Keyword and Semantic Searches with ReRank

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Introduction

- Rerank:
  - A process used to improve the performance of both Dense Retrieval and Keyword Search by reordering or re-ranking search results to enhance relevance and accuracy
- Dense Retrieval:
  - In dense retrieval, documents and queries are represented as dense vectors in a high-dimensional vector space
- Keyword Search
  - A traditional search method that relies on keywords or terms to retrieve matching documents or data

Design

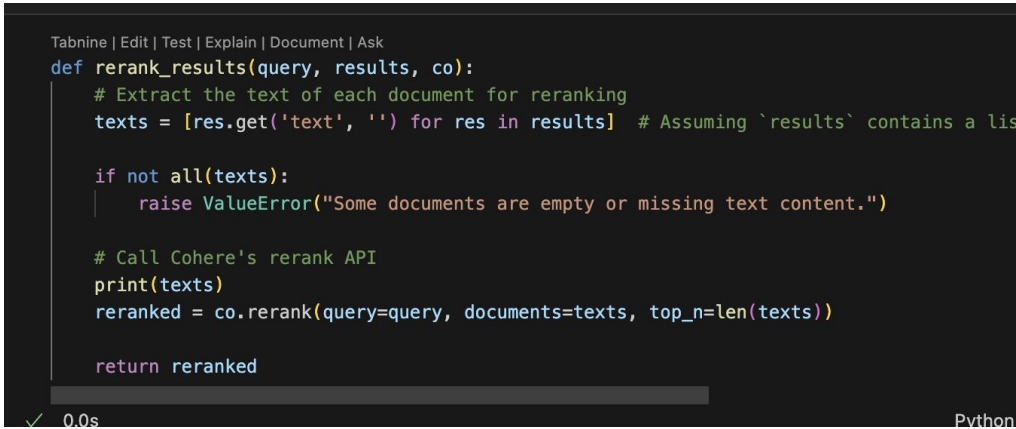
Keyword Search with 3 results

```
query = "What is the capital of Canada?"

response = client.query.get("Article", ["title", "text"]) \
    .with_hybrid(query=query, alpha=0.7) \
    .with_limit(3) \
    .do()

# Display results
for i, result in enumerate(response['data']['Get']['Article']):
    print(f"Result {i+1}:")
    print(f"Title: {result['title']}")
    print(f"Text: {result['text']}")
```

```
Result 1:
Title: Ottawa: The Capital of Canada
Text: Ottawa is the capital city of Canada, located in the province of Ontario.
Result 2:
Title: History of Canada
Text: Canada has a rich history, including its indigenous peoples and colonial past.
Result 3:
Title: Canada Geography
Text: Canada is the second-largest country in the world by land area.
```

Design

ReRank of the Keyword Search results



Design

Displaying reranked results

```python
# Display reranked results
print('Query:', query)
for i, result in enumerate(reranked_results.results):
    print(f"Rank {i+1}: {result.index} : {texts[i]} (Relevance Score: {result.relevance_s
```

Python

```
Query: What is the capital of Canada?
Rank 1: 0 : Ottawa is the capital city of Canada, located in the province of Ontario. (Releva
Rank 2: 1 : Canada is the second-largest country in the world by land area. (Relevance Score:
Rank 3: 2 : Canada has a rich history, including its indigenous peoples and colonial past. (R
```

Test and Results

```python
query = "capital of Canada"

response = client.query.get("Article", ["title", "text"]).with_bm25(query=query) \
    .with_limit(3) \
    .do()

# Display sparse retrieval results
for i, result in enumerate(response['data']['Get']['Article']):
    print(f"Result {i+1}:")
    print(f"Title: {result['title']}")
    print(f"Text: {result['text']}")
```

Python

```
Result 1:
Title: Ottawa: The Capital of Canada
Text: Ottawa is the capital city of Canada, located in the province of Ontario.
Result 2:
Title: History of Canada
Text: Canada has a rich history, including its indigenous peoples and colonial past.
Result 3:
Title: Canada Geography
Text: Canada is the second-largest country in the world by land area.
```

Conclusion

Some of the code doesn’t work due to version issues, so had to change some of the original code.

Github

https://github.com/emilywengster/sfbu/tree/c6ad49fdc67626ed05c7b2fb08e97f1e4386a85b/Generative%20AI/Fine-Tuning/Keyword%20and%20Semantic%20Searches%20with%20ReRank