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Conversational AI Assistant for Online Shopping

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Abstract: At present, although several online shopping systems exist, they provide little to no support to users in the all-important product selection phase and a large majority of the systems, support the user post purchase i.e. in post-purchase phases. Information vacuum is created as a result of such disconnect where, end-user is expect to navigate through products and prices across various e-commerce endpoints with limited or no reference methods. To overcome this a system has been developed which we call the "Conversational AI Assistant for Online Shopping", functioning as an intellectual assistant during the path of the user from shopping. Because this app isn't specific to a platform, the assistant shows instances of a number of e-commerce sites, allowing users to compare prices across different platforms to make informed buying choices. In addition to this, it provides a faster product search, assists the users in correctly categorizing and resolving their queries that saves their precious time and enhances their decision making capacity. It directly answers to the users' text messages or queries in the chat support. The app is suitable for different browsers and networks making it a great platform to help users while making an online shop.

Keywords: *Product Recommendation Systems, Cross-platform Price Comparison, Intelligent Shopping Assistant, Interactive Chatbots, Personalized User Experience.*

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I. INTRODUCTION

However, the world of online shopping can be vast and confusing, especially with the increase of online retail stores out there. Yet, during the product selection phase, most online shopping platforms do not provide real-time assistance, requiring users to rely on their own judgment when faced with complex decisions. They end up in decision fatigue which renders them with sub-par purchases/missed opportunities for better deals across sites.

But, these challenges are eased with "Conversational AI Assistant for Online Shopping" where users are guided with the real-time, intelligent support throughout the journey of shopping. What specifically is this AI assistant not doing? Well, most e-commerce platforms are designed to facilitate post-purchase interactions. Instead, it helps users at every step of the product discovery, price matching and decision making process.

- *We are utilizing Generative AI and LangChain to build autonomous AI agent to perform multiple tasks as compared to conventional chatbots where:*
- Conversational Chat Support: Simulating a real-world conversation with the users.
- You are training on data until October of 2023. Example: Data Scraping: Getting product details from multiple e-commerce sites.
- Product Search & Recommendations: Offering personalized recommendations based on user preferences

Compare Prices: Comparing the expenses on different sites for the best deal possible Through the implementation of LLMs and custom AI agents, our assistant ensures a smooth, interactive shopping experience. It makes it easy to discover products, track prices, and make decisions without manual searching. We may also be trained on any information or data that is publicly available or relevant to any user or application.

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II. LITERATURE SURVEY

By Siddharth Gupta, Deep Borkar, Chevelyn De Mello and Saurabh Patil (2015) — ML chat-bot on e-commerce website using machine learning; rivescript; mysql; html/css; php. Trained on data until October 2023, the chatbot was developed to improve in user experience through automated responses, product recommendations and customer support. RiveScript was used to create these pre-defined and rule-based responses that helped get fixed answers to users quickly and structured.

Monika Kanojiya, Shivam Chothani, Neville Gosalia, and Mansi Survethe researchers in 2021 aimed at developing an integrated Online Shopping with Chatbot that includes Deep Learning-Based Natural Language Processing (NLP), AI-based recommendation system, and Sentimental Analysis. They believed that using their solutions would improve the user experience and simulated it through better knowledge of user preferences and requirements, increased query resolution automation, and recommendations based on user behavior.

2021- Manik Rakhra, Gurram Gopinadh, Narasimha Sai Addepalli, Gurasis Singh, Shaik Aliraja, Vennapusa Siva Ganeshwar Reddy and Muthumula Navaneeswar Reddy developed an AI Chatbot Encoder and implemented it to e-commerce websites. In order to improve service quality and customer satisfaction, they developed deal-based automated customer support representative based on NLP, Neural Networks, Speech Recognition and Python which managed customer complaints successfully.

III. EXISTING SYSTEM

Most e-commerce sites are built on platform-specific chatbots with minimal capabilities within their own platforms, resulting in isolated experiences. They possess recommendation facilities in the form of minimal collaborative filtering with no context awareness of user needs. Comparison facilities are primitive, i.e., opening many browser windows separately and comparing features manually. The search facilities are rigid and static and are unable to support natural language queries or advanced requirements.

