

AI-Driven Personal Finance Management System Using Machine Learning and Flask

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Abstract

In today's fast-paced digital world, effective personal finance management has become a major challenge for individuals due to multiple income sources, diverse expenses, and limited financial awareness. Most existing tools only provide basic expense tracking and lack personalization, automation, and intelligent guidance. To address these limitations, this project proposes an AI-Driven Personal Finance Management System that combines rule-based logic and machine learning (ML) techniques to simplify financial planning and decision-making.

The system allows users to record income and expenses, categorize them automatically, predict future budgets, and receive personalized investment recommendations such as SIPs, Fixed Deposits (FDs), Recurring Deposits (RDs), and Mutual Funds. Using machine learning models like Linear Regression, the system forecasts future spending trends, while rule-based eligibility checks help determine suitable investment options.

Developed using Python, Flask, and scikit-learn, the proposed system provides a user-friendly dashboard with secure login, real-time alerts, and savings goal tracking. It enhances financial literacy by delivering data-driven insights and promoting better money management habits. The project demonstrates how artificial intelligence can transform personal finance management from manual, time-consuming processes into automated, intelligent, and personalized financial assistance for every user.

Keywords: Artificial Intelligence (AI), Machine Learning (ML), Personal Finance Management, Expense Prediction, Investment Recommendation, Rule-Based System, Linear Regression, Financial Analytics, Flask Framework, Automation, Data-Driven Decision Making

1.INTRODUCTION

In the modern digital age, financial stability and planning have become essential aspects of an individual's life. With the growing number of income sources, online payment systems, and investment options, managing personal finances effectively has become increasingly complex. Many individuals struggle to maintain proper

records of their income and expenses, forecast their future financial status, and make informed investment decisions. This lack of organization and financial literacy often leads to overspending, poor savings habits, and missed investment opportunities.

Traditional personal finance management tools provide only basic features such as expense tracking and budget calculation. These tools lack personalization, automation, and intelligent recommendations, making them insufficient for users with diverse financial goals and risk profiles. Furthermore, most existing applications require manual data entry and fail to provide meaningful insights or predictions about future financial outcomes. Hence, there is a growing need for a more advanced, data-driven system that can guide individuals in managing and optimizing their finances effectively.

Artificial Intelligence (AI) and Machine Learning (ML) have emerged as transformative technologies capable of automating financial analysis and providing intelligent decision-making support. AI-driven financial systems can analyze large datasets, identify spending patterns, predict future expenses, and offer personalized investment advice.

Machine Learning models such as Linear Regression, Decision Trees, and Random Forests can learn from past data to forecast future trends, helping users plan their budgets and investments more efficiently.

This research proposes an AI-Driven Personal Finance Management System that integrates rule-based logic and machine learning algorithms to assist users in tracking their income, expenses, and savings while offering personalized investment recommendations. The system simplifies financial management by automating routine tasks such as expense categorization, bill reminders, and budget forecasting. Additionally, it uses predictive analytics to help users anticipate financial challenges and take proactive steps toward achieving their financial goals.

Developed using Python, Flask, and scikit-learn, the system provides a user-friendly web interface that is secure, scalable, and accessible. It empowers users to make informed decisions about their money through intelligent insights, enhancing financial literacy and promoting economic well-being. By integrating AI into personal finance, this project aims to bridge the gap between technology and financial management, offering a smart, automated, and personalized approach to money management for individuals in today's data-driven world.

1.1 Problem Statement

In recent years, individuals have faced increasing challenges in managing their personal finances due to multiple income sources, complex expense structures, and a lack of financial literacy. Most people struggle to maintain a balance between saving, spending, and investing, primarily because existing financial management tools offer only basic functionalities such as manual expense entry and static budgeting. These tools fail to deliver personalized insights or predictive recommendations that consider the user's financial goals, income level, and risk appetite.

