



AI-POWERED ANALYTICS DASHBOARD WITH GOOGLE DRIVE INTEGRATION

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Abstract: Businesses and professionals often rely on Google Sheets for storing and managing data, but analyzing this data manually is time-consuming and requires significant technical expertise. This project introduces an AI-powered analytics dashboard that seamlessly integrates Google Drive, AI-based analysis, and dynamic visualization to make data insights accessible to users without technical skills. The platform enables Google OAuth2 authentication, spreadsheet browsing, and automatic data import with a chat-based AI query interface for intelligent insights and interactive chart generation. Built using Python, Django/Flask, React, and integrated with the Gemini API, the system automates data understanding, reduces dependency on technical analysts, and democratizes data-driven decision-making for businesses, students, researchers, and professionals across domains.

Index Terms - Artificial Intelligence, Analytics Dashboard, Google Drive Integration, Natural Language Processing, OAuth2 Authentication, Data Visualization, Gemini API, Predictive Analytics, React, Python.

I. INTRODUCTION

The rapid growth of cloud-based data storage platforms such as Google Drive and Google Sheets has transformed how businesses and individuals manage data. Organizations increasingly rely on spreadsheets for tracking sales, finances, research results, and operational metrics. However, extracting meaningful insights from this data remains a significant challenge for non-technical users. Traditional dashboards require manual configuration and complex SQL queries, while existing Business Intelligence tools demand specialized expertise and incur high setup costs.

Artificial intelligence offers a transformative opportunity to automate data understanding and visualization. By combining natural language processing with data analytics, systems can now interpret user queries expressed in plain English and generate visual and textual insights automatically. This eliminates the need for technical knowledge and makes data analysis accessible to everyone.

This paper proposes an **AI-Powered Analytics Dashboard with Google Drive Integration** that connects directly to Google Drive and answers user queries using natural language. The system enables Google OAuth2 authentication, automatic spreadsheet data import, AI-driven query processing via the Gemini API, and dynamic chart generation using React and Plotly, providing a **fast, intelligent, and user-friendly analytics platform** suitable for businesses, researchers, students, and professionals.

II. EXISTING SYSTEM AND PROBLEM STATEMENT

Existing approaches to spreadsheet data analysis include manual Excel and Google Sheets analysis, static dashboards, and enterprise Business Intelligence tools such as Tableau and Power BI. While these tools are powerful, they suffer from significant limitations. Manual analysis is time-consuming and requires technical expertise. Static dashboards cannot respond to ad hoc user queries. BI tools require complex setup, licensing fees, and trained personnel to operate effectively. None of these solutions offer direct Google Drive connectivity combined with an AI-driven natural language query interface in a single, integrated platform.

A. Problem Statement

Manual analysis of spreadsheet data is time-consuming and requires considerable technical expertise. Existing tools either lack AI-powered insights or require complex configurations to connect with Google Drive. Users need a simple, intelligent system that can automatically fetch spreadsheets, understand natural language queries, and provide visual and textual insights without any coding knowledge or data science background.

B. Drawbacks of Existing Systems

Existing systems require significant technical expertise to operate and interpret results. High setup and maintenance costs make them inaccessible to small businesses and individuals. Data preparation is time-consuming and error-prone when performed manually. Real-time insights are limited or absent in most static dashboard solutions. Scalability is poor, and integration with cloud storage platforms like Google Drive is either non-existent or requires complex configuration.

III. PROPOSED SYSTEM AND ARCHITECTURE

The proposed AI-powered analytics dashboard follows a **modular layered architecture** designed to ensure scalability, security, and real-time AI-driven data analysis. The system integrates Google OAuth2 for secure authentication, a Python backend for data processing, the Gemini AI API for natural language understanding, and a React frontend for interactive visualization. The architecture consists of the following major layers:

A. User Interface Layer

The user interface layer is built using **React with HTML, CSS, and JavaScript**. It provides an intuitive dashboard where users can authenticate via Google OAuth2, browse and select spreadsheets from their Google Drive, submit natural language queries through a chat interface, and interact with dynamically generated bar charts, line charts, and pie charts powered by Matplotlib and Plotly.

