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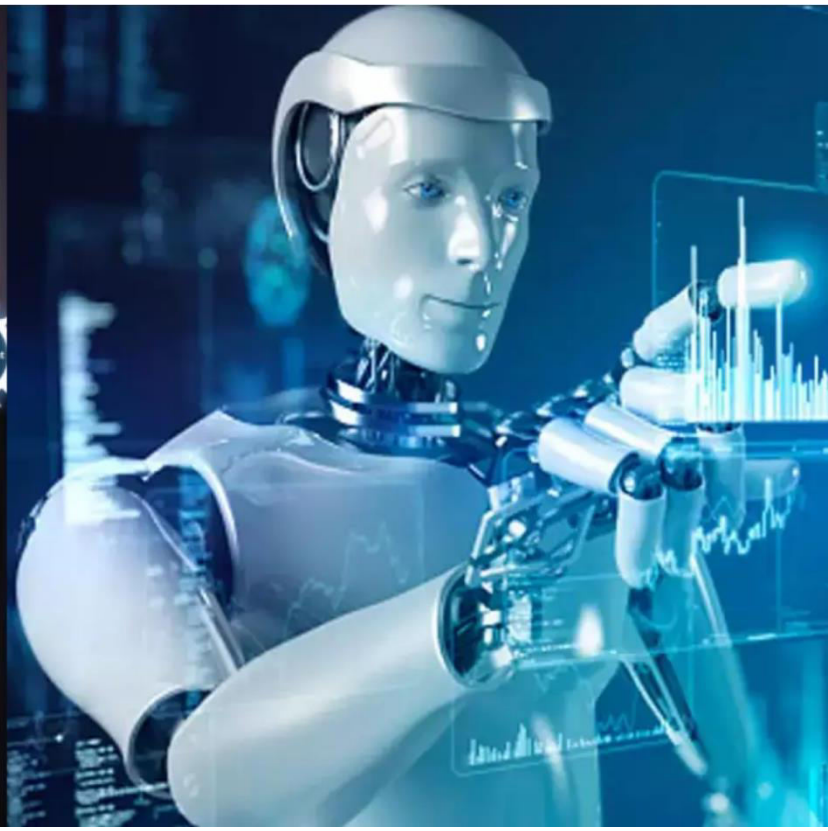
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Design and Development of an AI-Powered Data Analyst Agent for Automated Data Analysis and Intelligent Insights

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ABSTRACT: The AI Data Analyst Agent is an intelligent web-based application designed to simplify data analysis. It allows users to upload CSV and Excel files, clean and process data, identify trends and anomalies, and generate insights through charts and reports. The system uses React for the frontend, Python with Fast API for the backend, and SQLite for database management. It aims to reduce manual effort, improve analysis efficiency, and support data-driven decision-making.

KEYWORDS: AI Data Analyst Agent, Artificial Intelligence, Data Analysis, React, Python, Fast API, SQLite, CSV, Excel, Data Cleaning, Data Processing, Data Visualization, Data Insights, Anomaly Detection, Machine Learning.

I. INTRODUCTION

The AI Data Analyst Agent is an intelligent web-based application designed to simplify data analysis and help users extract meaningful insights from their datasets. Manual data analysis can be time-consuming and complex, especially when handling large datasets containing missing values, errors, or hidden patterns.

The application provides features such as CSV and Excel file uploading, data cleaning, data processing, data visualization, trend analysis, and anomaly detection. It uses React for the frontend, Python with FastAPI for the backend, and SQLite for database management. The system helps users analyze datasets and obtain useful insights through an interactive interface.

The main objective of the AI Data Analyst Agent is to reduce manual effort, improve data analysis efficiency, and support better decision-making. By combining data processing, visualization, and AI-based analysis, the application aims to make data analysis easier, faster, and more effective.

II. LITERATURE SURVEY

A literature survey is an important part of project development that reviews existing research, technologies, and systems related to data analysis. It helps identify the limitations of traditional data analysis methods and understand how artificial intelligence can simplify data processing and insight generation. The study of existing systems provides a foundation for developing the AI Data Analyst Agent, an intelligent platform designed to help users analyze datasets efficiently and obtain meaningful insights.

