

AI-based Smart Finance & Budgeting Platform

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Abstract— In today's fast-paced digital era, effective financial management has become increasingly challenging for both individuals and businesses. Many people struggle to monitor expenses, optimize their budgets, and make informed financial decisions. To address this issue, an AI-based smart finance and budgeting platform was developed using the MERN stack (MongoDB, Express.js, React.js, Node.js), and integrated with intelligent analytics powered by Artificial Intelligence (AI). This platform is designed to offer personalized financial assistance, enabling users to track and categorize expenses, forecast future financial plans, and enhance their budgeting strategies using Machine Learning (ML) models. Key features of the platform include AI-powered expense tracking, automated invoice generation, a voice-enabled assistant, and customized savings recommendations. By incorporating Natural Language Processing (NLP) and predictive analytics, the platform delivers real-time financial insights, making money management more efficient and accessible. Emphasis is placed on security and scalability through encrypted data exchange, multi-user authentication, and cloud-based infrastructure. The voice assistant further improves user experience by enabling intuitive, hands-free financial interactions. Ultimately, this research aims to revolutionize personal finance by equipping users with intelligent tools to make informed financial decisions, manage their savings effectively, and optimize their budgets. With a user-friendly interface and smart automation, this system introduces a next-generation solution for digital finance and budgeting.

Index Terms— Artificial Intelligence, OCR Technology, MERN Stack, Financial Wellness, Expense Tracking, Intelligent Automation.

I. INTRODUCTION

In the modern digital landscape, managing personal and commercial finances has become more complex than ever. The growing number of financial transactions, diversified spending categories, and the demand for real-time decision-making have rendered traditional budgeting techniques inefficient and outdated. Manual financial planning approaches are not only time-consuming but also lack the flexibility required to adapt to evolving economic behaviors.

To overcome these limitations, an AI-based Smart Finance & Budgeting System, developed using the MERN stack. This web-based platform empowers users to monitor and categorize their expenses, simplify budgeting, and gain personalized financial insights. By leveraging AI and ML, the system analyzes user spending behavior to identify trends and forecast future expenses.

The integration of Natural Language Processing (NLP) enhances user interaction through voice commands, making the platform more intuitive and accessible.

In these AI-based systems, implementation of some outstanding features, i.e., AI-driven expense tracking, Automated receipt/invoice generation using OCR, Smart savings and investment recommendations, Voice-enabled financial assistant for user interaction, Cloud-based secure infrastructure with encrypted data, etc. This solution is tailored for both individuals and small businesses seeking smart tools for financial management. The core objective of this research is to replace traditional budgeting practices with intelligent automation, enabling users to make informed financial decisions and achieve improved financial outcomes with greater ease and confidence.

II. LITERATURE SURVEY

Later improvements in money-related advances and manufactured intelligence (AI) have cleared the way for different instruments pointed at advancing individual fund management. Despite this advance, numerous existing frameworks still confront challenges in terms of flexibility, real-time interactivity, and consistent AI integration. The taking after area surveys related works that have contributed to the field, highlighting their qualities and key restrictions.

A. Existing Systems

AI-Driven Personal Financial Advisors

Parth Pangavhane et al. [1] proposed an AI-based budgetary admonitory framework that utilizes machine learning to screen client investment designs and give personalized budgetary suggestions. The framework was planned to computerize decision-making forms and help clients in overseeing their accounts more effectively. Limitations of the system are that the framework centers primarily on long-term money-related planning and needs instruments for day-to-day cost tracking. It does not bolster real-time highlights such as voice interaction or email-based communication. The level of personalization is negligible, especially for clients with shifting degrees of monetary literacy.

