A
Project Report
on

AI-Based Web-Application for Personalized Finance Tracker

Submitted to

Sant Gadge Baba Amravati University, Amravati

**Submitted in partial fulfilment of
the requirements for the Degree of
Bachelor of Engineering in**

Computer Science and Engineering

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SHRI SANT GAJANAN MAHARAJ COLLEGE OF ENGINEERING, SHEGAON – 444 203 (M.S.)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CERTIFICATE

This is to certify that **Ms. Shruti Milind Sonone, Mr. Anikesh Sanjay Gadekar, Mr. Chinmay Mahesh Harne and Mr. Nakul Vishal Wankhede** students of final year Bachelor of Engineering in the academic year 2024-25 of Computer Science and Engineering Department of this institute have completed the project work entitled **"AI-Based Web-Application for Personalized Finance Tracker"** and submitted a satisfactory work in this report. Hence recommended for the partial fulfilment of degree of Bachelor of Engineering in Computer Science and Engineering.

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Abstract

Personal finance management has become increasingly important in today's dynamic and fast-paced economic environment. Many individuals struggle with tracking their expenses, planning budgets, and making informed investment decisions due to a lack of financial awareness and tools. To address these challenges, this project proposes an AI-based web application designed to help users take control of their financial lives through automation, personalization, and real-time insights. The system allows users to input their income, monthly expenses, and risk appetite. Based on this data, machine learning models such as K-means clustering to analyze the user profile to provide personalized investment suggestions. The application also integrates live market data using APIs like Investing.com, offering real-time insights into stock performance, especially focusing on NIFTY 50 stocks. An easy-to-use and visually rich dashboard displays categorized expenses using graphs and charts to enhance financial visibility. The platform is developed using technologies such as Python, Flask, HTML, CSS, and JavaScript, ensuring seamless backend-frontend communication. This application aims to encourage better financial discipline, promote awareness, and empower individuals to make smarter financial choices through the support of Artificial Intelligence and data analytics.

Keywords: Personal Finance, Artificial Intelligence, Investment Planning, Expense Tracking, Financial Chatbot.

List of Abbreviations

Abbreviation	Description
AI	Artificial Intelligence
ML	Machine Learning
API	Application Programming Interface
UI	User Interface
UX	User Experience
DBMS	Database Management System
JSON	JavaScript Object Notation
HTTP	Hypertext Transfer Protocol
CSS	Cascading Style Sheets
SaaS	Software as a Service
RDBMS	Relational Database Management System
SDK	Software Development Kit

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Chapter 1
Introduction

INTRODUCTION

1.1 PREFACE

In today's fast-paced digital era, managing personal finances has emerged as both a necessity and a challenge. With the proliferation of credit cards, investment platforms, EMI-based services, and real-time financial apps, individuals are constantly navigating a sea of income, expenditure, savings, and investments. However, a large segment of the population still lacks the financial literacy or tools necessary to effectively manage and optimize their financial decisions. This is especially true in developing countries where access to financial advisory services is limited, and the cost of traditional financial consultation remains high.

Artificial Intelligence (AI), combined with modern web technologies, offers promising solutions to bridge this gap. AI-based systems can now analyze vast quantities of financial data, recognize user patterns, detect spending anomalies, and recommend customized financial plans. This transformation has fueled the growth of smart finance managers and robo-advisory platforms, which empower users with intelligent, data-driven insights for better financial planning [1].

This project report presents the design and development of an AI-based web application —FinancePal—for personalized finance tracking. The proposed system aims to automate the tedious process of manually monitoring and optimizing financial behavior. By leveraging technologies such as machine learning, data visualization, and secure databases, FinancePal serves as a digital financial assistant that not only tracks income and expenses but also forecasts future financial needs, recommends savings plans, and helps users make informed investment decisions [2].

In addition to AI, the project incorporates user-centered design principles, ensuring a seamless and intuitive experience. Technologies like React for the frontend, Node.js for backend, and MongoDB for data storage have been employed. The system is also equipped to integrate with APIs for live market data, banks, and third-party financial services, allowing real-time insights and personalization. The project adheres to agile methodologies for efficient development and incorporates data privacy and security principles throughout the system lifecycle [3][4].

This chapter introduces the context, motivation, objectives, and structure of the project. It lays the foundation for understanding how FinancePal aligns with modern user needs and technological trends in AI-based personal finance systems.

1.2 MOTIVATION

Financial literacy plays a critical role in shaping the economic health of individuals and societies. Despite growing awareness, studies continue to highlight a global gap in financial understanding, especially when it comes to budgeting, debt management, investment planning, and retirement saving. Traditional financial consultation remains costly, inconsistent, and inaccessible to the general public [2].

