AI-Assisted Family Budgeting Tool

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***Abstract*—Managing family finances can be overwhelming, especially with multiple income sources, recurring expenses, and financial goals to track. The AI-Assisted Family Budgeting Tool simplifies this process by using Natural Language Processing (NLP) to make budgeting more intuitive and effortless. Instead of manually entering data or using complicated spreadsheets, users can interact with the tool in plain, conversational language—just like chatting with a personal financial assistant. This intelligent system helps families understand, categorize, and analyze their expenses, offering insights into spending patterns and predicting future financial needs. It allows users to input details such as income, recurring bills, savings goals, and discretionary spending, and then dynamically generates a balanced and optimized budget tailored to their financial situation.**

By leveraging NLP, the tool can process unstructured financial data—such as bank statements, receipts, or even simple text-based inputs—and transform them into actionable recommendations. It provides real-time alerts for overspending, upcoming bills, and saving opportunities, ensuring that families stay on top of their finances without stress. With this AI-powered budgeting assistant, financial planning becomes smarter, more accessible, and proactive, helping families easily achieve financial stability and long-term security.

***Index Terms*—User-Friendly Interface, Natural Language Processing (NLP), Financial Planning, Overspending Warning, Conversational Interface.**

I. INTRODUCTION

Managing personal and family finances can often feel overwhelming, especially when juggling multiple income sources, expenses, savings goals, and unexpected financial changes. Traditional budgeting methods—such as spreadsheets and manual tracking—are time-consuming, prone to errors, and require financial expertise. Many individuals struggle with tracking their expenses, understanding their spending habits, and making informed financial decisions. In an increasingly digital world, leveraging artificial intelligence (AI) and Natural Language Processing (NLP) can transform the way families approach budgeting, making financial management more intuitive, automated, and insightful.

The AI-Assisted Family Budgeting Tool is designed to simplify and enhance personal finance management by allowing users to interact with their budgeting system in natural, conversational language. This eliminates the complexity of manual tracking and provides a user-friendly, intelligent assistant that categorizes expenses, predicts financial needs, and offers personalized budgeting suggestions. By automating the budgeting process, the tool helps users develop better spending habits, avoid overspending, and make informed financial decisions. Additionally, it supports financial planning for lifestyle adjustments, unexpected expenses, and long-term savings goals.

A. Applications

- Household Budgeting: Helps families track and optimize their monthly income and expenses, ensuring financial stability.
- Expense Categorization: Automatically sorts expenditures into categories such as groceries, rent, entertainment, and savings.
- Emergency Fund & Lifestyle Adjustments: Assists users in adjusting budgets based on changing financial situations, such as medical emergencies or job transitions.
- Financial Literacy Enhancement: Helps users understand their spending patterns and develop better money management habits.

B. Challenges

Implementing an AI-powered budgeting tool comes with challenges such as data accuracy and privacy, ensuring financial information remains secure and reliable. The system must also accurately interpret complex transactions from various sources, preventing misclassification. User adoption and trust can be a hurdle, as people may hesitate to rely on AI for financial decisions. Additionally, seamless integration with bank accounts and financial APIs is necessary but technically complex. Finally, the tool must be adaptable and customizable, catering to diverse financial habits and evolving needs. Overcoming these challenges is key to making AI-driven budgeting effective and user-friendly.

II. LITERATURE REVIEW

S. Harsshita et al [1] This study introduces IntelliFinance, a user-friendly app designed for efficient daily expense management. By integrating Optical Character Recognition (OCR) and NLP, the app captures and processes receipt images to categorize expenses, providing users with comprehensive spending insights and visualizations. Oudom Hean et al [2] This paper evaluates the effectiveness of Large Language Models (LLMs) like ChatGPT and Google's Gemini in providing financial advice on topics such as mortgages, taxes, loans, and investments. Findings indicate an average accuracy rate of approximately 70%, highlighting both the potential and limitations of LLMs in personal finance applications. Aimen Mushtaq et al [3] This study explores the application of FinBERT, a financial domain-specific language model, in personal finance coaching. The research demonstrates FinBERT's high accuracy in detecting explicit sentiments, suggesting its feasibility in aiding individuals' financial decision-making processes.