1. Traditional Data Analysis Systems: Traditional data analysis methods often require manual calculations and considerable time to understand large datasets. These methods can make it difficult to identify hidden patterns, trends, and errors. Automated analysis systems help reduce manual effort and improve efficiency.

2. Data Cleaning and Preprocessing Systems: Data cleaning is an important step in data analysis because datasets may contain missing values, duplicate records, and incorrect data. Data preprocessing techniques help organize datasets, improve data quality, and prepare information for further analysis.

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3. Data Visualization Systems: Data visualization tools represent information through charts and graphs, making complex datasets easier to understand. Visual representations help users identify patterns, compare values, and interpret data more effectively.
4. AI-Based Data Analysis Systems: Artificial intelligence can support data analysis by helping users interpret datasets and generate meaningful insights. Natural-language queries can make analysis more accessible by allowing users to ask questions about their data instead of relying entirely on manual calculations.
5. Trend Analysis and Anomaly Detection: Trend analysis helps identify changes and patterns in datasets, while anomaly detection helps recognize unusual values or observations. These techniques support better understanding of data and help users identify important findings.
6. Web-Based Data Analysis Applications: Web-based applications provide interactive interfaces for uploading, processing, and analyzing datasets. Support for CSV and Excel files allows users to work with commonly used data formats through a single platform.
7. Proposed AI Data Analyst Agent: Based on the study of existing data analysis technologies, the AI Data Analyst Agent combines dataset uploading, data cleaning, processing, visualization, and insight generation in a single application. It uses React for the frontend, Python with FastAPI for backend services, and SQLite for database management. The system aims to simplify data analysis, reduce manual effort, and help users make better data-driven decisions.

III. METHODOLOGY

The methodology of the AI Data Analyst Agent describes the complete workflow of the system, starting from dataset uploading to generating meaningful insights. The user uploads a CSV or Excel file through the React-based interface. The request is sent to the Python FastAPI backend, where the dataset is processed and

analyzed. The system supports data cleaning, data processing, visualization, trend analysis, and anomaly detection. SQLite is used for database management. Finally, the processed results, charts, and insights are presented to the user through the application interface.



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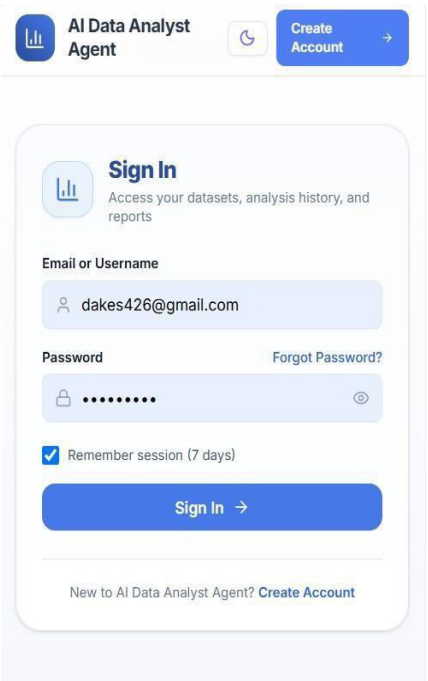
IV. WORKING STEPS OF THE AI DATA ANALYST AGENT

