

GEN-AI SHOPASSIST SOLAR PANEL CHATBOT

Title: ShopAssist AI – Top3 Solar Panels Recommendation Chatbot

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1. Acknowledgements

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I extend my deepest appreciation to the upGrade Team for their unwavering dedication and expertise. Your collective efforts have been instrumental in bringing this project to fruition.

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- [upGrade Team]

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- [upGrade Team]

Support Staff

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- [upGrade Team]
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Your dedication, hard work, and passion have made this project a remarkable success. Thank you all for your exceptional contributions.

Yogesh Bhmare

2. Introduction

In recent years, the demand for renewable energy sources has grown significantly, with solar power being a prominent option. As the variety of solar panels on the market increases, consumers face challenges in selecting the best panel for their specific needs. The ShopAssist AI project addresses this issue by creating an intelligent chatbot that helps users choose the top 3 solar panels tailored to their requirements.

The chatbot leverages a database of solar panel specifications and user inputs to provide personalized recommendations. This project report outlines the objectives, design, implementation, challenges, lessons learned, and applications of the ShopAssist AI chatbot.

3. Objectives

The primary objectives of the ShopAssist AI project are:

- **User Assistance:** Provide users with an intuitive interface to obtain solar panel recommendations.
- **Personalized Recommendations:** Use user-specific data to offer tailored solar panel choices.
- **Ease of Use:** Ensure the chatbot is accessible and user-friendly.
- **Data Utilization:** Leverage a comprehensive dataset of solar panels to provide accurate and useful suggestions.

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4. System Design

Dataset

We have a dataset `'solar_panel.csv'` where each row describes the features of a single solar panel and also has a small description at the end. The chatbot that we build will leverage LLMs to parse this `'Description'` column and provide recommendations

As you could see in the output above, the chatbot should ask a series of questions to

Determine the user's requirements. For simplicity, we have used 6 features to encapsulate the user's needs. The 8 features are as follows:

1. Brand Name
2. Panel Type
3. Rated Power
4. Rated Voltage
5. Purchase Price
6. Discount

Confirm if the user's requirements have been correctly captured at the end.

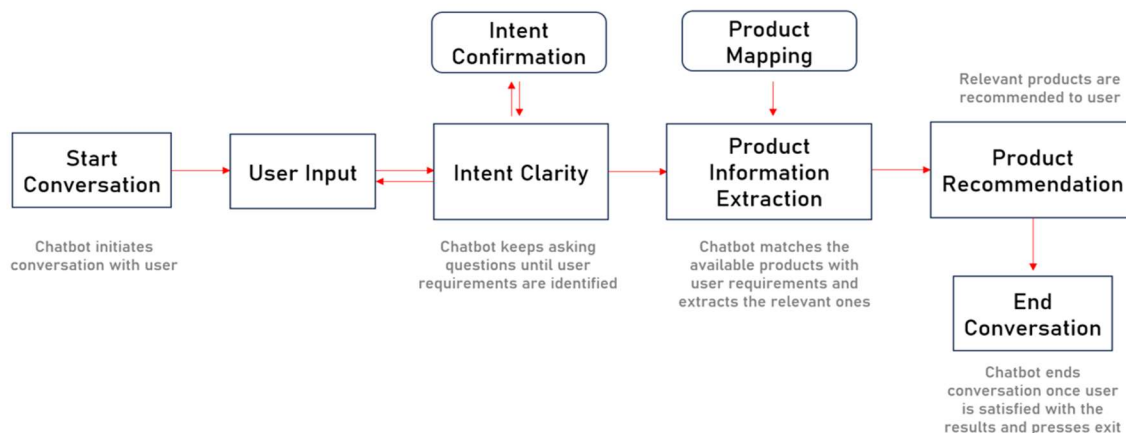
After that the chatbot lists down the top 3 products that are the most relevant, and engages in further conversation to help the user find the best one.

