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AI-Powered Data Insight and Visualization Web Platform with Automated Anomaly Detection

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Abstract- AI-Powered Data Insight and Visualization Web Platform is a web-based system developed to simplify data analysis for non-technical users. In today's data-driven environment, analyzing datasets requires technical skills and manual effort, making it difficult for beginners to understand and interpret data effectively. The proposed system addresses this problem by providing an automated platform that performs data preprocessing, statistical analysis, visualization, and anomaly detection. The system allows users to upload datasets in CSV or Excel format and automatically processes the data by handling missing values, removing duplicate records, and identifying column data types. It calculates statistical measures such as mean, median, mode, minimum, maximum, and standard deviation to summarize the dataset. The platform generates visualizations including bar charts, line charts, and pie charts to help users identify patterns and trends. An anomaly detection module based on the Interquartile Range (IQR) method is used to detect unusual data values. Additionally, an AI-based chat assistant enables users to interact with the dataset using natural language queries. The system also supports automated report generation, making data analysis simple, efficient, and user-friendly.

I. INTRODUCTION

In the modern digital world, large volumes of data are generated across various domains such as business, healthcare, and education. Analyzing this data is essential to extract meaningful insights and support decision-making processes. However, traditional data analysis tools often require programming knowledge and technical expertise, making them difficult for non-technical users.

To address this challenge, this paper proposes an AI-Powered Data Insight and Visualization Web Platform that automates dataset analysis. The system enables users to upload datasets and automatically generates statistical summaries, visualizations, anomaly detection results, and AI-based insights. The main objective of this system is to simplify data analysis and make it accessible to all users.

II. METHODOLOGY

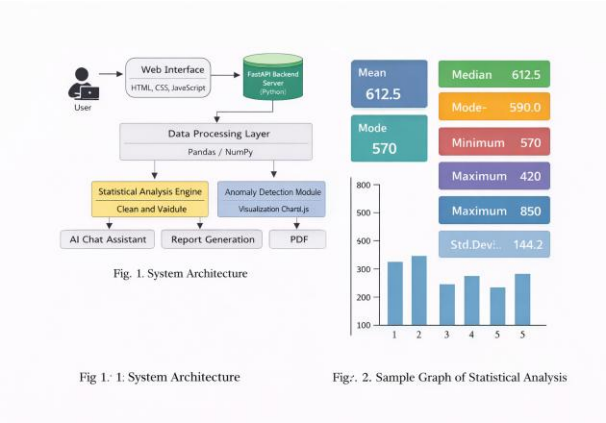

Fig. 1. System Architecture

Fig 1.: 1: System Architecture

Fig:. 2. Sample Graph of Statistical Analysis

The proposed system follows a structured workflow consisting of multiple stages.

Dataset Upload:
Users upload datasets in CSV or Excel format through the web interface.

Data Preprocessing:
The system cleans the dataset by removing duplicate records, handling missing values, and identifying column data types.

Statistical Analysis:
The system calculates statistical measures such as mean, median, mode, minimum, maximum, and standard deviation.
Data Visualization:

The system generates visual charts including bar charts, line charts, and pie charts to represent data patterns.

Anomaly Detection:
An anomaly detection module based on the Interquartile Range (IQR) method is used.

$$IQR = Q3 - Q1$$
$$\text{Lower Bound} = Q1 - 1.5 \times IQR$$
$$\text{Upper Bound} = Q3 + 1.5 \times IQR$$

Values outside this range are considered anomalies.

AI Chat Assistant:
The system includes an AI chatbot that allows users to query the dataset using natural language.

Report Generation:
The system generates a downloadable PDF report containing insights, charts, and analysis results.

III. RESULTS AND FINDINGS

The proposed system was tested using sample datasets to evaluate its performance. The system successfully performed automatic data preprocessing, statistical analysis, visualization, and anomaly detection.

The results show that the system can effectively convert raw data into meaningful insights. The generated charts helped identify trends and patterns, while anomaly detection successfully identified unusual values in the dataset. The AI chatbot provided accurate responses to user queries.

IV. CONCLUSION

This paper presented an AI-Powered Data Insight and Visualization Web Platform designed to simplify dataset analysis for non-technical users. The system integrates data preprocessing, statistical analysis, visualization, anomaly detection, and AI-based interaction within a single platform.

The system improves data understanding and helps users make informed decisions without requiring programming knowledge. Future work includes integrating machine learning algorithms, real-time data processing, and advanced predictive analytics.

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