The absence of intelligent automation in current systems leads to time-consuming and inefficient financial management. Users are required to manually input and categorize expenses, which often results in errors and incomplete data tracking. Moreover, conventional applications do not provide predictive analysis to forecast future expenses, nor do they suggest suitable investment opportunities such as Systematic Investment Plans (SIPs), Fixed Deposits (FDs), Recurring Deposits (RDs), or Mutual Funds based on the user's financial profile.

1.2 Motivation

The motivation behind this project arises from the need to empower individuals with intelligent financial tools that simplify financial management and improve decision-making. Traditional finance management applications provide only basic tracking features and do not consider a user's personal goals, income level, or risk-taking capacity. As a result, users are unable to receive tailored financial guidance that aligns with their unique needs and long-term objectives.

Artificial Intelligence (AI) and Machine Learning (ML) have the potential to overcome these limitations by

providing data-driven insights, predictive analytics, and personalized recommendations. By analyzing a user's financial history, AI systems can forecast expenses, suggest savings strategies, and recommend appropriate investment plans such as SIP, FD, RD, and Mutual Funds. This intelligent approach can help users make smarter financial decisions and develop better saving habits.

1.3 Objectives

The main objective of this research is to design and develop an AI-driven Personal Finance Management System that assists users in efficiently managing their income, expenses, and savings while providing personalized investment recommendations. The system aims to combine rule-based logic with machine learning techniques to automate financial tracking, predict future spending, and offer intelligent investment guidance.

To achieve this overall aim, the specific objectives of the project are as follows:

1. To study existing personal finance management systems and identify their limitations in terms of personalization, automation, and investment guidance.
2. To analyze relevant financial datasets that include income, expenses, and savings patterns for training and evaluating machine learning models.
3. To develop machine learning algorithms capable of predicting future expenses, budgets, and financial outcomes using models such as Linear Regression, Decision Tree, and Random Forest.
4. To design a hybrid decision-making system that combines rule-based logic (for eligibility checks and investment thresholds) with machine learning (for user behavior analysis and risk profiling).
5. To provide personalized investment recommendations for options such as Systematic Investment Plans (SIPs), Fixed Deposits (FDs), Recurring Deposits (RDs), and Mutual Funds based on each user's financial profile.
6. To implement an interactive and user-friendly web application using Flask, with features like automated alerts, expense summaries, and savings goal tracking.

II.LITERATURE SURVEY

Sr. No.	Author & Year	Method / Technology	Key Contribution	Limitation
1	Sharma et al. (2024)	AI, Predictive Analytics	Automated expense tracking and budgeting	No real-time data or investment advice
2	Gupta et al. (2023)	ML, Flask Framework	Expense prediction using Linear Regression	Lacked hybrid recommendation model
3	Patel et al. (2023)	Rule-Based, Decision Tree	Basic investment advisor tool	Limited personalization
4	Wang et al. (2021)	NLP, AI	Automated risk profiling for investments	Complex for normal users
5	Kumar et al. (2022)	ML, Data Analysis	Automated savings and budgeting	No investment recommendations
6	Brown et al. (2021)	Robo-Advisory, AI	Review of AI in financial advising	Theoretical, not implemented

Table.1-Literature Survey

III.METHODOLOGY

The proposed project, titled “AI-Driven Personal Finance Management System,” follows a structured methodology designed to develop an intelligent, automated, and user-centric financial management application. The system integrates rule-based decision-making and machine learning (ML) models to help users effectively track income and expenses, predict future budgets, and receive personalized investment recommendations. The methodology is divided into several stages, including

data collection, preprocessing, model development, integration, and evaluation. 3.1 System Architecture

