OPEN ACCESS INTERNATIONAL JOURNAL OF SCIENCE & ENGINEERING

SMART VIEW - AI -POWERED VISUALIZATION & REVIEWING & RECOMMENDATION OF MULTI APP

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Abstract: This paper presents an AI-Powered Visualization and Recommendation System designed to analyze large volumes of mobile application reviews and transform unstructured textual feedback into structured, actionable insights. With the rapid growth of mobile applications across various domains, user-generated reviews have become an important indicator of application quality, usability, and performance. However, manual analysis of thousands of textual reviews is inefficient and often fails to uncover deeper trends and recurring issues. The proposed system integrates Natural Language Processing (NLP), Machine Learning (ML), and interactive visualization techniques to automate the analysis process. The system performs data ingestion, preprocessing, sentiment classification, theme extraction, and severity-based recommendation generation within a unified modular architecture. By operating in a standalone and privacy-preserving environment, the system ensures data integrity while supporting developers and product managers in making structured, data-driven decisions for application improvement.

Keywords: App Review Analytics, Sentiment Classification, Theme Extraction, Natural Language Processing, Machine Learning, Visualization Dashboard, Recommendation Engine.

I INTRODUCTION

The rapid advancement of mobile technology has significantly transformed how users interact with digital services across communication, finance, education, entertainment, and commerce. As application ecosystems continue to expand, user-generated feedback in the form of app reviews has emerged as a valuable data resource. These reviews reflect user satisfaction, usability concerns, feature requests, and technical issues. Despite their importance, most organizations rely on manual review processes or basic statistical summaries such as average ratings, which fail to capture deeper analytical insights. The increasing volume of feedback necessitates an intelligent and automated system capable of extracting structured information from unstructured textual data. The proposed AI-powered system addresses this challenge by integrating data processing pipelines, sentiment classification models, and theme extraction mechanisms to convert raw review datasets into prioritized and actionable recommendations.

1.1 Background and Context

In traditional software development environments, user feedback is often collected through app store ratings, review comments, surveys, or support tickets. Most development teams rely on manual review of comments or simple statistical summaries such as average rating values. In some cases, centralized analytics platforms are used to aggregate feedback and generate high-level reports.

1.2 Motivation / Need of Study

User reviews directly influence application ratings, downloads, and user retention. Ignoring or misinterpreting this feedback can lead to persistent bugs, performance issues, and reduced user satisfaction. As the number of mobile applications increases, so does the volume of feedback, making manual evaluation increasingly impractical.Technological advancements in natural language processing and machine learning provide an opportunity to

design more intelligent systems capable of extracting patterns, classifying sentiment, and identifying meaningful themes from unstructured text. At the academic level, developing such a system strengthens understanding of data processing pipelines, machine learning workflows, database management, and visualization techniques.

Therefore, there is both practical and educational motivation to develop a structured, automated system that analyzes user reviews and generates meaningful recommendations in an organized and privacy-conscious manner.

1.3 Problem Definition

The rapid increase in mobile application usage has led to a massive growth in user-generated reviews. These reviews contain important insights about user satisfaction, technical issues, and feature improvements, but their unstructured textual format makes manual analysis difficult and time-consuming. Existing systems often provide only basic rating summaries without identifying recurring issues or prioritizing critical problems. Therefore, there is a need for an intelligent, automated, and standalone system that can analyze large volumes of review data, classify sentiment accurately, extract key themes, and generate structured, actionable recommendations for effective decision-making.

1.4 Objectives of the Project

The main objective of this project is to develop an AI-based system that automatically analyzes mobile app reviews and converts unstructured textual data into meaningful insights. The system aims to classify sentiment accurately, identify recurring issues through theme extraction, prioritize problems using a severity model, and generate actionable recommendations. Additionally, it seeks to provide an interactive visualization dashboard while ensuring privacy through a standalone and secure architecture.

II LITERATURE SURVEY

The literature survey presents a structured analysis of existing systems, technologies, and approaches related to intelligent data processing and analytical software systems. The purpose of this review is to understand how current solutions operate, what strengths they offer, and where limitations exist. By examining traditional, optimized, and advanced system architectures, this chapter identifies practical challenges and improvement opportunities. The findings from this study help define the research gaps that are addressed by the proposed system.

2.1 Overview of Existing Systems

Existing app review analysis systems primarily rely on manual evaluation or basic statistical methods such as average ratings and simple keyword filtering. Some modern platforms use machine learning techniques for sentiment classification, but they often operate as isolated tools without full integration of preprocessing, theme extraction, and recommendation generation. Most systems provide surface-level insights without prioritizing recurring issues or generating structured action plans. Additionally, many solutions depend on centralized or cloud-based architectures, which may raise concerns related to scalability, privacy, and operational complexity. As a result, current systems lack a comprehensive, automated, and standalone framework for converting large-scale unstructured review data into actionable insights.

