TEAM BISCUIT

By -
Yusuf Bootwala 23BDS0185,
Chinmoy Deb 23BCT0050,
Taher Panbiharwala 23BCT0028

PROBLEM STATEMENT

Restaurants face increasing pressure to deliver **fast, personalized, and consistent service** without overburdening staff or frustrating customers. Peak hours lead to slower service, order errors, and missed upselling opportunities, while high staff turnover and costly training disrupt consistency. Customers expect tailored recommendations, dietary accuracy, and instant answers, yet overworked staff struggle to meet these demands. Owners must also balance labor costs, track inventory in real time, and maintain customer satisfaction.

OUR SOLUTION

We developed an AI Waiter Assistant that simulates a real waiter, capable of handling restaurant interactions naturally and reliably.

Voice + Chat Interface

- Customers can interact either by speaking or typing. The assistant responds with natural speech using TTS (Piper), making it feel closer to a real human waiter.

Intelligent Order-Taking with Structured JSON Outputs

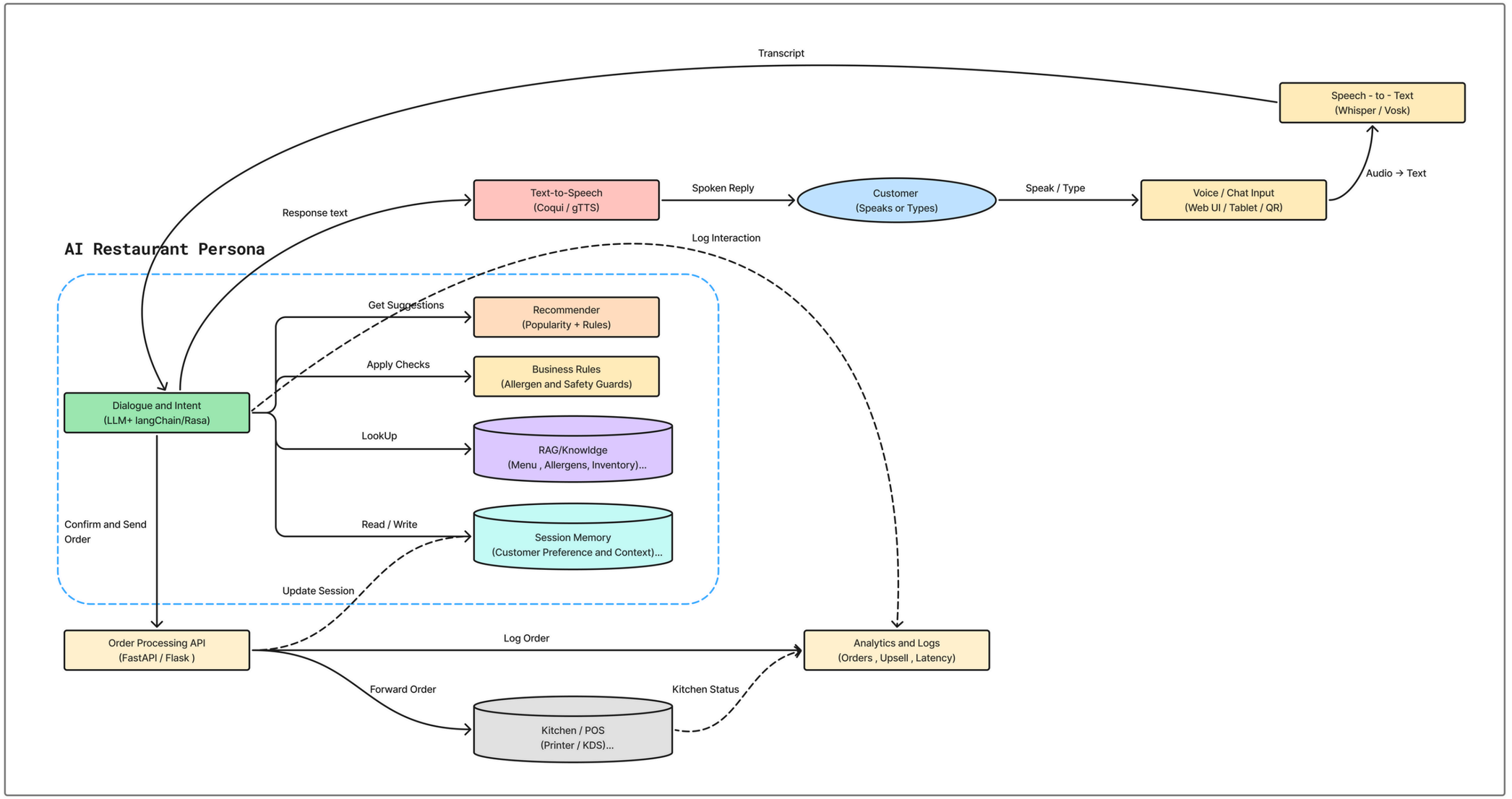
- Instead of free-text, the system produces structured JSON orders (drinks, appetizers, mains, sides).
- This ensures every order is clear, machine-readable, and error-free, ready for downstream use (POS or kitchen integration).

