TASK 12

SUBJECT:

Programming For AI

PROGRAM:

BS DATA SCIENCE

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Lab 12 task

Project Overview: Hotel Information Chatbot using Semantic Search

Objective

This project is a **Hotel Information Chatbot** designed to provide quick, smart answers to user queries about hotel services, bookings, amenities, check-in times, etc. It uses **natural language understanding** to detect what the user is asking and responds accordingly.

EXPLANATION

App.py:

Imports aur Initialization

- **json**: intents file load karne ke liye.
- **numpy:** arrays aur random selection ke liye.
- **faiss:** Facebook ka fast similarity search library.
- **SentenceTransformer:** text ko vector mein convert karne ke liye.
- Flask: web application framework.

➢ **Data Loading**:

The chatbot reads from a file called intents.json. This file contains various "intents", where each intent has a list of example user messages (called "patterns") and possible responses. These are loaded when the application starts.

➢ **Sentence Embeddings**:

It uses a pre-trained Sentence Transformer model (all-MiniLM-L6-v2) to convert all the pattern texts into vector form (numerical representations). These embeddings help the chatbot understand the meaning of the user's message beyond just matching words.

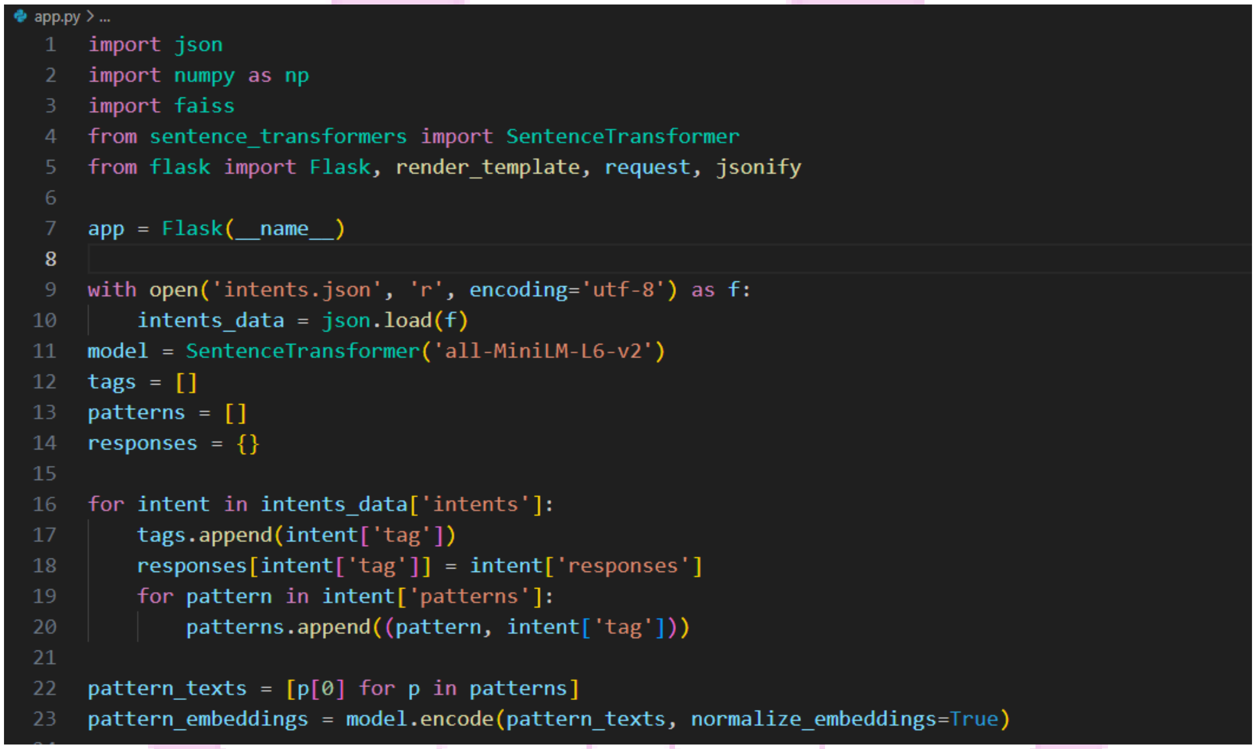
➢ **FAISS Index Creation**:

Once all the patterns are converted into vectors, they are added to a FAISS index. FAISS is a high-performance tool that allows the bot to quickly find the most similar stored message to what the user typed.

