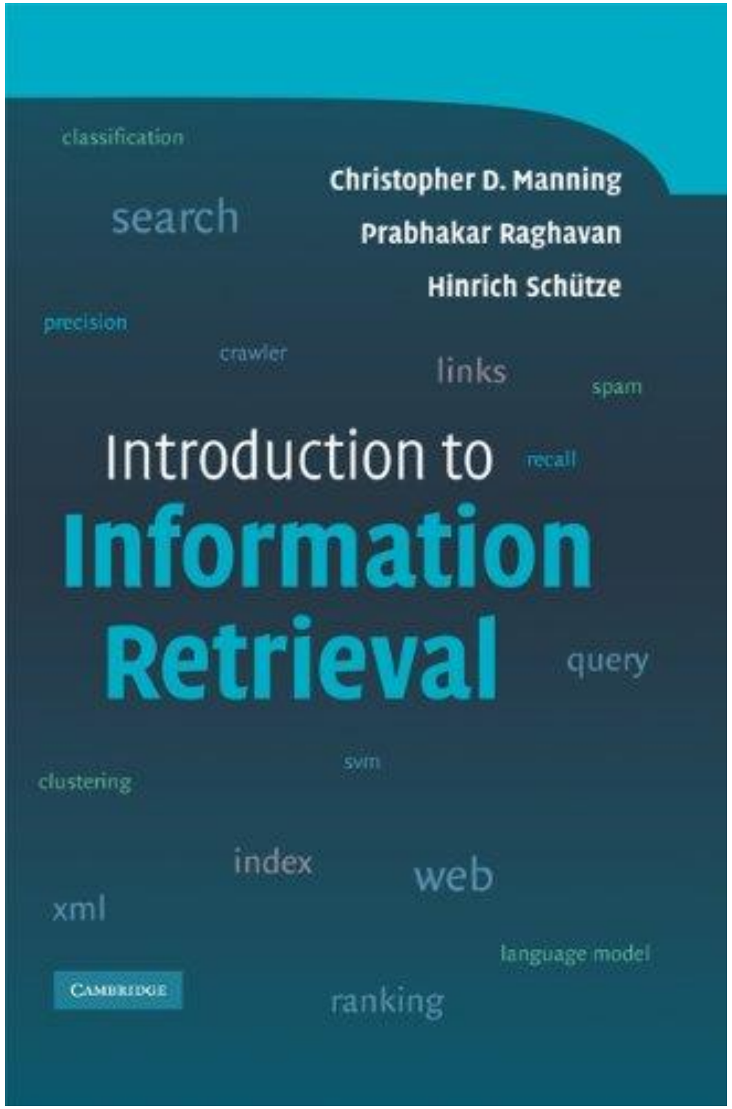

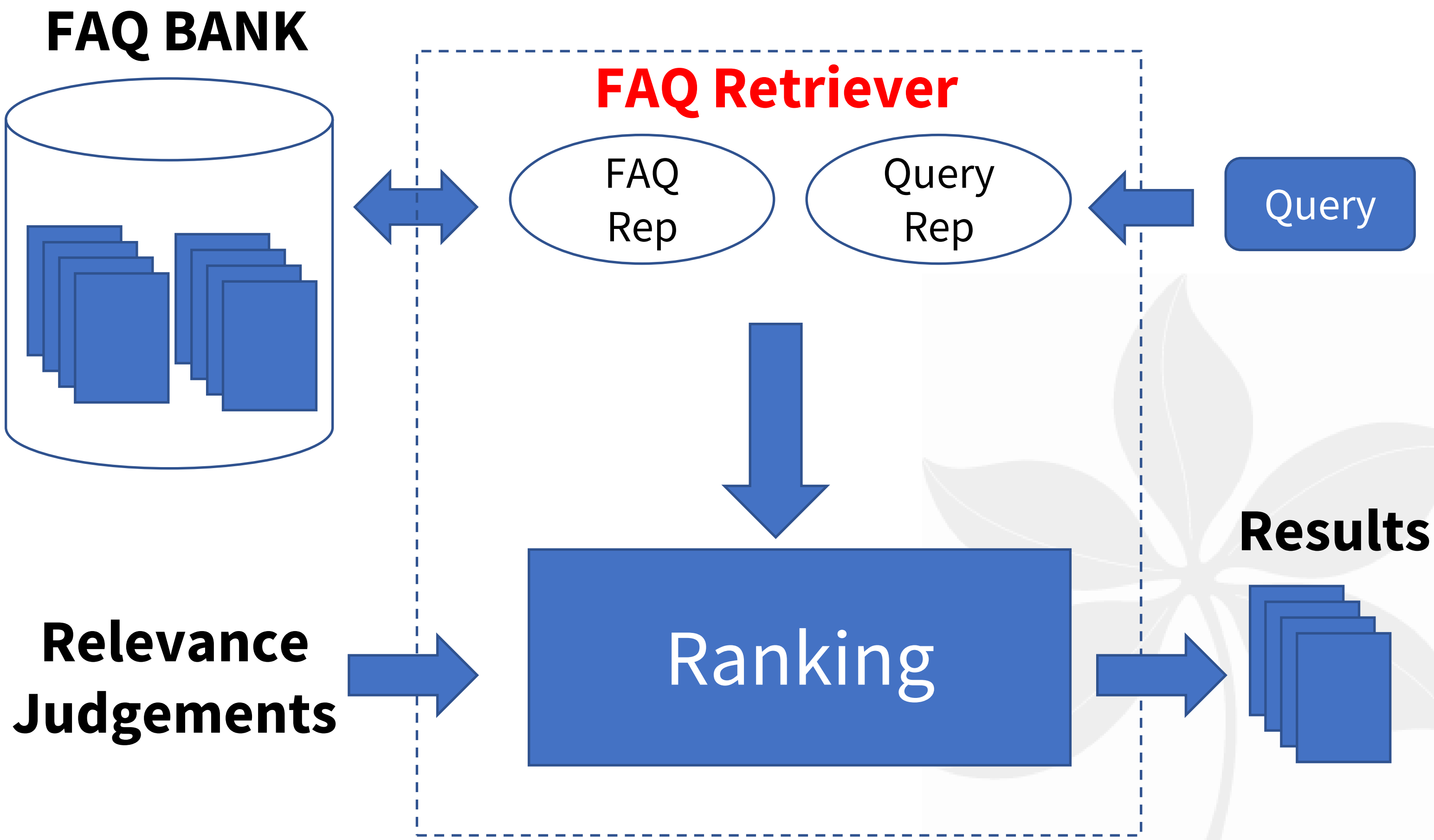

Related work on COVID-19 datasets

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CORD-19 (Wang et al., 2020)