Reserve Funds Expectation Utilizing Machine Learning

Muhammad Aizat Zainal Alam et al. [2] investigated machine learning strategies inside a behavioral financial system to foresee financial reserves adequacy. Their approach utilized classification calculations to analyze the impact of client behavior on monetary outcomes. Limitations of the system are that the framework offers review investigation without real-time following capabilities. It depends intensely on verifiable information, making it less successful for modern or unpredictable users. There is no integration with user-friendly stages such as portable or web-based applications.

Online Pay and Cost Tracker

Chandini et al. [3] created a straightforward web-based device that permits clients to physically record their pay and uses. The framework incorporates highlights such as exchange categorization and visualization through charts and tables. Limitations of the system are that the framework needs computerization and does not consolidate AI-based functionality. Manual information passage presents a high risk of human error and decreases the application's long-term usability. It does not back progressed highlights like speech-to-text input, PDF era, or brilliant categorization.

Crowdsourcing for Asset Scheduling

Hamrouni et al. [4] presented a many-to-many enlistment and planning model outlined for versatile crowdsourcing situations. In spite of the fact that not straightforwardly related to individual back, the consider illustrates progressed planning methods that can drive future automation in financial planning systems. Limitations of the system are that the system isn't particularly designed for budgetary applications and has restricted coordinate relevance.

Its complexity and overwhelming engineering make it unacceptable for lightweight, versatile apps focusing on individual fund users.

Machine Learning in Stock Advertise Forecasting

Kamley et al. [5] checked on different machine learning models utilized for forecasting stock advertise patterns. The model exhibits the potential of AI in taking care of complex financial forecast tasks. Limitations of the system are that the center is fundamentally on speculation analytics, not ordinary individual financial management. These models require ceaseless, high-quality datasets that are frequently inaccessible for individual fund utilization cases. Most usage needs open interfacing for common clients with small or no specialized background.

AI in Fintech for Smart Finance

Akre et al. [6] provided a comprehensive overview of how artificial intelligence is included in modern fintech applications. This paper discusses key innovations such as AI-driven transaction analysis, automated credit ratings, and intelligent financial support. Research effectively demonstrates the potential for AI transformation in finance, but is discussed rather than in institutional and banking cases, not personalized, user-oriented budget planners. Furthermore, data protection concerns and ethical considerations related to the use of AI in finance were recognized but not addressed in depth.

AI-Driven Personalized Budget Planner

Avhale et al. [7] We coordinated AI-driven systems for individual budget planning that integrates predictive modeling and user behavior analysis. This application allows for aggressive financial decisions by providing budget proposals and expenditure forecasts. However, effectiveness depends on the quality of the input data and the level of user integration. There is a lack of real-time language interactions and features, including automated reports and standard notifications and notifications in advanced personal finance apps.

Smart Personal Finance Insights Using AI

G. M. H. et al. [8] used AI to develop future-oriented personal budgeting tools, analysed historical data, and predicted future costs. The system provides intuitive dashboards and visual research results to improve users' understanding of spending habits. Despite innovations in forecast accuracy, the model takes over regular spending patterns, which do not apply to all users. It also doesn't support integrated features like voice command or cloud-based multi-device access.

Financial Planning Using AI – A Consumer Perspective

Paul Mladjenovic [9] invests in his book *AI Investing for Dummies*, a role of AI discussed in personal financial planning from a consumer perspective. He highlights tools that help individuals manage their money better through intelligent assistants, automatic new compensation, and intelligent targeting. Knowledge is practical, but mainly focuses on theoretical aspects and tools at the implementation level. The book does not have a detailed implementation strategy for technical readers and does not deal with interactive or web-based applications.

Cloud-Based AI Tools for Personal Finance

Chhabra et al. [10] presented a cloud integrated with the cloud that AI used to analyze and plan financial data. With the help of AI algorithms, the system offers cross-platform synchronization, data security, and intelligent classification. This model requires a continuous internet connection and exposes advanced digital capabilities to users. Furthermore, the system currently does not support personalization features such as adaptive learning for user modifications and voice activation commands.

