AI-Powered Restaurant Reservation Assistant

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Introduction to the Conversational AI Agent

Our AI Assistant, built as a **conversational AI agent**, leverages the power of **Large Language Models (LLMs)** to streamline restaurant reservations. This project demonstrates practical application of LLMs in real-world scenarios, enhancing user experience through natural language interaction.

Core Components

LangGraph: For orchestrating complex conversational flows and state management.

SQLite: Serving as the robust backend for reservation data with real-time availability.

Streamlit: Providing an intuitive and interactive user interface.

Streamlit

Technical Architecture: A Robust Stack

The solution is engineered with a modern, scalable technical stack, designed for performance and maintainability.

Frontend: Streamlit

An open-source app framework for rapidly creating interactive web applications, ideal for data science and machine learning projects.

Flow Control: LangGraph

A library for building stateful, multi-actor applications with LLMs, enabling complex conversational logic and agentic workflows.

LLM: Groq (Llama3 / Gemma)

Leveraging Groq's high-performance inference engine for Llama3 and Gemma models ensures rapid and accurate conversational responses.

Database: SQLite

A lightweight, file-based relational database management system, chosen for its simplicity and efficiency in managing reservation data.

Entities: Pydantic-based State

Utilizing Pydantic for data validation and settings management, ensuring robust and type-safe handling of reservation entities and conversational state.

Reservation Flow: From Request to Confirmation

The booking process is designed to be intuitive and efficient, guiding the user through each step from initial request to final confirmation.

1

User Input & Initial Data Capture

The user provides essential details: name, email, party size, desired date, time, and any specific reservation type (e.g., birthday party, meetings).

2

Availability Check

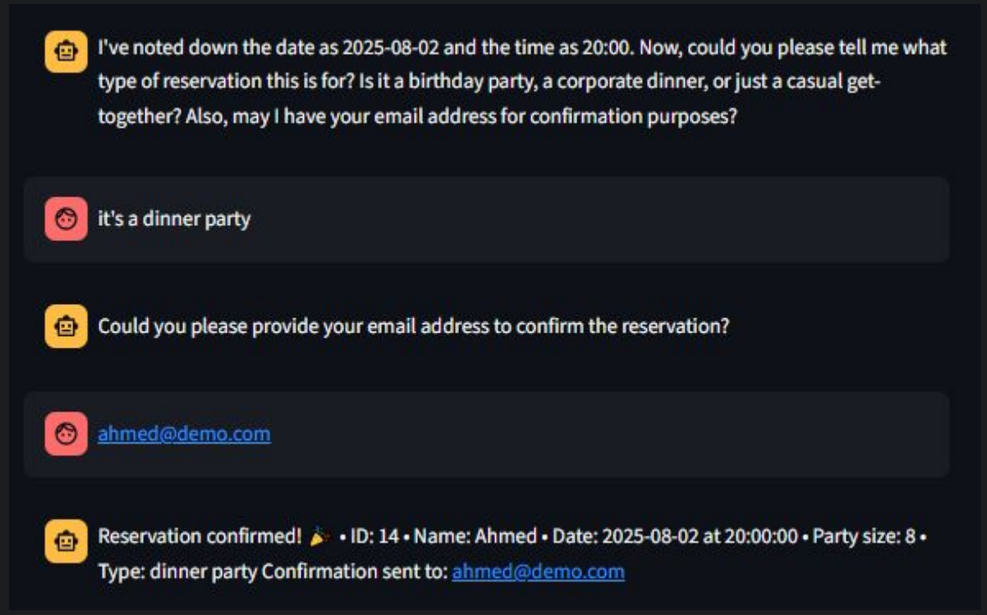
The AI assistant queries the database in real time to check for slot availability based on the user's criteria.

3

Confirmation & Database Update

Upon user confirmation, the reservation status is updated to **"confirmed"** in the database, and the slot is officially booked.

User Interface: Confirmed Reservation



This screenshot illustrates a confirmed reservation.