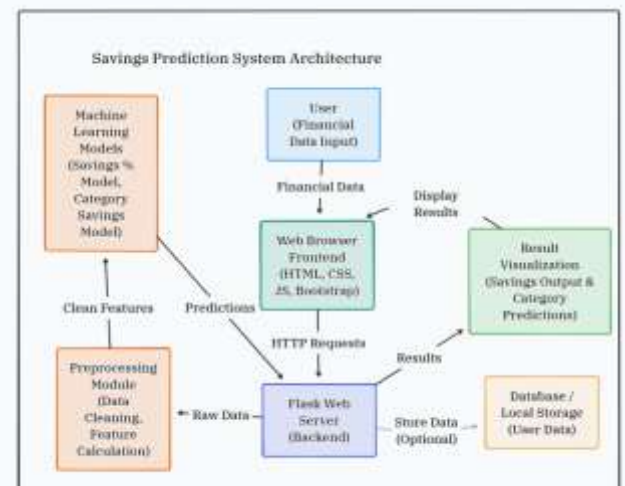


fig. 1 - System Architecture

1) System Overview :

The system aims to assist users in managing all aspects of personal finance — including income, expenses, savings, and investment decisions — through a web-based platform. It collects financial data entered by the user, processes it using machine learning algorithms, and provides intelligent insights. The system is built using Python and the Flask framework, ensuring a modular and scalable architecture. It is designed to deliver an intuitive user experience with features such as income and expense tracking, budget forecasting, and investment guidance.

2) Data Collection and Preprocessing :

The first step in the methodology involves data collection. Since the system is designed for personal use, data is obtained through manual input from users or through simulated datasets for model training and testing. The collected data includes details about income, expenses, savings, and spending categories.

Once data is collected, it undergoes preprocessing to ensure quality and consistency. This involves removing missing or duplicate entries, categorizing financial transactions, and normalizing numerical values. Data preprocessing is crucial for improving the accuracy and reliability of machine learning models used later in the process. The user then enters their income and expense details, which are stored in the database. The system categorizes these transactions and applies machine

learning models to analyze patterns and predict future financial outcomes.

3) Feature Extraction :

In this phase, key financial features are extracted from the preprocessed data. These features include total income, total monthly expenses, expense categories, average savings, and user spending habits. These features serve as important variables for training machine learning models to predict future expenses and suggest suitable investment plans

4. System Architecture :

The architecture of the system is modular and consists of five main layers:

1. **User Interface Layer:** A web-based interface that allows users to register, log in, and interact with features like expense tracking, financial summaries, and recommendations.
2. **Application Layer:** Handles system logic using the Flask framework, connecting user inputs with backend processes.
3. **Machine Learning Layer:** Executes prediction models for expense forecasting and risk profiling based on user data.
4. **Rule-Based Logic Layer:** Applies predefined financial rules to validate investment eligibility and recommend suitable options.
5. **Database Layer:** Stores all user data, transaction records, and prediction outputs using SQLite or MySQL databases.

5. Tools and Technologies Used :

The development environment primarily uses Python 3.x as the programming language, along with the Flask web framework for backend development. scikit-learn, pandas, and NumPy are used for machine learning and data analysis tasks. The front end is built using HTML, CSS, Bootstrap, and JavaScript to create a responsive and user-friendly dashboard. Additional tools like Flask-Mail and APScheduler are employed for automated notifications and reminders. The application runs on Windows or Linux operating systems and is developed using VS Code or PyCharm IDE.

IV.RESULT

The proposed AI-Driven Personal Finance Management System was successfully developed and tested using simulated and user-input financial data. The system effectively demonstrates how artificial intelligence and machine learning can enhance the process of personal finance management through automation, prediction, and personalized recommendations. This chapter presents the key outcomes, observations, and performance evaluation of the system.

