

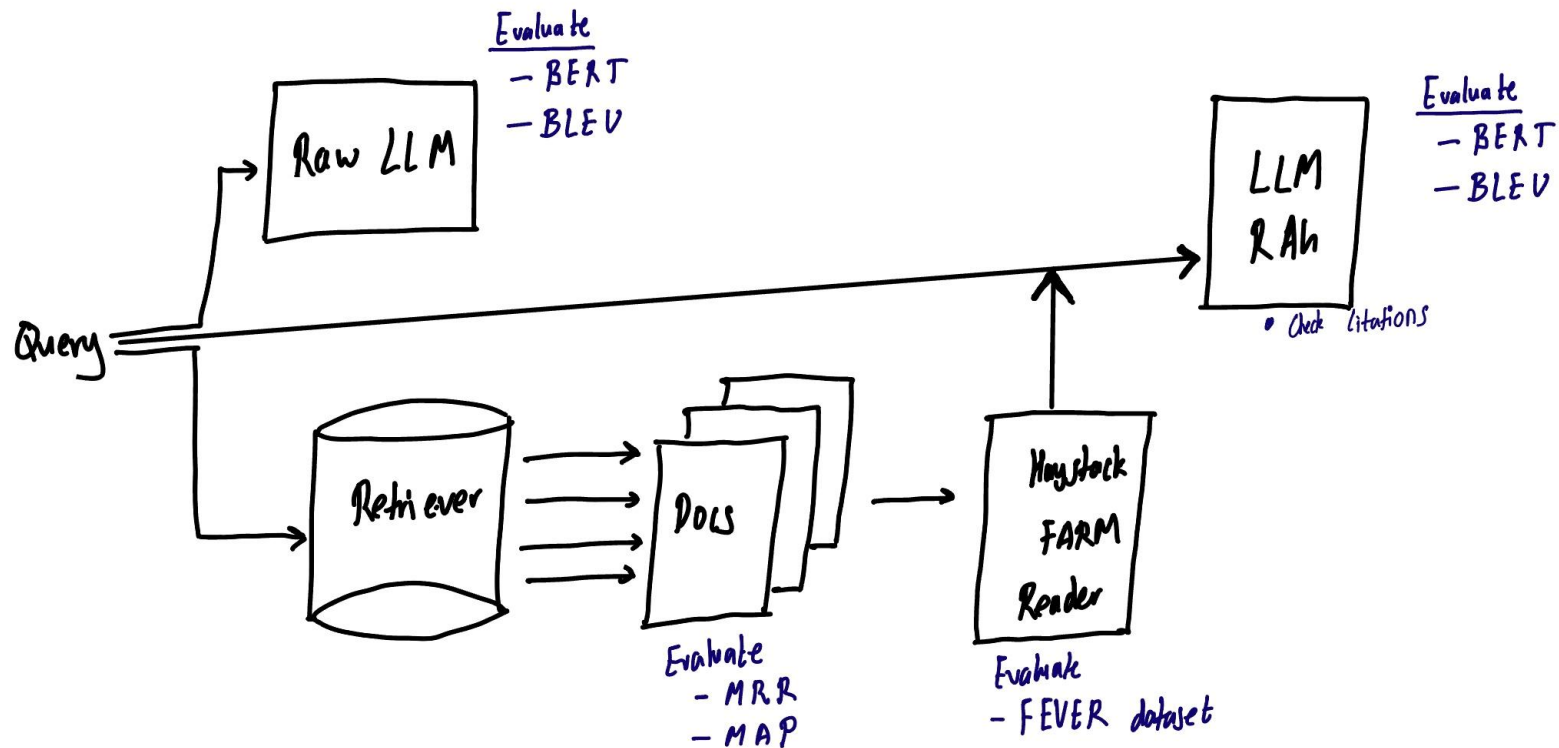
Looksy - Team News Verifiers

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Problem Statement

How can we develop an LLM-based information retrieval system, specifically focusing on Singaporean news, that accurately verifies the authenticity of news content and combat the spread of fake news?