B. Limitations

After going through the existing research, it's clear that many current financial management apps and tools have some common issues. Most of them still depend on users entering their data manually, which can lead to mistakes and make the apps less convenient to use over time. Even though some of these systems use advanced technologies like machine learning or cloud services behind the scenes, they often miss out on real-time features that could make things easier for users, like voice commands, email alerts, or smart expense categorization. On top of that, these platforms usually don't adjust well to different types of users. They don't offer enough personalization based on someone's financial habits, knowledge, or lifestyle. Also, many of these tools don't pay much attention to how user-friendly their design interfaces are, often being hard to use or not designed for mobile phones, which most people rely on. Because of these issues, many people may find it hard to stick with these apps or get the most value out of them. This shows there's a real need for a more modern, flexible, and user-focused personal finance system—one that's powered by AI and built with real everyday users in mind.

III. PROPOSED WORK

The proposed system is an AI-based smart Finance & Budgeting System designed to help users manage their finances more intelligently and efficiently. It leverages modern web technologies and AI techniques to provide real-time insights, voice-enabled interaction, predictive analytics, and secure data handling.

A. Analysis

This stage includes recognizing what clients require from the framework, what the framework ought to do, and whether the innovation required to construct it is viable and efficient. According to the user's requirements, the

proposed framework is planned with a user-centric approach, guaranteeing that budgetary administration is both basic and productive. Clients should be able to effectively track and categorize their costs with negligible effort. Real-time budget checking is consolidated, with alarm notices to illuminate clients when they are nearing or surpassing their budget limits. For included comfort, the stage incorporates a voice-enabled interface, permitting hands-free interaction. Client information will be overseen with a solid emphasis on security to secure sensitive financial data. Additionally, the framework will offer personalized monetary recommendations to assist clients in saving more and making educated investment choices. Multi-user back with suitable get-to controls guarantees that the framework can cater to people, families, or small organizations.

Functionally, the framework will permit clients to input costs physically or through voice commands. Using AI calculations, it'll naturally categorize exchanges into suitable cost categories. Prescient models will be utilized to analyze authentic information and estimate future investment patterns, making a difference clients remain financially arranged. The framework will moreover back robotized computerized receipt era and secure storage. A secure login instrument with clearly characterized client roles, such as admin and user roles, will be implemented. Also, cloud capacity will be utilized to guarantee information is available from numerous devices while also maintaining standard backups for security and unwavering quality.

The technical analysis of the system states that the framework will be created utilizing the MERN stack (MongoDB, Express.js, React.js, and Node.js) for versatile and responsive performance Natural Dialect Handling (NLP) APIs will be coordinates to empower voice interactions Security will be implemented through JWT-based confirmation and information encryption Cloud framework will be utilized for facilitating, capacity, and cross-device availability.

B. Requirements

The functional requirements of the system are user registration & authentication, in which users can register and securely log in to the system. Role-based access for different types of users (e.g., individual, family, admin). Next is Expense Management, in which users can add, edit, or delete expenses. AI automatically categorizes expenses based on content and behavior. After that, there is budget tracking in which users can set custom or monthly budgets. The system will alert users when they are nearing or exceeding their budget. Voice Assistant Integration, which helps users to interact with the system using voice commands (e.g., add expense, check budget, request reports). Automated Receipt Generation, in which the system automatically generates and stores receipts for transactions. And last on is personalized financial recommendations, in which the system provides tips and advice tailored to individual spending patterns.

The non-functional requirements of the system are security, in which data will be encrypted during transmission and storage. Secure login using JWT and robust authentication practices. The system should respond to user actions within 2 seconds on average. Scalability is designed to handle increased numbers of users and data without impacting performance. Intuitive, user-friendly interface with support for voice input.

C. Use Case Diagram

Figure 1 illustrates the main functionalities (use cases) of the AI-Based Smart Finance & Budgeting System and how different actors interact with them.