Meanwhile, a new wave of digital consumers—tech-savvy and connected—seeks personalized and real-time solutions to manage finances. AI technologies such as deep learning and natural language processing (NLP) now offer the ability to decode user behavior and offer tailored advice. Notably, research by Shafiee et al. [2] emphasizes the development of personalized configurators that support decision-making in finance, validating the potential of AI-powered advisory tools.

Our motivation stems from the need to democratize access to such tools—bridging the gap between expert financial advice and common users. FinancePal is designed to be more than an expense tracker—it serves as a smart financial partner that understands the user's financial behavior, anticipates needs, and proactively suggests improvements. For instance, if a user consistently overspends on dining out, the system can provide spending limits, alerts, and budget optimization tips.

Another key motivation lies in the ability to integrate finance with well-being. Financial stress is known to be a leading contributor to mental health issues. Empowering users to manage their money effectively fosters not only economic health but also overall life satisfaction. Platforms like FinRobot and Fynbot showcase the value of user-friendly digital assistants in financial spaces [6][13].

By using open-source technologies and focusing on automation and personalization, FinancePal can serve as an accessible, low-cost solution for millions seeking clarity and control over their finances. The project also aligns with India's Digital India initiative and broader goals of financial inclusion.

1.3 PROBLEM STATEMENT

Despite the availability of multiple financial applications, most are limited in scope—often only tracking expenses or offering fixed budgeting advice. These platforms lack the depth of AI-powered insights and real-time integration necessary to make impactful decisions.

The core problems identified include:

- Lack of Personalization: Most apps offer generic recommendations, failing to consider user-specific financial goals, earning patterns, or liabilities [1][3].

- Absence of Predictive Intelligence: Current systems do not forecast future cash flows, EMIs, or financial risks, limiting proactive financial planning [4].
- Fragmented Financial Data: Users often rely on multiple platforms—bank apps, investment dashboards, credit card portals—resulting in scattered data, which hinders comprehensive analysis [10].
- Inaccessible Financial Advisory: Expert consultation is costly, often reserved for high-income individuals, leaving the middle and lower-income groups underserved [2][11].
- Data Privacy Concerns: With increasing cyber threats, users are hesitant to share sensitive financial information with third-party apps lacking robust encryption and secure data handling protocols [9].

This project aims to address these challenges by building a consolidated, intelligent platform that combines data-driven personalization, predictive analytics, financial education, and enhanced data security—all in a single application.

1.4 OBJECTIVES

The main objectives of the project are:
1. To develop a web-based platform for centralized financial tracking and analysis.
2. To provide personalized financial insights based on user behavior using AI and machine learning models.
3. To recommend savings and investment strategies aligned with the user's financial goals.
4. To offer real-time data visualization for expenses, income, investments, and goals using charts and dashboards.
5. To build an adaptive system that evolves with the user's changing financial habits.

Through these objectives, the platform aims to serve as a comprehensive tool for personal finance management that is intelligent, secure, and easy to use.

1.5 SCOPE OF PROJECT

The scope of the "AI-Based Web Application for Personalized Finance Tracker" project extends beyond traditional expense tracking. It embraces the broader objective of empowering users to gain financial clarity, improve saving and investment habits, and make smarter monetary decisions through artificial intelligence and automation.

The application, hereafter referred to as FinancePal, is designed to serve as a comprehensive, intelligent, and user-centric financial management tool tailored for individuals, families, and small business owners.

At its core, FinancePal aims to unify scattered financial data—spanning income, expenditure, debts, savings, and investments—into a single, cohesive interface that offers real-time monitoring and actionable insights. Users often manage finances using multiple disconnected tools, including spreadsheets, banking apps, loan statements, and investment platforms. This fragmentation makes it difficult to maintain oversight of one's financial health. FinancePal addresses this gap by offering centralized dashboards that consolidate data and present it in visually intuitive formats such as bar graphs, pie charts, and spending heatmaps. These visuals aid in understanding trends, anomalies, and potential areas of improvement in financial behavior.

The scope also includes implementation of AI-based modules that go beyond passive tracking. Machine learning algorithms are employed to identify user spending patterns, detect unusual transactions, and classify expenses into dynamic categories (e.g., essentials, luxuries, subscriptions, utilities). The system can forecast future expenses based on historical behavior, simulate different saving strategies, and recommend optimal monthly budgets. For instance, if a user consistently spends more than average on entertainment, the app may suggest budget limits and cheaper alternatives. This proactive assistance transforms FinancePal from a reactive tracker into a strategic advisor.