Building the Chatbot

Stage 1

- Intent Clarity Layer
- Intent Confirmation Layer

CHATBOT SYSTEM DESIGN



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Stage 2

- Product Mapping Layer
- Product Information Extraction Layer

Stage 3

- Product Recommendation Layer

Major Functions Behind the Chatbot

Let's now look at a brief overview of the major functions that form the chatbot. We'll take a deep dive later.

1. initialize_conversation()

This function initializes the variable conversation with the system message.

Purpose:

- To start the conversation with a predefined system message, setting the context for the interaction.

Key Steps:

- Define the system message.
- Assign this message to the conversation variable.

2. get_chat_completions()

This function takes the ongoing conversation as the input and returns the response by the assistant.

Purpose:

- To process the current conversation and generate a response from the chatbot.

Key Steps:

- Input the current conversation.
- Use the chatbot's language model to generate a response.
- Return the generated response.

3. moderation_check()

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This function checks if the user's or the assistant's message is inappropriate. If any of these is inappropriate, it ends the conversation.

Purpose:

- To ensure the conversation remains appropriate and safe for all users.

Key Steps:

- Analyze the user's message for inappropriate content.
- Analyze the assistant's message for inappropriate content.
- If any inappropriate content is detected, terminate the conversation.

4. intent_confirmation_layer()

This function takes the assistant's response and evaluates if the chatbot has captured the user's profile clearly.

Purpose:

- To verify that the chatbot has accurately understood and recorded the user's requirements.

Key Properties Checked:

- Brand Name
- Panel Type
- Rated Power
- Rated Voltage
- Purchase Price
- Discount

Discount Key Steps:

- Analyze the assistant's response.
- Check if the key properties are captured.
- Confirm the completeness of the user profile.

5. dictionary_present()

This function checks if the final understanding of the user's profile is returned by the chatbot as a Python dictionary or not. If there is a dictionary, it extracts the information as a Python dictionary.

Purpose:

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- To ensure that the user profile is structured correctly as a Python dictionary for further processing.

Key Steps:

- Verify the presence of a dictionary in the chatbot's response.
- Extract and return the user profile information as a Python dictionary.

6. `compare_solar_panel_with_user()`

This function compares the user's profile with different solar panels and comes back with the top 3 recommendations.

Purpose:

- To match the user's requirements with available solar panels and identify the best options.

Key Steps:

- Compare the user's profile against the database of solar panels.
- Evaluate and rank the panels based on user preferences.
- Return the top 3 recommended solar panels.

7. `initialize_conv_reco()`

This function initializes the recommendations.

Purpose:

- To set up the recommendation process at the beginning of the conversation.

Key Steps:

- Prepare the system for generating recommendations.
- Initialize necessary variables and context.

5. Implementation

The implementation of the ShopAssist AI chatbot involves several critical steps, including data collection and preparation, chatbot development, recommendation engine creation, and deployment.

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Data Collection and Preparation

Data collection is the foundational step in building the ShopAssist AI chatbot. Accurate and comprehensive data is crucial for providing reliable recommendations.

- **Data Source:** Data is gathered from a URL: <https://www.moglix.com/solar/solar-panels/213110000>
- **Data Cleaning:** The collected data is cleaned to handle missing values, remove duplicates, and ensure consistency. This step involves imputing missing values, standardizing units, and converting categorical data into numerical formats for analysis.
- **Data Storage:** The cleaned data is stored in a structured format, such as a CSV file or a database, to facilitate easy retrieval and processing during the recommendation process.

Chatbot Development

Developing the chatbot involves selecting an appropriate framework, installing necessary libraries, and integrating APIs for additional functionalities.

- **Framework Selection:** The chatbot is built using a framework like Flask, which provides tools for natural language understanding and conversation management.
- **Module and Library Installation:** Essential libraries and modules are installed, including:
 - **pandas** for data manipulation and analysis
 - **NumPy** for numerical operations
 - **matplotlib** and **seaborn** for data visualization
 - **OpenAI** Utilized for generating natural language responses and processing user inputs to provide intelligent and contextually relevant recommendations.
 - **Flask** for web deployment
- **OpenAI API Key:** The OpenAI API key is used to access the language model that generates natural language responses and processes user inputs.