CODA-19 (Huang et al., 2020)
COVID-Q (Wei et al., 2020)
Weibo-Cov (Hu et al., 2020)
COVID Twitter dataset
(Chen at al., 2020)
COVID-19 FAQ datasets
(Sun and Sedoc, 2020)
(Poliak et al., 2020)
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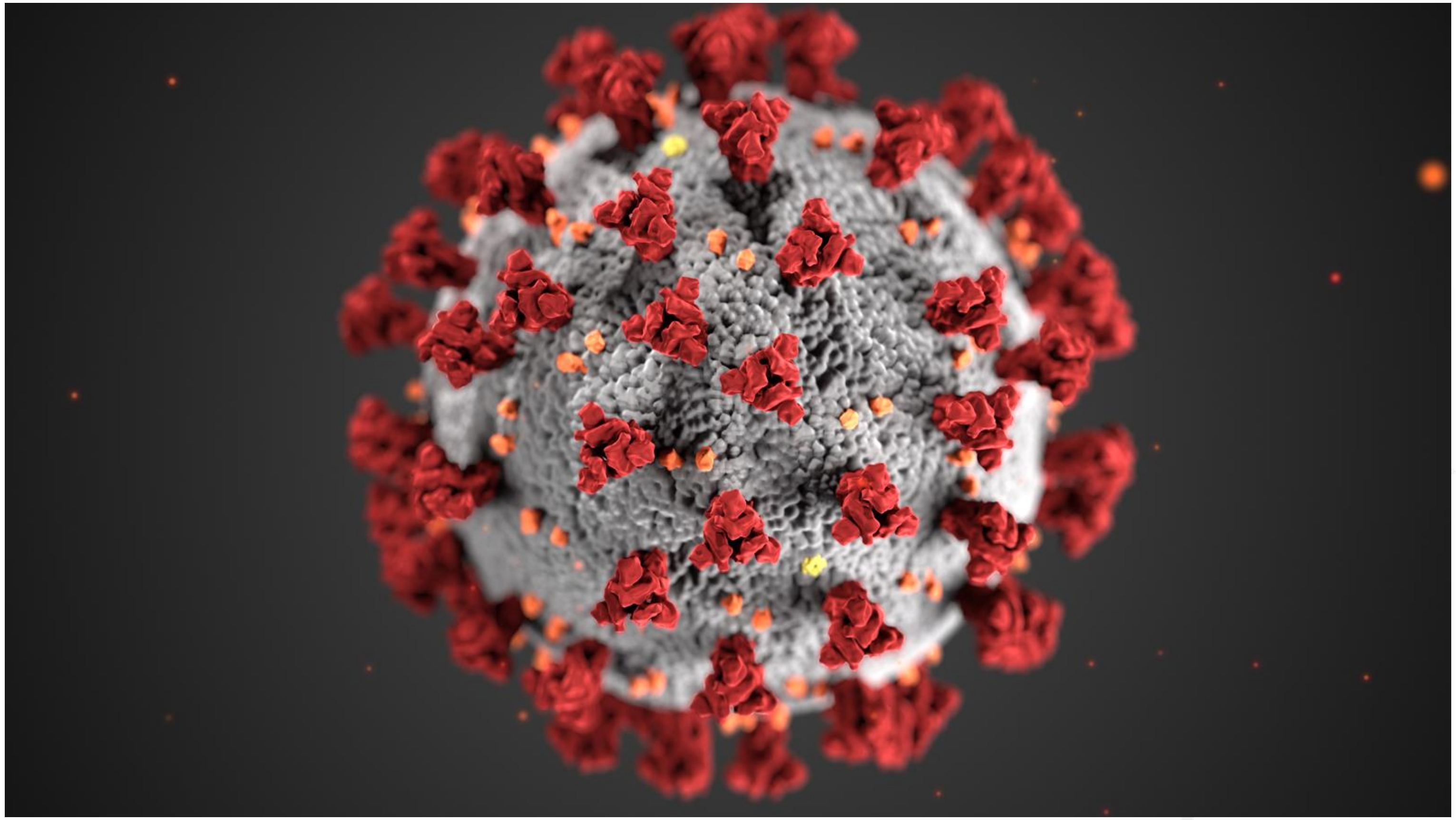
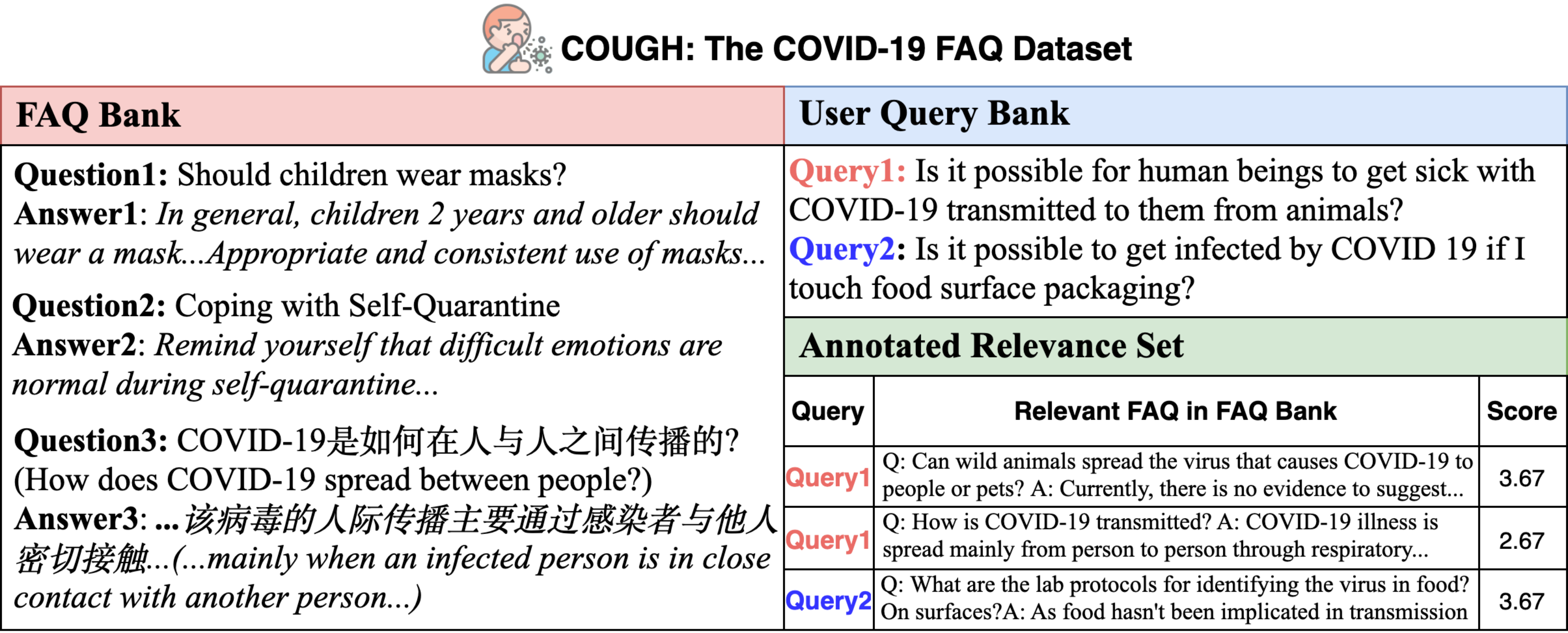