➢ **Handling User Input**:

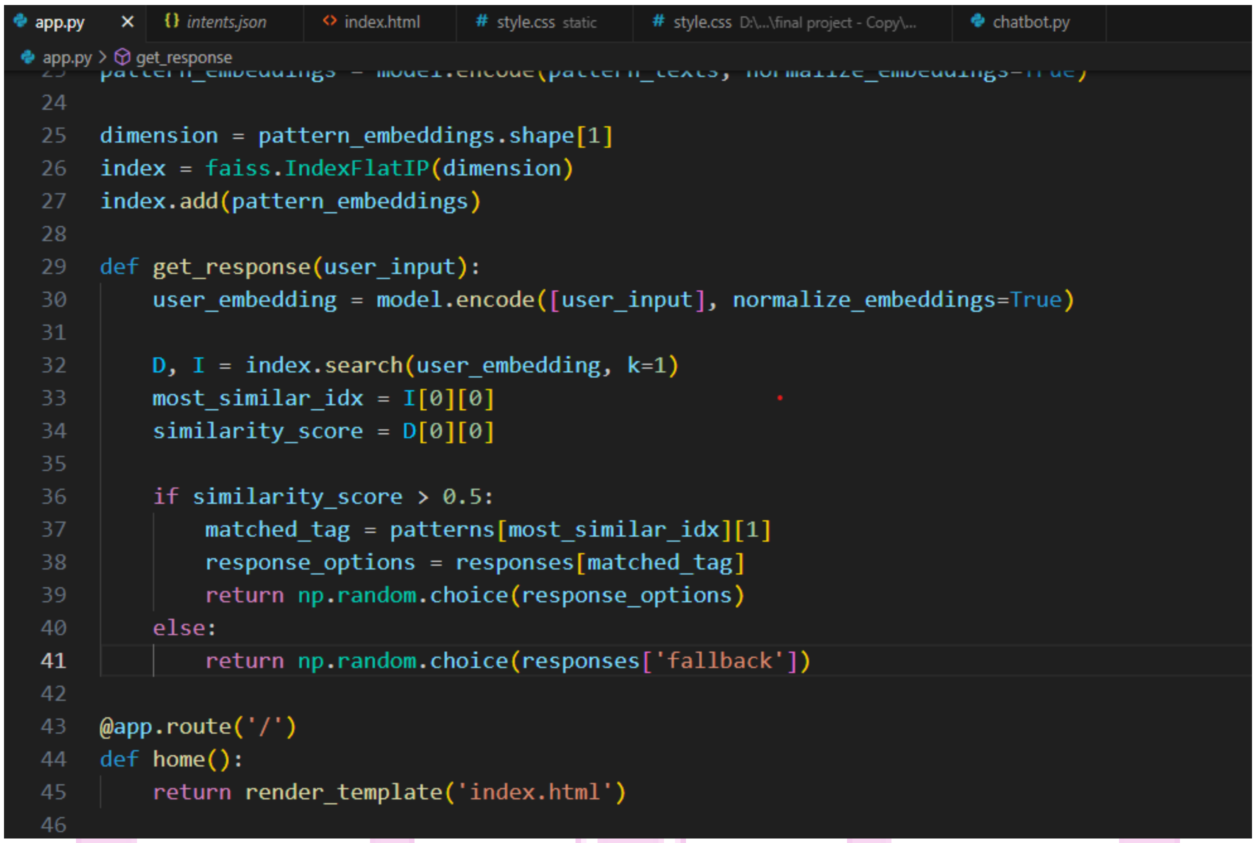
When a user sends a message, the chatbot converts it into a vector using the same Sentence Transformer. It then uses FAISS to search for the most similar existing pattern. If the similarity score is above a certain threshold (like 0.5), it picks a random response related to that pattern's tag. Otherwise, it gives a fallback response.