Recommendation Engine

The recommendation engine is the core component of the chatbot, responsible for evaluating and ranking solar panels based on user inputs.

- **Prompt Technique Development:** A prompt-based approach is used to rank and score solar panels according to user-specified criteria. This approach considers factors like rated power, voltage, budget, efficiency, durability, and installation ease.
- **Chain of Thoughts:** The chatbot uses a chain of thought technique to guide users through the decision-making process. This involves asking a series of questions to understand the user's needs better and refine the recommendations accordingly.
- **Scoring Mechanism:** A scoring mechanism is implemented to evaluate each solar panel based on how closely it matches the user's preferences. The panels with the highest scores are recommended to the user.

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Deployment

Deploying the chatbot involves making it accessible to users through a suitable platform and ensuring it operates efficiently.

- **Platform Selection:** The chatbot is deployed using Flask, making it accessible to users via a web browser.
- **User Interface:** An intuitive user interface is designed to facilitate easy interaction with the chatbot. The interface allows users to input their preferences and view the recommendations seamlessly.
- **Testing:** Thorough testing is conducted to ensure the chatbot provides accurate and relevant recommendations. This includes unit tests, integration tests, and user acceptance testing to identify and rectify any issues before deployment.

6. Challenges

Developing the ShopAssist AI chatbot of **Top3 Solar Panel Recommendation** presented several challenges:

- **Data Quality:** Ensuring the dataset was accurate and comprehensive was crucial for reliable recommendations. Handling missing values and inconsistencies required significant effort.
- **User Interaction:** Designing an intuitive and user-friendly chatbot interface was essential for effective user interaction. Ensuring the chatbot understood and responded accurately to user inputs required careful design and testing.
- **Integration:** Seamlessly integrating backend logic with the chatbot interface posed challenges, particularly in maintaining real-time performance and responsiveness.
- **Scalability:** Ensuring the system could handle a large number of user requests simultaneously was crucial for providing a smooth user experience. This required optimizing the recommendation engine and backend infrastructure.

7. Lessons Learned

The ShopAssist AI project of **Top3 Solar Panel Recommendation** provided several valuable lessons:

- **Data Importance:** High-quality data is crucial for providing accurate recommendations. Investing time in data collection and cleaning pays off in the reliability of the final product.
- **User Experience:** A user-friendly interface significantly enhances the usability of the chatbot. Prioritizing user experience in design and development ensures higher user satisfaction.
- **Continuous Improvement:** Regular updates and improvements based on user feedback are essential for maintaining the relevance and accuracy of the recommendations. Iterative development and testing help refine the chatbot over time.

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- **Scalability Considerations:** Planning for scalability from the outset ensures the chatbot can handle growing user demands without performance degradation.

8. Applications

The ShopAssist AI chatbot of **Top3 Solar Panel Recommendation** has several practical applications:

- **Residential Users:** Helping homeowners choose the best solar panels for their specific needs and budget. The chatbot provides recommendations tailored to the user's location, energy requirements, and financial constraints.
- **Commercial Users:** Assisting businesses in selecting efficient and durable solar panels for commercial installations. The chatbot can recommend panels based on large-scale energy needs and long-term investment considerations.
- **Retailers:** Providing a tool for retailers to assist their customers in choosing the best solar panels. The chatbot can be integrated into retail websites, enhancing customer service and driving sales.

9. Conclusion

The ShopAssist AI project of **Top3 Solar Panel Recommendation** successfully created a chatbot that helps users find the top 3 solar panels based on their specific needs. By leveraging data and providing a user-friendly interface, ShopAssist AI makes the process of selecting solar panels more efficient and tailored to individual preferences. The project highlights the importance of high-quality data, user experience, and continuous improvement in developing effective AI-driven solutions.

THANK YOU