Experiment-3

Implement Natural Language Processing in Multi Sentence Conversation

Date: 21/8/24

AIM

Implement natural language processing in multi sentence conversation.

PROCEDURE

Step-1: Text Preprocessing

Step-2: Feature Extraction

Step-3: Applying NLP Models

Step-4: Text Classification

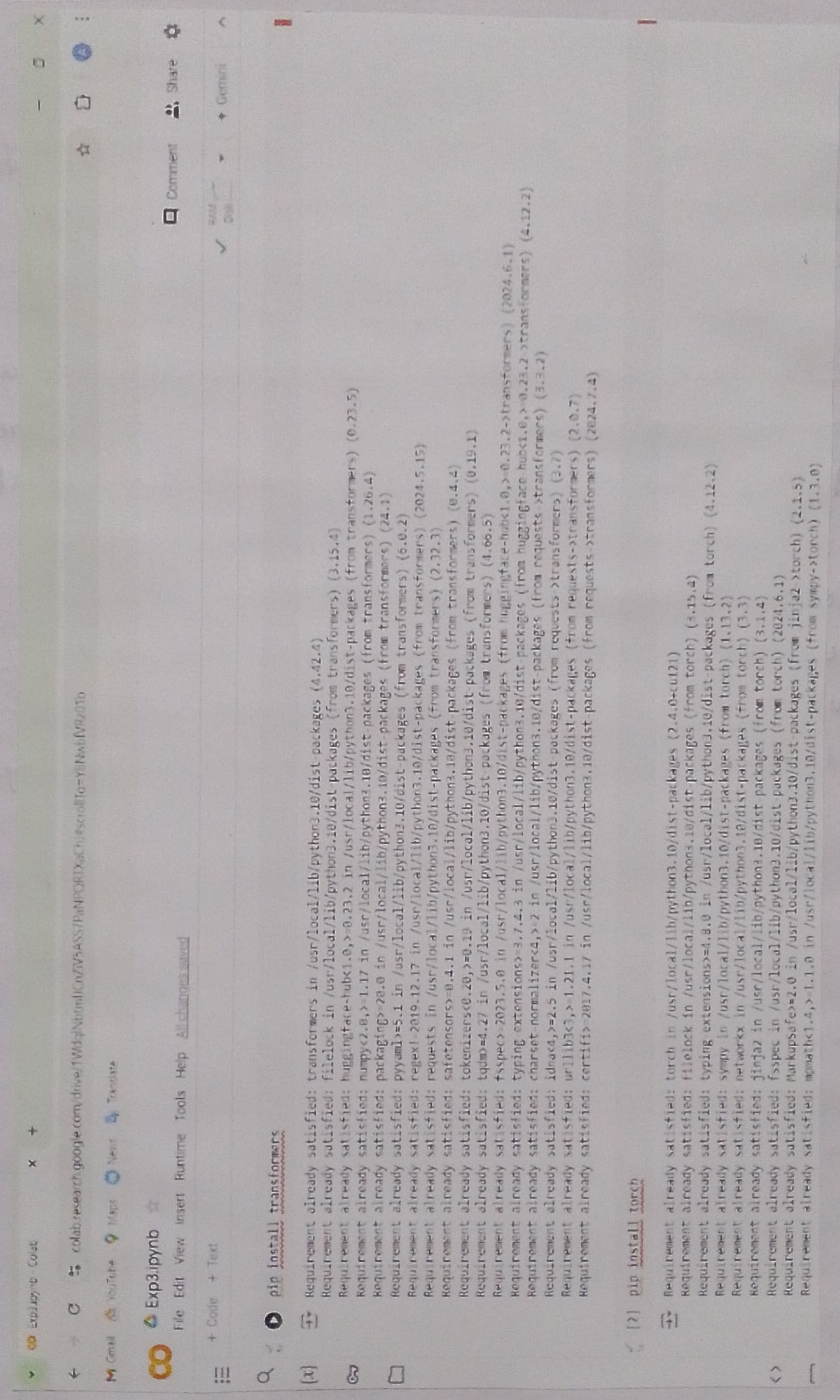
SOURCE CODE

step1: Open browser > search openAI > click on try chatgpt > Login using your credentials.

step2: Now login and generate the prompt mentioning your requirements of implementing NLP in multi sentence conversation between you and a chatbot.

