Food Scout Report

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1. Introduction

In an era of overwhelming food options and limited time, users increasingly seek smarter tools for discovering dining experiences tailored to their preferences. **Food Scout** is an AI-powered restaurant discovery assistant that enables users to find restaurants through natural conversation. Unlike static search tools, Food Scout delivers personalized recommendations by understanding user intent, preferences, and context.

2. Objective

The goal of this project is to develop a **personalized restaurant recommender** that engages users in dialogue, extracts relevant entities from their inputs, and generates tailored suggestions. The assistant is built to interpret diverse inputs like cuisine type, location, budget, and dietary restrictions.

3. Methodology

3.1 NLP-Based Entity Extraction

- **spaCy** was used for Named Entity Recognition (NER) to identify structured information such as locations, cuisines, and price points.
- Custom **regex patterns** were implemented to catch phrases and keywords that traditional NER models might miss (e.g., “under 20 dollars,” “something spicy”).

3.2 Context-Aware Dialogue

- OpenAI’s **GPT-4** was used to generate human-like dialogue.
- The model was prompt-engineered to maintain context, ask clarifying questions, and adjust responses based on extracted user preferences.

3.3 User Interface

- A conversational UI was built with **Gradio**, providing an interactive platform where users can chat with the assistant in real-time.

4. System Architecture

4.1 Components

- **Frontend (UI)**: Built using Gradio, it provides a lightweight chat interface.
- **NLP Engine**: Processes input using spaCy and regex to extract structured data.
- **AI Core**: GPT-4 generates responses and manages conversation flow.
- **Context Manager**: Maintains user intent across messages and manages dialogue state.

4.2 Data Flow

1. User sends a message.
2. NLP module extracts key entities (location, budget, cuisine, etc.).
3. GPT-4 receives both raw input and extracted entities as context.
4. The context manager updates conversation state and determines the next step.

5. Challenges

- **Ambiguous Language**: Users often use imprecise terms (e.g., “cheap,” “near me”), requiring fallback logic or follow-up questions.
- **Entity Extraction Edge Cases**: SpaCy and regex had limitations with informal or idiomatic phrases.

These challenges were managed by introducing more robust entity extraction by training the model on datasets that represented possible answers for each category of information.

- **Properly Navigating Context:** There were difficulties with constraining the natural language output of GPT-4 with the rigid outputs of the extraction model

This challenge was addressed by introducing a state machine to manage the context and flow of the conversation to guide the user along the defined steps.

6. Potential Improvements

- **API Integration**: Incorporate real-time restaurant data from services like Yelp or Google Places to enhance the relevance of recommendations.
- **Long-Term User Preferences**: Implement persistent user profiles to remember dietary restrictions, disliked cuisines, or favorite restaurants.

- **Feedback Loop**: Let users rate suggestions to fine-tune future recommendations via reinforcement learning or rule-based adjustments.

7. Conclusion

Food Scout demonstrates how modern NLP and conversational AI can transform restaurant discovery into a more personalized and engaging experience. By blending real-time dialogue management with intelligent entity extraction, the assistant moves beyond static search to deliver smarter suggestions through human-like conversation.

8. Self Scoring Table

Kyle Poulson

80 points – significant exploration beyond baseline

30 points – Innovation or creativity: Implementing personalized food suggestions using guided user preference extraction

10 points – Highlighted complexity: Entity extraction using spaCy combined with context manager

10 points – Discussion of lessons learned and potential improvements: Handling ambiguous language and navigating context

10 points - exceptional visualization/diagrams/repo