AI SQL QUERY GENERATOR

HEXAWARE

CURRENT STATE

Problem Statement:

Non-technical users often face difficulties in writing complex SQL queries needed to retrieve data from databases. This limitation hinders their ability to interact with data efficiently and make informed decisions, as they rely heavily on technical staff for query generation. Consequently, this dependency creates bottlenecks, delays, and reduces productivity. An accessible solution is needed to empower non-technical users to generate accurate SQL queries independently, enhancing data accessibility and operational efficiency across various departments.

Areas of Impact:

- **User Experience:** Enhances accessibility to data for non-technical users.
- **Operational Efficiency:** Reduces the time and effort required to generate SQL queries.
- **Data Accessibility:** Improves data accessibility and utilization across various departments.
- **Innovation and Agility:** Empowers users to quickly retrieve data and experiment with different queries, fostering innovation and agility in decision-making.

Technologies:

- **Frontend:** React,Axios,CSS,BootStrap
- **Backend:** Flask, Python
- **AI Integration:** Azure OpenAI API(GPT-4)
- **Database:** SQL Alchemy
- **Deployment:** Azure

FUTURE STATE

Summary of the Solution:

The AI SQL Query Generator is an innovative full-stack application designed to bridge the gap for non-technical users needing to interact with databases. Users can input natural language descriptions of the data they need, and the system leverages GPT-4 from OpenAI to translate these descriptions into precise SQL queries. This seamless translation simplifies database interactions, eliminating the need for users to learn and write complex SQL code. The front end, built with React, offers an intuitive interface for easy input and output visualization. The backend, developed using Flask and Python, handles the processing and AI integration, ensuring efficient and accurate query generation. This solution not only enhances accessibility but also streamlines data retrieval processes, making it a powerful tool for improving operational efficiency and decision-making across various departments.

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Advantage of Solution:

- **Ease of use:** Simplifies the process of generating SQL queries, making it accessible to non-technical users.
- **Efficiency:** Automates SQL query generation, reducing time and effort.
- **Accuracy:** Leverages advanced AI to ensure accurate query translations.
- **Scalability:** Can be easily scaled to handle many user queries simultaneously.
- **Consistency:** Provides consistent results, reducing the likelihood of human error in manual query writing.
- **Rapid Prototyping:** Allows users to quickly test and refine data queries, accelerating the development of data-driven solutions.

Benefits of End User:

- **Improved Accessibility:** Users can retrieve data without needing SQL knowledge.
- **Time Savings:** Reduces the need to learn and write SQL, speeding up data retrieval.
- **Enhanced Decision Making:** Provides quick access to data, facilitating better decision-making.
- **User Independence:** Empowers users to access and query data independently without relying on technical support.
- **Increased Productivity:** Frees up time for users to focus on analysis and interpretation rather than query writing.
- **Customized Queries:** Allows users to generate highly specific and tailored queries based on their unique requirements.
- **Real-Time Insights:** Facilitates immediate data retrieval, enabling real-time insights and timely actions.
- **User-Friendly Interface:** Offers an intuitive and easy-to-use interface, enhancing the overall user experience.

Benefits of Support Team:

- **Reduced Support Load:** Minimizes the need for support in query generation.
- **Improved User satisfaction:** Enhances user experience, leading to fewer complaints and queries.
- **Efficient Resource Allocation:** Frees up support team resources, allowing them to be allocated to other critical tasks.
- **Enhanced Productivity:** Reduces repetitive query-related tasks, boosting overall productivity.
- **Better Issue Resolution:** Enables the support team to address and resolve more complex technical problems efficiently.
- **Lower Training Costs:** Reduces the need for extensive training on SQL query writing for both users and support staff.

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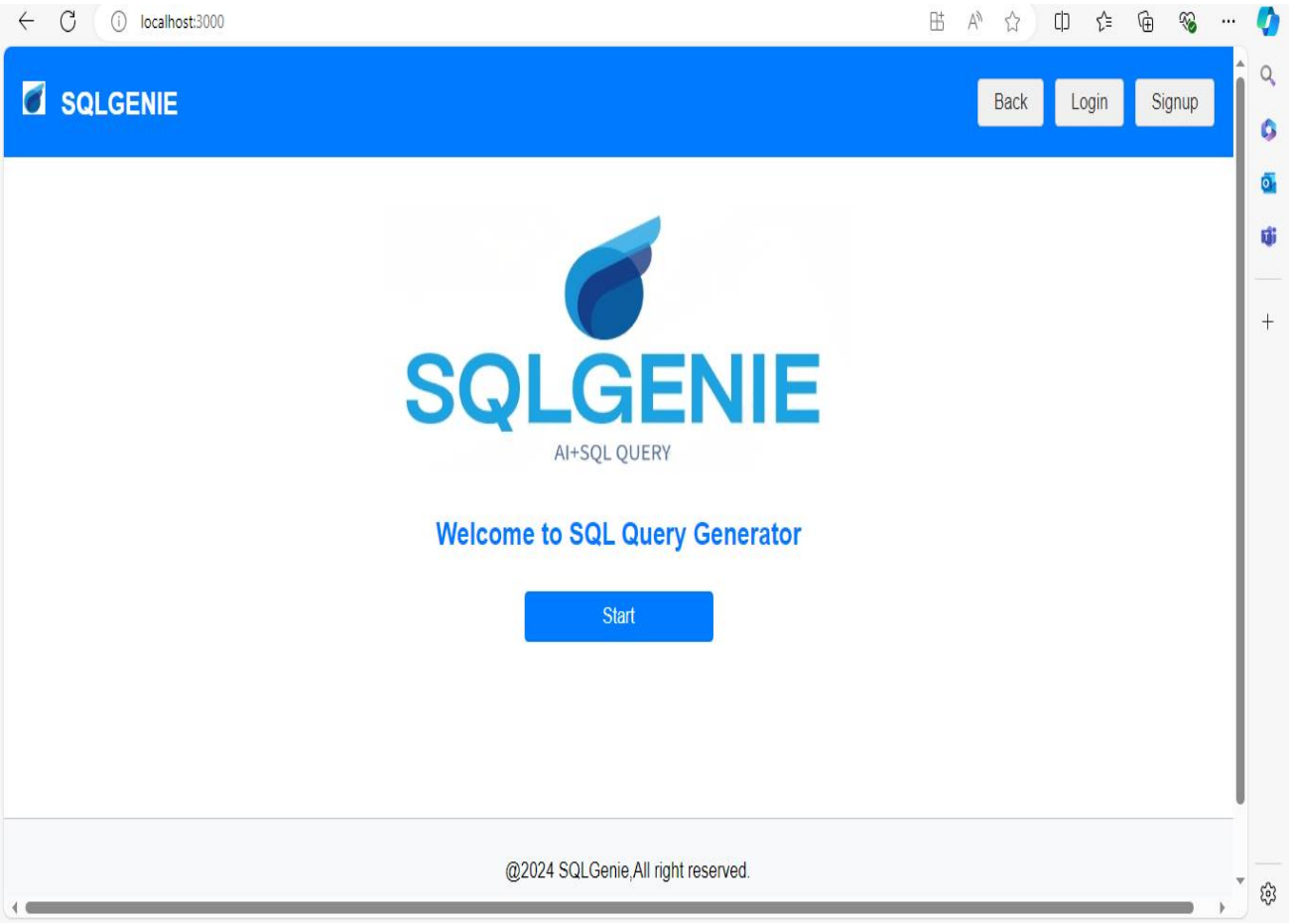
APP