- **Flask Web Interface**: The chatbot runs on a simple Flask web app. The homepage displays a chat interface (HTML page), and when the user sends a message, a POST request is made to the backend. The backend processes the message and returns a response in JSON format.



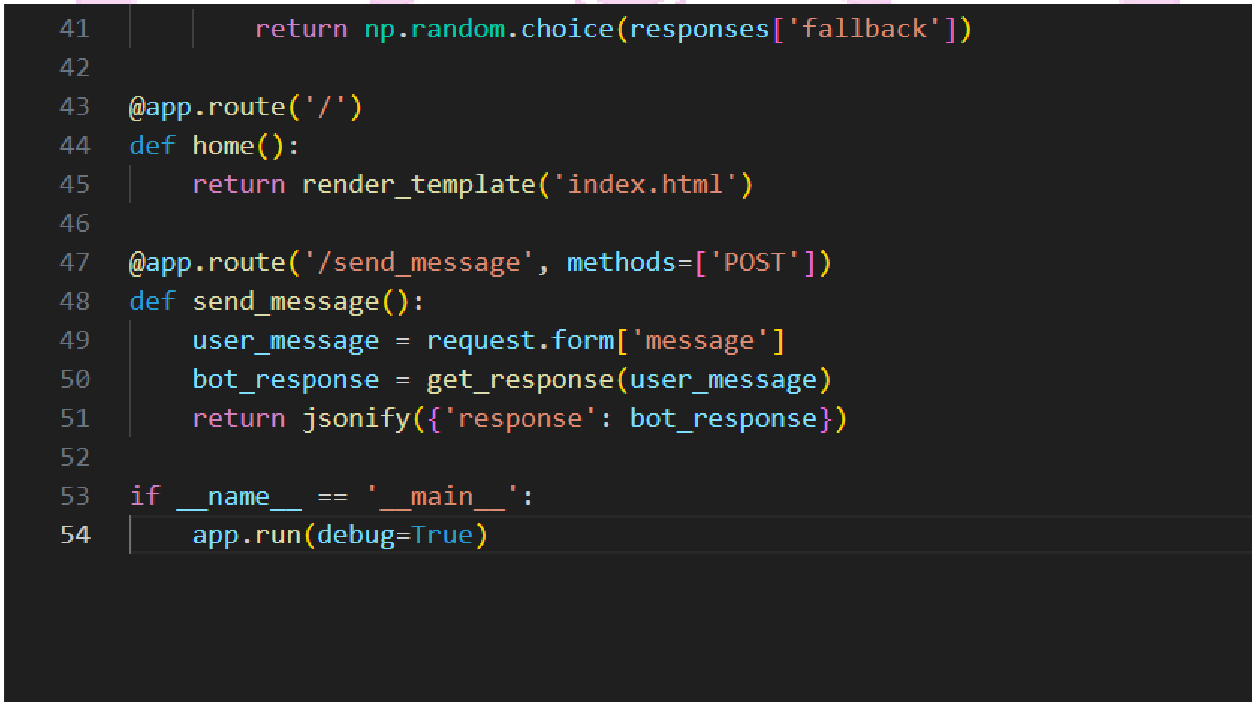
app.py > ...

```
import json
import numpy as np
import faiss
from sentence_transformers import SentenceTransformer
from flask import Flask, render_template, request, jsonify

app = Flask(__name__)

with open('intents.json', 'r', encoding='utf-8') as f:
    intents_data = json.load(f)
model = SentenceTransformer('all-MiniLM-L6-v2')
tags = []
patterns = []
responses = {}

for intent in intents_data['intents']:
    tags.append(intent['tag'])
    responses[intent['tag']] = intent['responses']
    for pattern in intent['patterns']:
        patterns.append((pattern, intent['tag']))

pattern_texts = [p[0] for p in patterns]
pattern_embeddings = model.encode(pattern_texts, normalize_embeddings=True)
```