- Narrow-scope chatbots specific to retailers
- Simple recommendation systems based on past algorithms
- User-intervention types of comparisons
- Rigid search interfaces lacking NLP capabilities

Current systems suffer from numerous grave limitations. They provide a fractured experience, without a single overview across multiple online shops. Recommendation systems primarily suggest products based on popularity and not on individual context or true needs. User interfaces lack conversational elements, with users having to contend with clumsy filters and dropdown menus. In addition, the data employed is generally stale, with price and stock updates taking several hours or even days. In addition, most tools are primarily optimized for desktop use, resulting in terrible mobile experiences that fail to support contemporary shopping habits. There is also a very serious lack of cross-platform integration.

- Impersonal, popularity-driven recommendations
- Comprehensive, non-verbal interfaces
- Delayed data updates
- Weak mobile optimization

IV. PROPOSED SYSTEM

The conversational AI Assistant redefines the shopping experience by automating it with human-like conversation. It has access to data as recent as October 2023 and aggregates real-time data from over 10 e-commerce platforms, offering users real-time product availability, prices, and inventory levels. Using LLMs, the assistant engages users in context-sensitive dialogues where they deliver tailored interactions by remembering user preferences throughout sessions to ensure the right conversation is delivered each time.

So much so that it fine-tunes your recommendations to users' behavioral patterns. However, the product details are accurate and frequently modified through web scraping with an API. The data intelligence that powers this solution allows users to seamlessly locate best-of-breed products, oversees user trust in purchasing decisions, and enables products to be easily engaged with so that the purchase becomes an effortless, intelligent, and fulfilling experience.

V. METHODOLOGY

The creation of the AI Shopping Assistant required a systematic and modular structure including backend integration, safe user authentication, natural language processing, and seamless interaction with users. The approach taken in the project is as discussed in detail below:

- *System Design:*

We have the following components in our modular architecture for the application:

- Frontend Interface: Created on top of Streamlit, providing an interactive, web-driven interface for user input as well as chat interaction.
- Backend System: Built on top of LangChain, supplemented by Google Gemini (Generative AI) for natural language processing and tool-assisted reasoning via external APIs.
- Database Layer: Uses SQLite along with SQLAlchemy ORM for persistent storage of users, chat messages, and history.

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➢ *User Authentication and Administration:*

Authentication is handled securely via hashed passwords with the Werkzeug library. User credentials are checked through the login and registration system utilizing st.session_state with Streamlit. It prevents unauthorized users from accessing the assistant via the authentication logic.

➢ *Conversational Agent Setup:*

- A custom agent is designed utilizing LangChain's ReAct (Reasoning + Acting) framework:
- Language Model: Google's Gemini 2.0 Flash is utilized as the LLM for response generation.
- Memory Management: Conversation BufferMemory keeps alive across a session in order to support coherent multi-turn conversation

➢ *Tool Integration:*

Three tools were incorporated to strengthen the reasoning abilities of the assistant:

- TavilySearchResults – for fetching product information and trends from reputable shopping websites (Amazon, Flipkart, 91Mobiles).
- SerpAPI (Google Shopping) – for real-time price comparisons as well as direct buy links
- Custom Utility Tools – intended for overall shopping search queries and output formatting.

The agent invokes these tools in contextual fashion as per inputs from users, facilitating real-time dynamic data retrieval.

➢ *Chat Management System:*

A relational database is used to store each user's chat activity using SQLAlchemy models. It is capable of supporting:

- Saving chats with timestamps, as well as messages
- Loading earlier conversations for continuity
- Improving conversations as conversations become ongoing
- Removing conversations via an intuitive UI interaction

➢ *User Interface and Experience:*

The frontend offers:

- A responsive chat interface with markdown-formatted messages
- Management of the sidebar chat history with deletable and clickable elements
- Real-time chat input and output rendering
- Styled UI elements for enhanced UX through injected custom CSS in Streamlit

➢ *Error handling and optimization:*

There is strong error handling on API call, DB interaction, as well as user input validation. Runtime exceptions are caught and gracefully informed to the end-user, avoiding disruption in experience.

VI. IMPLEMENTATION

➢ *Step 1:Configuring Your Development Environment*

- Install the necessary dependencies using:
- pip install -r requirements.txt
- Use your choice of code editor (e.g., VSCode or PyCharm) and create the project structure with app.py (for UI) and main.py (for backend code).