Liyang Wang et al [4] This paper discusses constructing an NLP-based financial risk detection model to identify and predict potential risks in financial documents. Empirical research validates the model's effectiveness, offering valuable tools for financial institutions in risk management. Denisa Millo et al [5]This paper reviews the integration of text mining and NLP techniques in various financial system components, including asset pricing and risk management. It discusses prevalent models and algorithms, highlighting challenges like data quality and model interpretability. Jonathan Davies et al [6] This study examines the challenges of scaling up participatory budgeting in Scotland and evaluates the use of the digital platform Consul, which applies NLP to enhance citizen participation. Initial results suggest NLP technology can address issues arising from mainstreaming participatory budgeting. Prabin Adhikari et al [7] International Journal of Science and Research Archive, January 2025 Summary: This study examines the transformative impact of AI on personal finance and wealth management in the United States, focusing on how AI technologies enhance financial decision-making, improve financial behaviors, and democratize access to wealth management tools.

Daniele Guariso et al [8] This paper explores the use of NLP methods to automate Sustainable Development Goals (SDG) budget tagging, aiming to enhance public financial management capacity by processing large amounts of public documents efficiently. Visesh Agarwal et al [9] This literature review analyzes the application of AI techniques in personal finance management, focusing on web-based tools and responsive systems that enhance financial literacy and assist individuals in managing their finances effectively. Siqiao Xue, et al [10] WeaverBird is an intelligent dialogue system tailored for the finance sector. It utilizes a GPT-based large language model fine-tuned with extensive financial texts. By integrating a local knowledge base and search engine, WeaverBird can comprehend complex financial queries and provide informed responses with citations, enhancing credibility. ilvia Garc´ıa-Me´ndez et al [11] This study presents a system that combines Natural Language Processing techniques with Machine Learning algorithms to classify banking transaction descriptions for personal finance management. Trained on a labeled dataset of real customer transactions, the system demonstrates high accuracy in categorizing short-text financial data. Huaqin Zhao et al [12] This paper provides a comprehensive overview of the integration of Large Language Models (LLMs) into various financial tasks. It discusses how LLMs are utilized for automating financial report generation, forecasting market trends, analyzing investor sentiment, and offering personalized financial advice, thereby enhancing operational efficiency and customer satisfaction in the financial sector. Longbing Cao et al [13] This review offers a comprehensive roadmap of the challenges, techniques, and opportunities of AI research in finance over past decades. It outlines the landscapes and challenges of financial businesses and data, provides a dense overview of AI research in finance, and discusses future AI-empowered finance and finance-motivated AI research.

A. Research Gaps

Numerous studies have explored AI-driven financial management and budgeting solutions, leveraging Natural Language Processing (NLP) and Machine Learning to assist users in tracking expenses and optimizing budgets. While these advancements have improved automation and accuracy in financial tracking, several gaps remain. One key challenge is the system's ability to accurately interpret unstructured financial data, such as handwritten expense notes, voice inputs, or vague transaction descriptions. Additionally, existing tools often struggle to provide highly personalized budgeting recommendations that adapt dynamically to changing financial conditions. Privacy and data security are also critical concerns, as financial data is highly sensitive and requires robust encryption and compliance with financial regulations. Lastly, ensuring that AI-generated financial insights remain explainable and user-friendly for individuals with varying levels of financial literacy remains an open challenge.

B. Research Objectives

Building upon insights from existing research, the primary objective of this project is to develop an AI-Assisted Family Budgeting Tool that simplifies and enhances personal finance management through NLP-driven conversational interaction. This system will allow users to input financial details naturally, either through text or voice, eliminating the need for manual data entry. The tool will leverage advanced NLP and Machine Learning techniques to categorize expenses, predict future financial needs, and provide dynamic, personalized budgeting recommendations.