Menu-Aware Conversations

- Using ChromaDB embeddings, the assistant understands the restaurant's menu in real time.
- Based on simple preferences (spicy/non-spicy, vegetarian, popular items), the assistant suggests dishes and upsells naturally — just like a skilled human waiter.

ARCHITECTURE OVERVIEW

Section 1



MODEL TRAINING & RESULTS

We fine-tuned Gemma-2-2B-IT on a custom dataset of 17,000 synthetic restaurant conversations covering ~31 scenarios such as greetings, order-taking, dietary restrictions, menu comparisons, complaints, and billing.
The goal was to build a domain-specialized model that not only generates natural dialogue but also produces structured JSON outputs for orders.

Key Evaluation Results (Test Set):

- BLEU (84.45): High overlap with reference outputs, showing strong linguistic accuracy.
- ROUGE-1/2/L (~0.93): Captures n-gram and structural fidelity across responses.
- BERTScore F1 (0.93): Strong semantic similarity with gold responses.
- chrF (96.34): Robust character-level precision/recall, ensuring fluency.
- Slot-Filling F1 (1.0): Perfect structured JSON compliance — all required fields correctly predicted.

These results highlight that while exact match is low (due to natural variations in conversation), the model consistently produces semantically accurate, well-structured outputs suitable for restaurant automation.

IMPACT AND INNOVATION

Our prototype already demonstrates tangible benefits for restaurants and customers:

Faster Ordering

- The AI waiter reduces waiting times by instantly handling orders through chat or voice. This improves table turnover and helps during peak hours when human staff are overburdened.

Structured, Error-Free Outputs

- Orders are generated as structured JSON, eliminating ambiguity and reducing human errors in communication between customer, waiter, and kitchen. This ensures higher accuracy and customer satisfaction.

Scalable to Restaurants

- The system is modular and lightweight — built with Streamlit, FastAPI, and Docker — making it easy to deploy in different restaurant environments.
- It can scale from small cafés (simple order taking) to large restaurants (full POS/analytics integration).

FUTURE SCOPE

While our Round-2 demo focuses on order-taking and menu awareness, the architecture is designed to scale into a full restaurant assistant with advanced features:

Seating & Table Management

- Automating table allocation and reservations to optimize dining space and reduce customer wait times.

Group Ordering & Bill Splitting

- Handling conversations with multiple diners at once and automatically splitting the bill — a pain point for both customers and staff.

Future Scope

Manager Analytics Dashboards

- Providing insights into sales trends, popular dishes, staff efficiency, and customer feedback. This turns raw interaction data into actionable intelligence for restaurant owners.

POS/Payment Integration

- Directly connecting to restaurant POS systems (like Odoo POS or ERPNext) and payment gateways to enable end-to-end automation from order to payment.