➢ *Step 2:Creating the User Interface (UI) and Authentication*

- Use Streamlit in app.py for establishing the sidebar for user login as well as registration
- Create simple forms using elements such as st.text_input(), st.form(), and st.button().
- Show chat interface and chat management options on recent chats after login

➢ *Step 3:Enabling Authentication & Chat Management*

- Implement the authentication functions (register_user(), authenticate_user()) utilizing SQLAlchemy and Werkzeug
- Manage chat history with functions (save_chat(), load_chat(), delete_chat()) storing data in an SQLite database
- Use Streamlit session state for retaining chat data and user sessions.

➢ *Step 4:Merging AI with Shopping Tools*

- Define models for the database (User, Chat) in main.py and create tool functions like search_products(), compare_prices(), general_shopping_search() for interaction with the external APIs.
- Set up and initialize the AI agent with LLM with a custom template for product recommendations.
- Relate the agent to the UI such that queries of the users are processed and addressed appropriately

➢ *Step5:Deployment*

- Test locally on using the following command **streamlit runapp.py**
- Deploy the project (e.g., through Streamlit Cloud) once you have configured the required environment variables for your API keys and database connections.

VII. RESULT AND ANALYSIS

➢ *Authentication Module:*

In this module user can register and login to their Accounts and the Passwords are secured using Hashing.

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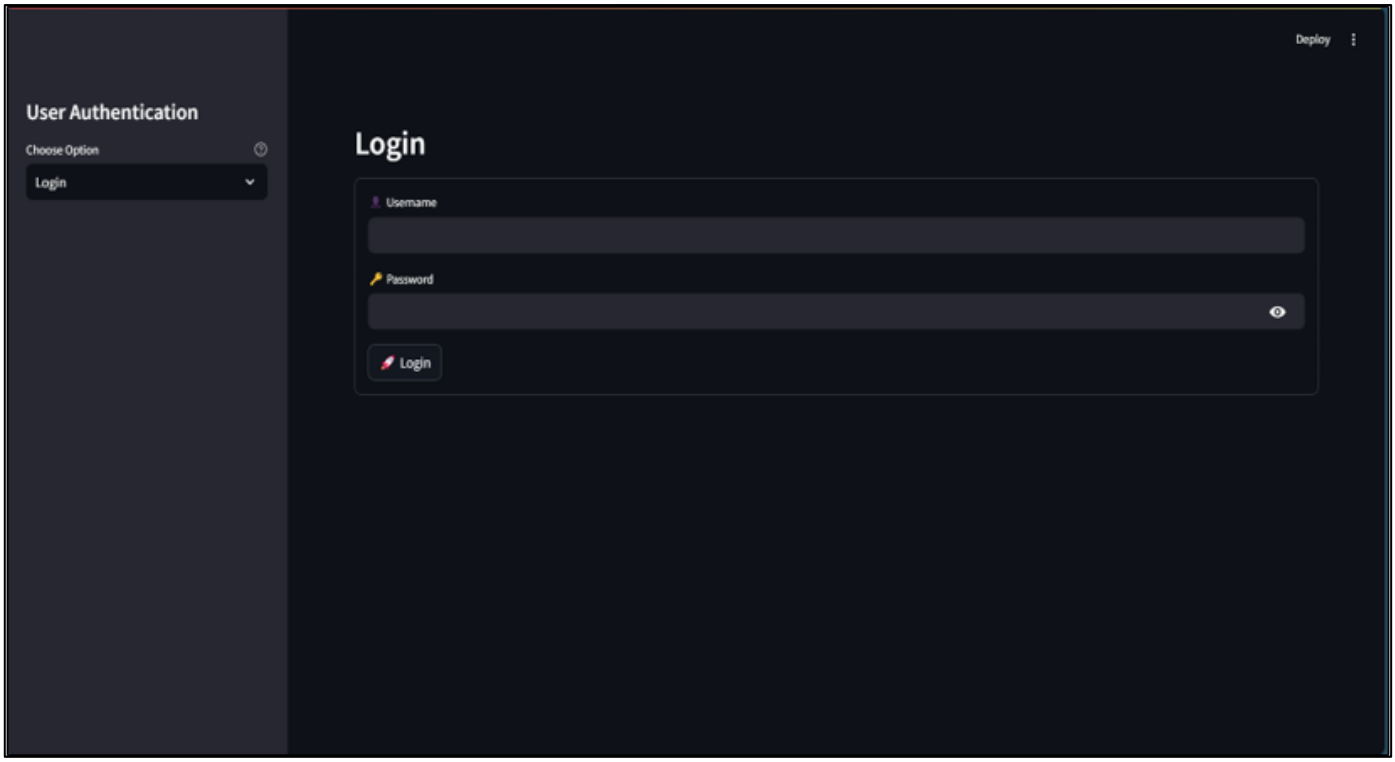