Additionally, it will incorporate real-time alerts to prevent overspending, notify users of upcoming bills, and highlight potential savings opportunities. A key focus of this research is to ensure financial inclusivity by designing an intuitive and user-friendly interface that accommodates users with different

levels of financial knowledge. Furthermore, the tool will integrate robust security measures to protect user data while maintaining high accuracy in financial analysis. By addressing these challenges, the proposed system aims to revolutionize how families manage their finances, making budgeting a seamless and intelligent experience.

III. PROPOSED METHODOLOGY

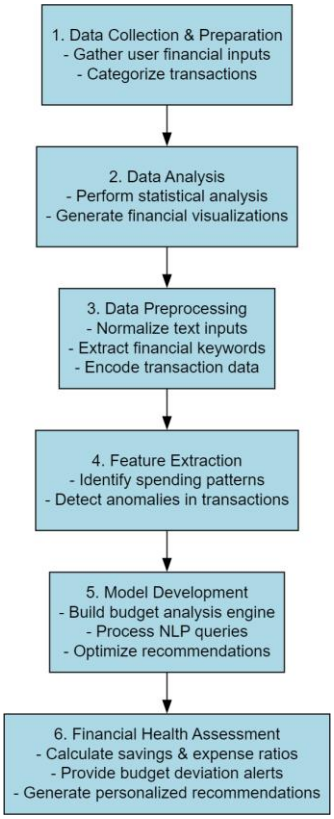

Fig. 1. Methodology

Developing an AI-assisted family budgeting tool requires a structured approach to ensure accuracy, efficiency, and usability. This methodology outlines the key steps involved in data collection, analysis, preprocessing, feature extraction, model development, and financial health assessment. By leveraging machine learning, Natural Language Processing (NLP), and statistical analysis, the system enables users to track their expenses, analyze spending patterns, and receive personalized recommendations. Each stage is designed to enhance financial decision-making, detect anomalies, and optimize savings strategies, making budgeting seamless and more intuitive for users. The overall workflow of this methodology is illustrated in Fig. 1, which provides a step-by-step representation of the process, ensuring a clear understanding of how data is handled and transformed within the system.

A. Data Collection & Preparation

The first step in developing the AI-Assisted Family Budgeting Tool is collecting financial data from users. The system gathers essential details such as income, expenses, and budgetary goals. Each transaction is categorized into predefined labels, including rent, food, utilities, entertainment, and miscellaneous expenditures. Proper categorization ensures that financial patterns can be easily analyzed, allowing for more efficient budget planning.

B. Data Analysis

Once the financial data is structured, statistical analysis is conducted to identify spending habits, income distribution, and savings trends. By examining these aspects, the system can provide insights into how users allocate their financial resources. To enhance user experience, financial information is presented through charts and graphs, allowing for a visually intuitive understanding of financial patterns. This visual representation helps users track their expenses and identify areas where adjustments may be needed.

C. Data Preprocessing

To ensure accurate financial data processing, various preprocessing techniques are applied using Natural Language Processing (NLP). The system normalizes text inputs by correcting typos, abbreviations, and inconsistencies in user-provided financial data. Additionally, key financial terms are extracted using NLP techniques, making it easier to categorize and analyze transactions accurately. To enable AI-driven analysis, financial categories and transaction types are numerically encoded, ensuring seamless data compatibility with machine learning models.

D. Feature Extraction

The next step involves feature extraction, where AI models identify key spending patterns in user transactions. By analyzing recurring expenses and seasonal trends, the system can forecast future spending behaviors. Anomaly detection algorithms are also implemented to flag unusual or unexpected transactions, alerting users to potential financial risks. These features help users stay informed about their spending habits and prevent unnecessary financial losses.

