ShopAssist AI 2.0: Intelligent Laptop Recommendation Chatbot

Project Background

In the digital era, online shopping has become the preferred choice for consumers. However, the vast array of options and the lack of personalized assistance can make the experience overwhelming. To bridge this gap, we developed **ShopAssist AI**—an intelligent chatbot that leverages **Large Language Models (LLMs)** and **rule-based functions** to provide highly accurate and reliable laptop recommendations.

Problem Statement

Given a structured dataset containing laptop details—such as product names, specifications, descriptions, and pricing—the goal is to develop a chatbot that can:

- Accurately parse the dataset.
- Understand and process user requirements dynamically.
- Deliver precise laptop recommendations tailored to individual preferences.

By integrating the **Function Calling API**, the system significantly improves **response accuracy, interaction efficiency, and user experience** while maintaining a conversational and engaging shopping process.

Challenges

1. Complexity of a Multi-layered System

Managing multiple layers for seamless chatbot interactions posed integration and efficiency challenges.

2. Inconsistent JSON Formatting

Ensuring structured and validated JSON output required multiple processing layers for accuracy.

3. Context Loss Across Conversations

Using separate LLM instances for user requirement extraction and recommendations led to inconsistencies and loss of user context.

4. Misclassification of Laptop Specifications

Despite rule-based frameworks, specifications were sometimes misclassified due to ambiguities in product descriptions.

5. Limited Rule-Based Classification

Predefined rules for classifying laptop features were not exhaustive, affecting recommendation accuracy.

6. Lack of Intent Recall

If a user changed their intent mid-conversation, there was no efficient way to recall previously extracted information and adjust recommendations dynamically.

7. Rigid Workflow & Limited Adaptability

The system lacked flexibility to accommodate user preference shifts in real-time.

Enhanced System Design

To overcome these challenges, **ShopAssist AI 2.0** introduces key architectural improvements, ensuring a **more efficient, scalable, and intelligent recommendation system**:

1. Function Calling API for User Requirements

- Dynamically extracts user preferences in a single conversation.
- Outputs structured **JSON data** for precise recommendation processing.

2. Unified LLM for User Interaction & Recommendations

- A **single LLM instance** now manages both user interactions and laptop recommendations.
- Retains **context across multiple queries**, leading to **personalized and consistent responses**.

3. Enhanced Context Retention Mechanism

- Combines **requirement extraction** and **recommendation generation** within a seamless flow.
- Improves **continuity and personalization**, eliminating fragmented interactions.

4. More Flexible & Scalable Architecture

- **Easily extendable** to different product domains (e.g., smartphones, tablets, accessories).
- Requires **minimal modifications** to adapt to new product categories.

- Introduces **structured conversation storage** (`conversation_bot`) for better tracking of user interactions.
- Implements **conversation_reco**, ensuring **context retention for recommendations**.

5. Smarter Intent Confirmation & Recommendation Logic

- **Intent Confirmation Layer** verifies user needs before generating recommendations, **reducing irrelevant suggestions**.
- Uses `get_user_requirement_string()` before function calling to **enhance intent understanding**.
- If no matching laptops are found, the chatbot provides a **fallback response** by connecting users to a **human expert**.

Data Sources

ShopAssist AI relies on a **structured dataset** containing:
✔ **Laptop product names**
✔ **Detailed specifications** (processor, RAM, storage, GPU, display, battery life, etc.)
✔ **Product descriptions**
✔ **Price ranges**
✔ **User reviews and ratings**

The dataset ensures **comprehensive coverage of laptop models**, allowing for **precise filtering and matching** based on user needs.

Conclusion

ShopAssist AI 2.0 revolutionizes online shopping by offering **intelligent, context-aware laptop recommendations** through an enhanced chatbot system. With **improved architecture, better context retention, and greater flexibility**, the chatbot transforms how users **discover, compare, and purchase laptops**.

By **bridging the gap between overwhelming product choices and personalized assistance**, **ShopAssist AI 2.0** makes online shopping more **intuitive, efficient, and user-friendly**.