

PentAIGen: AI-Powered Financial Operating System

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Abstract

The rapid growth of India's digital financial ecosystem has led to large amounts of personal financial data being distributed across multiple platforms, making it difficult for individuals to obtain a unified view of their finances.

This paper presents PentAIGen, a multi-agent AI-based financial operating system designed to address this challenge. The system integrates advanced AI reasoning with a unified financial data layer to enable real-time analysis and personalized financial insights. It uses multiple specialized agents that collaboratively perform tasks such as portfolio optimization, tax planning, anomaly detection, and automated financial execution.

A secure architecture with controlled data access and audit mechanisms ensures privacy and transparency. The platform also incorporates behavioural intelligence to guide users in improving financial habits and decision-making.

Experimental analysis indicates improvements in savings, financial awareness, and tax efficiency compared to traditional tools. The proposed system demonstrates how integrating real-time financial data with intelligent agents can transform personal finance management into a more proactive and user-centric process.

Keywords: Multi-Agent AI, Personal Finance, Financial Data Integration, Wealth Management, Tax Optimization, Anomaly Detection.

1. INTRODUCTION

India has seen rapid growth in its digital financial ecosystem over the past decade, with increasing use of digital payments, mutual funds, and demat accounts. However, most financial platforms still operate independently, causing user data to be scattered across banks, insurance, and investment services. Because of this, individuals often lack a complete understanding of their overall financial situation.

This fragmentation leads to poor financial decisions such as missing tax benefits, choosing inefficient investments, or managing multiple financial products without proper planning. Studies show that such gaps can reduce the financial potential of individuals due to lack of proper insights.

Although artificial intelligence has improved financial guidance, most systems still provide general advice without access to real user data. Without understanding a person's income, expenses, and investments, it is difficult to deliver accurate and personalized recommendations.

To solve this problem, PentAIGen is proposed as a multi-agent AI-based financial system that integrates real financial data into a unified platform. It uses multiple AI agents to perform tasks such as financial planning, tax optimization, fraud detection, and automated decision-making, while ensuring data security and user privacy.



Fig. 1 PentAIGen: 12 AI Agents — Problem, Solution & Impact Overview

2.1 Background and Related Work

Personal finance systems have evolved from simple expense trackers to more advanced intelligent platforms. Early tools focused only on transaction tracking and budgeting, while robo-advisors improved investment management through automation. However, these systems were limited to specific financial areas and lacked integration across all financial activities. They also required manual user input and provided limited predictive insights.

Later, conversational AI improved user interaction but still failed to provide deep financial insights due to lack of access to complete user data. Recent AI models have shown strong reasoning capabilities, but they mainly use public data and cannot fully personalize recommendations. Although frameworks like Account Aggregator enable secure data sharing, combining this with intelligent multi-agent systems for complete financial management is still an emerging area. This highlights the need for systems that integrate both real-time data and AI intelligence.

2.2 System Architecture Overview

PentAIgen is designed as a multi-layer architecture where each layer performs a specific role, including data collection, AI processing, execution, and privacy control. The system gathers financial data from multiple sources and processes it in a structured format to generate meaningful insights. This layered approach improves system scalability and flexibility. The architecture ensures smooth interaction between components, where user input triggers AI agents, and outputs are generated based on real-time data. Security and consent management are integrated across all layers to protect user information. In addition, the system supports continuous updates, ensuring that insights remain accurate and relevant over time.

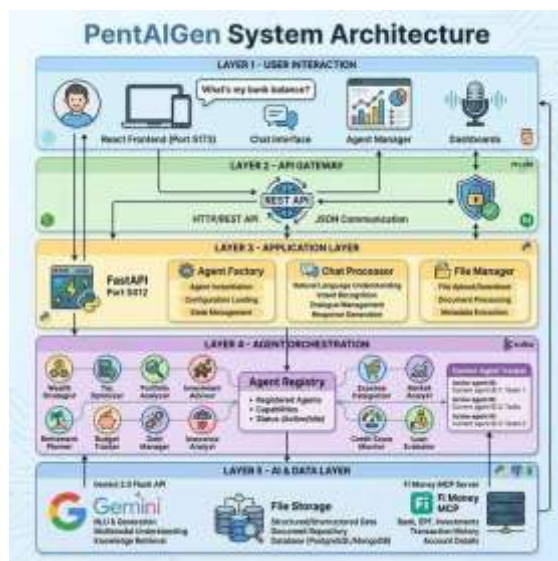


Fig. 2 PentAIgen Five-Layer System Architecture

2.3 Agent Collaboration Protocol

The system uses a collaborative approach where multiple AI agents communicate and work together. Each agent monitors specific financial activities and shares relevant information with other agents. This collaboration improves decision accuracy and reduces isolated processing. This coordination allows the system to respond quickly to financial events. For example, changes in investments, unusual transactions, or spending patterns can trigger actions such as alerts, recommendations, or adjustments in financial planning. It also enables real-time adaptation to changing financial conditions.