E. Model Development

At the core of the budgeting tool is the model development phase, where AI-driven budgeting engines are designed to enhance financial decision-making. A rule-based AI model is developed to analyze user spending behavior and generate personalized budgeting recommendations. NLP-powered processing enables the system to interpret user queries, extract intent, and provide relevant financial insights. The model is continuously optimized and fine-tuned based on user feedback to improve accuracy and ensure recommendations align with individual financial goals.

F. Financial Health Assessment

To provide a comprehensive evaluation of users' financial well-being, the system calculates key financial ratios, such as savings versus expenses. Based on this analysis, users

receive real-time budget deviation alerts whenever their spending exceeds predefined limits. Additionally, the AI assistant generates customized recommendations to optimize savings, reduce unnecessary expenditures, and encourage responsible financial habits. By continuously monitoring financial health, the system helps users maintain control over their budgeting decisions.

This structured methodology ensures that the AI-Assisted Family Budgeting Tool effectively helps users manage their finances with accuracy, efficiency, and ease of use. Through data-driven insights, intelligent recommendations, and NLP-powered interactions, the system serves as a valuable financial companion, enabling better budgeting decisions and promoting financial stability.

IV. EXPERIMENTAL RESULTS

1) LOGIN page

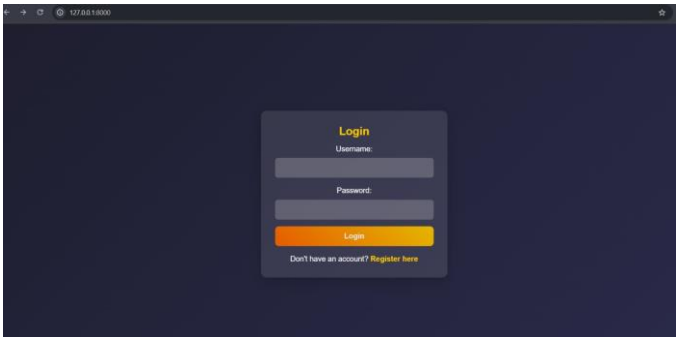

Fig. 2. login page

On the login page, users can authenticate based on their role. If logging in as an admin, users must enter their designated admin credentials to access the administrative dashboard. Similarly, general users can provide their user credentials to log in to their respective accounts. This unified login interface ensures a streamlined authentication process, catering to both administrators and regular users within the same platform.
Refer to Fig-2 for the Login Page interface.

2) Register page

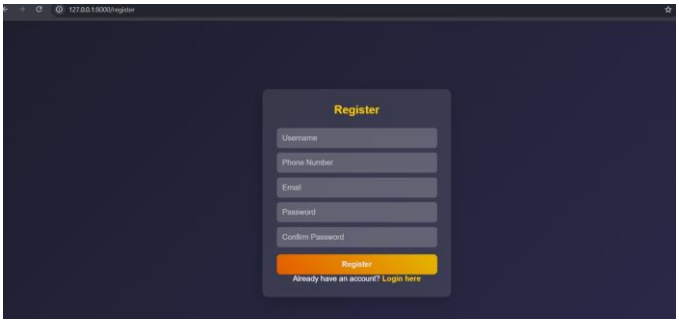

Fig. 3. register page

The registration page allows new users to create an account on the platform. If a user does not have an existing account, they can provide the necessary details, such as name, email, password, and other required information, to complete the registration process. This ensures secure access and personalized financial management features upon successful account creation.
Refer to Fig-3 for the Registration Page interface.

3) Set Budget Page

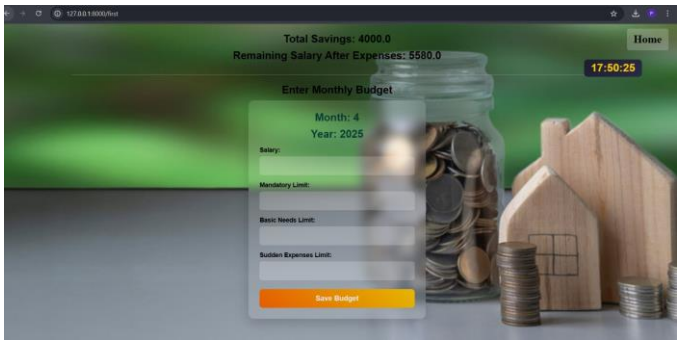

Fig. 4. Set Budget Page

The Set Budget Page, also known as the first page of our project, allows users to define their monthly budget and set spending limits for different expense categories. This ensures better financial planning by helping users allocate funds efficiently and track their expenses against predefined limits.
Refer to Fig-4 for the Set Budget Page interface.