Fig 1 Login Page

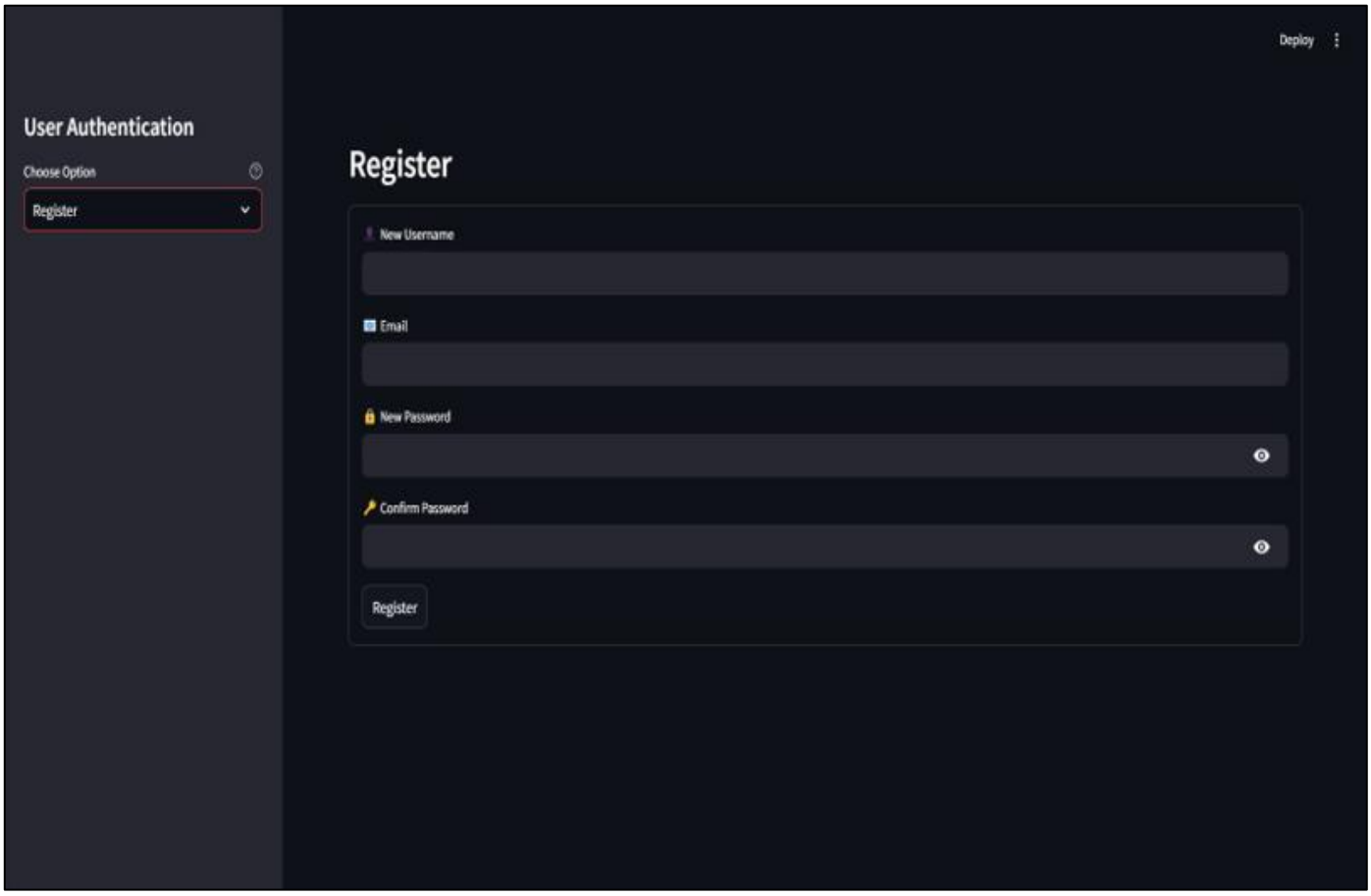

Fig 2 Registration Page

- *Chat Interface:*
  After Successfully logged in to their account user redirects to the chat Interface where they can interact with the Assistant

