Project Documentation - IntelliSQL

Names: B.Rohith Kumar,22BCT0330(VIT Vellore)
K.Geethika Varshini,22BCB0001(VIT Vellore)
M.Bhuvan Chowdary,22BKT0068(VIT Vellore)
N.Revanth Reddy,22BCE3158(VIT Vellore)

1. Introduction

IntelliSQL is an innovative AI-powered web application that leverages Streamlit and Google Gemini to simplify database interaction. By using natural English queries, users can retrieve insights from a structured SQLite database without needing SQL expertise. This bridges the gap between non-technical users and complex data systems, making database querying more accessible and intuitive.

2. Technologies Used

This project integrates multiple tools and technologies to build a complete and functional solution:

• Python – core programming language for backend logic

• Streamlit – used to build the interactive frontend UI

• Google Generative AI (Gemini) – converts English questions into SQL queries

• SQLite – lightweight database to store and query student data

• dotenv – used to manage sensitive API keys securely

3. Database Schema

The database used in this project is named 'Students'. It is designed to capture various details about students including academic background, placement, and internship status. Below are the fields:

- name (VARCHAR): Full name of the student
- class (VARCHAR): Educational program (e.g., BTech, MTech)
- marks (INT): Academic score
- company (VARCHAR): Placement company name
- city (VARCHAR): Student's city
- graduation_year (INT): Year of graduation
- internship_completed (BOOLEAN): Indicates internship status (1 for completed, 0 for not)

4. Database Creation & Sample Data

The database is initialized using Python's sqlite3 module in the `sql.py` script. If the database file does not exist, it will be created and populated with 35 student records. This approach allows dynamic creation and testing without external dependencies.

Sample SQL structure:

```
CREATE TABLE Students (
   name VARCHAR(30),
   class VARCHAR(10),
   marks INT,
   company VARCHAR(30),
   city VARCHAR(20),
   graduation_year INT,
   internship_completed BOOLEAN
);
```

5. Application Workflow

The working of IntelliSQL follows a streamlined 5-step pipeline that ensures minimal user effort and real-time response:

1. The user inputs a natural language question (e.g., 'List BTech students from Mumbai').

2. The input is passed to the Gemini LLM model with a predefined SQL prompt.

3. Gemini returns the appropriate SQL query based on the user's intent.

4. The SQL is validated and executed using sqlite3 on the local 'data.db'.

5. The result is displayed in an interactive table format in the Streamlit interface.

6. Gemini Prompt Example

Gemini is instructed through a few-shot prompt that includes the database schema and sample conversions. This helps it learn how to map English queries to SQL. Example:

```
You are an expert in converting English questions to SQL query!
 The SQL database is named STUDENTS and has the following columns:
 NAME (VARCHAR), CLASS (VARCHAR), MARKS (INT), COMPANY (VARCHAR), CITY (VARCHAR),
GRADUATION_YEAR (INT), INTERNSHIP_COMPLETED (BOOLEAN).
```

Example 1: How many students are present?
SELECT COUNT(*) FROM STUDENTS;
Example 2: List all BTech students from Mumbai.
*SELECT * FROM STUDENTS WHERE CLASS="BTech" AND CITY="Mumbai";*

7. Streamlit UI Design

The interface design emphasizes clarity and a futuristic look. The Streamlit app is styled with custom CSS to include features like glowing neon buttons, glassmorphism description boxes, Orbitron/Roboto fonts, animated headers, and responsive input fields. These visual elements make the interface engaging and modern.

8. Installation Requirements

To run IntelliSQL on your local machine, make sure the following Python libraries are installed:

streamlit
google-generativeai

9. Conclusion

IntelliSQL is a powerful demonstration of how LLMs can bridge technical gaps in database usage. It empowers users with no SQL knowledge to extract meaningful data insights through a conversational interface. Ideal for educational use, internal tools, and LLM-integrated analytics dashboards.