app.py × | intents.json | index.html | style.css static | style.css D:\...\final project - Copy\... | chatbot.py

app.py > get_response

```python

dimension = pattern_embeddings.shape[1]
index = faiss.IndexFlatIP(dimension)
index.add(pattern_embeddings)

def get_response(user_input):
    user_embedding = model.encode([user_input], normalize_embeddings=True)

    D, I = index.search(user_embedding, k=1)
    most_similar_idx = I[0][0]
    similarity_score = D[0][0]

    if similarity_score > 0.5:
        matched_tag = patterns[most_similar_idx][1]
        response_options = responses[matched_tag]
        return np.random.choice(response_options)
    else:
        return np.random.choice(responses['fallback'])

@app.route('/')
def home():
    return render_template('index.html')

```



```python
        return np.random.choice(responses['fallback'])

@app.route('/')
def home():
    return render_template('index.html')

@app.route('/send_message', methods=['POST'])
def send_message():
    user_message = request.form['message']
    bot_response = get_response(user_message)
    return jsonify({'response': bot_response})

if __name__ == '__main__':
    app.run(debug=True)
```

templates/index.html (Frontend)

A WhatsApp-like chat interface with:

Header → Displays the chatbot name ("StayEase Hotel Assistant").

Message Area → Shows conversation history (user & bot messages).

Input Box → Text field + send button for user queries.

Basic JavaScript → Handles sending messages and displaying responses.

static/style.css (Styling)

Provides modern WhatsApp-like UI with:

Background → Blurred hotel image for aesthetics.

Chat Container → Semi-transparent white panel with rounded corners.

Message Bubbles →User messages (green, right-aligned).Bot messages (white, left-aligned).

Animations → Smooth fade-in for messages.

Mobile-Friendly Design → Works on phones & desktops.

How the Chatbot Works (Step-by-Step)

User sends a message (e.g., "Do you have a pool?")Flask (/send_message route) receives the message.

NLP Processing:

The message is converted into a vector embedding using SentenceTransformer. FAISS searches for the most similar question in the dataset.

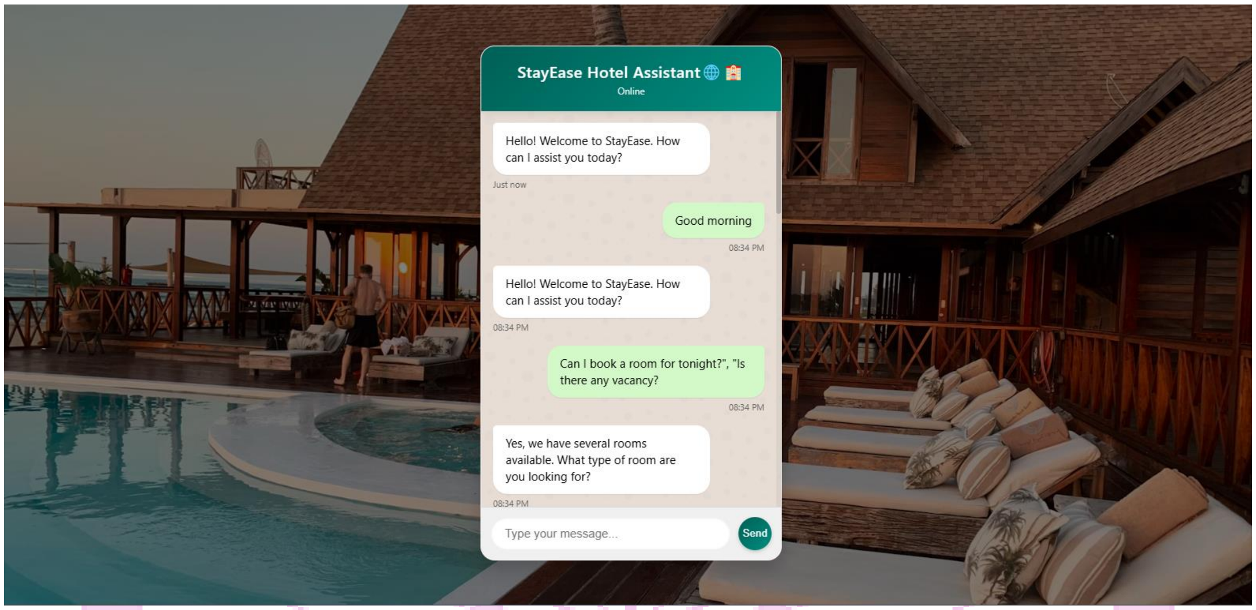
Response Selection:

If similarity is high (> 0.5), the bot picks a random response from the matched intent.If no match is found, it uses the fallback response ("I didn't understand...").

Frontend Update:

The bot's reply is displayed in the chat interface.

OUTPUT



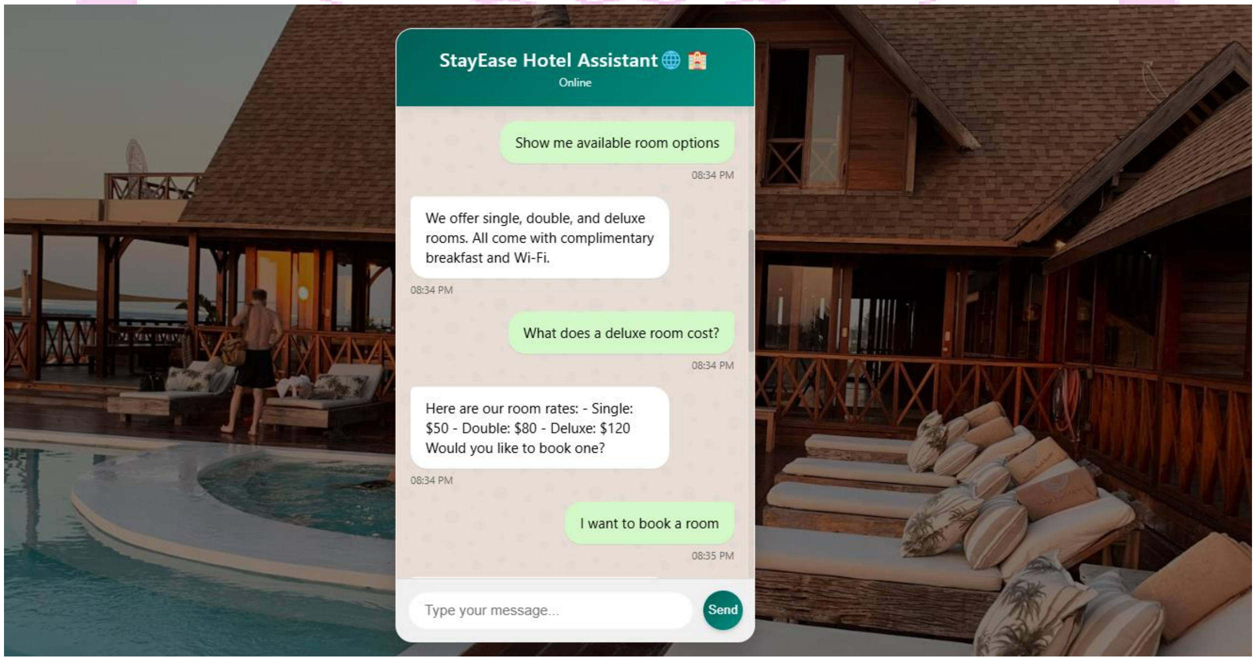
Hello! Welcome to StayEase. How can I assist you today?
Just now