4) Home Page

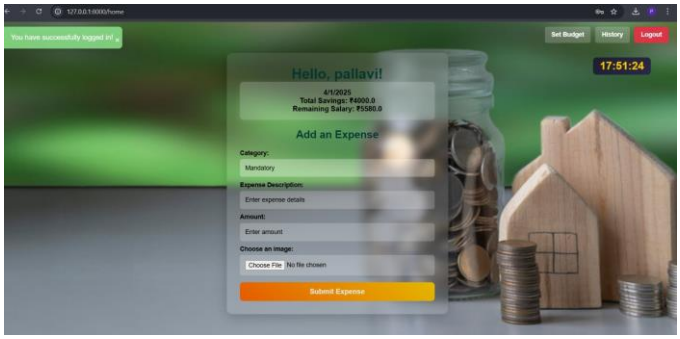

Fig. 5. home page

The Home Page serves as the main dashboard after a user logs in. It provides a comprehensive overview of financial insights, including spending summaries, budget status, and alerts. Users can access key features such as transaction tracking, savings analysis, and personalized recommendations to manage their finances effectively.
Refer to Fig-5 for the Home Page interface.

5) History Page

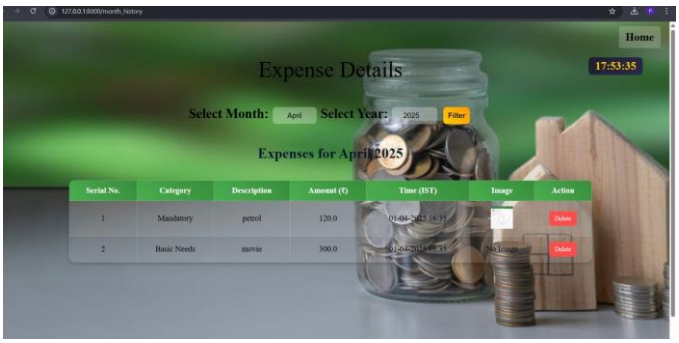

Fig. 6. History page

The History Page allows users to review their past financial transactions in detail. It provides an organized view of all recorded expenses, enabling users to track and analyze their spending over time. Additionally, users have the option to edit or delete entries if an expense was mistakenly recorded or not incurred.
Refer to Fig-6 for the History Page interface.

V. CONCLUSION

The AI-Assisted Family Budgeting Tool represents a significant advancement in personal finance management, leveraging artificial intelligence, Natural Language Processing (NLP), and data analytics to simplify and enhance budgeting. By enabling users to interact with their finances conversationally, the tool removes the complexities of manual financial tracking, making financial management more intuitive and accessible.

Through personalized financial coaching, the system provides tailored budgeting advice, helping users optimize their savings, reduce unnecessary expenses, and achieve long-term financial stability. Predictive budget adjustments ensure proactive financial planning by analyzing spending trends and dynamically adjusting limits to prevent financial shortfalls. Additionally, AI-powered fraud detection enhances financial security by identifying unusual transactions and alerting users to potential unauthorized expenses. Beyond day-to-day budgeting, the tool fosters long-term wealth growth by analyzing savings habits and recommending suitable investment opportunities based on user income and risk preferences.

As illustrated in **Fig. 1**, the structured methodology behind the tool ensures accuracy, efficiency, and adaptability. With continuous refinement through user feedback, machine learning, and predictive analytics, this AI-driven financial assistant is poised to transform how families manage their finances, promoting responsible spending and long-term financial well-being.

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