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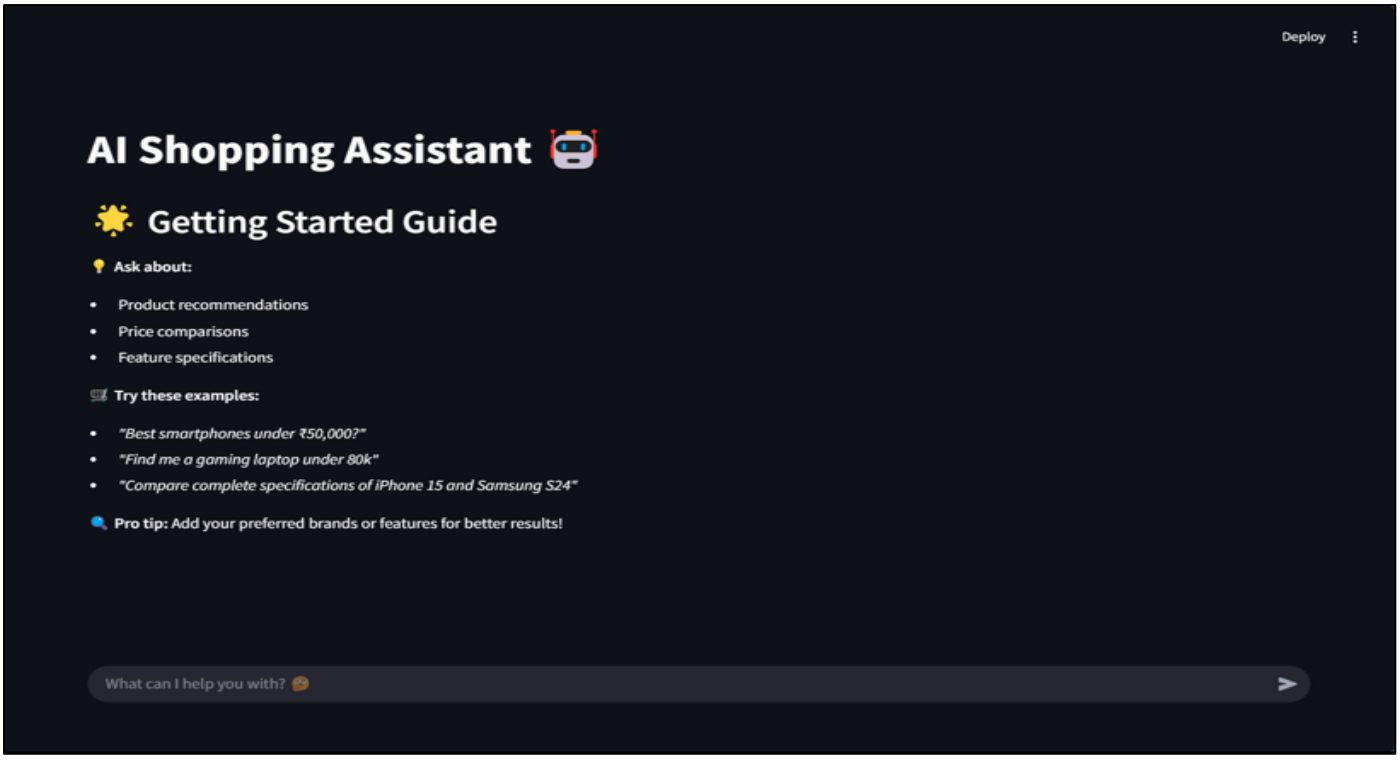

Fig 3 Chat Interface

And the user can also access their previous chats from the side menu recent chats section