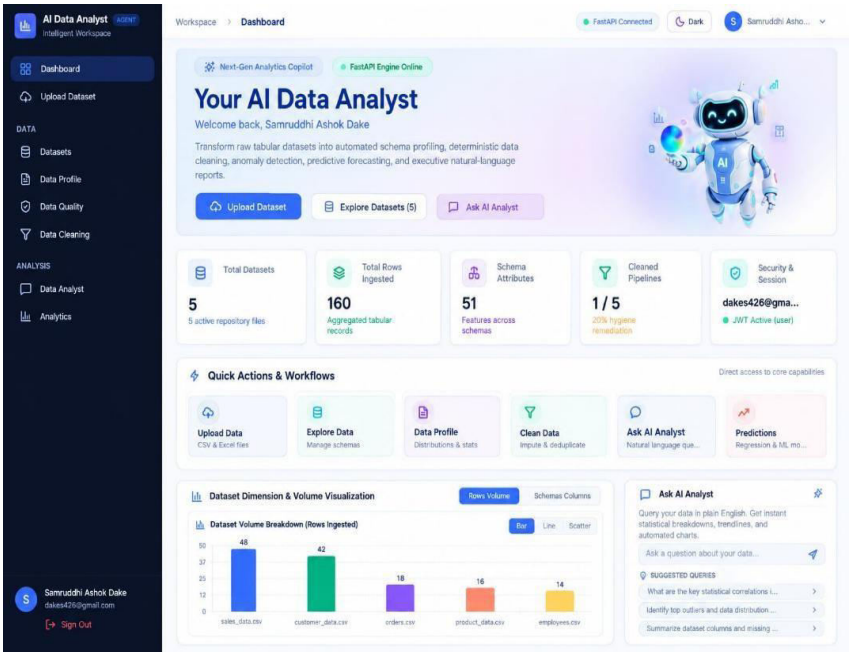
1. Dataset Upload: Users upload CSV or Excel files through the React-based interface.
2. Backend Processing: The FastAPI backend receives the uploaded file and handles the analysis request.
3. Data Cleaning and Preprocessing: The dataset is checked and prepared for analysis by handling data quality issues supported by the system.
4. Data Analysis: The system processes the dataset to answer user queries and identify useful information.
5. Trend Analysis and Anomaly Detection: The system helps identify patterns, trends, and unusual data values.
6. Database Management: SQLite is used for database management and storing relevant application data, according to the implemented database functionality.
7. Result Visualization: The application presents the analysis results through charts, reports, and meaningful insights.
8. Output Display: Users can view the generated results through the application interface to understand their data and support decision-making.

V. HARDWARE AND SOFTWARE REQURIMENT

1. Operating System: Windows 10/11
2. Frontend: React.js, JavaScript, HTML, CSS
3. Backend Language: Python
4. Framework: FastAPI
5. Database: SQLite
6. Data Analysis Libraries: Pandas, NumPy
7. Data Visualization: Matplotlib, Plotly
8. Code Editor: Visual Studio Code
9. Version Control: Git, GitHub
10. Web Browser: Google Chrome, Microsoft Edge
11. Internet: Stable Internet Connection
12. Hardware Requirements: Computer/Laptop with a suitable processor, minimum 4 GB RAM (8 GB recommended), and sufficient storage space.