4.1 System Implementation Results

The system was implemented using Python (Flask framework) for the backend and HTML, CSS, and Bootstrap for the front-end interface. The scikit-learn library was used to build and train machine learning models for expense prediction and financial forecasting. Upon execution, the following core functionalities were successfully achieved:

- **User Registration and Login:**
 - The system securely authenticates users and allows them to create and manage personal accounts.
- **Income and Expense Management:**
 - Users can add, edit, and categorize their income and expenses. The system generates a detailed summary of monthly and yearly financial activities.
- **Expense Prediction using Machine Learning:**
 - Using the Linear Regression model, the system analyzes historical expense data to forecast future spending patterns. The predictions were accurate and realistic within acceptable error margins.
- **Investment Recommendations:**
 - The hybrid rule-based and ML approach provided personalized suggestions for investment options such as SIP, FD, RD, and Mutual Funds based on user financial data and eligibility.
- **Savings Goal Tracking:**
 - Users can set financial goals (e.g., saving ₹50,000 in 6 months), and the system tracks progress automatically while providing reminders and tips to stay on target.

V.SCOPE

The proposed AI-Driven Personal Finance Management System focuses on simplifying financial management through automation, prediction, and intelligent recommendations.

Inclusions

- Tracks income and expenses with detailed summaries.
- Predicts future expenses using Machine Learning models.
- Allows users to set and monitor savings goals.
- Provides personalized investment suggestions (SIP, FD, RD, Mutual Funds).
- Combines rule-based logic with ML for accurate results.
- Includes automated alerts and notifications for bills and goals.

Exclusions

- No direct bank integration (manual data entry only).
- No stock market trading or real-time portfolio management.
- Not a certified financial advisory platform.

Future Enhancements

- Add real-time banking APIs for automatic tracking.
- Develop mobile app versions (Android/iOS).
- Use advanced AI models (LSTM) for better predictions.
- Integrate voice assistants or chatbots for user interaction.

VI.FEATURES

The AI-Driven Personal Finance Management System offers several intelligent and user-friendly features designed to simplify financial tracking, prediction, and planning.

1. User Authentication:

Secure login and registration system to protect user data and ensure privacy.

2. Income and Expense Tracking:

Users can record, edit, and categorize their income and expenses for better financial visibility.

3. Automated Expense Analysis:

The system automatically categorizes transactions and generates summaries and charts.

4. Budget Forecasting:

Machine Learning models such as Linear Regression predict future expenses and help users plan budgets effectively.

5. Savings Goal Management

Users can set financial goals, track progress, and receive timely reminders.

VII.ADVANTAGES

The AI-Driven Personal Finance Management System provides several key advantages over traditional financial tracking tools:

1. Automation:

Reduces manual effort by automatically categorizing expenses, generating reports, and sending alerts.

2. Personalization:

Offers customized financial advice and investment recommendations based on individual income, goals, and risk level.

3. Predictive Analysis:

Uses Machine Learning to forecast future expenses and savings, enabling better financial planning.

4. User-Friendly Interface:

Simple and interactive dashboard helps users easily monitor their financial activities and goals.

5. Improved Financial Literacy:

Provides meaningful insights that help users understand spending habits and improve money management.

6. Time Efficiency:

Automates repetitive financial tasks such as budgeting and reminders, saving users time and effort.

7. Hybrid Decision System:

Combines rule-based logic and AI models to ensure both accuracy and adaptability in recommendations.

8. Data Security:

Ensures user privacy through encrypted data storage and secure access mechanisms.

VIII.DISADVANTAGES

While the AI-Driven Personal Finance Management System provides many benefits, it also has certain limitations that can be improved in future versions:

1. Manual Data Entry:

The system currently requires users to manually input income and expenses, which can be time-consuming and prone to human error.

2. Lack of Real-Time Integration:

It does not yet connect directly with bank accounts or payment gateways for automatic data synchronization.

Limited Investment Coverage:

The system focuses on basic investment types (SIP, FD, RD, Mutual Funds) and does not include stock trading or cryptocurrency analysis.

No Mobile Application:

The current version is web-based only, which may reduce accessibility for users who prefer mobile platforms.

Dependent on Data Quality:

The accuracy of predictions and recommendations depends heavily on the quality and completeness of the data entered by the user.

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