2.2 Research Gap Identification

Although several review analysis systems and sentiment classification tools exist, most of them focus only on basic sentiment detection or simple keyword analysis. They do not provide a fully integrated framework that combines data ingestion, preprocessing, sentiment classification, theme extraction, severity prioritization, and recommendation generation in a single workflow. Many existing solutions lack structured issue prioritization and actionable output that directly supports development decision-making. Additionally, dependence on cloud-based architectures creates concerns related to data privacy and system complexity. Therefore, there is a clear research gap in developing a standalone, modular, and intelligent system that transforms large-scale unstructured app reviews into prioritized and actionable insights through an end-to-end automated process.

2.3 Summary of Findings

The review of existing literature and current review analysis systems indicates that while significant progress has been made in sentiment analysis and text mining, most solutions remain limited in scope and integration. Many systems focus primarily on basic sentiment classification without extending the analysis to structured theme extraction or actionable recommendation generation. It was observed that traditional approaches rely heavily on manual processing or simple statistical summaries, which are inadequate for handling large-scale and unstructured review datasets.

Furthermore, several advanced systems implement machine learning techniques, but they often function as isolated modules rather than as part of a comprehensive end-to-end framework. There is limited emphasis on severity-based prioritization of issues, which is crucial for practical decision-making in software development. Privacy concerns and dependency on cloud-based infrastructure also present operational challenges. Overall, the findings highlight the need for a unified, standalone, and intelligent system that integrates sentiment analysis, theme identification,

prioritization mechanisms, and visualization within a single structured architecture.

III PROPOSED SYSTEM

The proposed system is an AI-based platform designed to automatically analyze mobile app reviews and convert unstructured textual data into structured and actionable insights. It integrates data ingestion, NLP-based preprocessing, sentiment classification using machine learning, and theme extraction within a modular architecture. The system prioritizes recurring issues using a severity scoring model and generates meaningful recommendations to support development decisions. An interactive visualization dashboard presents the analytical results in a clear and user-friendly manner. Additionally, the system operates in a standalone and privacy-preserving environment, ensuring data security and flexibility for future enhancements.

3.1 Frontend Design

The frontend of the proposed system is designed to provide a simple, interactive, and user-friendly interface for uploading review datasets and viewing analytical results. Developed using NiceGUI, the dashboard allows users to initiate preprocessing, sentiment analysis, and theme extraction with ease. It displays outputs such as sentiment distribution, recurring themes, and prioritized issues through clear visualizations. The design ensures smooth navigation, proper validation messages, and an intuitive layout, making the system accessible to both technical and non-technical users.

3.2 Backend Framework

The backend framework is developed using Python and serves as the core processing unit of the system. It handles data ingestion, preprocessing, sentiment classification, theme extraction, severity scoring, and recommendation generation. Libraries such as pandas, NLTK, and scikit-learn are used for data processing and machine learning tasks, while SQLite manages structured data storage. The modular architecture ensures smooth integration with the frontend and allows scalability and future enhancements.

3.3 Machine Learning Engine

The Machine Learning Engine forms the core analytical component of the SMART VIEW system, responsible for automated sentiment classification of user reviews. After preprocessing, textual data is transformed into numerical feature vectors using the Term Frequency–Inverse Document Frequency (TF–IDF) technique, which captures the importance of words within the review corpus while reducing the impact of common terms.

The sentiment classification task is performed using a supervised Logistic Regression model due to its efficiency and strong performance in high-dimensional sparse text spaces. Reviews are categorized into Positive, Neutral, or Negative classes based on learned decision boundaries. The probability of class membership is estimated using the sigmoid function:

$$P(y = 1|x) = \backslash frac\{1\}\{1 + e^{\{-w^{Tx}\}}\}$$

To address class imbalance, balanced weighting is applied during training. The trained TF–IDF vectorizer and classifier are serialized for reuse, enabling efficient batch-based inference without repeated retraining.

Predicted sentiment labels and confidence scores are stored in the database and forwarded to the theme extraction and recommendation modules. The modular design ensures scalability and allows future integration of advanced models

3.4 Database Management

The Database Management module handles the structured storage and retrieval of review data using SQLite. It stores raw reviews, processed text, sentiment results, themes, severity scores, and recommendations in relational tables while maintaining data integrity through primary and foreign keys. The system ensures secure, lightweight, and offline operation with efficient querying and performance optimization using Write-Ahead Logging (WAL) mode.

3.5 External API Integration

The External API Integration module enables the system to interact with third-party services and external data sources when required. Although the proposed system primarily operates in a standalone and offline environment, this module provides flexibility for future expansion. It can be used to fetch real-time app reviews from platforms such as app marketplaces, integrate authentication services, or connect with cloud storage solutions.