COUGH (Data Example)



COUGH: The COVID-19 FAQ Dataset

FAQ Bank

Question1: Should children wear masks?
Answer1: *In general, children 2 years and older should wear a mask...Appropriate and consistent use of masks...*

Question2: Coping with Self-Quarantine
Answer2: *Remind yourself that difficult emotions are normal during self-quarantine...*

Question3: COVID-19是如何在人与人之间传播的? (How does COVID-19 spread between people?)
Answer3: **...** *该病毒的人际传播主要通过感染者与他人密切接触...(...mainly when an infected person is in close contact with another person...)*

User Query Bank

Query1: Is it possible for human beings to get sick with COVID-19 transmitted to them from animals?
Query2: Is it possible to get infected by COVID 19 if I touch food surface packaging?

Annotated Relevance Set

Query	Relevant FAQ in FAQ Bank	Score
Query1	Q: Can wild animals spread the virus that causes COVID-19 to people or pets? A: Currently, there is no evidence to suggest...	3.67
Query1	Q: How is COVID-19 transmitted? A: COVID-19 illness is spread mainly from person to person through respiratory...	2.67
Query2	Q: What are the lab protocols for identifying the virus in food? On surfaces?A: As food hasn't been implicated in transmission	3.67

COUGH (Dataset Comparison)

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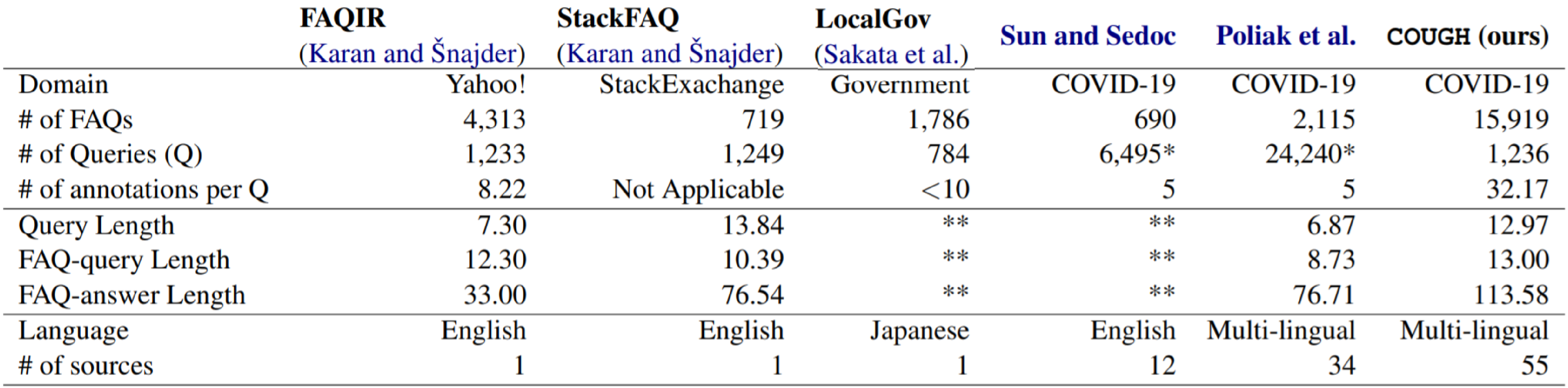

