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AI-Driven Personal Finance and Investment Recommendation System

An Intelligent System for Personalized Financial Planning and Investment

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***Abstract* - Effective management of personal finances has become increasingly important in the digital age, yet many individuals lack the necessary knowledge and tools to handle their financial activities efficiently. This research introduces an intelligent Digital Finance Assistant powered by Artificial Intelligence, designed to automate expense monitoring, budgeting, and investment planning. The proposed system integrates modern technologies such as Next.js for frontend development, Supabase for secure backend services, Prisma ORM for scalable data handling, and Optical Character Recognition (OCR) for extracting transaction details from receipts.**

Additionally, machine learning techniques are employed to categorize expenses and generate personalized financial recommendations based on user behavior. The platform offers key functionalities including automated receipt processing, multi-account aggregation, budget alerts, and interactive financial reporting. The development process follows an Agile Software Development Life Cycle to ensure flexibility and continuous improvement.

Experimental evaluation demonstrates that the system provides accurate insights, enhances financial awareness, and supports better decision-making. While certain limitations such as OCR accuracy and dependency on connectivity exist, future improvements aim to include mobile support, multi-currency handling, predictive analytics, and enhanced explainability. This study highlights how intelligent systems can improve financial literacy and promote disciplined financial behavior.

Keywords - Artificial Intelligence (AI), Machine Learning (ML), Personal Finance Management, Expense Tracking, Budget Planning, Optical Character Recognition (OCR)

1. INTRODUCTION

Managing personal finances effectively has become a fundamental requirement in today's technology-driven environment. Despite this, a significant portion of individuals, particularly students and early-stage professionals, struggle to maintain proper financial control due to limited awareness, inconsistent tracking practices, and dependence on outdated manual methods. Tools such as spreadsheets or handwritten records are not only inefficient but also fail to provide meaningful insights into financial behavior.

These challenges emphasize the need for advanced, user-centric solutions capable of simplifying financial processes and supporting informed decision-making. To address this gap, this study presents an AI-based Digital Finance Assistant that enhances financial management through automation and intelligent analysis.

The system combines modern web technologies and machine learning techniques to deliver a seamless user experience. It enables automated expense tracking, budget management, and personalized financial recommendations by analyzing user spending patterns. Unlike traditional applications, the proposed system integrates explainable AI, ensuring transparency in its suggestions while also promoting financial education.

By combining automation, analytical intelligence, and user-focused design, the system aims to empower individuals to improve financial habits, optimize spending, and achieve long-term financial stability.

1.1 MOTIVATES

Low Financial Literacy: A large portion of individuals do not possess the required knowledge or tools to handle their personal finances efficiently. This frequently results in ineffective budgeting, inadequate savings, and poorly informed financial choices, especially among students and young working professionals.

Inefficiency of Manual Systems: Conventional methods of tracking expenses, such as spreadsheets or handwritten records, are both time-intensive and susceptible to human error. These manual techniques do not generate meaningful insights into spending behavior, making it challenging for

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users to manage and optimize their finances effectively.

Overspending and Weak Savings Practices: In the absence of real-time tracking and timely alerts, users often surpass their budget limits and find it difficult to meet financial targets. This lack of monitoring and proper guidance leads to poor financial discipline and reduced savings over time.

Opportunities with Artificial Intelligence (AI): Artificial Intelligence offers strong potential to revolutionize personal finance management. By utilizing predictive analysis, customized recommendations, and automation, AI can enable users to plan budgets efficiently, monitor expenses accurately, and make smarter financial decisions. Machine learning techniques allow financial systems to adapt to individual spending habits and deliver useful, data-driven insights.

Need for Security and Scalability: With the rapid digitization of financial services, maintaining strong data protection, secure authentication mechanisms, and scalable system design has become essential. Users need assurance that their financial information is safe, while platforms must efficiently manage increasing numbers of users and transactions without affecting performance or security.

1.2 Problem Definition

Although many personal finance applications are available, they often have limited capabilities and restricted functionality. Most existing platforms primarily focus on expense tracking and do not offer personalized or transparent insights to users. Important features such as receipt scanning, automated expense categorization, and financial literacy support are rarely combined within a single integrated system. Additionally, concerns related to privacy and data security lower user confidence in current financial applications. Hence, there is a strong need for a comprehensive solution that integrates budgeting, savings management, financial education, and secure data handling within one unified digital finance assistant.

2. LITERATURE REVIEW

The literature survey highlights the advancements and limitations of existing AI-powered personal finance solutions. Abbreviations such as AI (Artificial Intelligence), ML (Machine Learning), OCR (Optical Character Recognition), and NLP (Natural Language Processing) are defined here for the first time and will be used throughout the paper.

Several studies have explored applications of AI in personal finance management:

- **Unlocking Financial Literacy with ML (Zhu, 2025):** Used supervised ML models to predict literacy levels among youth. However, it did not integrate these predictions with budgeting or savings features.
- **Budget Buddy (Javeed et al., 2025):** Proposed an AI-based finance tool integrating expense tracking and categorization. While effective in simplifying record-keeping, it lacked explainable AI and advanced personalization.
- **AI-Powered Personal Finance Assistant (Agarwal et al., 2024):** Developed a prototype using NLP for financial recommendations. Scalability and security remained challenges.
- **AI as Financial Advisor (Liu, 2024):** Highlighted AI's ability to act as a 24/7 digital financial advisor, but raised concerns about privacy, explainability, and trustworthiness.
- **Explainable AI and Adoption of Financial Advisors (Ben David et al., 2021):** Found that transparency in recommendations increases user trust, though practical implementation in finance remains limited.