Good morning
08:34 PM

Hello! Welcome to StayEase. How can I assist you today?
08:34 PM

Can I book a room for tonight?", "Is there any vacancy?
08:34 PM

Yes, we have several rooms available. What type of room are you looking for?
08:34 PM



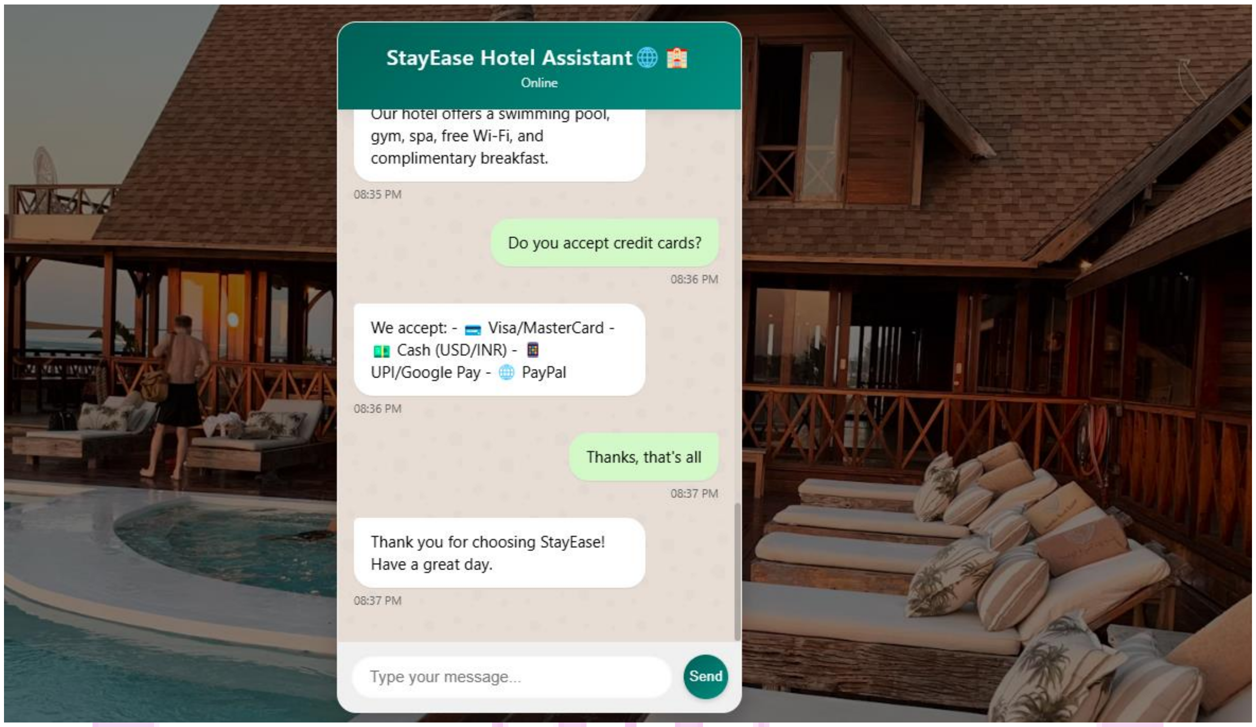
Show me available room options
08:34 PM

We offer single, double, and deluxe rooms. All come with complimentary breakfast and Wi-Fi.
08:34 PM

What does a deluxe room cost?
08:34 PM

Here are our room rates: - Single: $50 - Double: $80 - Deluxe: $120 Would you like to book one?
08:34 PM

I want to book a room
08:35 PM



Our hotel offers a swimming pool, gym, spa, free Wi-Fi, and complimentary breakfast.
08:35 PM

Do you accept credit cards?
08:36 PM

We accept: - 💳 Visa/MasterCard - 💵 Cash (USD/INR) - 📱 UPI/Google Pay - 🌐 PayPal
08:36 PM

Thanks, that's all
08:37 PM

Thank you for choosing StayEase! Have a great day.
08:37 PM