Prompt:

Create a Python script using the transformers library to build a simple chatbot powered by GPT-2. Begin by importing GPT2Tokenizer, GPT2LMHeadModel, and pipeline, then load the pre-trained GPT-2 model (gpt2-medium) along with its tokenizer. Initialize a text generation pipeline using these components. Define a ChatBot class that manages the conversation context and generates responses based on user input, with a method to update the context and produce coherent replies. Finally, instantiate the chatbot and simulate a multi-sentence conversation, printing both user inputs and the bot's responses to demonstrate its functionality.


Exp3.ipynb - Colab
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pip install transformers
Requirement already satisfied: transformers in /usr/local/lib/python3.10/dist-packages (4.42.4)
Requirement already satisfied: filelock in /usr/local/lib/python3.10/dist-packages (from transformers) (3.15.4)
Requirement already satisfied: huggingface-hub<1.0,>=0.23.2 in /usr/local/lib/python3.10/dist-packages (from transformers) (0.23.5)
Requirement already satisfied: numpy<2.0,>=1.17 in /usr/local/lib/python3.10/dist-packages (from transformers) (1.26.4)
Requirement already satisfied: packaging>=20.0 in /usr/local/lib/python3.10/dist-packages (from transformers) (24.1)
Requirement already satisfied: pyyaml>=5.1 in /usr/local/lib/python3.10/dist-packages (from transformers) (6.0.2)
Requirement already satisfied: regex!=2019.12.17 in /usr/local/lib/python3.10/dist-packages (from transformers) (2024.5.15)
Requirement already satisfied: requests in /usr/local/lib/python3.10/dist-packages (from transformers) (2.32.3)
Requirement already satisfied: safetensors>=0.4.1 in /usr/local/lib/python3.10/dist-packages (from transformers) (0.4.4)
Requirement already satisfied: tokenizers<0.20,>=0.19 in /usr/local/lib/python3.10/dist-packages (from transformers) (0.19.1)
Requirement already satisfied: tqdm>=4.27 in /usr/local/lib/python3.10/dist-packages (from transformers) (4.66.5)
Requirement already satisfied: fsspec>=2023.5.0 in /usr/local/lib/python3.10/dist-packages (from huggingface-hub<1.0,>=0.23.2->transformers) (2024.6.1)
Requirement already satisfied: typing-extensions>=3.7.4.3 in /usr/local/lib/python3.10/dist-packages (from huggingface-hub<1.0,>=0.23.2->transformers) (4.12.2)
Requirement already satisfied: charset-normalizer<4,>=2 in /usr/local/lib/python3.10/dist-packages (from requests->transformers) (3.3.2)
Requirement already satisfied: idna<4,>=2.5 in /usr/local/lib/python3.10/dist-packages (from requests->transformers) (3.7)
Requirement already satisfied: urllib3<3,>=1.21.1 in /usr/local/lib/python3.10/dist-packages (from requests->transformers) (2.0.7)
Requirement already satisfied: certifi>=2017.4.17 in /usr/local/lib/python3.10/dist-packages (from requests->transformers) (2024.7.4)
[2] pip install torch
Requirement already satisfied: torch in /usr/local/lib/python3.10/dist-packages (2.4.0+cu121)
Requirement already satisfied: filelock in /usr/local/lib/python3.10/dist-packages (from torch) (3.15.4)
Requirement already satisfied: typing-extensions>=4.8.0 in /usr/local/lib/python3.10/dist-packages (from torch) (4.12.2)
Requirement already satisfied: sympy in /usr/local/lib/python3.10/dist-packages (from torch) (1.13.2)
Requirement already satisfied: networkx in /usr/local/lib/python3.10/dist-packages (from torch) (3.3)
Requirement already satisfied: jinja2 in /usr/local/lib/python3.10/dist-packages (from torch) (3.1.4)
Requirement already satisfied: fsspec in /usr/local/lib/python3.10/dist-packages (from torch) (2024.6.1)
Requirement already satisfied: MarkupSafe>=2.0 in /usr/local/lib/python3.10/dist-packages (from jinja2->torch) (2.1.5)
Requirement already satisfied: mpmath<1.4,>=1.1.0 in /usr/local/lib/python3.10/dist-packages (from sympy->torch) (1.3.0)