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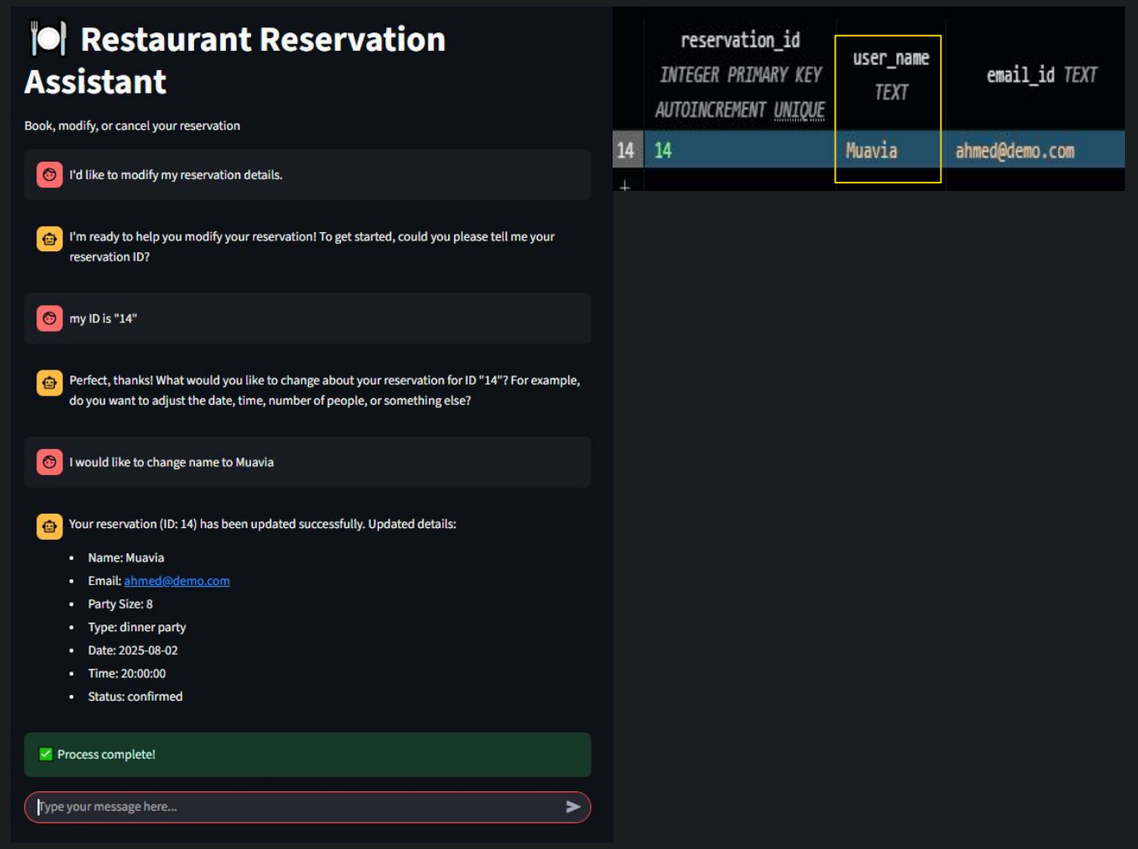
Modification Flow: Adapting to Changes

The modification feature allows users to easily adjust their reservation details, providing flexibility and reducing the need for new bookings.

- User provides their **reservation ID** and specifies the **new date, time, party size**, or other desired changes.
- The assistant first performs an **availability check** for the requested new slot or changes.
- If the modifications are feasible, the assistant **updates the existing record** in the database with the new details.
- A confirmation is sent to the user, outlining the updated reservation information.

UI & Database State: Modified Reservation



🍽️ Restaurant Reservation Assistant

Book, modify, or cancel your reservation

I'd like to modify my reservation details.

I'm ready to help you modify your reservation! To get started, could you please tell me your reservation ID?

my ID is "14"

Perfect, thanks! What would you like to change about your reservation for ID "14"? For example, do you want to adjust the date, time, number of people, or something else?