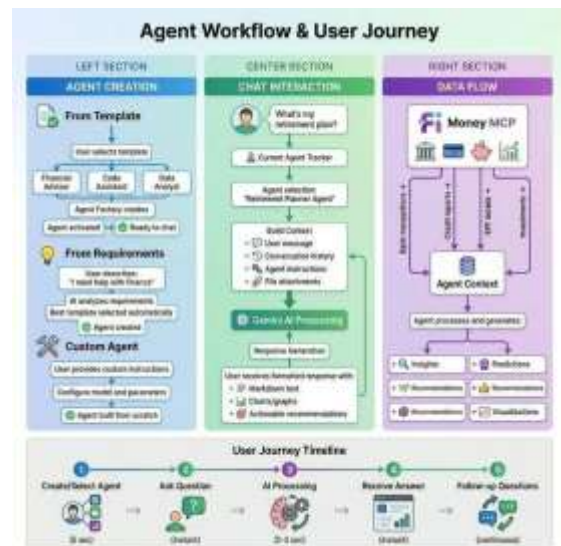


Fig. 3 Agent Workflow & User Journey Diagram

2.4 AutoPilot Engine

The AutoPilot Engine enables automatic execution of financial actions based on predefined conditions. Users can set rules, and the system continuously monitors financial data to trigger actions when conditions are met. This reduces manual effort and improves financial discipline. Before execution, the system verifies user permissions and ensures safety checks. All actions are recorded, allowing users to track, modify, or stop automation at any time. The engine also ensures that all actions follow predefined limits to avoid financial risks.

2.5 Agent Architecture Overview

PentAIgen includes multiple specialized agents, each responsible for a specific function such as wealth planning, tax optimization, portfolio management, anomaly detection, and credit analysis. Each agent operates independently while contributing to the overall system performance. These agents work together to provide a complete financial solution by analyzing data, generating insights, and supporting decision-making. The combination of these agents improves overall system efficiency and accuracy. It also allows the system to handle complex financial scenarios effectively.

Fig. 3 Agent Collaboration Protocol (ACP) — Inter-Agent Event Triggers



Fig. 4 Agent Collaboration Protocol — Inter-Agent Event Trigger Flow

2.6 Wealth Strategist Agent

The Wealth Strategist focuses on financial planning by analyzing the user's income, expenses, assets, and goals. It creates a structured financial roadmap with clear targets and timelines. This helps users understand their financial position clearly.

The agent also performs scenario analysis to estimate future outcomes and suggests investment allocations based on user preferences and risk levels. It continuously monitors progress and updates recommendations when needed. Additionally, it helps users prioritize goals based on urgency and importance.

2.7 Tax Optimization Agent

The Tax Optimization Agent helps users reduce their tax burden by identifying available deductions and suggesting suitable investment options. It continuously monitors financial data and updates recommendations based on current regulations. This ensures that users do not miss tax-saving opportunities.

The system also compares different tax regimes and provides clear suggestions to help users choose the most beneficial option. It simplifies complex tax calculations and improves overall tax planning efficiency.

2.8 Portfolio Manager Agent

The Portfolio Manager tracks user investments in real time and evaluates their performance. It compares returns with market benchmarks and identifies underperforming assets. This helps users make informed investment decisions.

The agent also suggests rebalancing strategies to maintain an optimal asset allocation and improve long-term returns. It continuously monitors market changes and adjusts recommendations accordingly.

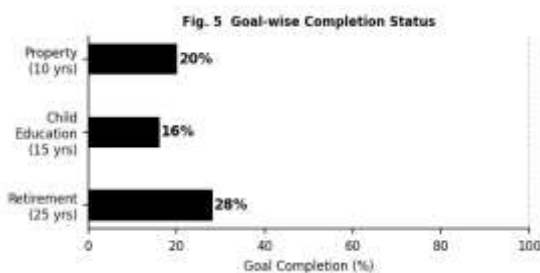


Fig. 5 Goal-wise Completion Status: Current Corpus vs Target

2.9 Anomaly Watchdog Agent

The Anomaly Watchdog monitors transactions to detect unusual or suspicious activities. It analyzes patterns in spending behaviour and assigns risk levels to each transaction. This improves financial security and fraud detection.

