DATS 6312

Natural Language Processing

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Final Project: Individual Report

by

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1. <u>Introduction</u>.

The project consisted of developing different learning resources for student using large language models, which consisted of the following pages:

- Arxiv Topic Modeling
- Document Upload Q&A
- Arxiv Q&A
- MediumBlink

2. <u>Description of your individual work</u>.

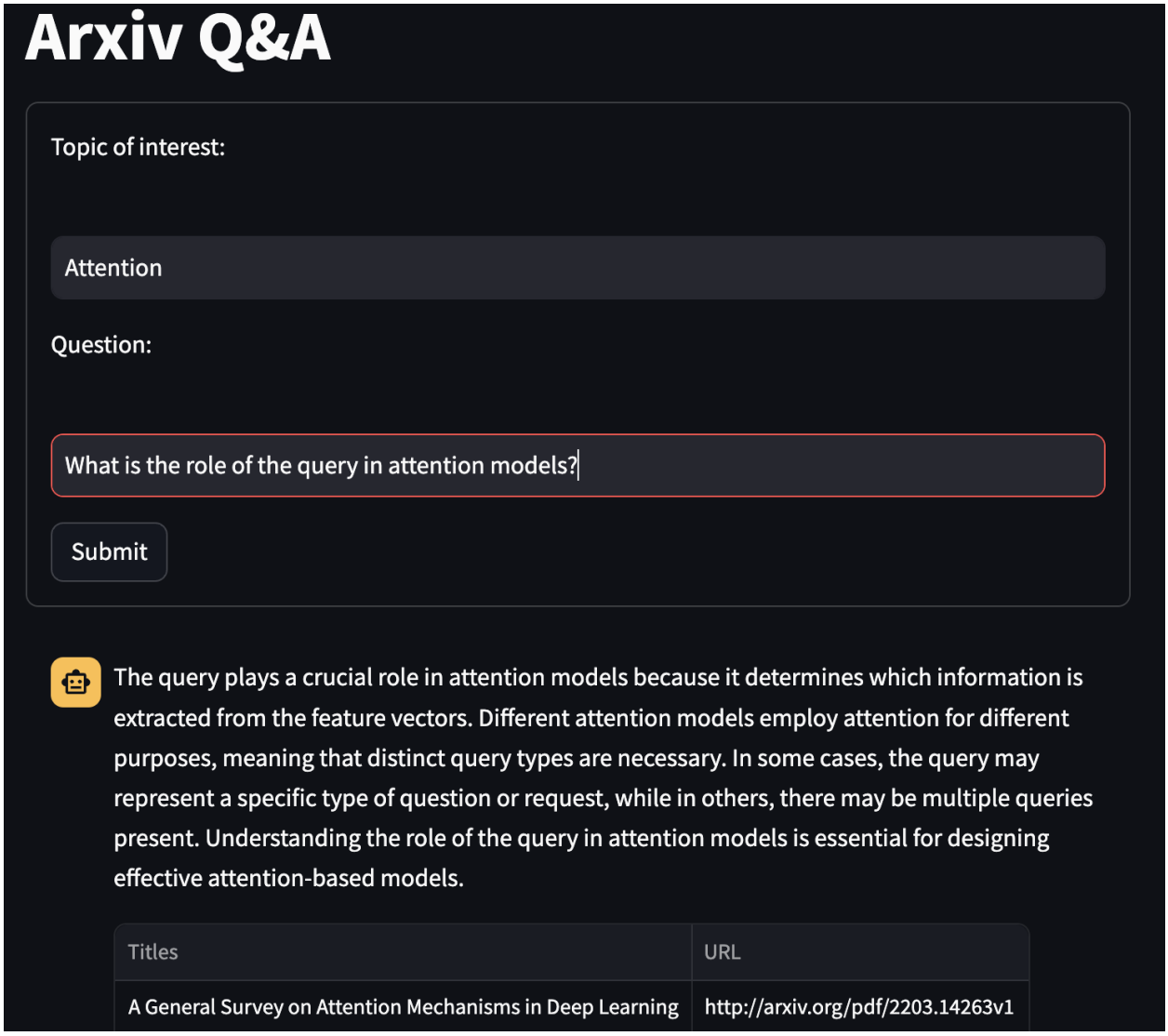
My work consisted of the parts highlighted in yellow above.

3. <u>Describe the portion of the work that you did on the project in detail</u>.

- Arxiv Q&A consisted of a dashboard that operated in the following way:
    1. Ask users for topic and topic specific questions in the context of machine learning applications.
    2. Once submitted the form with the previous user requirements, create a search query using arxiv python library and retrieving top 10 documents with additional metadata.
    3. Once the documents are retrieved they are tokenized using LLaMa The Block Wizard 7b generation model and recursively splitted.
    4. Once the preprocessing is complete, each chunk is embedded using instructor embeddings into a deeplake vector database.
    5. Once the deeplake is created, the retriever QA searches for documents with top 3 cosine similarities with respect to the users prompt.
    6. Once the relevant documents are identified, these documents are fed to the large language model as context in order to develop an appropriate response, and be post processed using a textwrapper.
    7. Lastly, the postprocess text gets displayed to the user, as well as a pandas dataframe containing the title of the relevant arxiv research paper and links to further learn in more detail.

4. <u>Results</u>.

As can be seen by the illustration below, the large language model performs exceptionally well in answering the question. This performance is particularly due to the online search of the relevant information to the answer the users question.



5. <u>Summary and conclusions</u>.

The project was successfully completed, however some of the limitations encountered were mostly related to the personal ignorance of the topic. Overly relying on "one-line" computationally expensive transformer models, embedding models and other peoples solutions took away from me being able to explain these topics in-depth. Even though the methodology is very efficient and simple to understand, the explainability trade-off still exists when the models are pre-trained and computationally expensive.
Had fun.

6. Calculate the percentage of the code that you found or copied from the internet.

80% was copied from the internet
20% was created by me in the integration of Streamlit app and both of the previous videos.
I know… Nevertheless, it produced good results.

7. References.

Arxiv Functionality:
https://www.youtube.com/watch?v=9SBUStfCtmk
The Block Wizard LLM Model:
https://www.youtube.com/watch?app=desktop&v=9ISVjh8mdlA