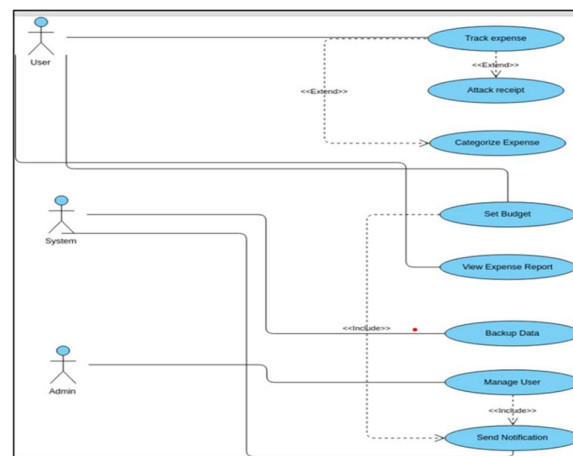


Fig 1. Use Case Diagram

D. Architecture Diagram

In Figure 2, the Architecture represents the overall system design for a finance-related application that uses AI to provide smart insights to users through a web or mobile interface. The system is divided into five major components:

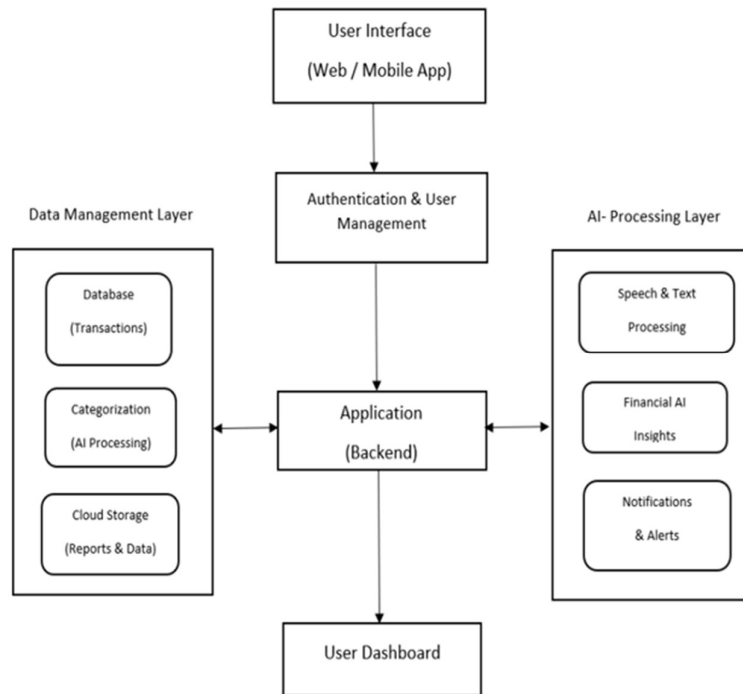


Fig 2. Architecture Diagram

User Interface (Web/Mobile App)

This is the portion of the application that clients are connected with specifically. Whether employing a browser or a portable app, clients can log in, track their costs, see reports, get budgetary tips, and oversee their settings.

Authentication & Client Management

This area guarantees that, as it were authorized clients can access the framework. It oversees errands like client enrollment, login, password security, and role assignments (such as admin or normal user).

Application Backend

The backend acts as the brain of the framework. It handles demands from clients, forms the central rationale of the application, and communicates with both the database and the AI layer to provide precise and secure services.

Data Administration Layer

This layer handles all monetary information. It includes a secure exchange database that stores cost and salary records, and AI-based categorization to naturally organize exchanges into fitting categories. Cloud capacity to spare client reports and past information, guaranteeing it's available anytime and securely backed up.

AI Handling Layer

This component makes the app clever. It employs natural language processing (NLP) to get its client's inputs, whether written or spoken, and reacts with valuable data. It also provides smart money-related bits of knowledge like budget proposals and investing habits, and Automated alarms approximately key budgetary occasions, such as overspending or up and upcoming bills.

