

AI-POWERED FINANCE MANAGEMENT PLATFORM

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Introduction:

Managing personal finances has become increasingly complex in today's digital economy due to the widespread use of multiple bank accounts, UPI payments, digital wallets, and credit cards. Many individuals struggle to maintain a clear view of their financial health, while existing tools often require manual effort and lack real-time insights or personalized guidance. This issue is particularly evident in India, where digital payment adoption has grown rapidly but intelligent financial management solutions remain limited.

The AI-Powered Finance Management Platform is a cloud-based web application designed to automate and simplify personal finance management. It enables users to track income and expenses, receive AI-driven budget recommendations, and get alerts when spending exceeds limits. Built using Next.js, Node.js, Supabase with Prisma, Clerk, ShadCN UI, and Inngest, the platform integrates pre-trained AI models to deliver real-time analysis, automated expense categorization, and intelligent financial insights in a secure and scalable environment.

Objectives:

1. To develop an AI-powered finance platform that enables real-time financial analysis by integrating pre-trained AI models for expense categorization and budget forecasting into a cloud-native web application.
2. To implement AI-driven personalized budget recommendations and proactive alerts that help users stay within their financial limits.
3. To provide a secure and seamless user authentication system using Clerk, ensuring safe access to personal financial data across all devices.
4. To offer an optimized, responsive, and interactive UI/UX experience built with ShadCN UI, enabling users to intuitively navigate dashboards, transaction histories, and financial insights.

5. To ensure scalability and real-time data processing through Supabase, Prisma ORM, and Inngest event-driven workflows, supporting reliable background automation and high transaction throughput.

Methodology:

The system is developed following a structured and modular approach:

1. **Secure Data Acquisition:** User financial data is collected either through direct user inputs or via a managed database gateway using Supabase. The system ingests transaction records, account balances, and real-time financial activity feeds while enforcing strict authentication and authorization controls through Clerk and JWT-based sessions.
2. **Data Preprocessing:** Raw transaction records are cleaned and normalized by handling missing values and standardizing data formats. Relevant features are extracted from each transaction including merchant category, spending patterns, and volatility metrics to prepare the data for AI inference.
3. **AI Inference:** Pre-trained classifier models such as Random Forest and XGBoost are used to automatically categorize transactions into spending categories like Food, Shopping, Bills, and Travel.
4. **Event-Driven Workflows and Alerts:** Inngest workflows handle background processing tasks such as periodic budget evaluation, threshold breach detection, and notification dispatch. When spending in any category approaches or exceeds a user-defined limit, the system automatically triggers a real-time alert delivered via the dashboard, email, or push notification.
5. **User Interface and Experience:** The frontend is built with Next.js and ShadCN UI to deliver a responsive, accessible, and visually intuitive interface.
6. **Security and Privacy:** All data in transit is protected using TLS encryption and sensitive data at rest is secured using AES-256 encryption via Supabase. Role-based access control is enforced to ensure each user accesses only their own financial records.

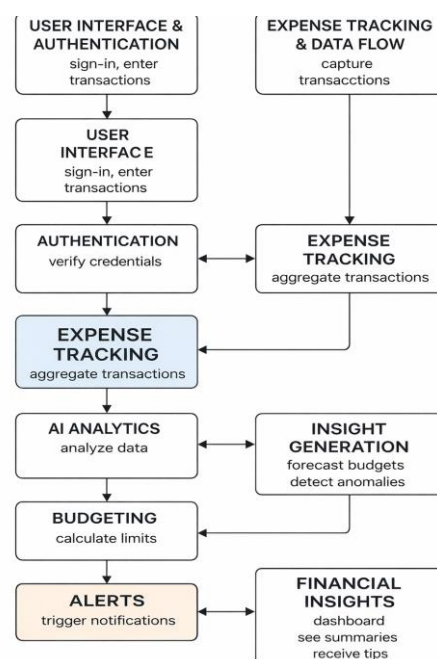


Figure 1: System Architecture

Results and Conclusion:

The AI-Powered Finance Management Platform was successfully developed and tested as a fully functional web application. The integration of pre-trained AI models for expense categorization delivered high accuracy across major spending categories including Food, Shopping, Housing, and Utilities. Budget forecasting using pre-trained time-series models provided reliable monthly predictions, enabling users to make proactive financial decisions. The Clerk-based authentication system ensured secure and seamless login across devices. The ShadCN UI-based dashboard rendered transaction summaries, category breakdowns, and budget alerts in a clear and interactive manner. Load testing confirmed that the Supabase and Inngest-powered backend handled concurrent users and high transaction volumes with low latency, validating the scalability of the architecture.