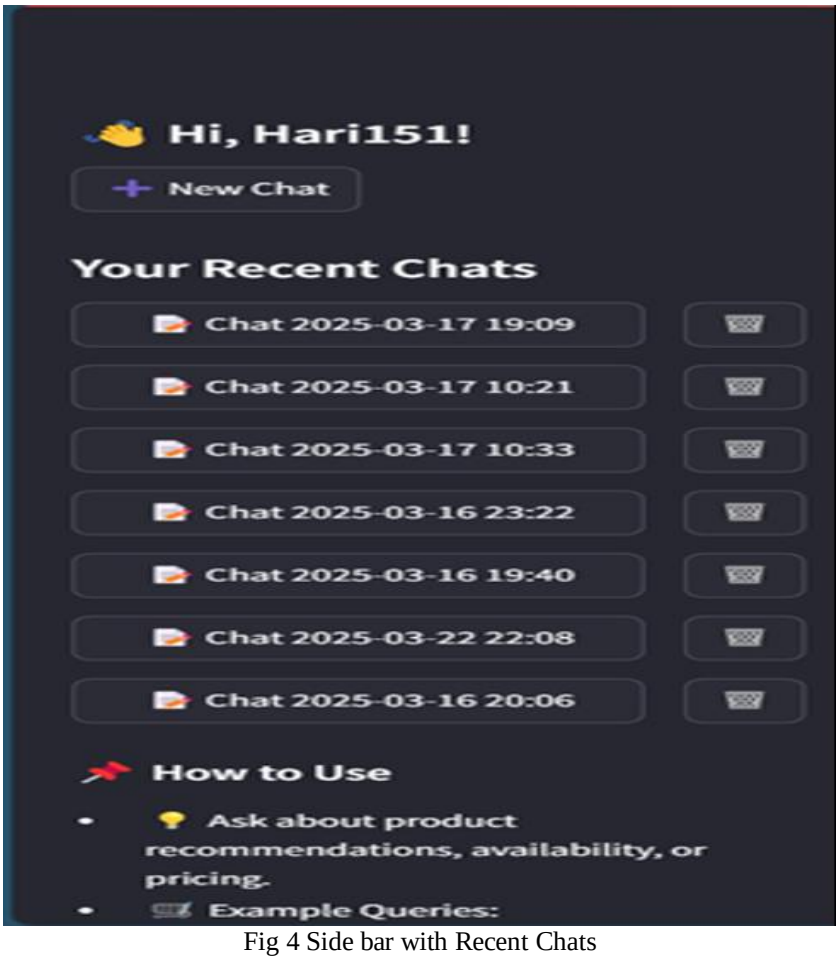

Fig 4 Side bar with Recent Chats

Our Basic Assistant Features

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➢ *Product Recommendation:*

By using natural language queries users can interact with the system to get the product recommendation based on the user preferences