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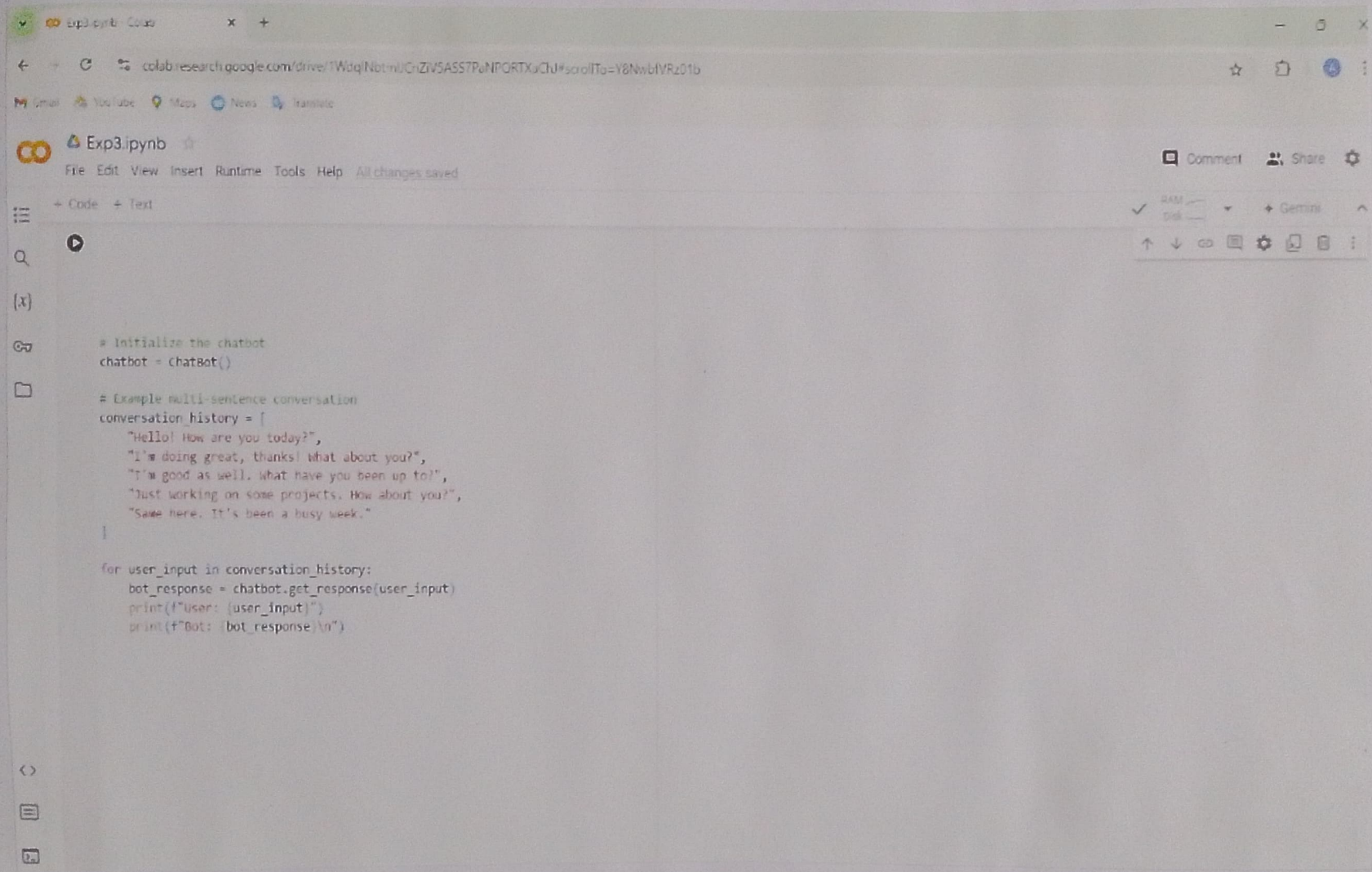
```
from transformers import GPT2Tokenizer, GPT2LMHeadModel, pipeline


    # Load pre-trained model and tokenizer
    model_name = 'gpt2-medium'
    tokenizer = GPT2Tokenizer.from_pretrained(model_name)
    model = GPT2LMHeadModel.from_pretrained(model_name)

    # Initialize the text generation pipeline
    text_generation_pipeline = pipeline('text-generation', model=model, tokenizer=tokenizer)


    class ChatBot:
        def __init__(self, model_name='gpt2-medium'):
            self.tokenizer = GPT2Tokenizer.from_pretrained(model_name)
            self.model = GPT2LMHeadModel.from_pretrained(model_name)
            self.pipeline = pipeline('text-generation', model=self.model, tokenizer=self.tokenizer)
            self.context = ""

        def get_response(self, user_input):
            # Update context
            self.context += f"User: {user_input}\nBot: "

            # Generate response
            response = self.pipeline(self.context, max_length=500, pad_token_id=self.tokenizer.eos_token_id, num_return_sequences=1)

            # Extract and update context with the response
            bot_response = response[0]['generated_text'].split("Bot: ")[-1].split("User: ")[0].strip()
            self.context += f"{bot_response}\n"
            return bot_response
```