	FAQIR	StackFAQ	LocalGov			
	(Karan and Šnajder)	(Karan and Šnajder)	(Sakata et al.)	Sun and Sedoc	Poliak et al.	COUGH (ours)
Domain	Yahoo!	StackExachange	Government	COVID-19	COVID-19	COVID-19
# of FAQs	4,313	719	1,786	690	2,115	15,919
# of Queries (Q)	1,233	1,249	784	6,495*	24,240*	1,236
# of annotations per Q	8.22	Not Applicable	<10	5	5	32.17
Query Length	7.30	13.84	**	**	6.87	12.97
FAQ-query Length	12.30	10.39	**	**	8.73	13.00
FAQ-answer Length	33.00	76.54	**	**	76.71	113.58
Language	English	English	Japanese	English	Multi-lingual	Multi-lingual
# of sources	1	1	1	12	34	55

Comparison of COUGH with representative counterparts.

*: Extracted from existing resources (e.g., COVID-19 Twitter dataset (Chen et al., 2020)).

**: Not Applicable, either not in English or not publicly available.

COUGH (Dataset Analysis)

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Varying Query Forms

- Question form
  - Interrogative
  - Usually related to general information about the virus.
- Query String form
  - Declarative
  - Search for more specific instructions concerning COVID-19 (e.g., healthy diet during pandemic).
- Forum form
  - Scrapped from medical forums.

Answer Nature

- Lengthy
  - FAQ-Answer length: 113.58
  - Longer than those in prior datasets.
- Noisy
  - Contain contents not directly pertinent to query.
  - E.x. Answer to the query “What is novel coronavirus" contains extra information about comparisons with other viruses.
- Manifest difficulties of FAQ retrieval in real scenarios.

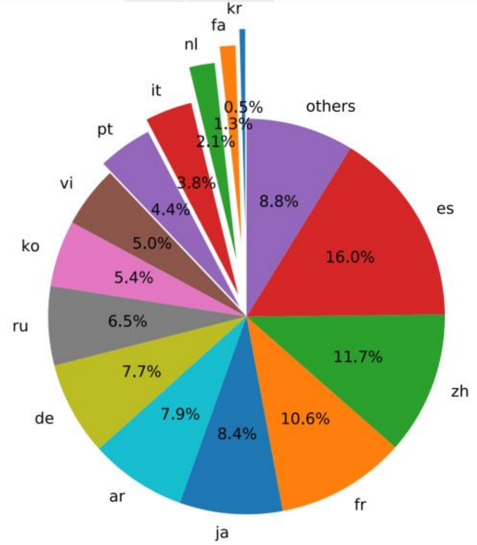
Large-scale Relevance Annotation

- 32.17 annotated FAQs per query.
  - Existing FAQ datasets overlooked annotation scale.
  - Reduce the chance of missing true positive tuples.
- Each <Query, FAQ item> tuple annotated by ≥3 people.
  - Reduce the variance and bias in annotation.
- Annotation done on a Likert scale.
  - Matched (4), Useful (3), Useless (2) and Non-relevant (1)

Multilinguality

- 6768 Non-English FAQs
  - Varying Query Forms
    - Question (3396)
    - Query String (3372)
- 18 non-English languages

  Spanish, Chinese, French, Japanese, Arabic, German, Russian, Korean ……



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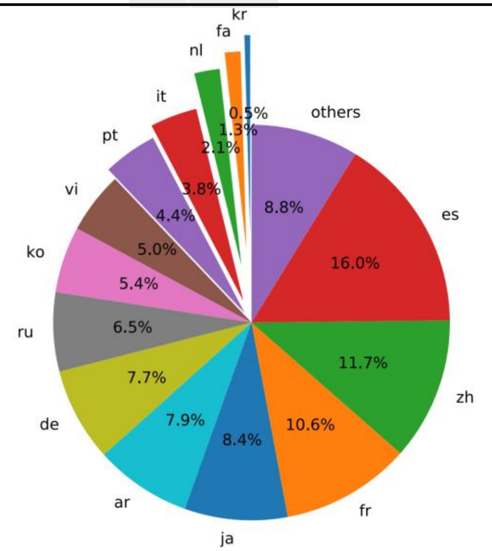