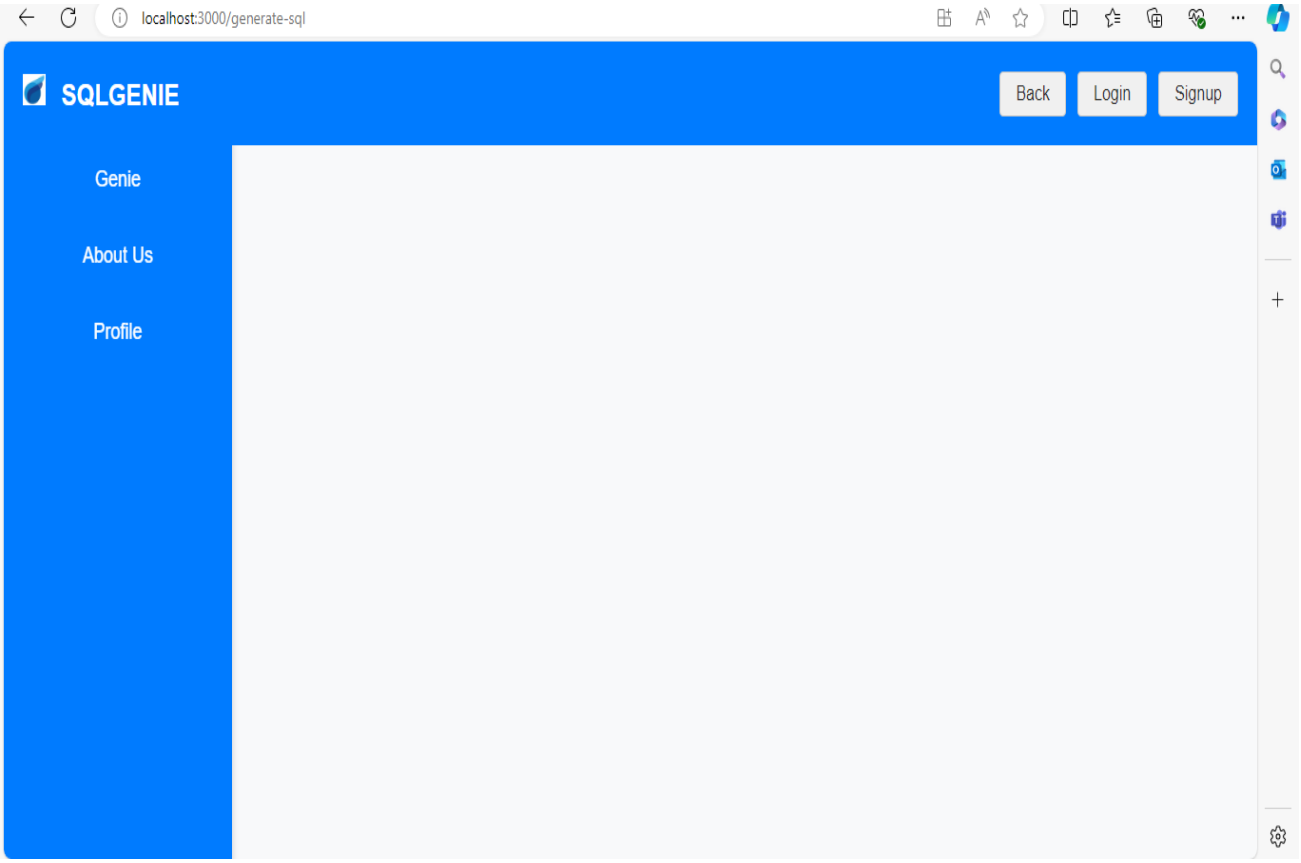
Basic UI:

- **Intuitive Interface:** An easy-to-use interface that facilitates smooth user interaction.
- **Clean and Responsive Design:** A visually appealing design that adapts seamlessly to various screen sizes and devices.



- **Home Page:** The app homepage features a well-designed layout with a welcoming message introducing the app's purpose. A prominent start button directs users to the main query generation page. Navigation links provide easy access to essential sections such as "About Us," "Profile," and "Dashboard." The design ensures consistent styling throughout, creating a cohesive and visually appealing user experience. Additionally, the dashboard includes login and signup buttons for user account management. This setup enhances user engagement, simplifies navigation, and makes the app intuitive and accessible.

- **Generate SQL Page:** On the Generate SQL page, there is a taskbar featuring three buttons: "Genie," "About Us," and "Profile." Each button serves a distinct purpose:
  - **Genie:** This button navigates to the SQL query generation component, where users can input natural language descriptions and receive corresponding SQL queries.
  - **About Us:** This button directs users to the "About Us" page, providing information about the application and its development.
  - **Profile:** This button leads to the "Profile" component, where users can view and manage their profile details.



This taskbar ensures seamless navigation between different functionalities, enhancing the user experience and providing easy access to the app's key features.

Prompt Details:

- **Input Field:** A text area where users can enter natural language descriptions for their queries.
- **Display Area:** A section where the generated SQL query is clearly shown, with options to copy or execute it.