User Dashboard

Finally, the client dashboard brings everything together in one place. It shows a clear outline of the user's information, reports, and personalized AI proposals in a way that's simple to get and utilize.

E. Software Details

The frontend is built utilizing React.js, a JavaScript library that makes a difference by making reusable and intelligent UI components. To plan the interface and make it mobile-friendly, we utilize cutting-edge CSS systems like Tailwind CSS or Bootstrap. For communication with the backend, devices like Axios or the local Bring API are utilized to send and receive information through REST APIs. To visualize information (like investing charts or investment fund patterns), libraries like Chart.js or Recharts are integrated. For voice input, browser instruments such as the Internet Discourse API or cloud services like Google Speech-to-Text API change over speech into text. Notifications like victory messages or cautions appear utilizing devices like React-Toastify or SweetAlert2.

The backend employments Node.js with Express.js to oversee API endpoints and business logic. Mongoose is utilized to associate with the MongoDB database and structure the information with schemas. User logins and sessions are secured utilizing JWT (JSON Web Tokens). Passwords are scrambled utilizing Bcrypt.js some time recently being stored. Sensitive points of interest like database URLs and API keys are put away safely utilizing dotenv in environment variables. The backend can also generate PDF reports utilizing devices like PDFKit, HTML PDF, or Puppeteer. Send emails utilizing Nodemailer for things like monthly reports or alerts. Security is moved forward using a helmet for secure HTTP headers CORS for dealing with demands from distinct domains. In database implementation, the framework employments MongoDB, a NoSQL database perfect for adaptable and scalable storage. It stores user-related information like Personal information, Transactions, Budget goals, Receipts, and data is organized into diverse collections (like clients, exchanges, categories) and overseen using Mongoose schemas.

IV. RESULTS AND DISCUSSION

This section highlights the testing and experimental validation conducted during the development of the financial management system. It includes the evaluation of core features, API integrations, security implementations, and overall user experience. The results confirm the application's successful functioning across multiple use cases. Figure 3 shows the system's homepage.

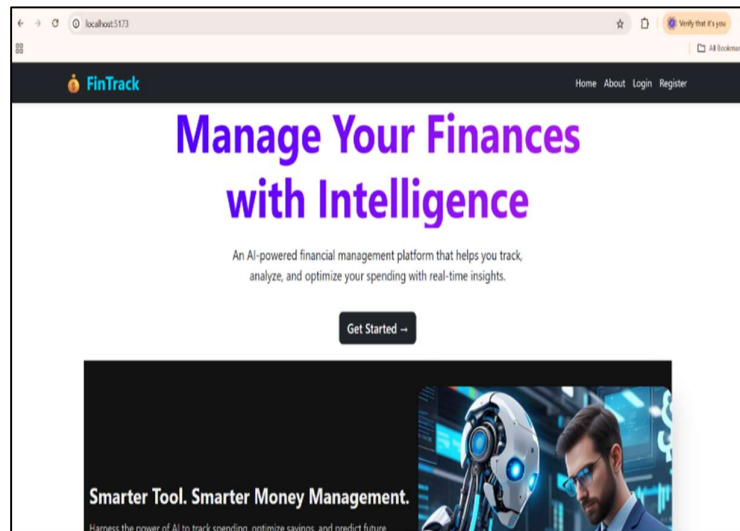


Fig 3. Homepage

A. User Registration and Login

This feature was developed to ensure secure and seamless user access to the platform. By using JWT (JSON Web Tokens) for meeting management and BCRYPT.JS for password encryption, the system successfully provided secure authentication and authorization. During testing, users' words are hydrated before being stored in the database, protecting sensitive information from potential threats. After registering, users received a secure token that allows them to register without repeatedly entering their login information. The registration and registration process has been tested several times to review the certification, with all attempts being successfully verified, and the system is robust. Figure 4 shows the registration flow and registration.