I would like to change name to Muavia

Your reservation (ID: 14) has been updated successfully. Updated details:

- Name: Muavia
- Email: ahmed@demo.com
- Party Size: 8
- Type: dinner party
- Date: 2025-08-02
- Time: 20:00:00
- Status: confirmed

✅ Process complete!

	reservation_id INTEGER PRIMARY KEY AUTOINCREMENT UNIQUE	user_name TEXT	email_id TEXT
14	14	Muavia	ahmed@demo.com

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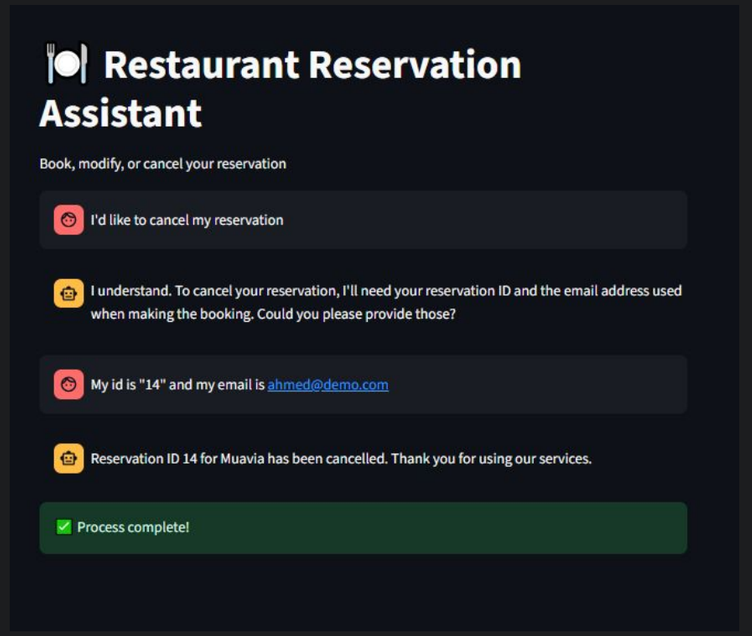
Cancellation Flow: Freeing Up Slots

The cancellation process is straightforward, ensuring that slots are quickly made available for other customers once a booking is no longer needed.

- User initiates cancellation by providing their unique **reservation ID and email** for verification.
- The AI assistant securely **locates the corresponding record** in the database.
- The reservation entry is **deleted from the database**, immediately freeing up the previously occupied time slot.
- A confirmation message is sent to the user, acknowledging the successful cancellation.

UI & Database State: Before & After



reservation_id *INTEGER PRIMARY KEY AUTOINCREMENT UNIQUE*	user_name *TEXT*	email_id *TEXT*	num_persons *INTEGER*	reservation_type *TEXT*	res_date *TEXT UNIQUE*
14	Muavia	ahmed@demo.com	8	dinner party	2000-01-01

res_time *TEXT UNIQUE*	status *TEXT DEFAULT*	created_at *TEXT DEFAULT*	updated_at *TEXT DEFAULT*
00:00	cancelled	2025-07-31T14:33:52.162084	2025-07-31 10:25:24

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Key Features & Advantages

Our AI Reservation Assistant offers several distinctive features that enhance both user and operational efficiency.

Conversational UX (No Forms)

Users interact naturally, speaking or typing their requests without needing to navigate complex forms or menus. This streamlines the booking process.

Robust Database Management

Secure and efficient handling of reservation data, ensuring accuracy, consistency, and real-time updates for bookings, cancellations, and modifications.

Intelligent Slot Suggestion

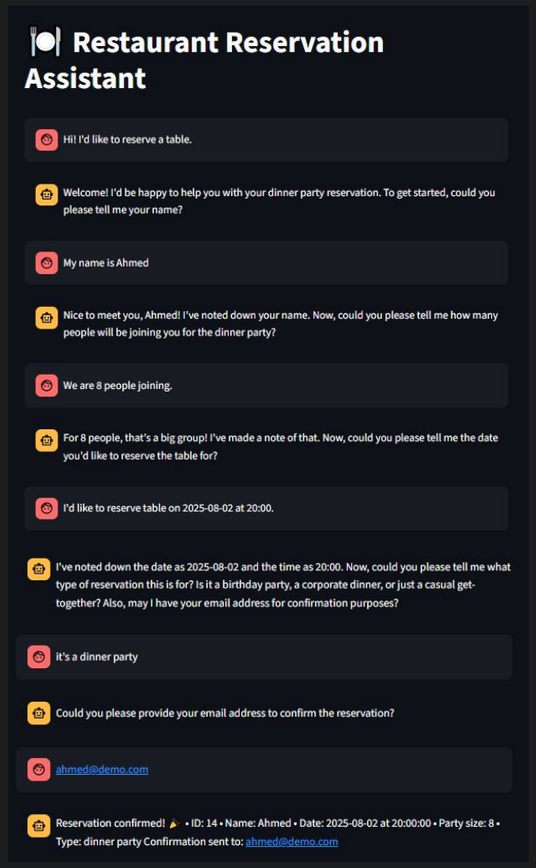
If a requested time slot is unavailable, the assistant intelligently suggests alternative nearby times or dates, improving user satisfaction and conversion.