B. Application Processing Layer

The backend application layer is built using **Node.js and Python (Django/Flask)**. It handles Google OAuth2 token management, Google Drive API calls for file browsing and data extraction, data preprocessing using Pandas and Polars, query routing to the AI module, and report generation and email delivery using Nodemailer.

C. AI Processing Layer

The AI processing layer is the intelligence core of the system. It integrates the **Gemini API** for natural language query understanding, Scikit-learn for predictive analytics and machine learning inference, and TensorFlow/PyTorch for advanced forecasting models. This layer interprets user queries expressed in natural language, maps them to the appropriate dataset columns, generates analytical summaries, and determines which visualizations best represent the result.

D. Database Layer

The database layer uses a **MySQL relational database** to store user authentication tokens, cached spreadsheet metadata, query history, and generated report records. This layer ensures secure storage and efficient retrieval of session data and analytics history, supporting the real-time responsiveness of the dashboard.

IV. IMPLEMENTATION

The system was implemented as a full-stack web application integrating a React frontend with a Python and Node.js backend, Google Drive APIs, and the Gemini AI API. The development followed a modular approach with each component independently developed and integrated incrementally. The backend fetches and preprocesses spreadsheet data using Pandas and Polars, forwards user queries to the AI module, and returns structured analytical results and visualization configurations to the frontend.

A. User Authentication and Google Drive Integration Module

Users authenticate securely via Google OAuth2, granting the system access to their Google Drive. After authentication, the system fetches a list of available spreadsheet files from the user's Drive. The

user selects a file, and the system automatically extracts and loads the data into memory for analysis. The OAuth2 tokens are securely stored and refreshed to maintain persistent Drive access without requiring repeated logins.

B. Data Extraction and Preprocessing Module

Once a spreadsheet is selected, the backend reads the data using the Google Sheets API and processes it with Pandas and Polars. Automatic data cleaning is applied, including handling missing values, type inference, and normalization. The cleaned dataset is stored in memory and made available to the AI query processing and visualization modules. Column metadata is extracted and passed to the Gemini API to provide context-aware query understanding.

C. AI Query Processing and Visualization Module

Users enter natural language queries through the chat interface, such as “show me monthly sales trends” or “what is the top- performing product?”. The Gemini API interprets the query in the context of the loaded dataset and generates both a textual analytical summary and a visualization configuration. The React frontend renders interactive bar charts, line charts, and pie charts using Plotly based on the AI-generated configuration. Users can interact with the charts, zoom in, and export them for reporting purposes.

D. Prediction and Report Generation Module

For predictive queries, the system applies Scikit-learn regression and forecasting models to generate future value predictions based on historical data trends. Users can request forecast outputs as charts or numerical summaries. The report generation module compiles all insights, charts, and summaries into a structured report that can be downloaded or shared via email using the Nodemailer integration.

V.

RESULTS

The system was evaluated through functional test cases covering all major modules. Testing confirmed that Google OAuth2 authentication, Google Drive file selection, data extraction, AI query processing, chart generation, predictive analytics, and email report delivery all function correctly and reliably. The test results demonstrate that the platform successfully automates data analysis and provides accurate, meaningful insights in response to natural language user queries.

table 1: functional test case results

Test ID	Description	Input	Expected Output	Result
TC01	Login Authentication	User login with Google OAuth2	Login Success	Pass
TC02	Google Drive Connection	Valid OAuth token	Drive Access Granted	Pass
TC03	Spreadsheet File Selection	Google Sheet file selected	Data Loaded in Dashboard	Pass
TC04	Natural Language Query Analysis	“Show monthly sales trends”	Chart and Insight Displayed	Pass
TC05	Predictive Analytics Forecast	Forecast query submitted	Predicted Values Generated	Pass
TC06	Chart Generation	Dataset available in memory	Charts Displayed Correctly	Pass
TC07	Email Report Sharing	User triggers report send	Report Delivered via Email	Pass