Fig 4. Registration & Login

B. Manual Expense Entry

This feature was designed to allow users to manually input financial transactions and validate whether they were stored accurately in the database. The user interface for this was developed using React, with Express.js handling the backend logic and MongoDB used for data persistence. Testing showed that all manually entered expenses were reliably stored, retrievable, and correctly associated with user profiles. No data inconsistency or loss was observed during repeated test cases. Fig. 5 displays the add transaction form used for manual entries.

Fig 5. Add transaction form

C. Voice-Based and Scan with AI Expense Entry:-

To enhance usability and accessibility, the system included an AI-powered voice input and scan functionality. Users could speak their expenses using natural language, which was then converted into text using speech-to-text processing. An NLP engine analyzed the text to identify the amount, category, and transaction type. Another addition was the “Scan with AI” feature, where users could scan receipts or bills, and the system would automatically extract and populate form fields using OCR (Optical Character Recognition). Testing demonstrated high accuracy in capturing voice commands and scanned receipts, with smart categorization of expenses based on context. Fig. 6 illustrates the smart expense entry process.

Fig 6. Smart expense entry

D. Data Visualization

Visual representation of financial data was integrated into the application to improve user insight into spending behavior. Libraries such as Recharts and Chart.js were used to generate interactive graphs and pie charts. These charts are dynamically updated based on user transactions and reflected data like category-wise distribution, spending patterns over time, and budget usage. The results proved that users were able to better understand their financial habits through visual means. Fig. 7 presents examples of data visualizations.

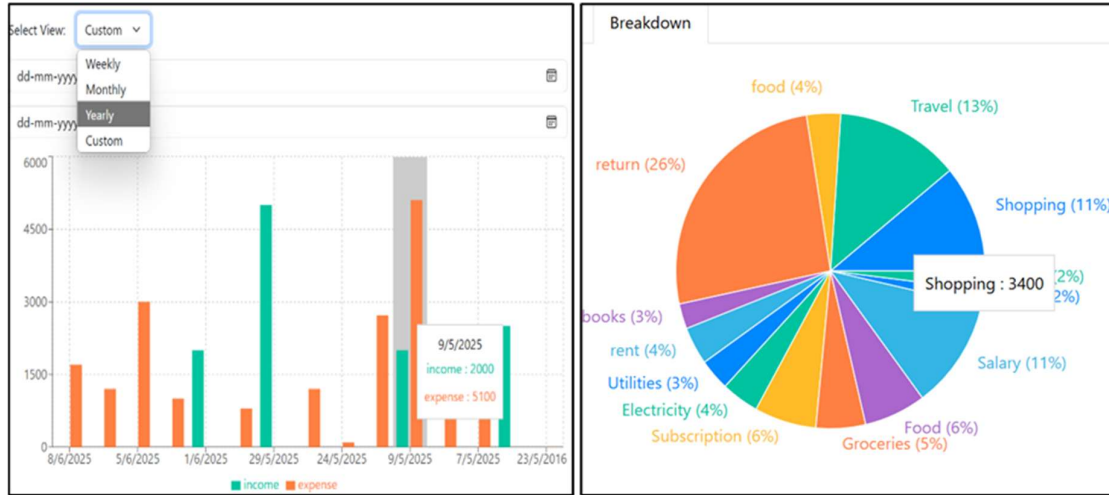


Fig 7. Data Visualization

E. PDF Receipt or Report Generation

A key feature tested was the generation of PDF-based reports summarizing user expenses. The backend used PDFKit and Puppeteer to convert styled HTML reports into downloadable PDF documents. These reports included categorized spending, total expense breakdowns, and timestamps.

The feature was evaluated successfully, and users could generate and download their expense reports without errors or formatting issues. This enhanced the ability to maintain formal financial records. Fig. 8 shows the image of report generation.