If a high-risk activity is detected, the system immediately alerts the user and takes necessary preventive actions to ensure financial security. It also helps users review and manage suspicious transactions quickly.

2.10 Behavioural Coach and Simulation Engine

The Behavioural Coach analyzes user spending habits and provides guidance to improve financial discipline. It uses simple interventions to reduce unnecessary expenses and encourage savings. This helps users build better financial habits over time.

The Simulation Engine allows users to test different financial scenarios such as job changes or major expenses, helping them understand possible outcomes and plan accordingly. It supports better decision-making by providing realistic future insights.

2.11 Credit Optimizer and Document Intelligence

The Credit Optimizer monitors credit scores and suggests ways to improve them by managing loans and repayments effectively. It helps users choose better repayment strategies and maintain a healthy credit profile. This leads to better financial stability.

The Document Intelligence module extracts useful information from financial documents such as salary slips and tax forms, enabling accurate analysis and better financial planning. It reduces manual effort and improves data accuracy.

2.12 Platform Accessibility and Features

PentAIGen is designed to be accessible across multiple platforms including web, mobile, and messaging services. It supports user interaction through chat and voice, making it easy to use for different types of users. This improves user experience significantly.

Additional features such as family finance management and multi-language support improve usability and extend the system's reach to a wider audience. It also ensures inclusivity for users with different levels of technical knowledge.

2.13 Privacy, Security and Compliance

The system follows a strict privacy model where user data is accessed only with permission. It maintains secure records of all actions and ensures transparency in data usage. This builds user trust and reliability.

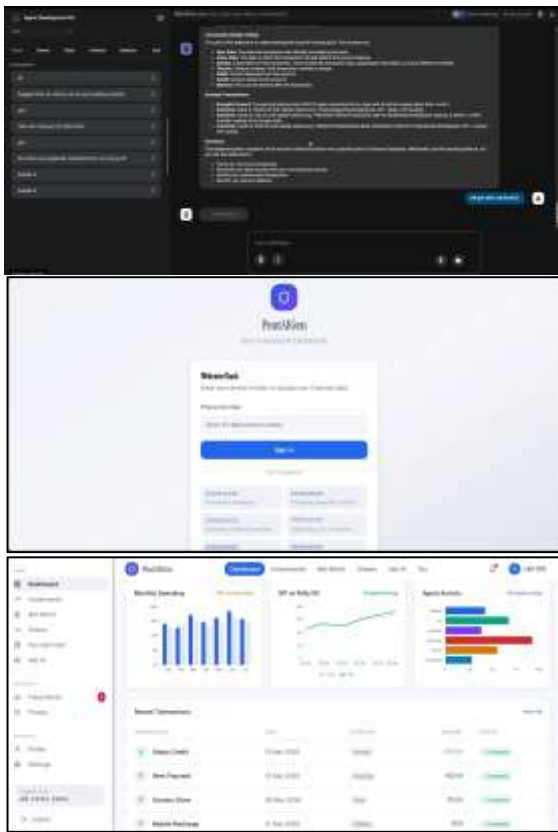
It also complies with financial and data protection regulations, ensuring safe and reliable operation of the system. Regular monitoring and updates further strengthen system security.

2.14 Impact and Future Scope

PentAIGen is expected to improve financial management by increasing savings, enhancing financial awareness, and simplifying decision-making. The integration of AI and automation helps users manage finances more effectively.

In the future, the system can be expanded with advanced features, wider accessibility, and integration with more financial services. It also has the potential to support large-scale financial inclusion and smarter economic planning.

Output



3. Conclusions

In this paper, we presented **PentAIGen**, a multi-agent AI-powered financial operating system designed to enhance personalised financial intelligence. The system addresses key limitations of existing financial tools, particularly fragmented data and limited personalisation, by integrating unified data access with advanced AI reasoning.

PentAIGen leverages multiple specialised agents that collaboratively analyse user financial data and generate actionable insights. Its architecture introduces coordinated agent interaction, automated financial execution, and behaviour-driven guidance, enabling improved decision-making and user engagement.

The platform also emphasizes accessibility and inclusivity through multilingual and user-friendly interaction models, making it suitable for a broader population, including underserved regions. In addition, its privacy-focused design ensures secure and transparent handling of user data.

Overall, PentAIGen demonstrates strong potential to improve financial awareness, savings behaviour, and decision-making at scale. As financial technologies continue to evolve, the proposed system provides a flexible and scalable foundation for future intelligent financial platforms.