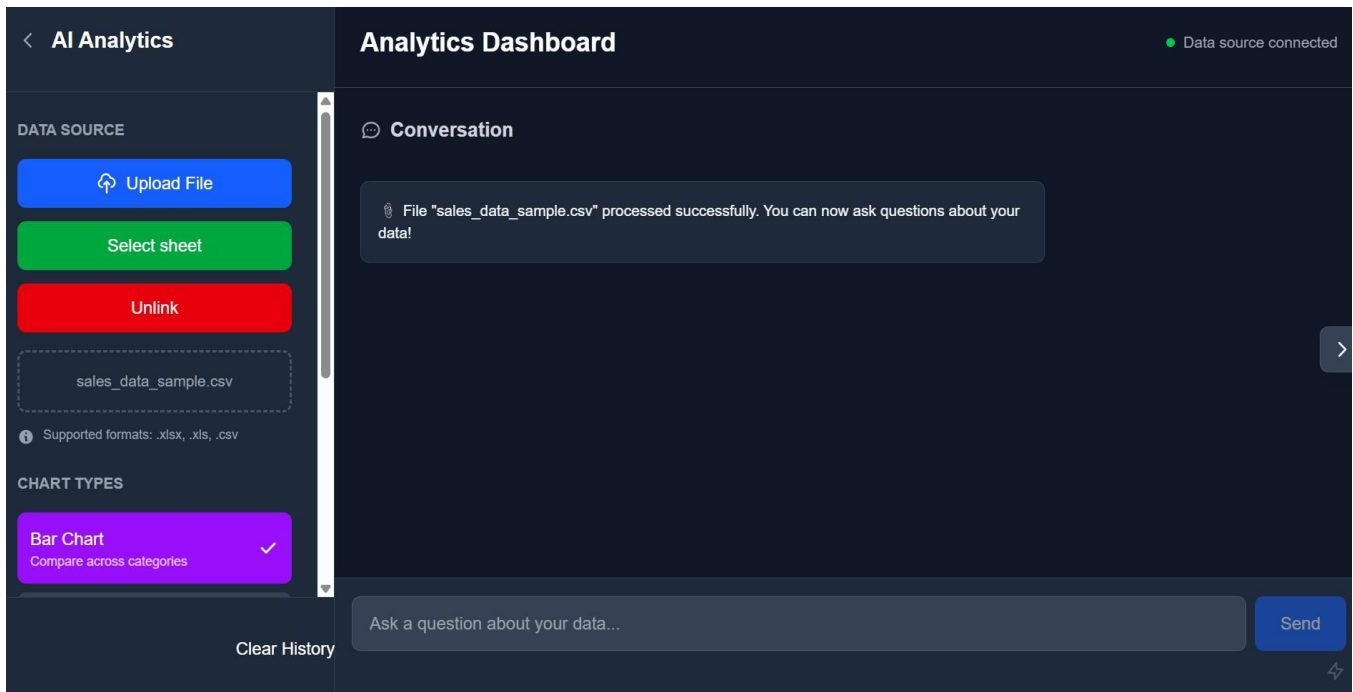


figure 1.1: Chat Interface

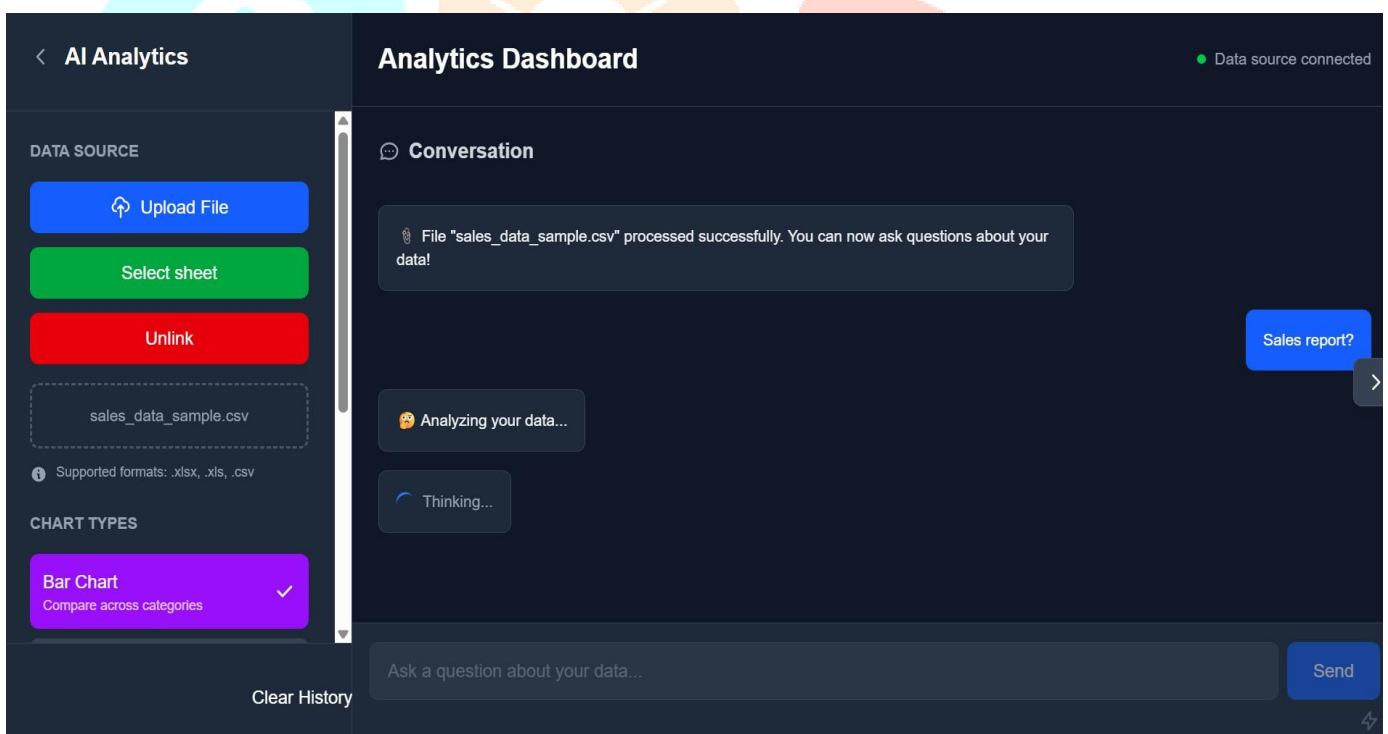


figure 1.2: Sample Chat

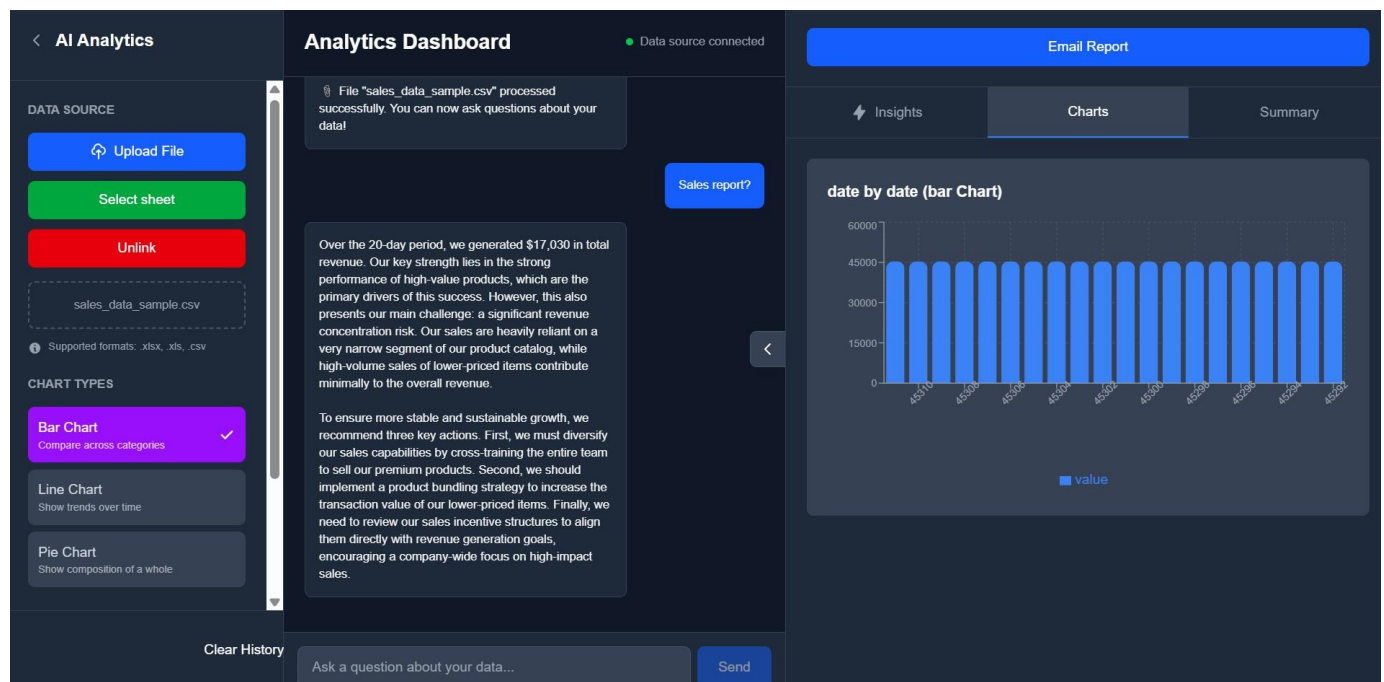


figure 1.3: Charts

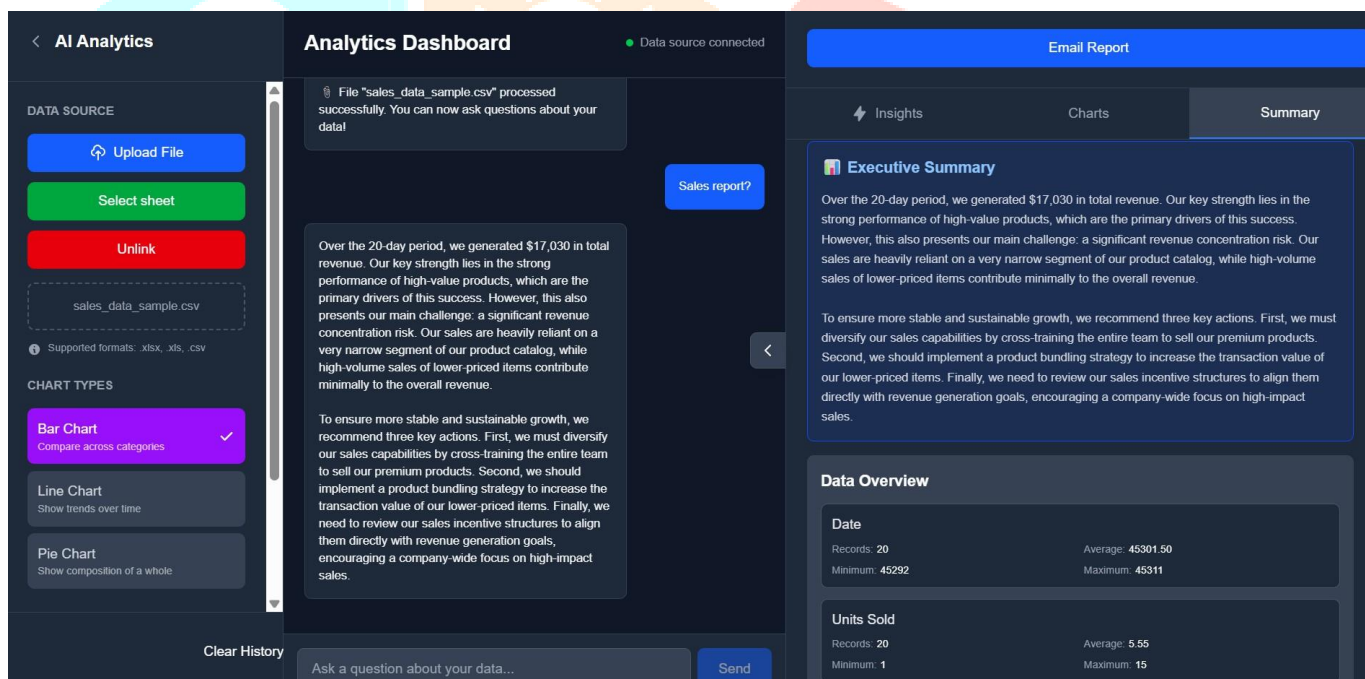


figure 1.4: Summary Report

VI. CONCLUSION

This paper presented an **AI-Powered Analytics Dashboard with Google Drive Integration**, a comprehensive intelligent data analysis platform designed to simplify spreadsheet analytics and make data-driven decision-making accessible to non-technical users. The proposed system integrates Google OAuth2 authentication, automatic spreadsheet data extraction, Gemini AI-powered natural language query processing, and dynamic visualization using React and Plotly. By combining these technologies, the platform eliminates the technical barriers traditionally associated with data analysis.

All seven functional test cases passed successfully, validating the correctness of authentication, data loading, AI query processing, visualization, predictive analytics, and email reporting modules. The system delivers real-time analytical insights in response to natural language queries, significantly reducing the