Figure 8 shows the 'Generate & Email Report' interface. It includes a 'Format' dropdown set to 'PDF', a 'Date Range' dropdown with options 'Last 7 Days', 'Last 1 Month', 'Last 1 Year', and 'Custom', and an 'Email' input field containing 'example@mail.com'. A green 'Generate and Send' button is located on the right.

Fig 8. Reports generation

F. Email Notifications

The application was designed to send automatic email alerts and reports to users for specific triggers, such as monthly summaries or large expenses.

This was implemented using the Nodemailer package in Node.js. During validation, the system successfully sent properly formatted emails with attachments to registered addresses. This confirmed both the reliability and usefulness of this communication feature in keeping users informed. Fig. 9 shows an example of an email notification.

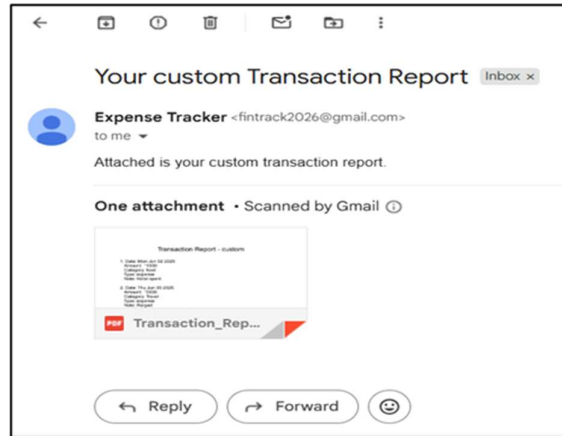


Fig 9. Email Notification

G. AI-Budget Planner

One of the system's most innovative and effective features was the AI budget planner. This module provided personalized budget proposals for users based on income, past actions, and financial goals. The AI algorithm analyzed the output patterns and dynamically recommended optimal allocations that were dynamically recommended across categories. During testing, the planner provided useful knowledge and coordination, making it a useful device for users who wanted to improve their financial discipline. Figure 12 presents the AI budget planner interface.

 The image shows a web form titled "AI Budget Planner" with a lightbulb icon. The instructions say: "Enter your monthly income and expenses, and our AI will suggest how to divide your budget into **Needs, Wants, and Savings**. Example: If your income is ₹50,000, we'll guide you to spend wisely and save smartly." The form has three input fields: "Monthly Income (₹)" with a placeholder "Enter your income", "Fixed Expenses (₹)" with a placeholder "Rent, bills, etc.", and "Other Expenses (₹)" with a placeholder "Food, travel, etc.". At the bottom is a large blue button labeled "Get AI Suggestion" with a magnifying glass icon.

Fig 12. AI-Budget Planner

V. CONCLUSION

This research presents a significant advancement in personal finance management by leveraging the power of Artificial Intelligence and modern web technologies. The system is designed to make budgeting and expense tracking more intuitive, interactive, and efficient. By enabling users to monitor their financial activities in real-time, receive personalized spending tips, and interact through voice commands, the platform transforms traditional budgeting into a smart, user-centric experience. With features such as automated categorization, voice-enabled expense logging, intelligent alerts, and AI-driven financial recommendations, the system empowers users to take better control of their money. Its secure architecture, built on the robust MERN stack, ensures data privacy while maintaining high performance and responsiveness. The application is user-friendly and scalable, making it suitable not only for individuals but also for families and small businesses. As financial awareness becomes increasingly important in today's fast-paced world, this AI-based platform bridges the gap between manual financial management and intelligent automation. Looking ahead, the system holds great potential for further enhancements such as integration with real-time banking APIs, investment portfolio analysis, advanced data visualization, and a dedicated mobile application for cross-platform accessibility. These

improvements will make the platform even more powerful and adaptive to users' evolving financial needs. Overall, this research demonstrates how the fusion of AI, automation, and intuitive design can simplify money management and help users make informed, smarter financial decisions.

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