

Project Design Phase-II

Technology Stack (Architecture & Stack)

Date	24 February 2026
Team ID	LTVIP2026TMIDS34458
Project Name	Intelligent SQL Querying with LLMs using Gemini Pro
Maximum Marks	4 Marks

TECHNICAL ARCHITECTURE – IntelliSQL

Architecture Overview (Textual Description)

The IntelliSQL system follows a 3-tier architecture consisting of a User Interface, Application Logic layer, and Data & AI services layer.

The user interacts with a web-based interface to submit natural language queries. These queries are processed by the application layer, which communicates with the Gemini Pro Large Language Model (LLM) to convert the input into SQL queries. The generated SQL is validated and executed on the database. Results are fetched, summarized using the LLM, and displayed back to the user.

This architecture ensures security, scalability, and ease of use for non-technical users.

Table-1: Components & Technologies

S.No	Component	Description	Technology
1	User Interface	Interface through which users enter natural language queries and view results	Streamlit (Python Web UI), HTML, CSS
2	Application Logic-1	Handles user input, request routing, and response handling	Python
3	Application Logic-2	Converts natural language queries into SQL queries	Gemini Pro (LLM API)
4	Application Logic-3	Validates SQL queries and restricts to SELECT-only operations	Python

S.No	Component	Description	Technology
5	Database	Stores structured data queried by users	SQLite / MySQL
6	Cloud Database	Optional cloud-based database service	Google Cloud SQL
7	File Storage	Stores logs, configuration files, and environment variables	Local File System
8	External API-1	Large Language Model API for Text-to-SQL conversion	Google Gemini Pro API
9	External API-2	API for environment variable management	Python dotenv
10	Machine Learning Model	Natural Language Processing for SQL generation and result explanation	Gemini Pro LLM
11	Infrastructure (Server / Cloud)	Application deployment environment	Local System / Cloud VM

Table-2: Application Characteristics

S.No	Characteristics	Description	Technology
1	Open-Source Frameworks	Open-source frameworks used for development and UI	Python, Streamlit
2	Security Implementations	Ensures safe query execution and prevents unauthorized operations	SELECT-only SQL validation, Environment variable protection
3	Scalable Architecture	Separation of UI, logic, and AI services enables easy scaling	3-Tier Architecture
4	Availability	Application can be accessed whenever the server is running with minimal downtime	Local Server / Cloud VM

S.No	Characteristics	Description	Technology
5	Performance	Optimized query execution and fast response using lightweight database and efficient API calls	SQLite, Gemini Pro API

References:

<https://c4model.com/>

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