The integration layer is designed using secure HTTP-based communication protocols and structured data exchange formats such as JSON. Proper error handling and validation mechanisms ensure reliable data transmission and system stability. Additionally, API calls are managed through controlled endpoints to maintain data privacy and prevent unauthorized access.

This modular design ensures that external services can be connected without affecting the core backend architecture, allowing scalability and adaptability for future enhancements such as real-time data streaming or cloud-based deployment.
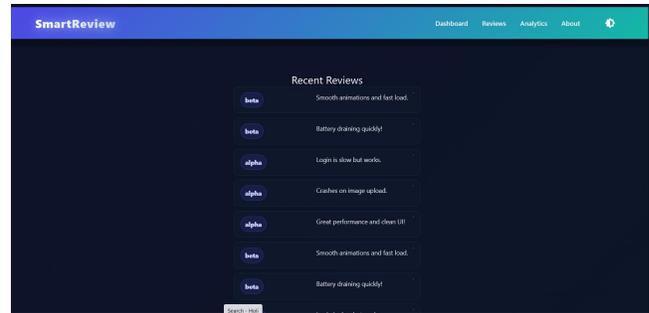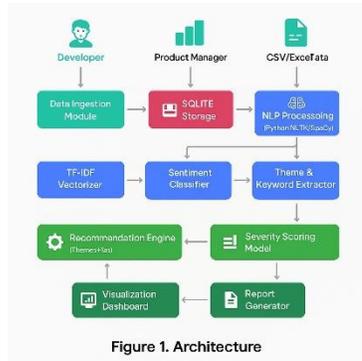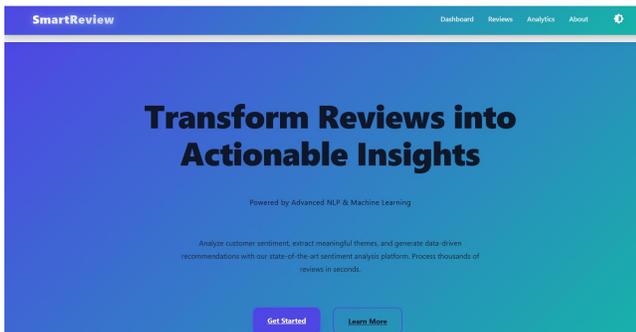
3.6 System Architecture

Figure 1. Architecture

Figure 1:System Architecture of SmartReview

Figure 2:Dashboard
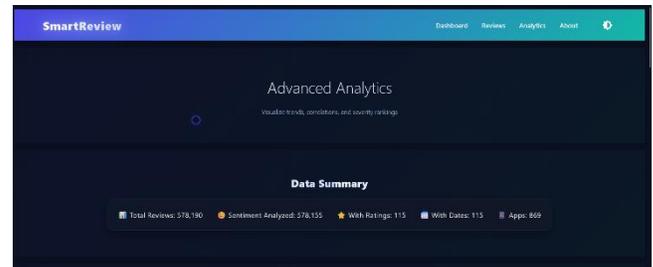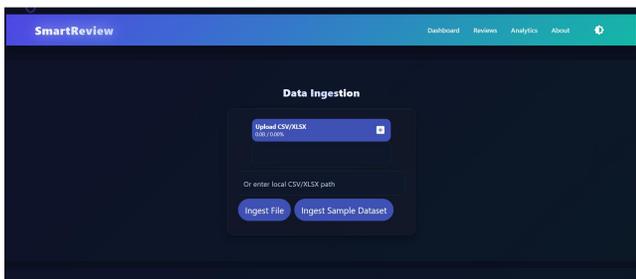
Figure 3:Landing page
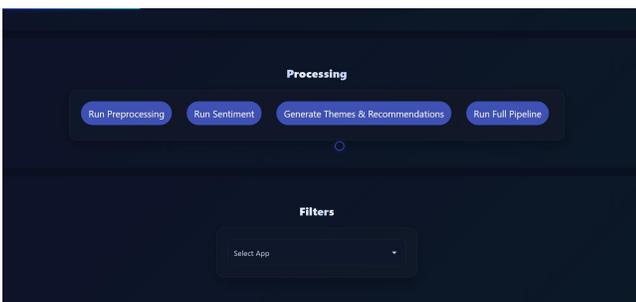
Figure 4:Processing pager

Figure 5:Reviews

IV CONCLUSION

The AI-Powered Visualization and Recommendation of Multi-App Reviews system presents an integrated solution for automated feedback analysis. By combining Natural Language Processing, Machine Learning, structured database management, and interactive visualization, the system transforms raw review data into meaningful and prioritized recommendations. The modular architecture ensures maintainability and scalability, while the privacy-focused offline design enhances data security. The project contributes both academically and practically by demonstrating a structured approach to intelligent review analytics and providing a foundation for future research and technological advancements in sentiment-based decision support systems.

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