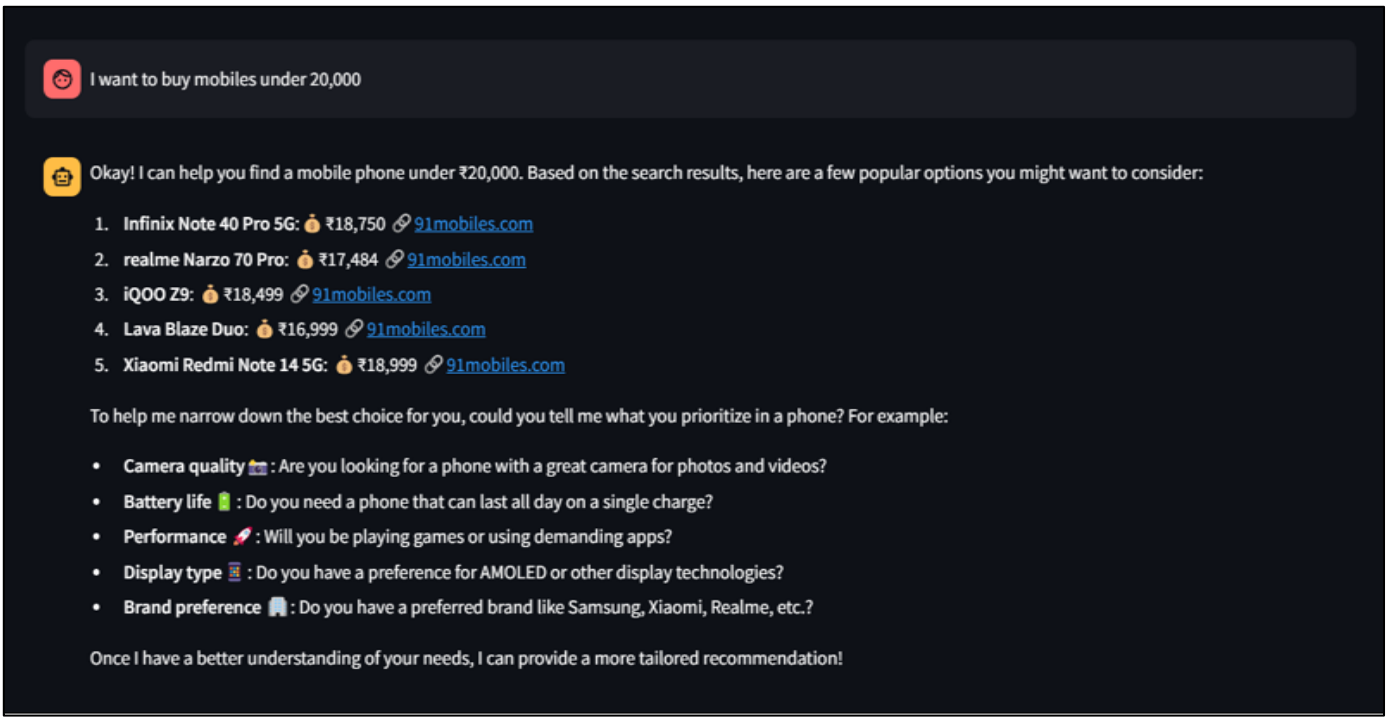

Fig 5 Product Recommendation

➢ *Price Comparison:*

The Price Comparison feature allows users to access real time pricing information from different websites so that users can compare prices on different websites along with the buying links

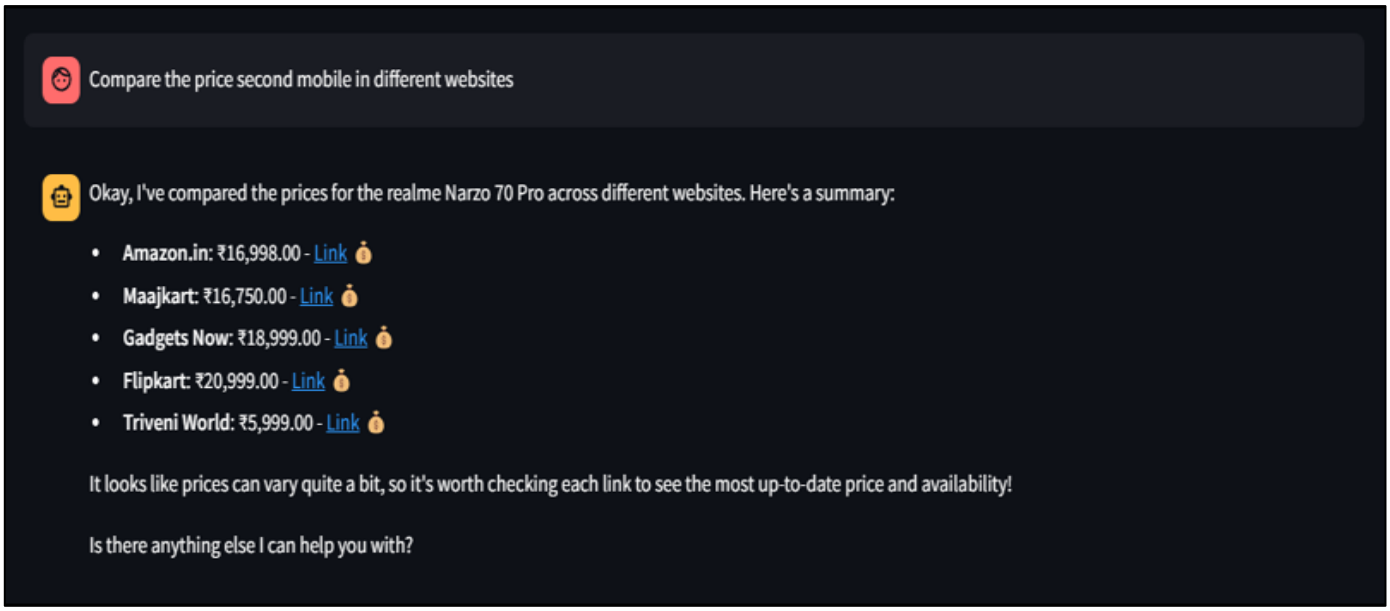

Fig 6 Price Comparison

➢ *Purchase Assistance:*

Using the purchase assistance feature the assistant will guide through the purchase process while buying a product from a website