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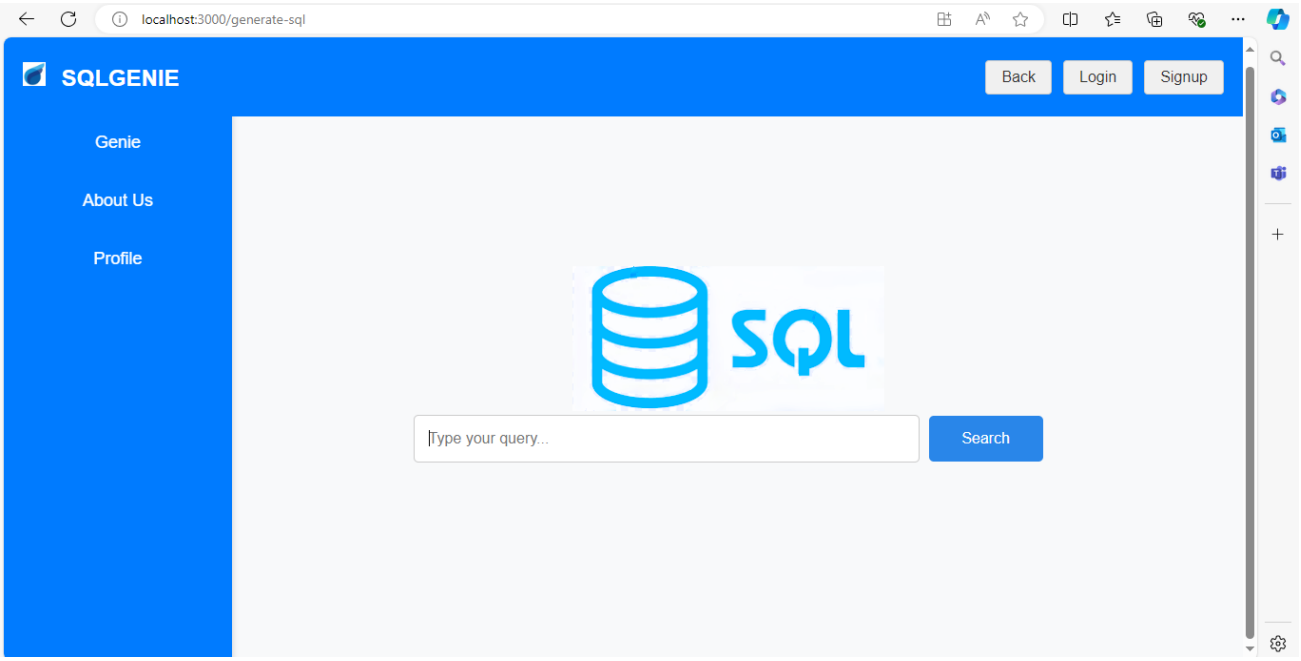
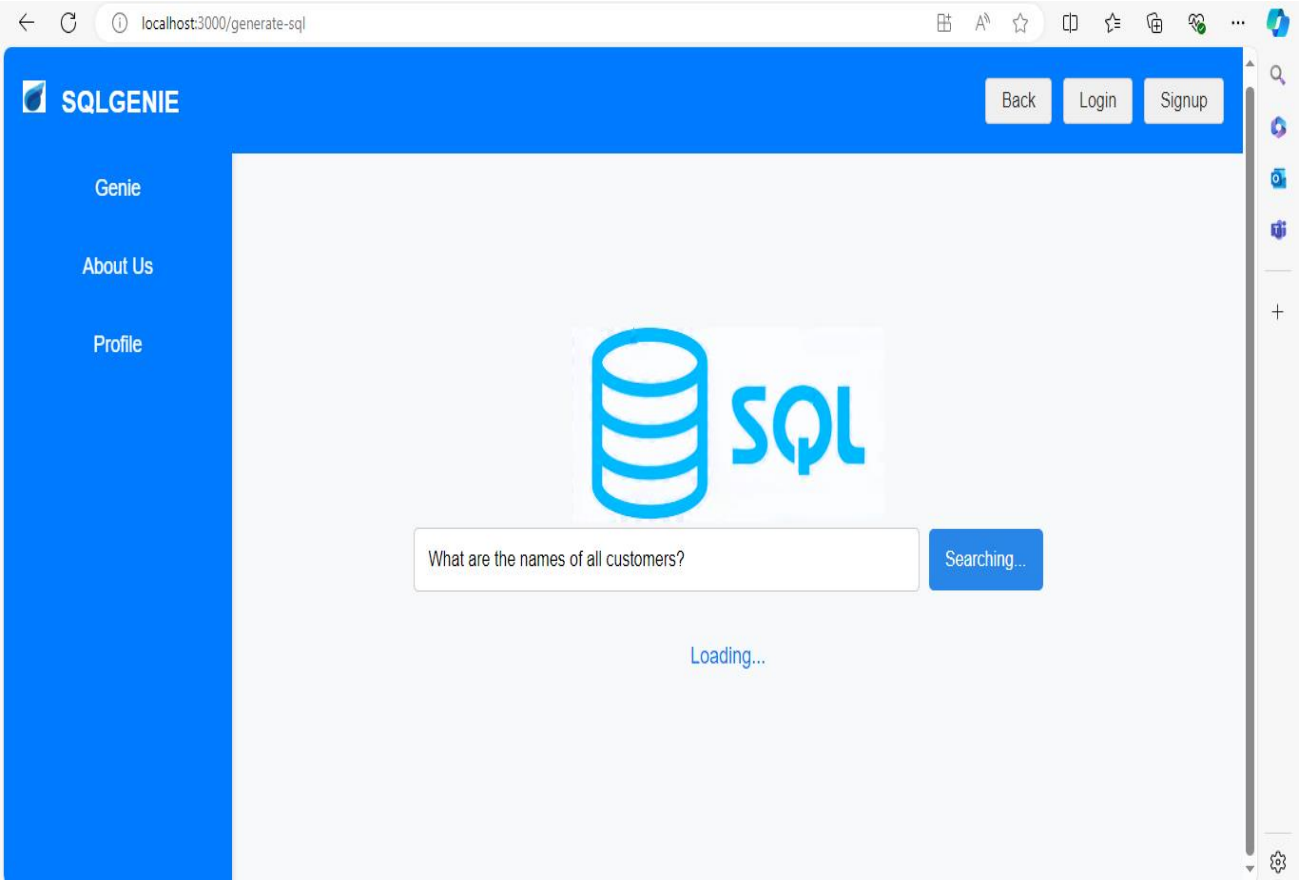
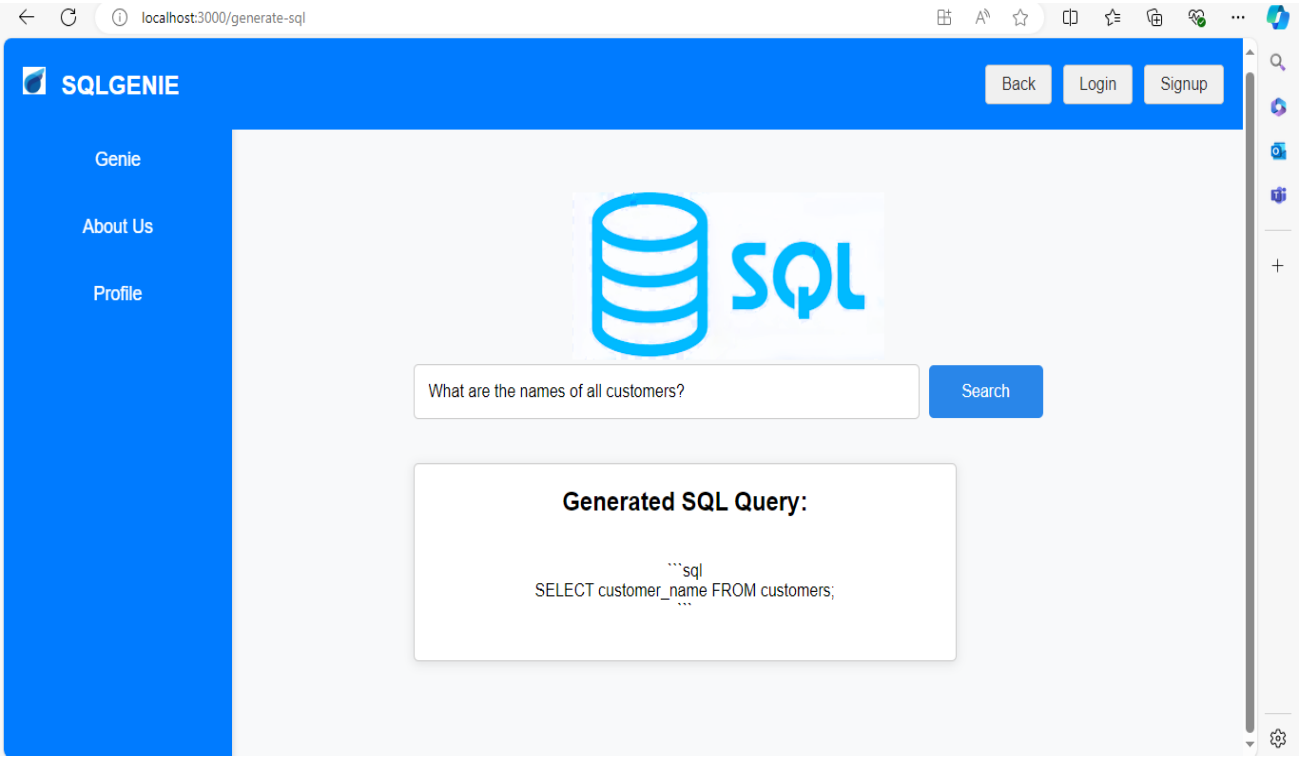