TABLE -1: LITERATURE REVIEW SUMMARY

Author(s)	Year	Focus Area	Research Gap
Javeed et al.	2025	AI-powered expense tracking	Limited personalization; lacks explainable AI
Zhu, A. Y. F.	2025	ML for financial literacy	Not integrated with budgeting/savings
Agarwal et al.	2024	NLP-driven finance assistant	Scalability and security challenges
Liu, Z.	2024	AI as 24/7 financial advisor	Privacy and reliability concerns
Ben David et al.	2021	Explainable AI in finance	Lack of real-world implementation

3. METHODOLOGY & SYSTEM DESIGN

3.1 Methodology

The system is developed using the Agile SDLC model, ensuring iterative development, continuous testing, and feedback-driven improvements.

Technologies Used:

- Frontend: React.js, Next.js, Tailwind CSS
- Backend: Supabase (PostgreSQL), Prisma ORM
- APIs: OCR for receipt scanning, AI for categorization, Resend for email alerts, Clerk for authentication
- Dev Tools: GitHub, VS Code

3.2 System Architecture

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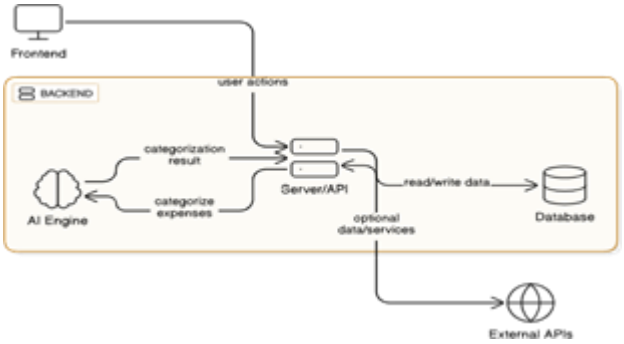

Fig -1: System Architecture

3.3 Functional Requirements

- Expense Tracking & OCR: Automated extraction and classification of financial data
- Budget Planning & Alerts: Instant notifications based on predefined spending limits
- AI Insights & Reports: Customized recommendations with transparent explanations
- Multi-Account Support: Integration of multiple financial sources such as wallets, banks, and cards
- Authentication & Security: Role-based authorization, data encryption, and bot prevention mechanisms

3.4 Non-Functional Requirements

• Real-time Performance: Response time within 3 seconds
• Availability: Ensures 99% system uptime through cloud infrastructure
• Scalability: Capable of handling a growing number of users
• Security: Reliable data protection along with backup and recovery mechanisms

4. RESULTS & DISCUSSION

4.1 Results

Expense-Tracking:
The system effectively enabled users to add, modify, and delete daily expenses across various categories such as food, travel, shopping, and utility payments. All transactions were securely stored and displayed on a personalized dashboard, ensuring well-structured financial records.

Budget-Management:
Users could define monthly budgets for different categories. Whenever expenses crossed the specified limits, the system issued prompt notifications, helping users maintain better financial control and awareness.

Data-Visualization:
The platform produced interactive visual representations, including pie charts and bar graphs, to help users clearly analyze their spending behavior. Reports were available on a daily, weekly, and monthly basis, allowing flexible financial evaluation.

Authentication and Security:
The system maintained data confidentiality through secure authentication methods and role-based access control. This ensured protection against unauthorized access and preserved sensitive financial data.

System-Performance:
The application was evaluated with multiple users and simultaneous transactions. The results showed fast response times and efficient data processing, proving the system's scalability and reliability in practical scenarios.

4.2 Discussion

- The findings demonstrate that AI-Driven Personal Finance and Investment Recommendation system serves as an efficient and user-friendly tool for managing personal finances.
- In comparison to traditional tracking methods such as spreadsheets or notebooks, the system significantly reduces time consumption and minimizes errors.
- The graphical representation of expenses enables users to easily detect overspending areas, supporting improved financial planning.
- When compared with existing expense management applications, AI-Driven Personal Finance and Investment Recommendation system provides more intuitive navigation, category-based budgeting features, and open-source adaptability, making it suitable for both students and professionals.

However, some limitations were identified:

- The present version does not provide integration with
  Bank accounts or UPI-based transactions.
- Notifications are currently restricted to in-app alerts and should be expanded to include SMS and email services.

5. CONCLUSION & FUTURE WORK

AI-Driven Personal Finance and Investment Recommendation system – Digital Finance Assistant delivers a complete solution for managing personal finances by integrating automation, AI-based insights, and

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a secure system design. It streamlines expense tracking, encourages better saving habits, and improves overall financial awareness.

Future-Scope:

- Support for multiple currencies to enable global usability.
- Development of a mobile application for both Android and iOS platforms.
- Integration with banking APIs for automatic transaction imports.
- Advanced analytical features for spending trends and forecasting.
- Enhanced AI capabilities to handle diverse receipt formats and provide better personalization.

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