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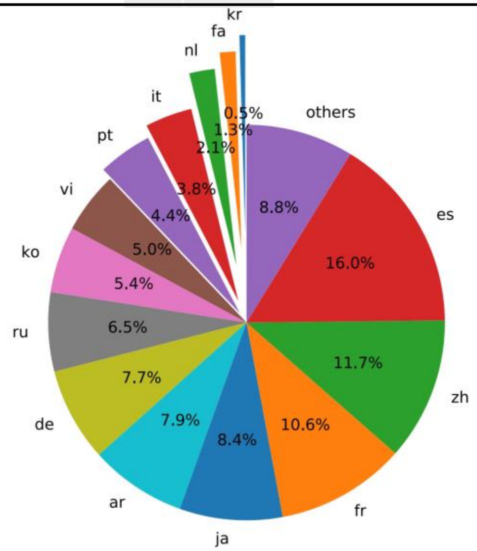

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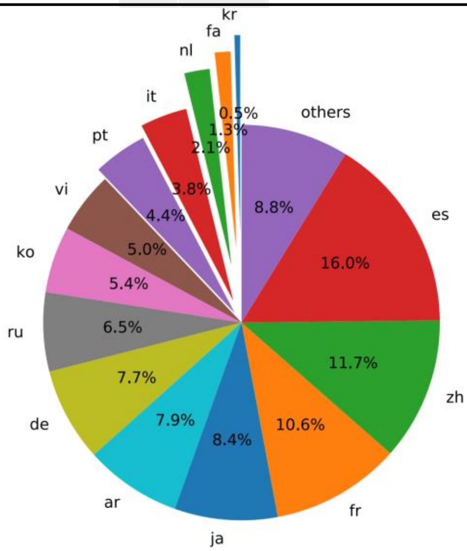
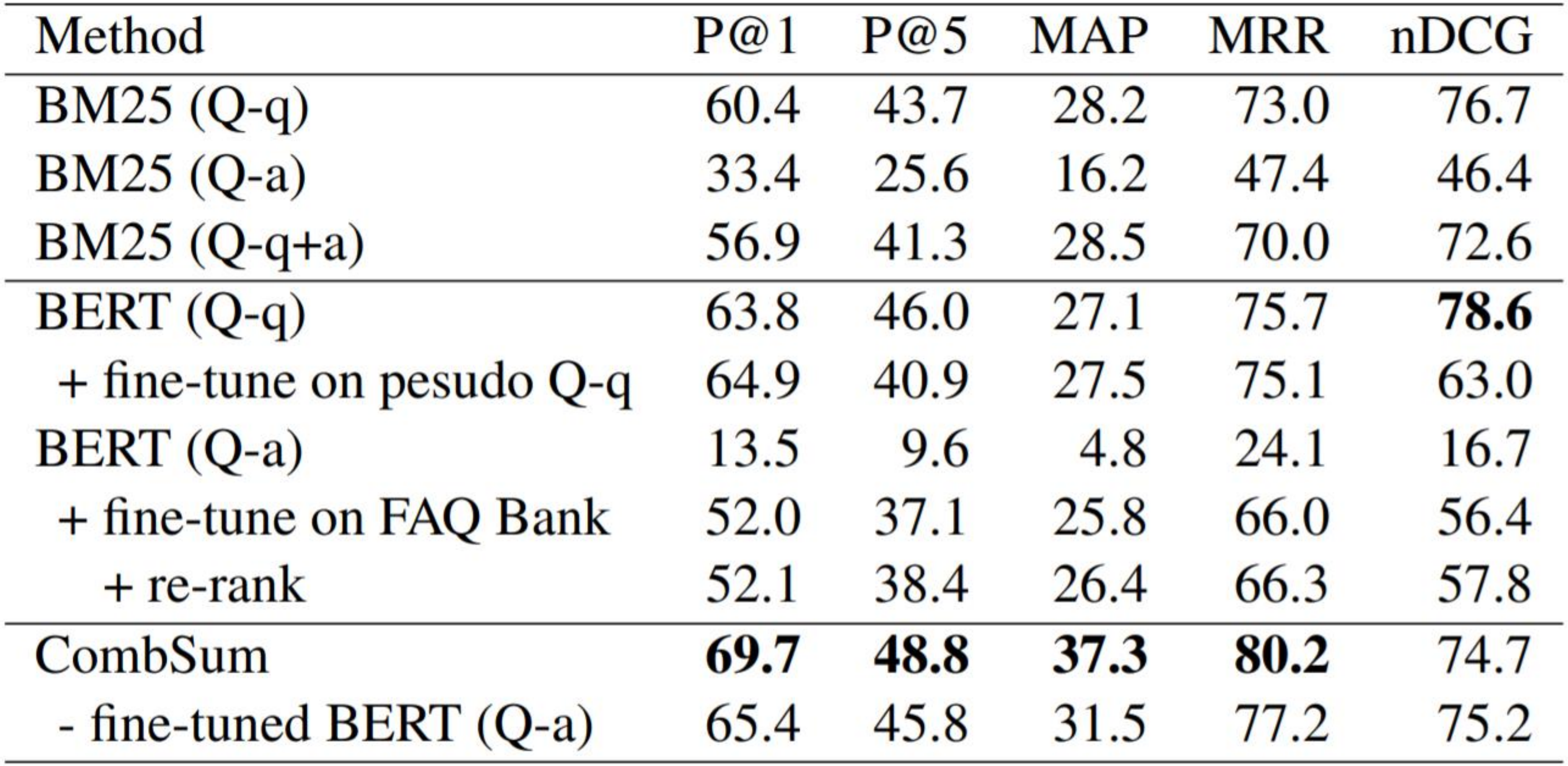