Pipeline



Dataset

- The Straits Times articles from 2022
- ElasticSearch Document Store (inverted index)

	url	datetime	headline	article
0	https://www.straitstimes.	2022-04-06T15:54:56+08:00	Citizen archivist: Making historical records more accessible to the public	"The newly launched Citizen Archivist Project by the
1	https://www.straitstimes.	2022-04-05T12:58:38+08:00	China fillip put Singapore share investors in good cheer	"SINGAPORE - The local market started the week with
2	https://www.straitstimes.	2022-08-10T12:02:25+08:00	Red Lions controversy: 5 things to know about the two groups contesting	"In an embarrassing U-turn, it has since dropped its
3	https://www.straitstimes.	2023-10-03T16:38:53+08:00	Remembering Lee Kuan Yew: The greatest Chinese outside mainla	"On his regular visits to Hong Kong, Mr Lee Kuan Yew
4	https://www.straitstimes.	2022-01-16T11:30:16+08:00	My five hours in the Padang queue which is Mr Lee's SG50 heart m	"On Sunday night, I found some old YouTube videos of
5	https://www.straitstimes.	2022-04-05T12:58:38+08:00	Singapore shares end higher on improved sentiments	"SINGAPORE - The benchmark Straits Times Index
6	https://www.straitstimes.	2022-04-05T12:58:38+08:00	Singapore shares ease after benchmark index hits 52-week high	"SINGAPORE - A lull has settled in on the local market,
7	https://www.straitstimes.	2022-01-04T18:40:33+08:00	Two dead, three sent to hospital after fire at Lorong 6 Geylang building	"SINGAPORE - Two workers died after a blaze broke
8	https://www.straitstimes.	2022-04-11T11:56:01+08:00	Slight haze in Singapore on Friday evening	"SINGAPORE - Slight haze clouded Singapore on Friday,
9	https://www.straitstimes.	2022-04-05T12:58:38+08:00	Singapore shares slip marginally over unease at US economy	"SINGAPORE - The local stock market closed marginally

Test set

- 29 questions

question	answer
Who is the Prime Minister of Singapore?	The Prime Minister of Singapore is Lee Hsien Loong.
What is the top university in Singapore?	The National University of Singapore (NUS) is often ranked as the top university in Singapore.
What's the climate like in Singapore this time of year?	Singapore has a tropical rainforest climate with no distinctive seasons, uniform temperature, and high humidity.
How does scamming affect victims' mental health in Singapore?	Victims of scams in Singapore often suffer from mental health issues alongside financial losses.
How did Singapore fare against Japan in the recent badminton championship?	Singapore beat Japan 3-2 in the Asia Team Championships, moving closer to a medal.
What's the new scheme for Covid-19 swabs in Singapore?	A new scheme in Singapore offers 3,500 people free Covid-19 swabs at test centres.
What is the focus of Singapore's Budget 2022?	Budget 2022 aims to chart Singapore's 'new way forward together', focusing on recovery and growth post-pandemic.

Retrieval Technique

- 3 retrievers
 - TF-IDF retriever
 - Embedding retriever
 - BM25 retriever
- Evaluation metrics
 - Mean reciprocal rank
 - Mean average precision

Retriever Evaluation Results

- Assign relevance indicator to documents

Retriever	Mean Reciprocal Rank	Mean Average Precision
TF-IDF	0.5174	0.4930
Embedding	0.6759	0.6158
BM25	0.7908	0.7181

Document Summarization using FARMReader

- ``roberta-base-squad2`` : A RoBERTa (encoder-only) model fine-tuned on the SQuADv2 dataset
- Given a query and documents, extract keywords/phrases with a score and context window

Reader Evaluation

- Evaluated against 20 hand-labelled claims from the FEVER2.0 dataset
- Goal: Check how many keywords the Reader is able to extract
- Metric: Precision

- e.g.

```
{  
  "index":2009, "id":95262, "verifiable":"VERIFIABLE", "label":"REFUTES",  
  "claim":"Eddie Guerrero did not experience substance abuse problems.",  
  "sources":["Eddie_Guerrero"],  
  "answers":[  
    "substance abuse", "alcoholism",  
    "addiction to painkillers", "addiction issues"  
  ]  
}
```

Generation

LLM:

- Vicuna-7b-v1.5 (from HuggingFace)
- Transformer-based, decoder-only
- Fine-tuned on user-shared conversation data (ShareGPT)
- Sample query: *How many people were arrested in connection with OCBC phishing scams?*

- Sample pred: `As an AI language model, I am unable to provide real-time data or specific numbers on the arrests and charges related to OCBC phishing scams. The most recent information I have access to is up until September 2021, and at that time, there were several arrests and charges related to phishing scams targeting OCBC customers. However, I cannot provide an exact number of how many people have been arrested and charged in connection with these sc`