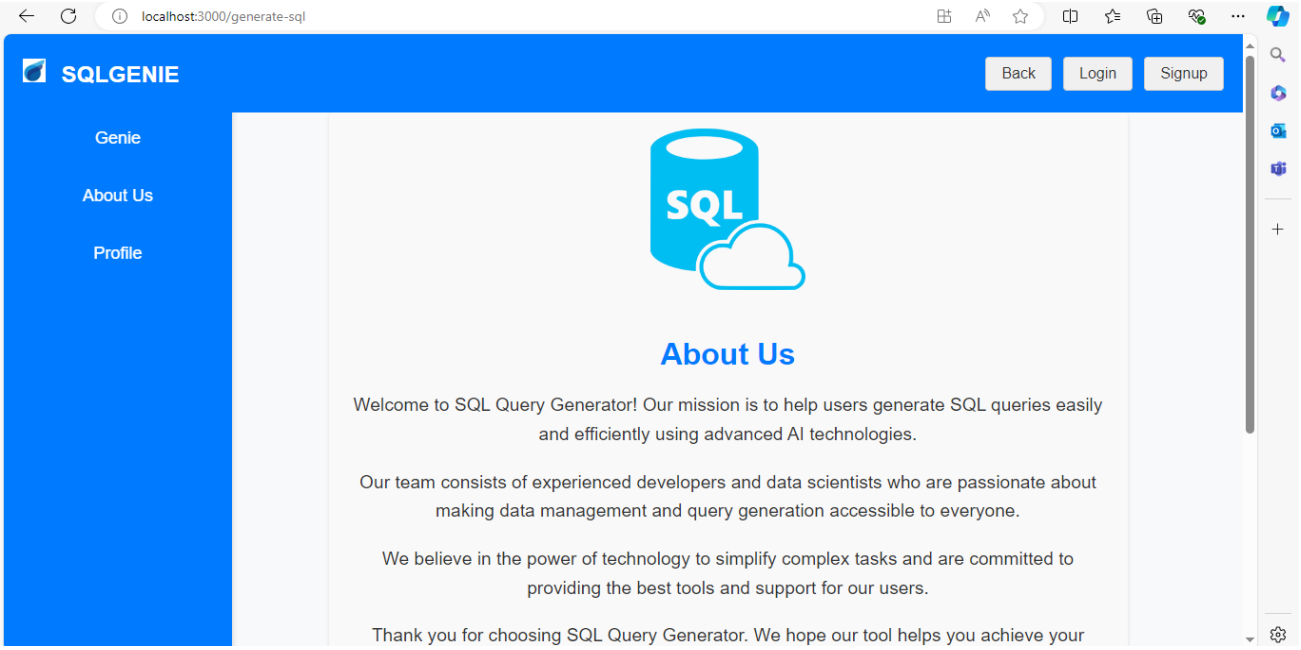
- **Search box:** Users can input their query into the search box, which sends the request to OpenAI. The resulting output is then displayed in the designated area, providing users with the generated SQL query.



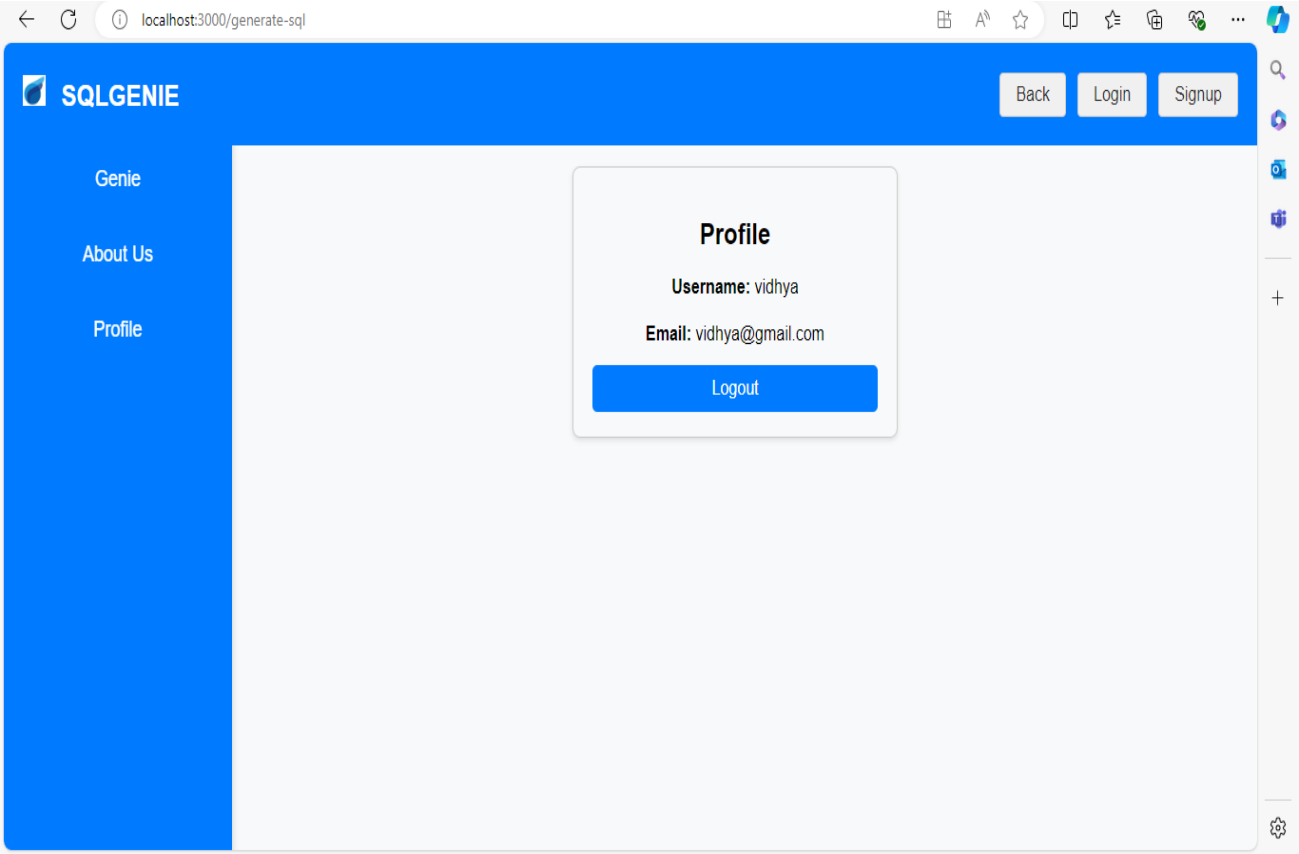


When the "Genie" button is clicked, a search box will appear where users can type their query. The response will be displayed in a container below the search box. During the query processing, a loading indicator will be shown to keep users informed of the progress. This setup ensures a user-friendly and responsive experience, making it easy for users to interact with the application and receive timely results.