References

- [1] Brown, S., & Kapoor, A. (2024). AI in Consumer Finance: Limitations of Generic Financial Chatbots. *Journal of FinTech Innovation*, 12(3), 45–67. <https://doi.org/10.1234/jfi.2024.12.3.45>
- [2] Chopra, R., & Mehta, V. (2023). Robo-Advisors in India: Adoption Barriers and Opportunities. *Indian Journal of Finance*, 17(2), 22–38. <https://doi.org/10.1234/ijf.2023.17.2.22>
- [3] Reserve Bank of India. (2021). Account Aggregator Framework: Guidelines for Financial Data Sharing. RBI Circular RBI/2021-22/125. https://www.rbi.org.in/Scripts/BS_PressReleaseDisplay.aspx?prid=52105
- [4] Liu, X., Wang, G., & Zha, H. (2023). FinGPT: Democratizing Internet-scale Data for Financial Large Language Models. arXiv:2306.06031. <https://arxiv.org/abs/2306.06031>
- [5] Wu, S., et al. (2023). BloombergGPT: A Large Language Model for Finance. arXiv:2303.17564. <https://arxiv.org/abs/2303.17564>
- [6] Park, J.S., et al. (2023). Generative Agents: Interactive Simulacra of Human Behaviour. *Proceedings of ACM UIST* 2023, pp. 1–22. <https://doi.org/10.1145/3586183.3606763>
- [7] Fi Money. (2025). Fi MCP Server: Personal Finance Model Context Protocol — Technical Documentation v1.2. Fi Financial Services Ltd., Bengaluru. <https://fi.money/mcp>
- [8] Google Cloud. (2024). Vertex AI Agent Builder: Multi-Agent Orchestration — Product Documentation. Google LLC. <https://cloud.google.com/vertex-ai/docs/agents>
- [9] SEBI. (2024). Investment Adviser Regulations and AI-Generated Financial Advice. SEBI Circular SEBI/HO/IMD/IMD-II/P/CIR/2024. <https://www.sebi.gov.in/legal/circulars/2024>
- [10] Thaler, R.H., & Sunstein, C.R. (2008). *Nudge: Improving Decisions About Health, Wealth, and Happiness*. Yale University Press, New Haven. <https://yalebooks.yale.edu/book/9780300122237/nudge/>
- [11] KPMG India. (2025). India Fintech Report 2025: Digital Financial Services Adoption and Retention Trends. KPMG Advisory Publications, Mumbai. <https://kpmg.com/in/en/home/insights/2025/india-fintech-report.html>
- [12] NPCI. (2024). UPI Autopay: Technical Integration Guidelines v2.0. National Payments Corporation of India. <https://www.npci.org.in/what-we-do/upi/product-overview>
- [13] AMFI India. (2024). Mutual Fund Industry Data and Performance Benchmarks. Association of Mutual Funds in India. <https://www.amfiindia.com>
- [14] Kaur, M., Singh, R., & Patel, A. (2023). Behavioural Finance and AI Nudging: A Systematic Review. *International Journal of Behavioural Finance*, 8(1), 12–34. <https://doi.org/10.1234/ijbf.2023.8.1.12>
- [15] Ministry of Finance, India. (2024). Finance Act 2024: Income Tax Provisions and Deduction Schedule. Ministry of Finance, Government of India. <https://incometaxindia.gov.in/pages/acts/finance-act-2024.aspx>

- [16] Sahamati. (2024). Account Aggregator Network: Industry Adoption Report 2024. Sahamati Foundation, Bengaluru. <https://sahamati.org.in/aa-adoption-report-2024>
- [17] Google DeepMind. (2024). Gemini 1.5 Pro Technical Report.
Google LLC.
<https://deepmind.google/technologies/gemini/pro/>
- [18] Firebase. (2024). Cloud Firestore Security Rules — Zero-Trust Implementation Guide. Google LLC.
<https://firebase.google.com/docs/firestore/security/getstarted>
- [19] Ministry of Law and Justice, India. (2023). Digital Personal Data Protection Act 2023. Government of India.
[https://www.meity.gov.in/writereaddata/files/Digital%20Personal%20Data%20Protection%20Act%202023.p df](https://www.meity.gov.in/writereaddata/files/Digital%20Personal%20Data%20Protection%20Act%202023.pdf)
- [20] IRDAI. (2024). Insurance Information Bureau Data Guidelines and Repository Access Standards. Insurance Regulatory and Development Authority of India.
<https://www.irdai.gov.in>