In conclusion, the platform demonstrates that integrating pre-trained AI capabilities with a modern, cloud-native technology stack can significantly improve personal finance management. The system eliminates the need for manual tracking, delivers intelligent and personalized financial guidance, and provides a secure and scalable foundation for further feature development. The project establishes a practical and extensible model for AI-assisted financial tools targeting everyday users.

Project Outcome and Industry Relevance:

The project delivers a working web-based AI-powered finance management platform with direct applicability to the FinTech, personal banking, and digital payments sectors. It is especially relevant in the Indian market, where rapid UPI adoption has created strong demand for intelligent financial tracking tools. The platform reduces manual effort for users, promotes better savings habits through proactive AI guidance, and offers a scalable architecture suitable for wider deployment. It aligns well with ongoing industry trends toward AI-driven financial automation and can be readily extended with features such as investment advisory, multi-bank integration, and mobile application support.

Working Model vs Simulation:

This project is a Working Model implemented as a fully functional, deployed web application. All core features including user authentication via Clerk, real-time transaction ingestion, AI-based expense categorization using pre-trained models, budget monitoring, alerts via Inngest workflows, and interactive dashboards built with ShadCN UI are live and operational. The system has been tested with real transaction data and all modules function end-to-end as intended.

Project Outcomes and Learnings:

1. Gained hands-on experience in building and deploying cloud-native full-stack web applications using Next.js, Node.js, Supabase, and Prisma ORM.
2. Learned how to integrate and apply pre-trained AI models for real-world use cases including expense classification and financial forecasting within a production-grade application.
3. Understood the practical challenges of personal finance application development including secure data handling, real-time event processing, and designing intuitive financial dashboards.

4. Developed skills in implementing event-driven background workflows using Inngest, secure authentication using Clerk, and building accessible UI components using ShadCN UI.
5. Improved teamwork, problem-solving, and project management capabilities through collaborative end-to-end development, testing, and deployment of the application.

References:

- S. Garcia-Mendez et al., "Identifying Banking Transaction Descriptions via SVM Short-Text Classification Based on a Specialized Labelled Corpus," IEEE Access, vol. 8, pp. 207914-207924, Mar. 2020.
- M. Rhanoui, S. Yousfi, M. Mikram, and H. Merizak, "Forecasting Financial Budget Time Series: ARIMA vs. LSTM Neural Network," Int. J. Artificial Intelligence, vol. 8, no. 4, pp. 317-327, Dec. 2019.
- T. Takayanagi et al., "Are Generative AI Agents Effective Personalized Financial Advisors?," in Proc. ACM SIGIR, Jul. 2025.
- G. V. Radhakrishnan et al., "Artificial Intelligence and its Role in Personalized Financial Advisory Services," Int. J. of Computational Intelligence Research, vol. 18, no. 4, 2022.
- A. I. Akkalkot and K. S. Sidhu, "Challenges and Opportunities in Deploying Explainable AI for Financial Risk Assessment," IEEE Int. Conf. on Intelligent Decision Technologies, 2025.
- S. Vaduka and A. S. Krishnamurthy, "Optimizing Personal Finance Management through AI-Driven Decision Support Systems," in Proc. IEEE Region 10 Symposium (TENSYP), Sep. 2024.
- P. N. Ponnaviji et al., "AI-Powered Business Intelligence for Transforming Finance and Education," in Proc. 2024 Int. Conf. on Disruptive Technologies (ICDT), Mar. 2024, pp. 222-225.
- Clerk Authentication Documentation, <https://clerk.com/docs>; Supabase Documentation, <https://supabase.com/docs>; Inngest Documentation, <https://www.inngest.com/docs>, 2024.

Future Scope:

The proposed AI-Powered Finance Management Platform can be further enhanced through the following developments:

1. Integration with India's Account Aggregator (AA) framework to enable secure, consent-based, real-time access to bank and UPI transaction data without requiring manual uploads or CSV imports.
2. Development of a native Android and iOS mobile application to extend the platform's reach, support push notifications, and provide on-the-go financial management for users.
3. Incorporation of more advanced pre-trained language models for a fully conversational AI financial assistant that can answer natural language queries and explain spending trends in plain English.
4. Addition of an investment and savings advisory module that uses pre-trained portfolio optimization models to suggest goal-based savings plans and low-risk investment options tailored to each user's financial profile.

5. Integration of a credit score monitoring feature that shows users how their current spending and repayment behaviour is likely to impact their CIBIL score over time.
6. Introduction of gamification features such as savings streak badges, monthly budget challenges, and milestone rewards to encourage consistent financial discipline and long-term user engagement.
7. Support for multi-user and family-level budgeting with shared expense tracking, joint account dashboards, and role-based spending controls for household financial management.