LLM Output Verification

- Ask LLM to check its output with retrieved context

```
def get_prompt_context(question, context, prediction):  
    prompt = f"""  
    Question: {prompt_queries[0]}  
    Context: {prompt_context[0]}  
    Answer: The President of Singapore was Halimah Yacob  
    Given the above question and context, is the answer correct? Please return Yes or No.  
    Yes  
  
    Question: {prompt_queries[0]}  
    Context: {prompt_context[0]}  
    Answer: 'Nicole Seah'  
    For the above question, is the answer correct? Please return Yes or No.  
    No  
  
    Question: {question}  
    Context: {context}  
    Answer: {prediction}  
    For the above question, is the answer correct? Please return Yes or No.  
    """  
    return prompt
```

RAG 1: Extracted Keywords/ Phrases

Prompt:

Given the context and scores, answer the question in no more than 50 words. Context: {<list of extracted phrases>};

Question: {query};

Answer:

Sample: The number of people arrested and charged in connection with the OCBC phishing scams is not specified in the given context

RAG 2: Extracted context

Prompt

Given the context and scores, answer the question in 100 words or less. Context: {[<list of contexts>]};

Question: {query};

Answer: Thirteen people aged between 19 and 22 have been arrested and charged in connection with the OCBC phishing scams.</s>

RAG 3: QA with References

Prompt

Create a concise and informative answer (no more than 50 words) for a given question based solely on the given documents. You must only use information from the given documents. Use an unbiased and journalistic tone. Do not repeat text. Cite the documents using Doc[num] notation. If multiple documents contain the answer, cite those documents like 'as stated in Doc[num], Doc[num], etc.'. If the documents do not contain the answer to the question, say that 'answering is not possible given the available information.'

{[<list of contexts>]}

Question: {query}; Answer:

Sample: "Thirteen people aged between 19 and 22 have been arrested for their suspected involvement in the recent spate of scams targeting OCBC Ban. " (Doc[582])</s>

RAG Evaluation

Method	BLEU Score	BERT Score	Verification
Raw LLM	0.0366	0.8509	69%
1	0.0421	0.8716	89.7%
2	0.0535	0.8656	86.2%
3	0.0470	0.8524	86.2%

Final Output- Verified News

Question: Who is the Prime Minister of Singapore?

Answer:

News Verified!

The Prime Minister of Singapore is Lee Hsien Loong, as stated in Document[688], Document[1996], and Document[1774].

References:

- Document[688] : [President Halimah to attend official mourning of UAE president in Abu Dhabi](#)
- Document[1774] : [Brunei's Sultan Hassanal Bolkiah on two-day state visit to Singapore](#)
- Document[1996] : [PM Lee among top leaders to attend state funeral for ex-Japan PM Abe](#)

Final Output- Unverified News

Question: What's the new scheme for Covid-19 swabs in Singapore?

Answer:

News Unverified!

The new scheme for Covid-19 swabs in Singapore is not provided in the given documents.

Final Output- Verified News (Markdown Format)

****News Verified!****

The Prime Minister of Singapore is Lee Hsien Loong, as stated in Document[688], Document[1996], and Document[1774].</s>

References:

- Document[688] : [President Halimah to attend official mourning of UAE president in Abu Dhabi](<https://www.straitstimes.com/singapore/president-halimah-to-attend-official-mourning-of-uae-president-in-abu-dhabi>)
- Document[1774] : [Brunei's Sultan Hassanal Bolkiah on two-day state visit to Singapore](<https://www.straitstimes.com/singapore/bruneis-sultan-hassanal-bolkiah-on-two-day-state-visit-singapore>)
- Document[1996] : [PM Lee among top leaders to attend state funeral for ex-Japan PM Abe](<https://www.straitstimes.com/asia/east-asia/singapore-pm-lee-among-top-leaders-to-attend-state-funeral-for-ex-japan-pm-abe>)

Final Output- Slightly Complicated Output

Question: What are the key takeaways from the recent Singapore Airshow?

Answer:

News Verified!

The key takeaways from the recent Singapore Airshow include building new homes in Paya Lebar and attracting top talent, as stated in Document[1739] and [926]. Additionally, the new Airbus can be more fuel-efficient and easily deployed onto alternative routes, as stated in Document[376].

References:

- Document[376] : [SIA confirms order of 7 freight planes, 22 passenger aircraft engines as industry recovers](#)
- Document[926] : [Kranji Primary teachers go the extra mile to provide daily after-school programme](#)
- Document[1739] : [Morning Briefing: Top stories from The Straits Times on Aug 22](#)

Thank You