time and expertise required for spreadsheet data analysis. The modular architecture ensures scalability, allowing the system to support a growing number of users and data sources without

performance degradation.

Future work will focus on integrating **voice-based query input**, **multi-cloud storage support** (OneDrive, Dropbox), **real-time collaborative dashboards**, and **mobile dashboard applications** to extend the platform's reach and usability. Advanced deep learning forecasting models and role-based dashboard customization are also planned for future releases.



Overall, the proposed system demonstrates that AI and cloud integration can fundamentally transform how organizations interact with their data, providing intelligent, scalable, and accessible analytics for everyone.

VII. LITERATURE SURVEY

The integration of artificial intelligence with data analytics and cloud platforms has been widely studied in recent research. Several significant works have demonstrated the feasibility and value of AI-driven dashboard systems, natural language interfaces for databases, and cloud-connected analytics platforms. This section reviews key research contributions that influenced the design and development of the proposed system.

Datta et al. (2020) explored automated data analysis systems that use machine learning to extract patterns from structured datasets. Their research demonstrated that combining statistical models with intelligent query routing significantly reduces the time required to derive insights from large tabular datasets, a principle directly applied in GoalGuider's AI query processing module.

Tran et al. (2021) proposed a cloud-integrated analytics platform that leverages API-based data ingestion and real-time processing pipelines. Their work established best practices for building scalable backend architectures that connect with cloud storage services, providing a technical foundation for the Google Drive integration design adopted in this project.

Hassan et al. (2022) investigated natural language interfaces for database query systems, demonstrating that large language models can effectively translate user intent expressed in plain English into structured analytical operations. Their findings validated the approach of using AI APIs such as Gemini for natural language query processing in analytics systems.

Ding et al. (2022) conducted research on interactive data visualization systems for non-technical users. Their study highlighted that automatic chart type selection based on data characteristics and query intent significantly improves user comprehension and engagement with analytical results, informing the visualization module design in this project.

Zhang et al. (2023) developed a transformer-based analytics assistant that combines large language model capabilities with structured data processing. Their work demonstrated high accuracy in query interpretation and insight generation across diverse dataset types, directly supporting the technical approach of integrating the Gemini API for AI-powered query processing in the proposed system.

These studies collectively establish that AI-powered analytics platforms combining cloud integration, natural language processing, and interactive visualization represent a viable and valuable solution to the challenges of modern data analysis. The proposed system builds upon these research foundations by delivering a unified, accessible, and intelligent analytics dashboard connected directly to Google Drive.

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