VI. RESULTS AND DISCUSSION





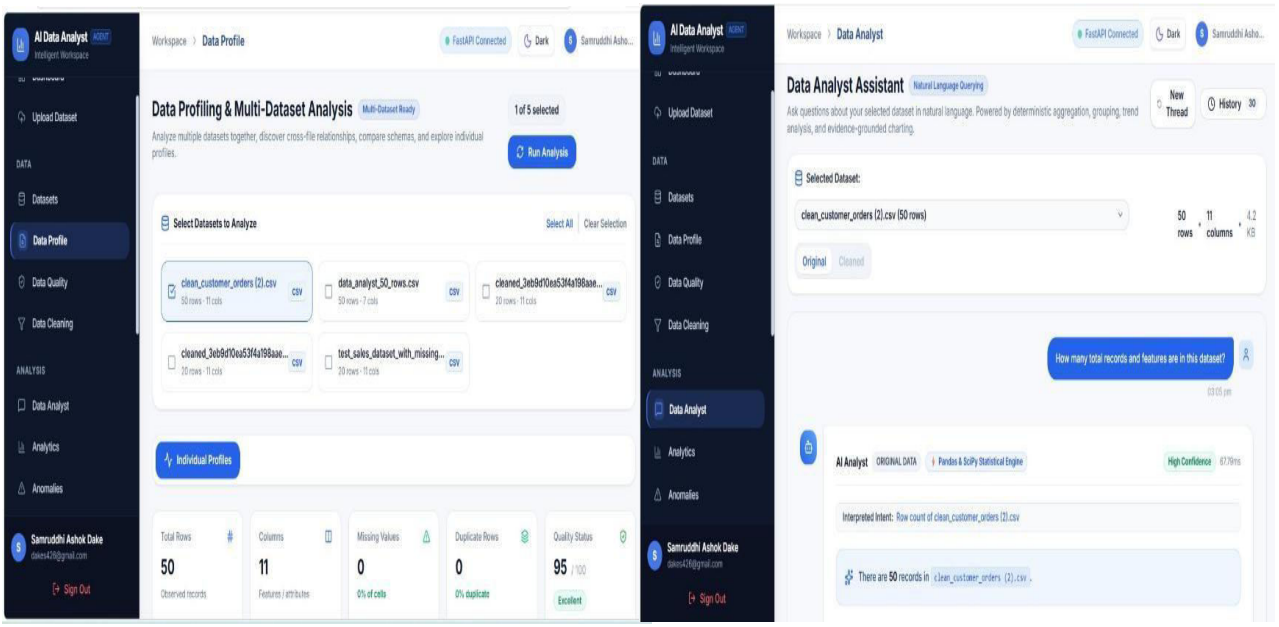
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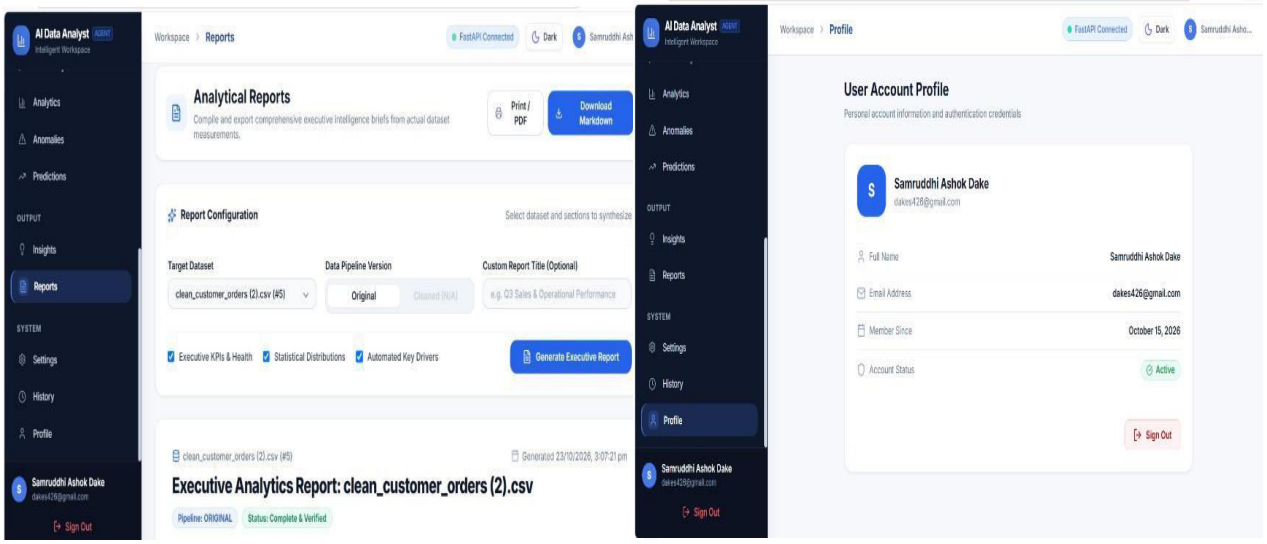
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VII. CONCLUSION

The AI Data Analyst Agent is an intelligent web-based application developed to simplify data analysis and help users extract meaningful insights from datasets. It provides features such as CSV and Excel file uploading, data cleaning, data processing, data visualization, trend analysis, and anomaly detection. The application uses React for the frontend, Python with FastAPI for the backend, and SQLite for database management.

The system aims to reduce manual effort, minimize data processing errors, and improve the efficiency of data analysis. By presenting useful insights and visualizations through an interactive interface, it helps users understand their data more effectively. Overall, the AI Data Analyst Agent aims to make data analysis easier, faster, and more efficient, supporting better data-driven decision-making.

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