- **About Us:** Users can learn about the application's context, objectives, and problem it addresses. It offers insights into the app's value and the team behind its development.



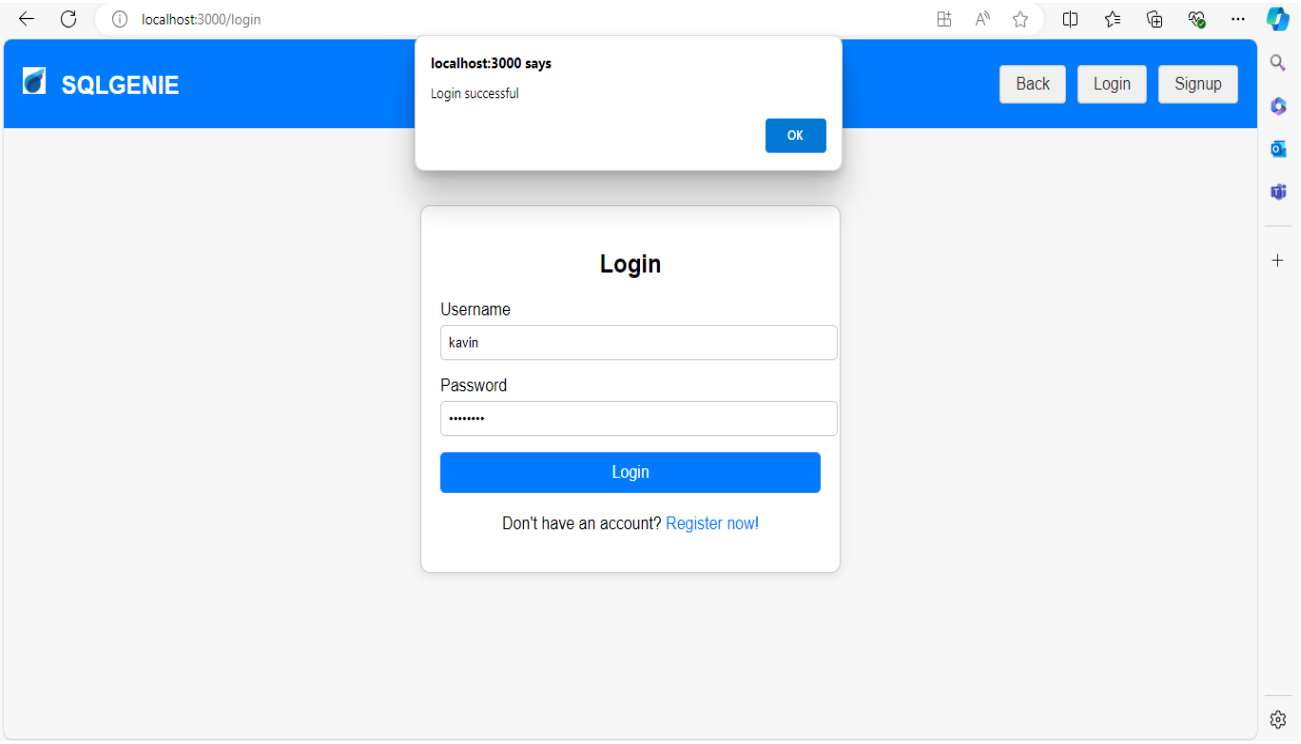
- **Profile:** This page displays the user's name and details, along with a logout button for ending the session.



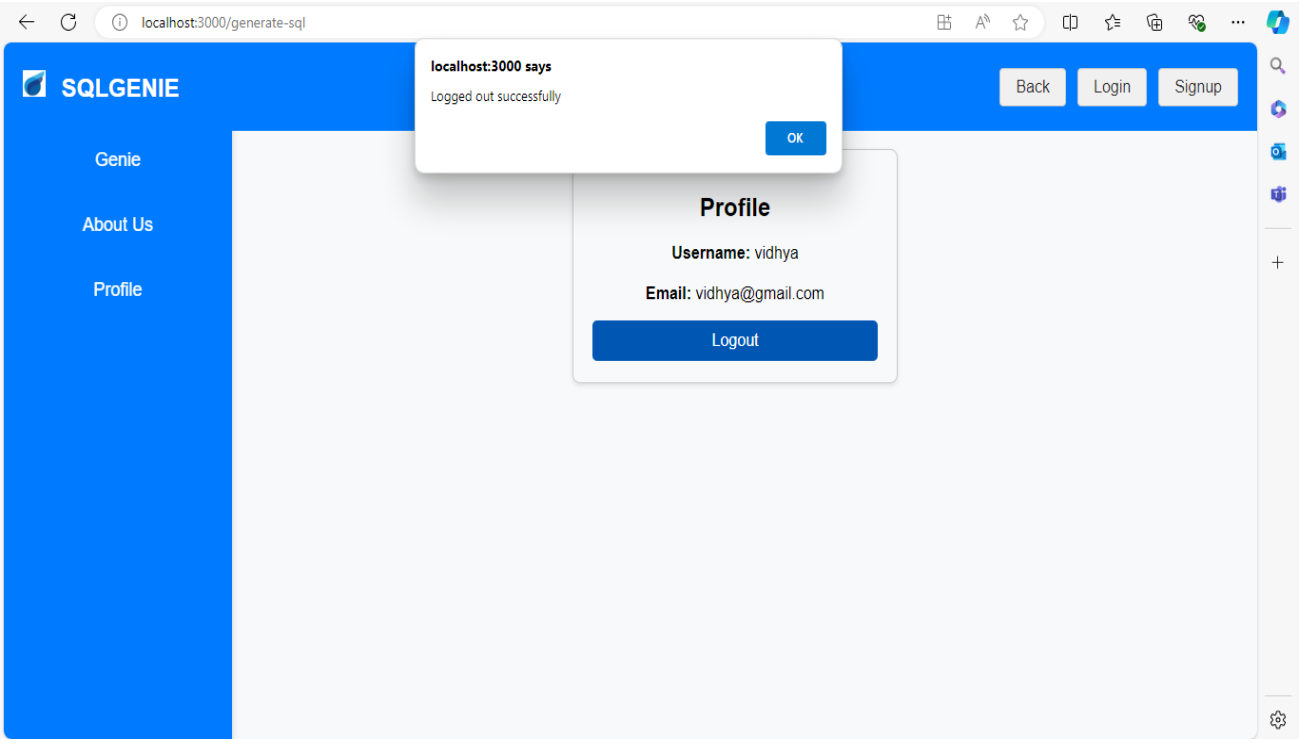
Security Features and Data Privacy Considerations:

- **Session-Based Authentication and Authorization:** Utilize session management to securely authenticate and authorize users, ensuring their identity and access levels are maintained throughout their session.
- **WERZUG Security Practices:** Implement WERZUG security principles to enhance overall system security, including robust measures for data protection and access control.
- **Strong Password Hashing:** Use strong hashing algorithms to securely hash and store passwords, protecting them from unauthorized access and ensuring data integrity.
- **File-Based Database:** Store user data in a file-type database, ensuring data is organized and protected according to security best practices.
- **API Methods for Authentication:** Implement API endpoints for user registration, login, and logout, facilitating secure and efficient interaction with the authentication system.

On the dashboard, users can view login and register buttons. Clicking **Register** allows users to enter their details, which are then stored in the file-type database. After registration, users can click **Login** to enter their username and password. Successful login will redirect them to the SQL query generation page.



When users click on the **Profile** page, their details are displayed within a container, including a **Logout** button. Clicking **Logout** will end the session and redirect users to the homepage. Users must be logged in to access the SQL query generation page; attempting to navigate to it without logging in will be restricted.



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Output Details Matching Benefits:

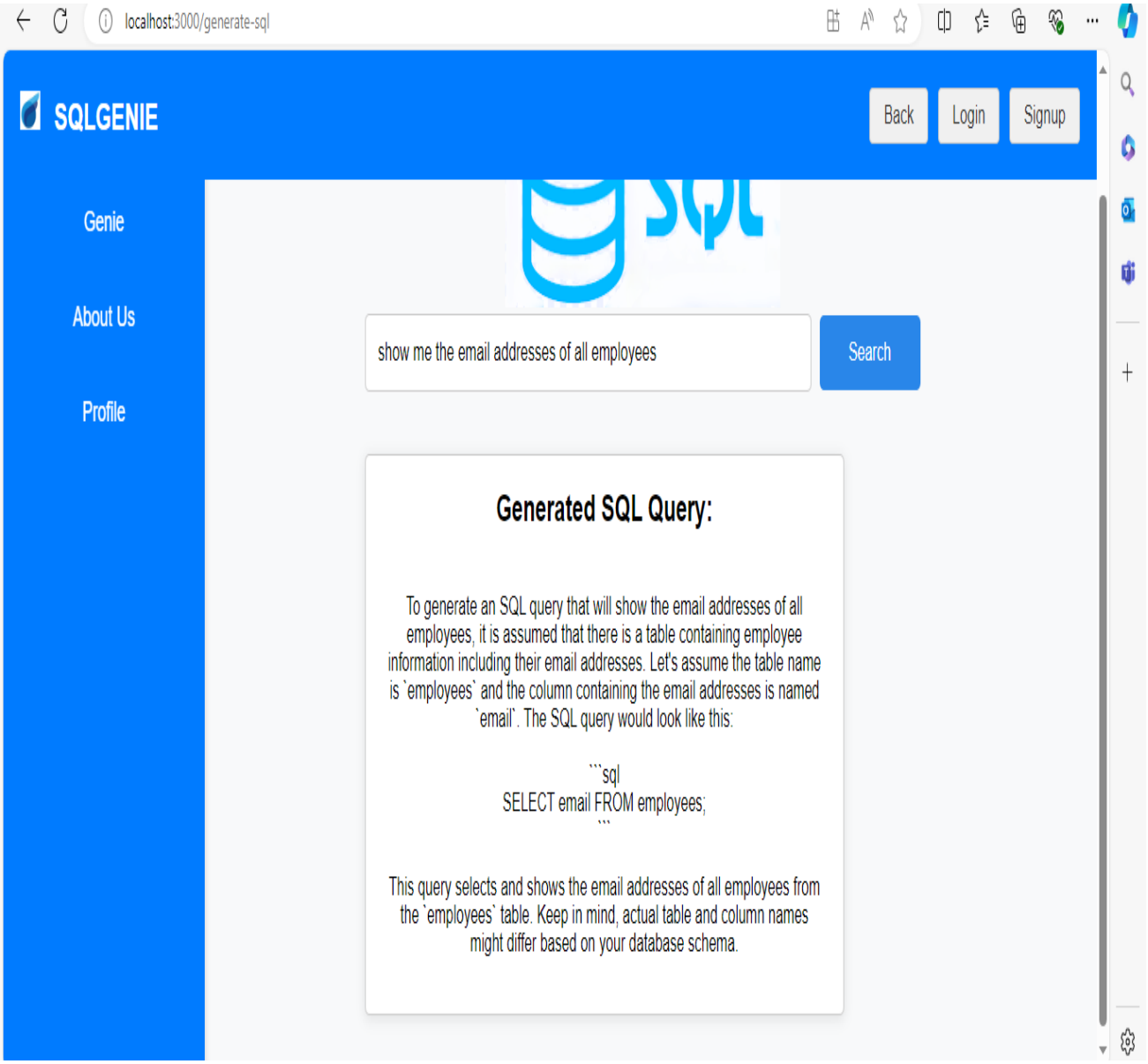
Accurate and Efficient Query Generation: Ensure the AI generates precise and reliable SQL queries, effectively transforming user inputs into accurate commands.

Clear and Concise Display: Present the generated SQL queries and results in a user-friendly format that enhances readability and usability.

#Testing-1

User Input: "Show me the email addresses of all employees"

Output:



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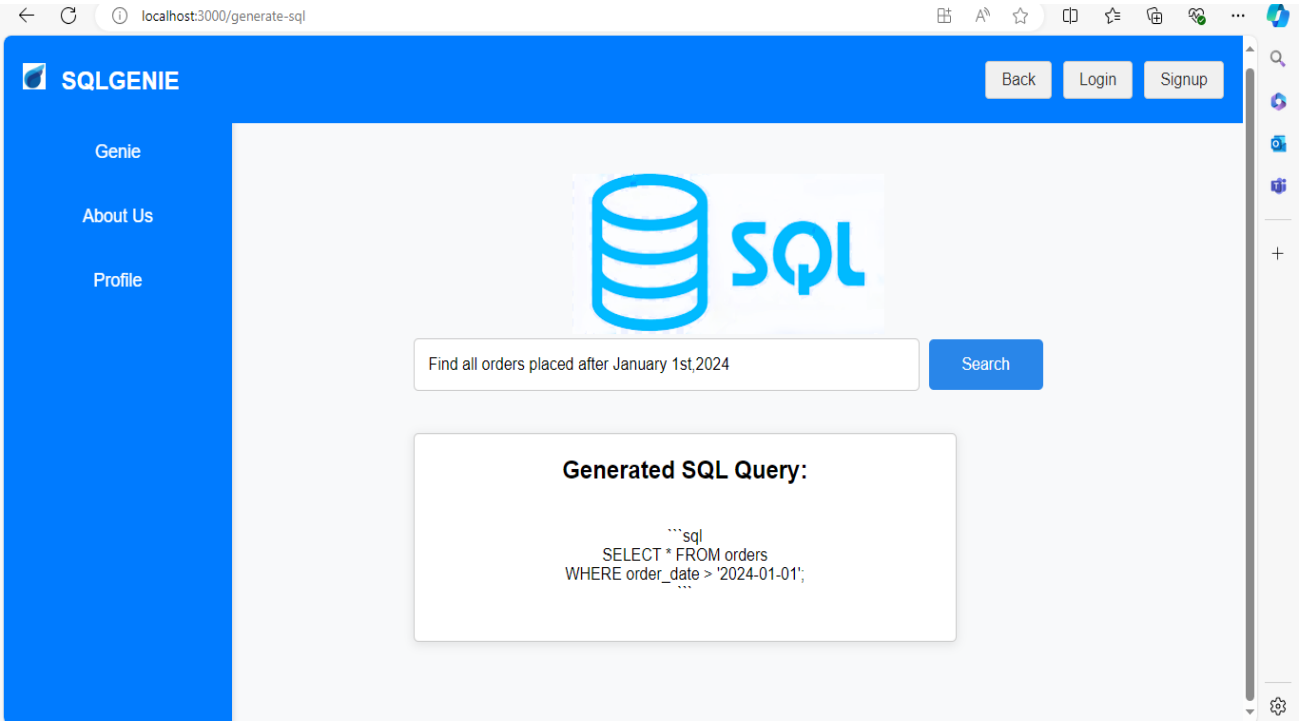
#Testing-2:

User Input: "Find all orders placed after January 1st,2024."

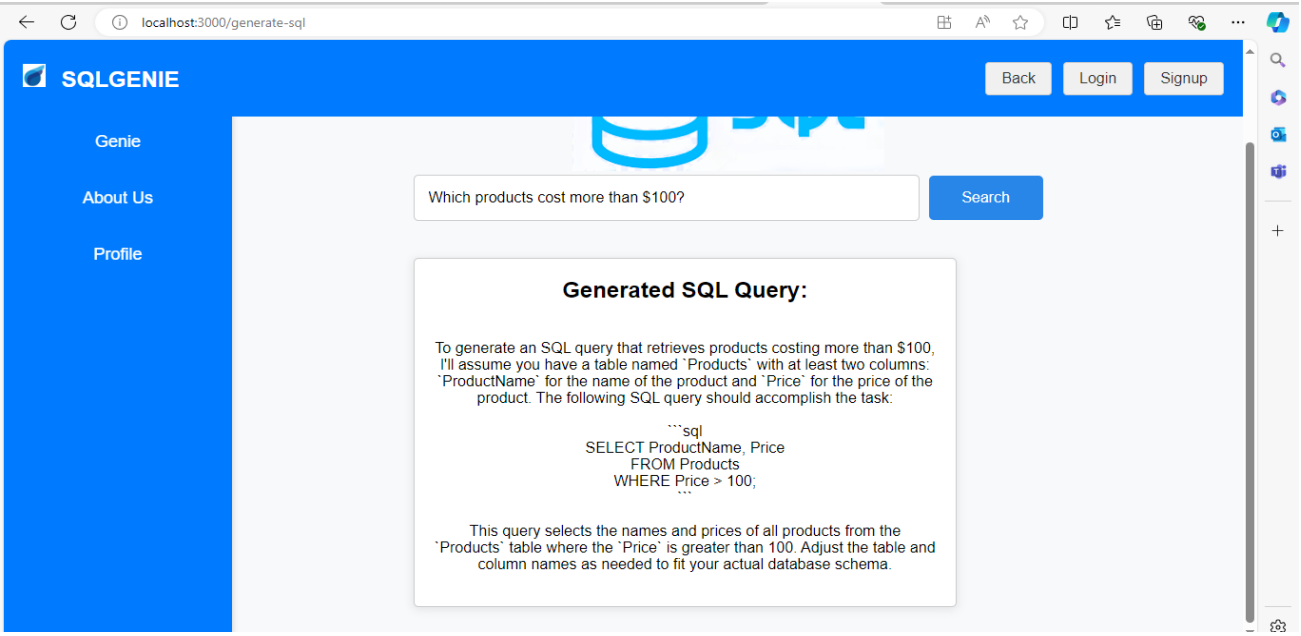
Output:



#Testing-3:

User Input: "Which products cost more than $100?"

Output:



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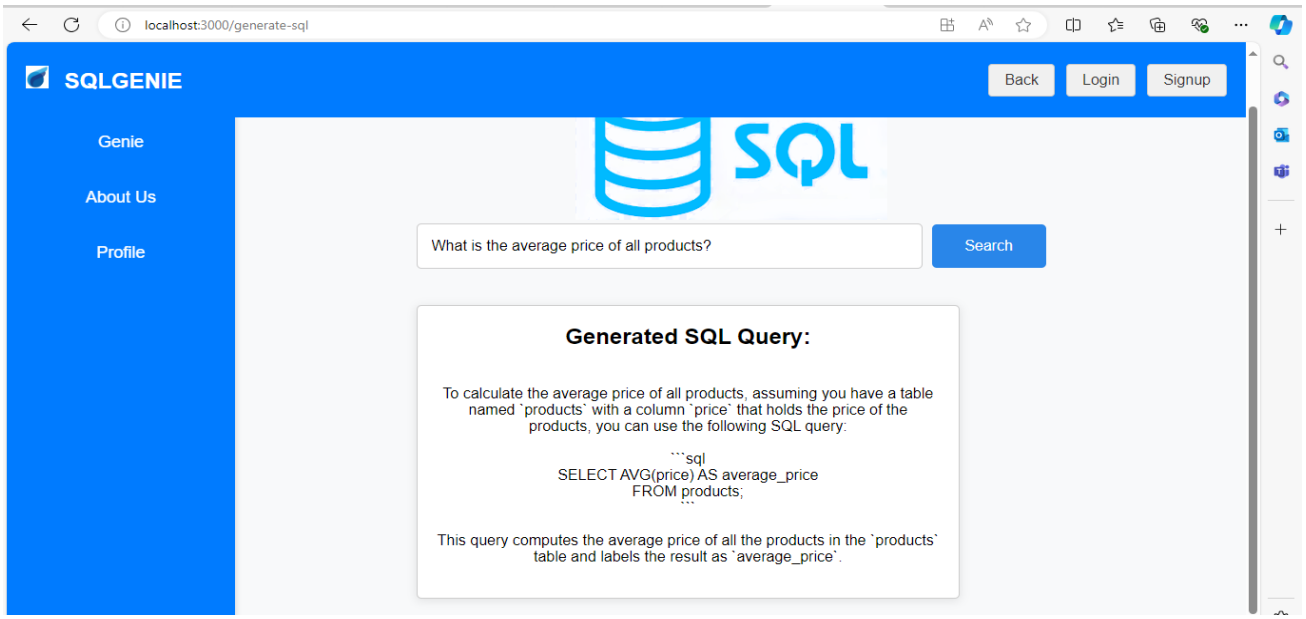
#Testing-4:

User Input: "What is the average price of all products?"

