1. Abstract

Overview

The project involves creating a simple rule-based chatbot that can answer predefined questions. The chatbot is implemented using Python and Gradio for the interface. It relies on a set of predefined questions and responses stored in a JSON file. This type of chatbot is particularly useful in scenarios where the range of possible user inputs and responses is well-defined and limited.

Objective

The primary objective of this project is to develop a rule-based chatbot capable of interacting with users by providing appropriate responses to predefined questions. This project aims to demonstrate the basic principles of building a chatbot using deep learning techniques.

Scope

The scope of the project includes:

- Loading and parsing a JSON file containing predefined questions and responses.
- Developing a deep learning model to predict appropriate responses based on user input.
- Creating a graphical user interface using Gradio to facilitate user interaction with the chatbot.
- Ensuring the chatbot can handle a variety of user inputs within the predefined scope.

Importance

This project is important as it provides a foundational understanding of how chatbots work and can be implemented. It demonstrates the use of deep learning and natural language processing techniques in building interactive applications. Additionally, it highlights the importance of predefined rule-based systems in scenarios where user interactions are predictable and limited.

2. Algorithm

Description

The algorithm for the rule-based chatbot involves several steps, including loading the dataset, preprocessing the data, building the model, and creating the interface for user interaction.

Steps

1. **Define Intents and Responses:**
   - Load predefined questions and responses from a JSON file.
2. **Load Required Libraries:**
   - Import necessary libraries including json, numpy, keras, sklearn, random, pickle, and gradio.
3. **Load Intents Data:**
   - Load the JSON file containing the intents into a data structure.
4. **Define the Chatbot Logic:**

    - Use deep learning to predict the response based on user input.
5. **Create the GUI:**
    - Use Gradio to create a web-based interface for the chatbot.
6. **Implement Interaction Logic:**
    - Map user input to predefined responses based on the loaded intents.
7. **Launch the Interface:**
    - Launch the Gradio app to allow user interaction with the chatbot.

Flowchart

plaintext

Copy code

```
+-----------------------+
| Start                 |
+-----------------------+
          |
          v
+-----------------------+
| Load Intents Data     |
+-----------------------+
          |
          v
+-----------------------+
| Load Required         |
| Libraries             |
+-----------------------+
          |
          v
+-----------------------+
| Define Chatbot Logic  |
+-----------------------+
          |
          v
```

```
+-----------------------+
| Create GUI with Gradio|
+-----------------------+
         |
         v
+-----------------------+
| Implement Interaction |
| Logic                 |
+-----------------------+
         |
         v
+-----------------------+
| Launch Interface      |
+-----------------------+
         |
         v
+-----------------------+
| End                   |
+-----------------------+
```

Examples

- User Input: "Hello"
- Predicted Response: "Hello! How can I help you?"

3. Source Code

Python Code

python

Copy code

```python
import json
import numpy as np
from tensorflow import keras
from sklearn.preprocessing import LabelEncoder
import random
import pickle

import gradio as gr


# Load the intents file

with open("intents.json") as file:

    data = json.load(file)


# Load the trained model

model = keras.models.load_model('chat_model')


# Load the tokenizer object

with open('tokenizer.pickle', 'rb') as handle:

    tokenizer = pickle.load(handle)


# Load the label encoder object

with open('label_encoder.pickle', 'rb') as enc:

    lbl_encoder = pickle.load(enc)


# Parameters

max_len = 20


def predict_response(user_input, history):

    result =
model.predict(keras.preprocessing.sequence.pad_sequences(tokenizer.texts_to_sequences([user_in
put]),

                                          truncating='post', maxlen=max_len))

    tag = lbl_encoder.inverse_transform([np.argmax(result)])


    # Prepare the response

    bot_response = "I don't understand."

    for i in data['intents']:

        if i['tag'] == tag:
            bot_response = random.choice(i['responses'])

    # Append the new chat messages to history
    history.append((f"You: {user_input}", f"ChatBot: {bot_response}"))
    return history


# Create Gradio interface
with gr.Blocks() as demo:
    # Add custom styling with Markdown
    gr.Markdown("""
    <style>
    .container {
        background-color: #f5f5f5; /* Light gray background color */
        padding: 10px; /* Smaller padding */
        border-radius: 8px; /* Slightly smaller border radius */
        max-width: 400px; /* Narrower width of the container */
        margin: 0 auto; /* Center horizontally */
        display: flex;
        flex-direction: column;
        align-items: center;
        justify-content: center;
        min-height: 100vh; /* Center vertically */
        box-shadow: 0px 4px 8px rgba(0, 0, 0, 0.1); /* Optional: Add shadow */
    }
    .input-box {
        width: 100%;
        margin: 5px 0; /* Smaller margin */
    }
    .send-button {
        width: 100%;
        margin: 5px 0; /* Smaller margin */
        display: block;
    }
    </style>
    <div class="container">
        <h2 style="color: #333; font-size: 20px;">Chat with the bot</h2>
    </div>
    """)

    # Chat history display
    chat_history = gr.Chatbot()

    # Input field for user message
    user_input = gr.Textbox(placeholder="Type your message here...", label="Your Message",
elem_id="input-box")

    # Send button
    send_button = gr.Button("Send", elem_id="send-button")

    # Define the callback function
    def respond(message, history):
        return predict_response(message, history)

    # Set up interaction
    send_button.click(respond, inputs=[user_input, chat_history], outputs=chat_history)

# Launch the Gradio app
demo.launch(share=True)
```

Libraries Used

- json
- numpy
- tensorflow.keras

- sklearn
- random
- pickle
- gradio

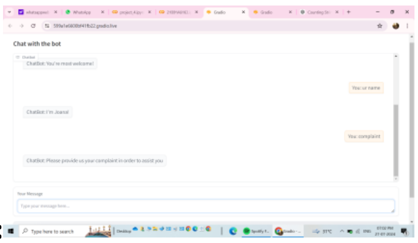
Code Explanation

The code consists of several main parts:

1. **Loading Data and Model:**
   - The intents are loaded from a JSON file.
   - The trained deep learning model, tokenizer, and label encoder are loaded from disk.
2. **Defining the Chatbot Logic:**
   - The predict_response function takes user input and predicts the appropriate response using the trained model.
3. **Creating the GUI:**
   - A Gradio interface is created with custom styling to provide a user-friendly chat environment.
4. **Interaction Logic:**
   - The respond function processes user input, updates chat history, and displays the chatbot's response.
5. **Launching the Interface:**
   - The Gradio app is launched to enable user interaction.

Examples

- **User Input:** "Hi"
- **Chatbot Response:** "Hello! How can I help you?"

Output: 

Chat with the bot

ChatBot: You're most welcome!

You: ur name

ChatBot: I'm Joana!

You: complaint

ChatBot: Please provide us your complaint in order to assist you

References

- Gradio Documentation

- TensorFlow Documentation
- Keras Documentation

Appendices

- **Appendix A:** Full source code.
- **Appendix B:** Detailed explanation of the JSON intents file.
- **Appendix C:** Installation and setup instructions.