Modular Design

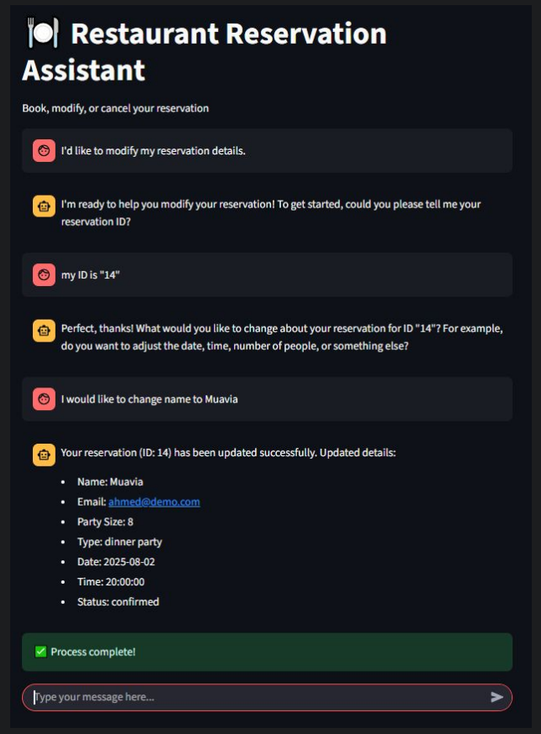
Built with a clean, modular architecture that allows for easy expansion, integration of new features, and maintenance. This ensures scalability and adaptability.

Demo & Live Screenshots

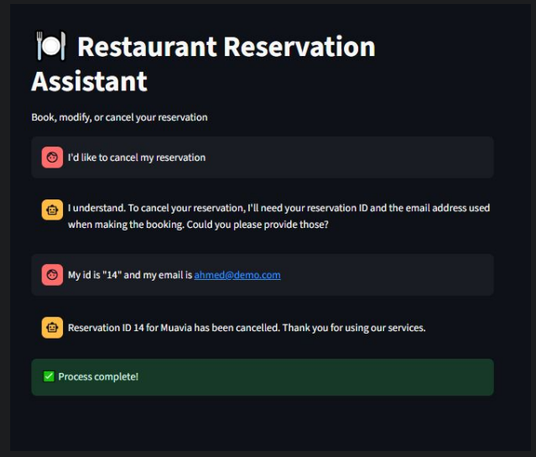
Witness the AI Reservation Assistant in action through these visual demonstrations of its core functionalities.



Reservation



Modification



Cancellation

These screenshots illustrate the seamless interaction within the Streamlit UI and the real-time updates reflected in the SQLite database.

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Conclusion & Future Scope

This project successfully demonstrates the feasibility and benefits of an AI-powered restaurant reservation assistant using modern LLM technologies and robust software engineering principles.

Summary of Achievements:

- Developed a functional conversational AI agent capable of handling complex reservation scenarios.
- Integrated LangGraph for advanced flow control and state management.
- Implemented a light weight database system for persistent data storage and retrieval.
- Created an intuitive user interface with Streamlit, enhancing user experience.

Scope for Future Improvements:

Advanced Agent Flow Improvements: Incorporate more sophisticated error handling, disambiguation, and context retention for truly human-like conversations.

Email/SMS Confirmation: Integrate external APIs for automated confirmation messages, enhancing reliability and user trust.

More Dynamic Nodes: Expand the LangGraph pipeline with additional nodes for features like waitlist management, special requests, or multi-restaurant support.