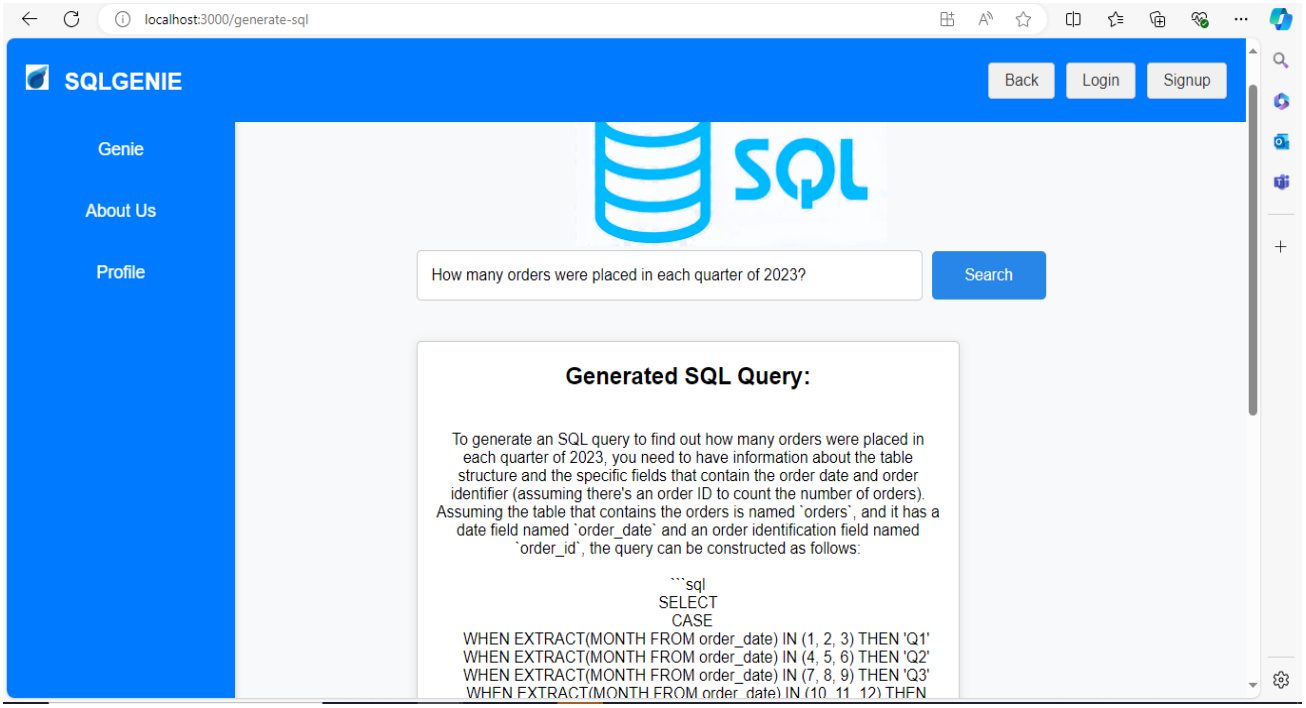
Output:



#Testing-5:

User Input: "How many orders were placed in each quarter of 2023?**"**

Output:



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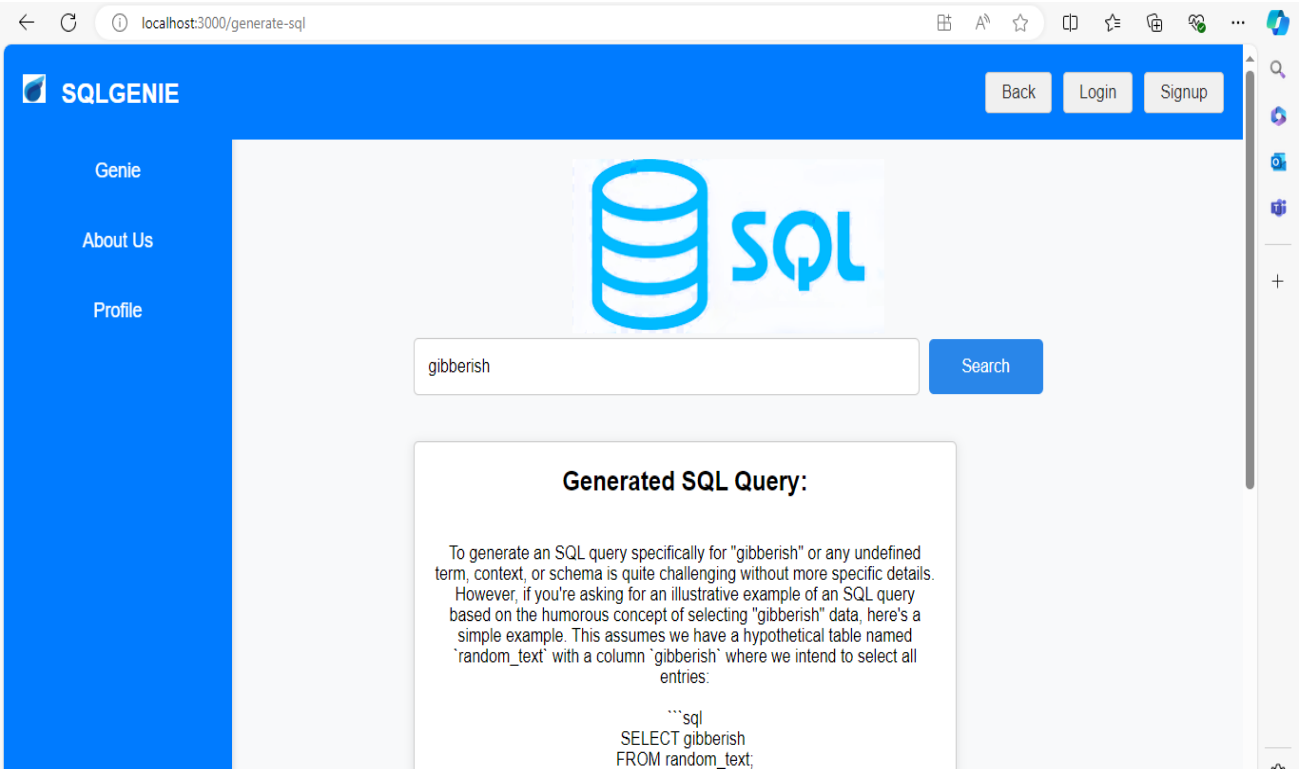
#Testing-6:

User Input: “gibberish”

Output:



GIT Repo:

Repository Link: https://github.com/vidhyavm/SQL_QUERY_AI_GENERATOR

GitHub Link: https://github.com/