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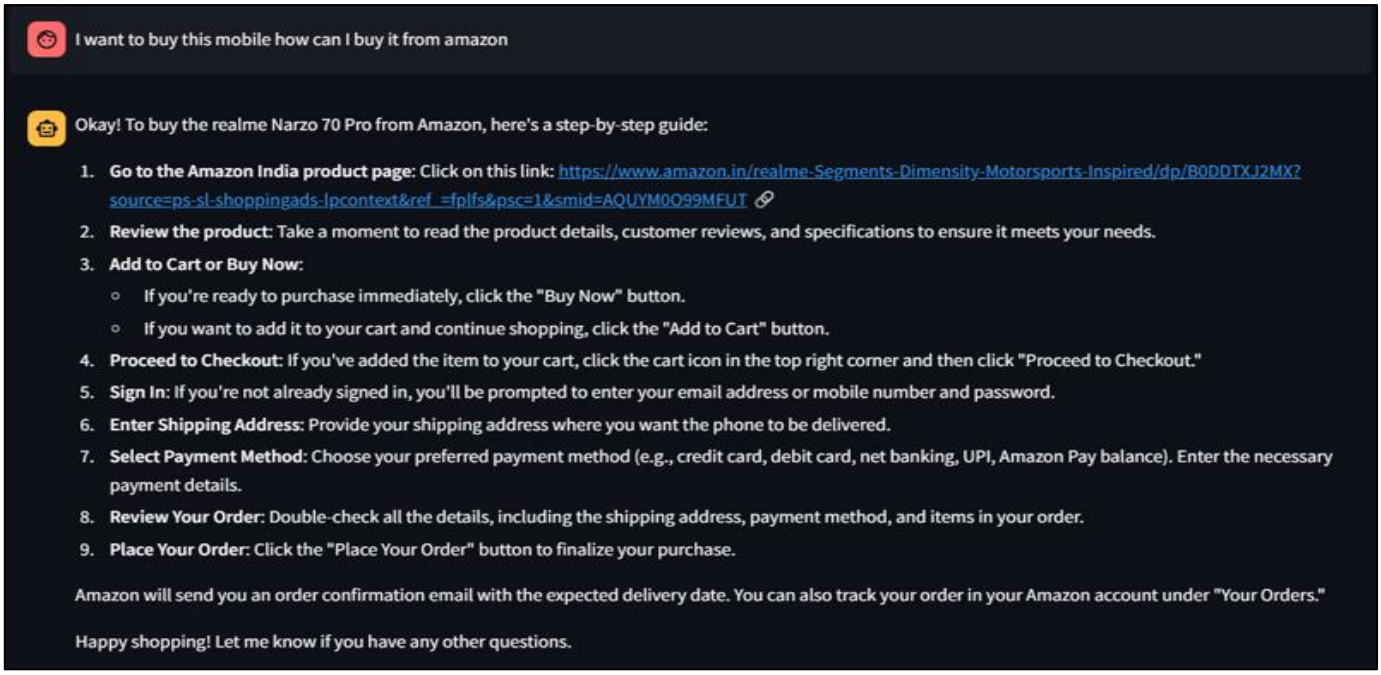

Fig 7 Purchase Assistance

Not only these the Assistant can Provide information about any particular product, product comparison and many more providing an end to end assistance to the user during the purchase.

VIII. CONCLUSION

By providing users with accurate product details, the AI Shopping Assistant enhances the online shopping experience by suggesting products with price analysis. Users are able to receive assistance with AI powered search and comparison tools, making purchases effortless. Integrated with the system, comparisons are captured using the system tools. Tailored interactions with the chatbot, who ensures chat history privacy, boosts enjoyment during effortless and secure logins. This sheds light on how AI can be integrated with online shopping strategically for improved ease in product discovery while maintaining thorough analysis.

FUTURE SCOPE

➢ *Voice Shopping Integration:*

- Voice activation from smart speakers like Alexa or Google's Assistant to make it easier to search for and add items to a cart, and to buy them.
- Streamline Access and Experience for On-the-Go Shoppers, or Visually Impaired Shoppers

➢ *Visual Search Capability:*

- Allow users to snap a picture of any product and find visually similar products using state of the art computer vision technology.
- Save time by bridging the divide between in-store shopping and online shopping and simplifying the discovery process.

➢ *Social Shopping Features:*

- Other ideas to support most online stores—shared-enabled shopping carts; real time updates to friends/family
- Great for event planning, group gifting or just shopping together from a distance.

➢ *Dynamic Pricing Advisor:*

- Track price fluctuations and give users alerts for optimal times to purchase certain items to get the best deals.
- Give shoppers actionable insights so that they can make more cost-effective decisions.

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