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1. Introduction

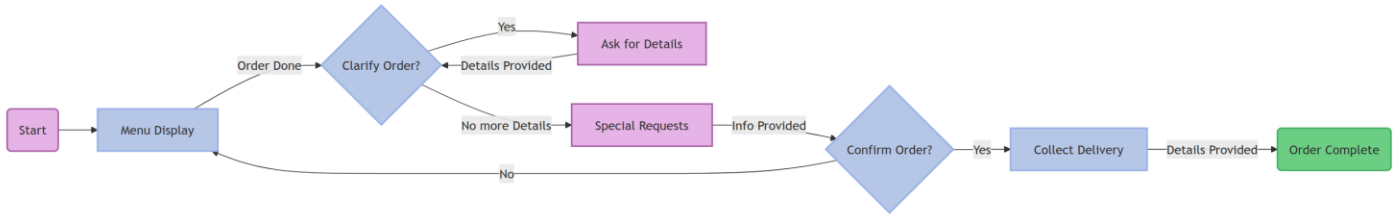
This report details the design and implementation of an AI-powered conversational agent for **Mamma Mia's Pizza, Pasta & Drinks**, a delivery service. The core objective of the project was to develop a system capable of managing a customer dialogue, taking orders from a defined menu, handling special requests, and recording a delivery address. The final order is then output in a structured data format.

This document serves as the official report for the project, outlining the implementation, key technologies, system architecture, and evidence of the agent's functionality as required by the course guidelines.

2.Implementation and Architecture

System Flowchart

The conversation is guided by a predefined flowchart using **Mermaid.js**. This diagram illustrates the decision points and conversational paths the agent can take, from initial greeting to final order confirmation.



Technology Stack

The project was built using a multi-component architecture powered by the Python Flask framework.

- **Backend:** Python 3 with Flask (**routes.py, run.py, __init__.py**), for handling API requests, and managing the application's structure.
- **Language Model:** The **Gemini 2.0 Flash API** (**agent.py**), for conversational responses.
- **Speech Integration: The Whisper** model (**speech_utils.py**) for Speech-to-Text.
- **Data Management:** A **menu.json** file for menu data, and **order_manager.py** for business logic and price calculations.
- **Frontend:** A web application using HTML, CSS (**style.css**), and JavaScript (**script.js**).

Agent Logic and Prompt Engineering

The agent's core logic, managed in **agent.py**, uses a **state machine** approach. The agent's behavior is dynamically guided by its current conversational stage (e.g., "start," "awaiting_item_details"). A new, custom system prompt is dynamically built for each API call to the Gemini model to ensure conversational accuracy. This prompt includes:

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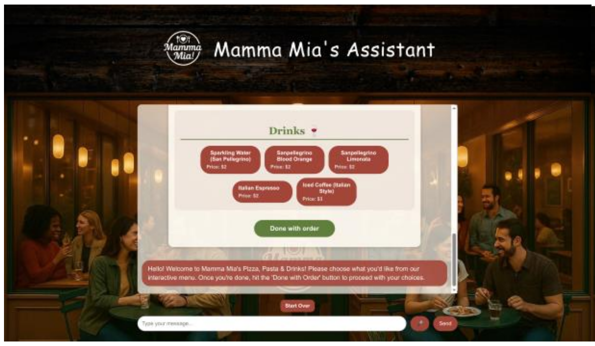
- **Persona:** Defines the agent's friendly persona as "Mamma Mia's AI assistant."
- **Menu Context:** Injects the full **menu.json** content to prevent the model from "hallucinating" items.
- **Strict Process:** Provides a step-by-step guide for the model to follow, from clarifying order specifics to collecting delivery information.
- **State Information:** Includes the full conversation history and the current state of the order, allowing the agent to maintain context and make appropriate decisions.

The routes.py file serves as the central hub, receiving user input and calling the generate_response function in **agent.py** to manage the dialogue. The agent then utilizes **order_manager.py** to handle all business logic, such as validating items and calculating prices.

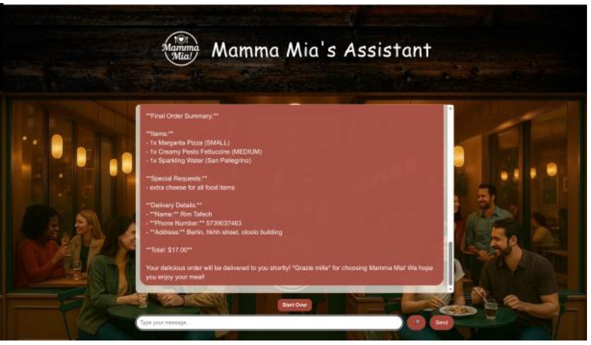
Frontend Implementation

The user interface provides a warm, Italian-themed aesthetic (**style.css**) and is highly interactive (**script.js**).

- **Interactive Menu:** The menu from **menu.json** is rendered as a series of clickable buttons, allowing users to select items without typing. This streamlines the ordering process and reduces errors.
- **API Communication:** The sendMessage function handles all communication, sending user text or a special JSON object to the Flask backend when the user submits their order.
- **Speech Input:** A microphone button utilizes the browser's Web Speech API to capture audio, which is sent to the backend for transcription via the Whisper model.


Mamma Mia's Assistant
Drinks
Sparkling Water (San Pellegrino) Price: $2
Sanpellegrino Blood Orange Price: $2
Sanpellegrino Limonata Price: $2
Italian Espresso Price: $2
Iced Coffee (Italian Style) Price: $3
Done with order
Start Over
Type your message...
Send

Hello! Welcome to Mamma Mia's Pizza, Pasta & Drinks! Please choose what you'd like from our interactive menu. Once you're done, hit the 'Done with Order' button to proceed with your choices.



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**Final Order Summary:**

**Items:**
- 1x Margarita Pizza (SMALL)
- 1x Creamy Pesto Fettuccine (MEDIUM)
- 1x Sparkling Water (San Pellegrino)

**Special Requests:**
- extra cheese for all food items

**Delivery Details:**
- **Name:** Rim Tafech
- **Phone Number:** 5739037463
- **Address:** Berlin, fifth street, obolo building

**Total: $17.00**

Your delicious order will be delivered to you shortly! *Grazie mille* for choosing Mamma Mia! We hope you enjoy your meal!
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