

DS Lab

Exp-2

Name: Vaibhav Boudh

Division: D20B

Roll no: 06

Aim: To build a Cognitive text based application to understand context for a Customer service application/ Insurance/ Healthcare Application/ Smarter Cities/ Government etc.

Theory:

Cognitive Computing

Cognitive computing refers to the simulation of human thought processes in a computerized model. It involves self-learning systems that use data mining, pattern recognition, and natural language processing to mimic the way the human brain works. Cognitive systems can analyze large amounts of unstructured data (like text, images, or videos) to extract insights and make decisions or predictions.

Context Understanding

Context understanding is a critical component of cognitive applications. It allows the system to grasp not just the literal meaning of words, but also the context in which they are used. This includes understanding:

User Intent: Determining what the user wants to achieve.

Entity Recognition: Identifying key entities like names, dates, locations, or specific terms related to a domain.

Sentiment Analysis: Gauging the emotional tone of the conversation.

Conversation Flow: Keeping track of the dialogue's flow to maintain coherence and relevance across multiple exchanges.

Key Components for Building Cognitive Applications

Natural Language Processing (NLP):

Tokenization: Breaking down text into individual words or phrases.

Part-of-Speech Tagging: Identifying the grammatical parts of speech in a sentence.

Named Entity Recognition (NER): Extracting entities like names, places, dates, etc.

Sentiment Analysis: Determining the sentiment behind the text (positive, negative, neutral).

Text Classification: Categorizing text into predefined categories (e.g., spam vs. non-spam).

Machine Learning:

Supervised Learning: Training models with labeled data to predict outcomes.

Unsupervised Learning: Finding patterns in data without predefined labels.

Reinforcement Learning: Models learn to make decisions by receiving feedback (rewards or penalties).

Domain-Specific Knowledge:

Customer Service: Understanding common customer inquiries and troubleshooting processes.

Insurance: Recognizing insurance terminology and processing claims.

Healthcare: Interpreting medical terminology and patient records.

Smarter Cities: Integrating data from various urban systems for efficient city management.

Government: Processing and responding to public inquiries, legal documents, and policy information.

Code:

```
from transformers import pipeline
import spacy
from google.colab import files

# Load spaCy model
nlp = spacy.load('en_core_web_sm')

# Initialize pipelines
summarizer = pipeline('summarization')
qa_pipeline = pipeline('question-answering')

# Upload text file
uploaded = files.upload()

# Read and analyze the lesson plan
file_name = list(uploaded.keys())[0]
with open(file_name, 'r') as file:
    lesson_text = file.read()

# Process the text with spaCy
doc = nlp(lesson_text)
key_concepts = [chunk.text for chunk in doc.noun_chunks if
chunk.root.dep_ == "nsubj"]

# Summarize the lesson
summary = summarizer(lesson_text, max_length=50, min_length=25,
do_sample=False)
summary_text = summary[0]['summary_text']
```

```

print("Key Concepts:", key_concepts)
print("Summary:", summary_text)

# Function to answer questions based on the text
def answer_question(question):
    result = qa_pipeline(question=question, context=lesson_text)
    return result['answer']

# Example usage
while True:
    user_question = input("Ask a question related to the text
(or type 'exit' to quit): ")
    if user_question.lower() == 'exit':
        break
    answer = answer_question(user_question)
    print("Answer:", answer)

```

Output 1 :

Input 1 was a paragraph about Amazon rainforests. The model understood the context and answered all the questions correctly.

```

• LabExperiment.txt(text/plain) - 692 bytes, last modified: 8/9/2024 - 100% done
Saving LabExperiment.txt to LabExperiment (2).txt
Key Concepts: ['The Amazon rainforest', 'It', 'The rainforest', 'the Amazon', 'The loss']
Summary: The Amazon rainforest is the world's largest tropical rainforest, covering over 5.5 million square kilometers across nine South American countries . The rainforest plays a crucial role
Ask a question related to the text (or type 'exit' to quit): What is the Amazon ?
Answer: the world's largest tropical rainforest
Ask a question related to the text (or type 'exit' to quit): How many countries does it cover ?
Answer: nine
Ask a question related to the text (or type 'exit' to quit): what is amazon rainforest referred to as ?
Answer: lungs of the Earth
Ask a question related to the text (or type 'exit' to quit): The loss of trees affects what
Answer: the biodiversity
Ask a question related to the text (or type 'exit' to quit): what is a major threat to Amazon ?
Answer: deforestation
Ask a question related to the text (or type 'exit' to quit): How large is amazon rainforest ?
Answer: 5.5 million square kilometers
Ask a question related to the text (or type 'exit' to quit): exit

```

Output 2 :

Input 2 was a paragraph to check the sentiment analysis of model. The output shows that the model works perfectly fine.

```

• LabExperiment.txt(text/plain) - 334 bytes, last modified: 8/9/2024 - 100% done
Saving LabExperiment.txt to LabExperiment (1).txt
Key Concepts: ['I', 'the new restaurant', 'The food', 'the staff', 'The ambiance', 'that', 'the entire dining experience', 'I']
Summary: The food was absolutely delicious, and the staff were incredibly friendly and attentive . The ambiance was perfect, with soft lighting and relaxing music that made the dining experience
Ask a question related to the text (or type 'exit' to quit): What is the sentiment of above paragraph ?
Answer: the staff were incredibly friendly and attentive
Ask a question related to the text (or type 'exit' to quit): Is the sentiment happy or angry ?
Answer: friendly and attentive
Ask a question related to the text (or type 'exit' to quit): exit

```

Conclusion: Therefore cognitive text-based applications represent the next step in making interactions between humans and machines more natural and effective.