Exp3.ipynb - Colab

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```
# Initialize the chatbot
chatbot = ChatBot()

# Example multi-sentence conversation
conversation_history = [
    "Hello! How are you today?",
    "I'm doing great, thanks! What about you?",
    "I'm good as well. What have you been up to?",
    "Just working on some projects. How about you?",
    "Same here. It's been a busy week."
]

for user_input in conversation_history:
    bot_response = chatbot.get_response(user_input)
    print(f"User: {user_input}")
    print(f"Bot: {bot_response}\n")
```

Exp3.ipynb - Colab

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```
/usr/local/lib/python3.10/dist-packages/huggingface_hub/utils/_token.py:89: UserWarning:
The secret `HF_TOKEN` does not exist in your Colab secrets.
To authenticate with the Hugging Face Hub, create a token in your settings tab (https://huggingface.co/settings/tokens), set it as secret in your Google Colab and restart your session.
You will be able to reuse this secret in all of your notebooks.
Please note that authentication is recommended but still optional to access public models or datasets.
  warnings.warn(
tokenizer_config.json: 100%|██████████| 26.0/26.0 [00:00<00:00, 651B/s]
vocab.json: 100%|██████████| 1.04M/1.04M [00:00<00:00, 3.91MB/s]
merges.txt: 100%|██████████| 456k/456k [00:00<00:00, 6.56MB/s]
tokenizer.json: 100%|██████████| 1.36M/1.36M [00:00<00:00, 7.83MB/s]
config.json: 100%|██████████| 718/718 [00:00<00:00, 6.44kB/s]
model.safetensors: 100%|██████████| 1.52G/1.52G [00:17<00:00, 130MB/s]
generation_config.json: 100%|██████████| 124/124 [00:00<00:00, 7.49kB/s]
Truncation was not explicitly activated but `max_length` is provided a specific value, please use `truncation=True` to explicitly truncate examples to max length. Defaulting to 'longer
User: Hello! How are you today?
Bot: We just have some people that do it very efficiently.
Anonymous: Right, it doesn't matter if I was only working and I wouldn't say the same thing on a holiday and I'm not here with my family so

User: I'm doing great, thanks! What about you?
Bot: Of course, I really want to work for you
Anonymous: Do you have any tips for those people who may not make

User: I'm good as well. What have you been up to?
Bot: No kidding, I hope you understand everything. As soon as I come back, I will come back and say your name, thank you very much
Anonymous: How did you end up coming back?

User: Just working on some projects. How about you?
Bot: Well, you are

User: Same here. It's been a busy week.
Bot: That's all.
```

VIVA QUESTIONS

1. Can you explain the main steps involved in preprocessing text for NLP tasks?

Ans. The main steps for text preprocessing in NLP include tokenization, lowercasing, removing stopwords, stemming/lemmatization and handling special characters or punctuation.

2. What is the purpose of using the TF-IDF method in NLP?

Ans. TF-IDF (Term Frequency - Inverse Document Frequency) is used to assess the importance of a word in a document relative to a collection of documents, helping to identify keywords.

3. How does the Bag-of-Words model differ from word embeddings?

Ans. The Bag of words model represents text as a sparse vector of word counts without considering context, while word embeddings encode words as dense vectors that capture semantic relationships.

4. What is the importance of Named Entity Recognition (NER) in NLP?

Ans. NER identifies and categorizes key entities in text, enabling better understanding and extraction of relevant information.

5. What challenges might you encounter when processing multi-sentence conversations, and how can you address them?

Ans. challenges include handling context, conference resolution and ambiguity. These can be addressed by using advanced models like transformers for context, conference resolution algorithms, and incorporating domain-specific knowledge.