Experimental Results



Method	P@1	P@5	MAP	MRR	nDCG
BM25 (Q-q)	60.4	43.7	28.2	73.0	76.7
BM25 (Q-a)	33.4	25.6	16.2	47.4	46.4
BM25 (Q-q+a)	56.9	41.3	28.5	70.0	72.6
BERT (Q-q)	63.8	46.0	27.1	75.7	**78.6**
+ fine-tune on pesudo Q-q	64.9	40.9	27.5	75.1	63.0
BERT (Q-a)	13.5	9.6	4.8	24.1	16.7
+ fine-tune on FAQ Bank	52.0	37.1	25.8	66.0	56.4
+ re-rank	52.1	38.4	26.4	66.3	57.8
CombSum	**69.7**	**48.8**	**37.3**	**80.2**	74.7
- fine-tuned BERT (Q-a)	65.4	45.8	31.5	77.2	75.2

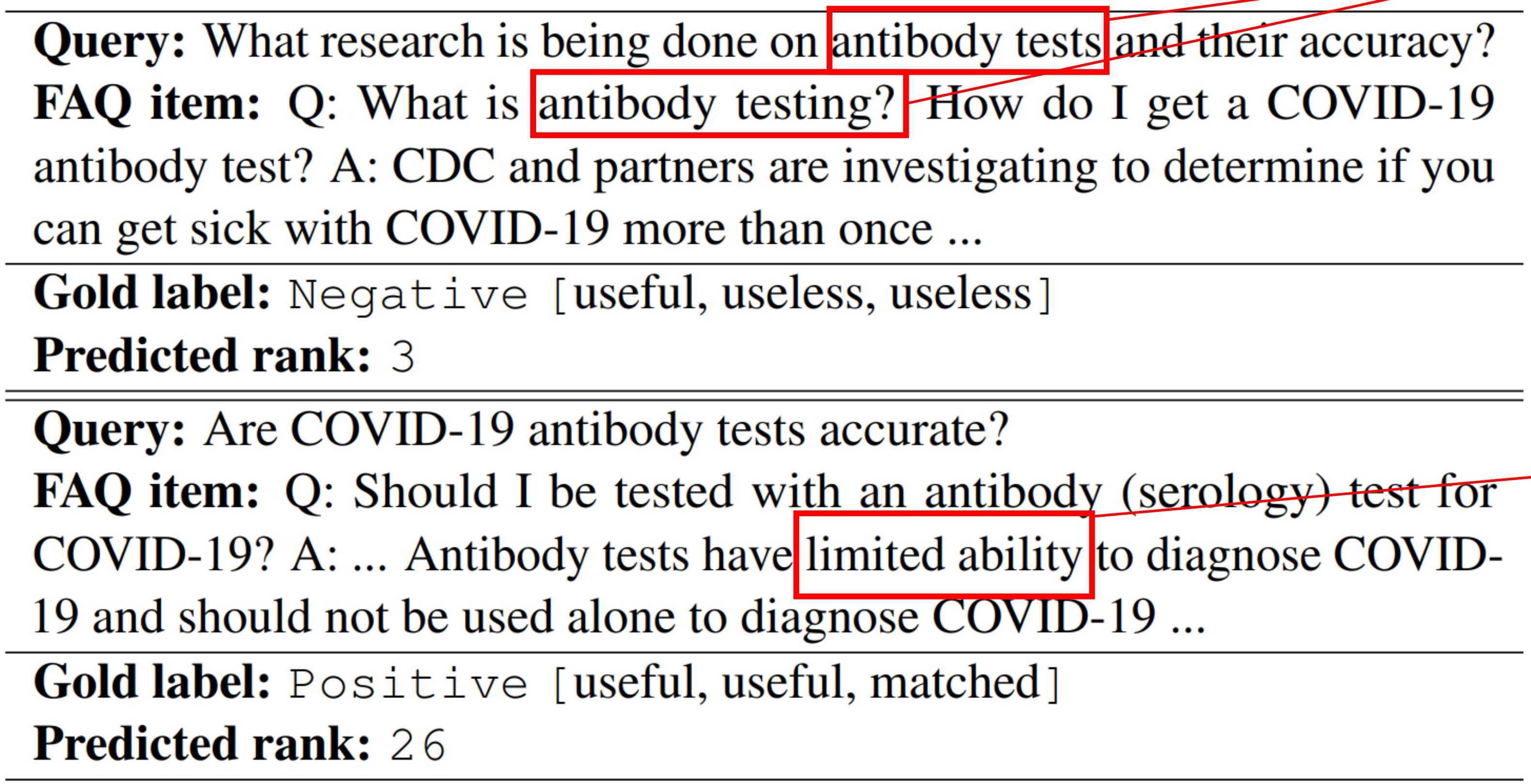
Evaluation results on COUGH (average of 5 runs).

Observations

- Q-q mode consistently performs better than Q-a mode.
- Utilizing the cross-encoder for re-ranking can yield better results.
- Fine-tuning under the Q-a mode can improve the performance.
- Removing fine-tuned BERT (Q-a) from CombSum hurts the performance.

Qualitative Analysis

Observation: Fine-tuning under the Q-q mode using synthetic data hurt the performance.



Query: What research is being done on antibody tests and their accuracy?
FAQ item: Q: What is antibody testing? How do I get a COVID-19 antibody test? A: CDC and partners are investigating to determine if you can get sick with COVID-19 more than once ...

Gold label: `Negative` [useful, useless, useless]
Predicted rank: `3`

Query: Are COVID-19 antibody tests accurate?
FAQ item: Q: Should I be tested with an antibody (serology) test for COVID-19? A: ... Antibody tests have limited ability to diagnose COVID-19 and should not be used alone to diagnose COVID-19 ...

Gold label: `Positive` [useful, useful, matched]
Predicted rank: `26`

Biased towards responses with similar texts.

Fails pragmatic reasoning: “limited ability” => “results are not accurate for diagnosing COVID-19”.

Case analyses with fine-tuned BERT (Q-q). Human annotations are inside [].

Wrap-up

- We introduce COUGH, a large challenging dataset for COVID-19 FAQ retrieval.

- COUGH features varying query forms, long and noisy answers, and multilinguality, as well as serving as a better evaluation benchmark because of high-quality larger-scale relevance annotations.

- Our comprehensive experiments expose limitations of current FAQ retrieval models.

Thanks!

Dataset is available at:

https://github.com/sunlab-osu/covid-faq

Contact: xlfzhang@umich.edu/zhang.9975@osu.edu, sun.397@osu.edu