10. Demo Video Link

https://drive.google.com/file/d/1wjRYGDoe2RLDLR8tG5Vy7o8SiVuCpVZd/view?usp=sharing

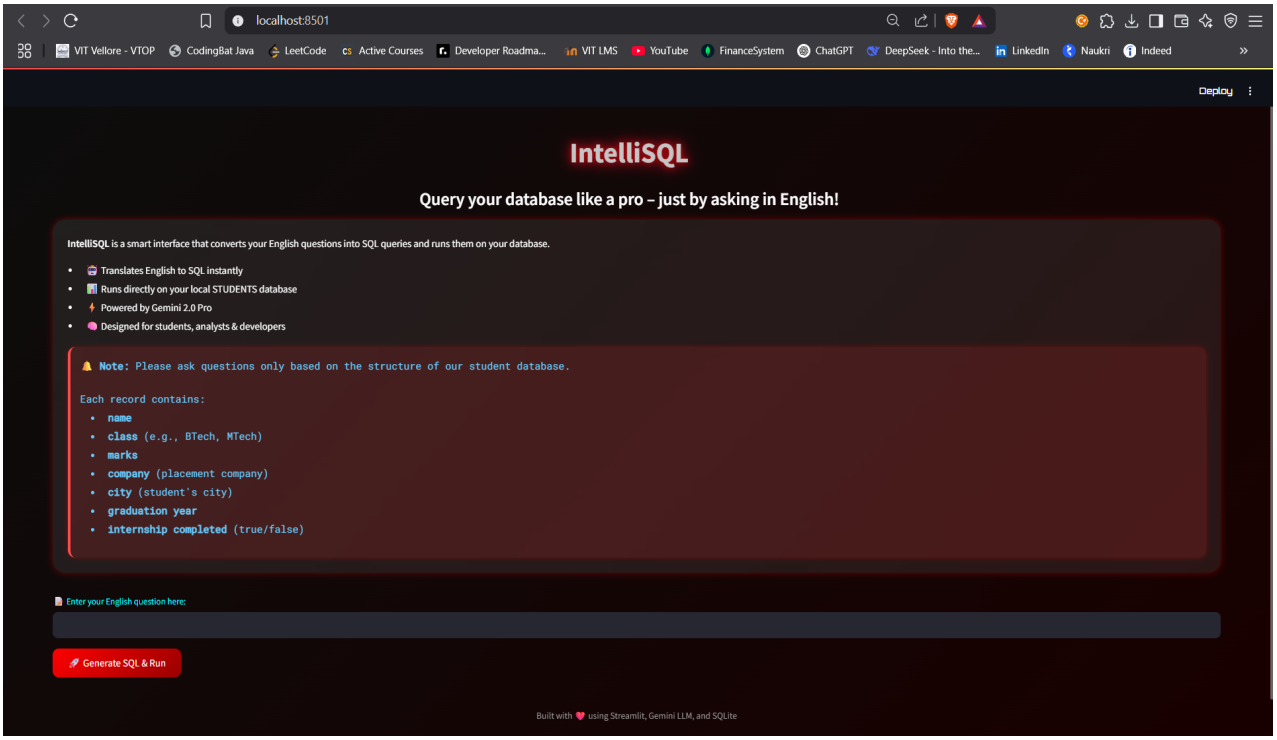
11. Live Deployment Link

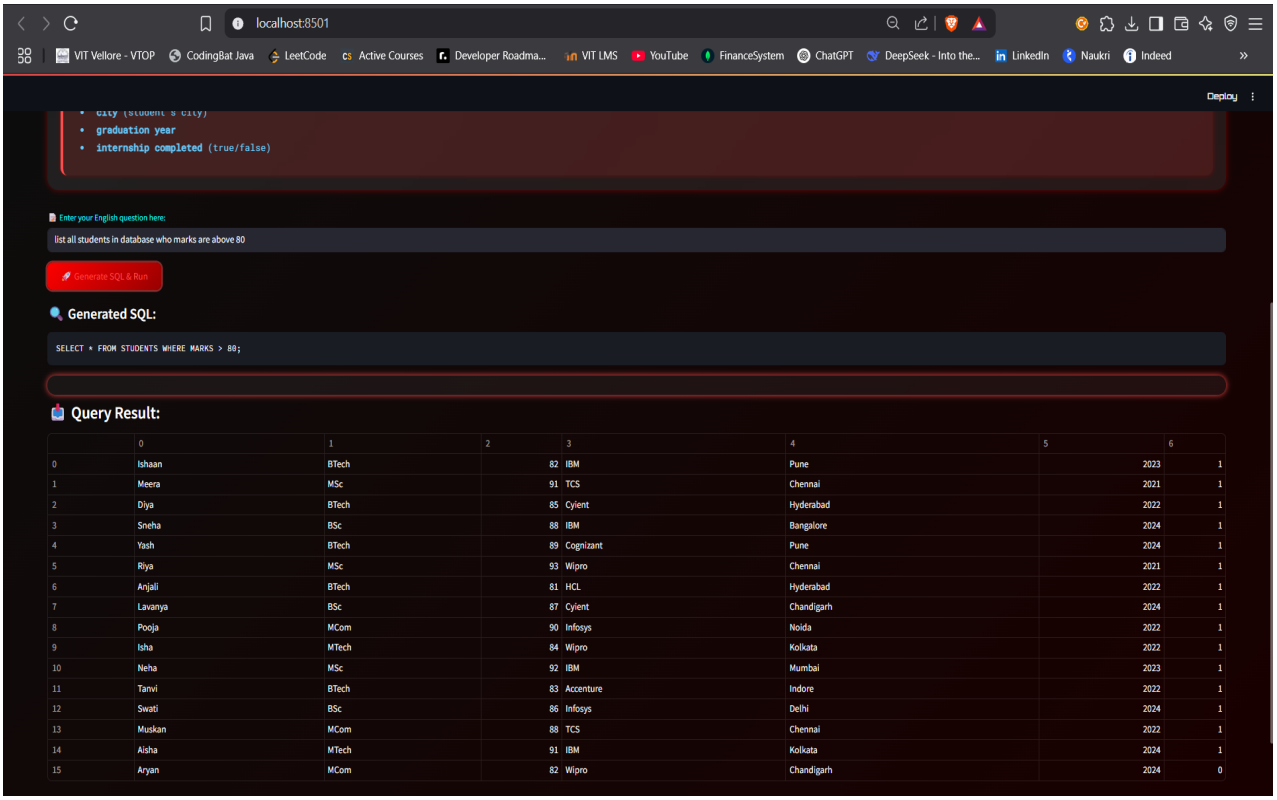
https://intelli-sql.streamlit.app/

12. Github Link

https://github.com/rohith679/Intelli_SQL

13. Demo Photos of Project





	0	1	2	3	4	5	6
0	Ishaan	BTech	82	IBM	Pune	2023	1
1	Meera	MSc	91	TCS	Chennai	2021	1
2	Diya	BTech	85	Cyient	Hyderabad	2022	1
3	Sneha	BSc	88	IBM	Bangalore	2024	1
4	Yash	BTech	89	Cognizant	Pune	2024	1
5	Riya	MSc	93	Wipro	Chennai	2021	1
6	Anjali	BTech	81	HCL	Hyderabad	2022	1
7	Lavanya	BSc	87	Cyient	Chandigarh	2024	1
8	Pooja	MCom	90	Infosys	Noida	2022	1
9	Isha	MTech	84	Wipro	Kolkata	2022	1
10	Neha	MSc	92	IBM	Mumbai	2023	1
11	Tanvi	BTech	83	Accenture	Indore	2022	1
12	Swati	BSc	86	Infosys	Delhi	2024	1
13	Muskan	MCom	88	TCS	Chennai	2022	1
14	Aisha	MTech	91	IBM	Kolkata	2024	1
15	Aryan	MCom	82	Wipro	Chandigarh	2024	0