Another critical component within the scope is personalized investment planning. Users can input their income, risk tolerance, and financial goals—such as buying a car, saving for a house, or building a retirement fund—and the system recommends diversified investment portfolios. These recommendations are backed by rule-based AI models that use historical market data and predictive analytics. Research by Wang and Yu [5] and Huang et al. [4] showcases the efficacy of reinforcement learning in robo-advisory platforms, which this project integrates to optimize investment suggestions.

Furthermore, the application is built with integration in mind. Using APIs, the system can fetch real-time data from banking institutions, stock markets, and mutual fund platforms. This not only ensures that the data is current but also reduces manual input for the user. Open banking APIs enable users to sync their accounts, receive alerts for low balances or unusual activity, and monitor net worth in real time [10]. This functionality turns FinancePal into a live, breathing assistant rather than a static budget sheet.

From a technical standpoint, the project scope covers full-stack web application development. The frontend is built using React.js to ensure a smooth, responsive, and mobile-friendly user experience. The backend uses Node.js and Express.js to handle business logic, and MongoDB is employed for storing user profiles, transaction history, and analytics models. Security is a critical consideration; all user data is encrypted using industry-standard practices, and JWT (JSON Web Token) authentication ensures secure session management [9].

Accessibility is also within scope. The system is designed with usability in mind, offering guided onboarding, tooltips, dark/light themes, and multilingual support. Future releases may include mobile apps and voice-command support for visually impaired users or those seeking a hands-free experience.

Another important aspect of the project scope includes the ability to scale and adapt. As user behavior changes or new financial products enter the market, the AI modules can be retrained to incorporate these shifts. The modular architecture allows new features like tax calculators, EMI estimators, and even chatbot-based financial counseling to be added with minimal changes to the core system [3][6][11].

1.6 ORGANIZATION OF THE REPORT

The report is structured as follows:
- Chapter 1: Introduction – Describes the background, motivation, scope, objectives, and outline of the project.
- Chapter 2: Literature Review – Summarizes existing research and tools relevant to AI in finance, highlighting the gaps FinancePal addresses [1]–[6].
- Chapter 3: Methodology – Details the technology stack, system design, modules, and frameworks used in implementation (React, Node.js, MongoDB, Machine Learning, etc.) [3][4][8].
- Chapter 4: Implementation – Focuses on how the components were built, integrated, and tested, including screenshots and technical configurations.
- Chapter 5: Results and Discussion – Presents a summary of system features, testing outcomes, and discusses performance and accuracy.
- Chapter 6: Conclusion and Future Work – Highlights key findings, benefits of the system, and outlines future enhancements such as mobile apps, AI chatbots, and automated investments.

Each chapter provides a critical piece of the system lifecycle, from conceptualization to deployment. All sources are cited appropriately, and an extensive reference list is provided at the end of the report.

Chapter 2
Literature Review

LITERATURE REVIEW

2.1 OVERVIEW OF AI IN FINANCE

Artificial Intelligence (AI) has transformed the financial sector by introducing automation, predictive analytics, and personalization into core financial operations. Traditionally, financial systems relied on rule-based models and manual data entry, which limited scalability and adaptability. With the advent of AI, especially machine learning (ML) and deep learning (DL), financial institutions can now process massive datasets, detect patterns, and deliver personalized insights to users in real time.

AI applications in finance can be broadly classified into five categories: algorithmic trading, fraud detection, credit scoring, financial forecasting, and personal finance advisory. In the context of this project, the most relevant domain is AI-driven personal finance, which uses natural language processing (NLP), reinforcement learning (RL), and neural networks to help users manage expenses, set goals, and make investment decisions.

According to Ozbayoglu et al. [1], deep learning has become particularly useful in time series prediction tasks such as forecasting stock prices and user cash flows. Their comprehensive survey outlines how recurrent neural networks (RNNs) and convolutional neural networks (CNNs) are applied to financial modeling, fraud detection, and risk analysis.

Robo-advisory platforms also exemplify AI integration in finance. Wang and Yu [5] presented a system combining deep reinforcement learning with inverse optimization to generate investment recommendations. These advisors learn user preferences over time and adjust portfolios accordingly, aligning well with the goals of this project's personalized finance engine.

Shafiee et al. [2] emphasized the importance of personalization and configurability in AI systems that support financial decision-making. Their research promotes the idea of building customizable digital financial advisors that cater to user-specific needs, lifestyle preferences, and economic conditions.

FinRobot [6] extends this ideology by offering an open-source, modular platform for developing AI-based finance assistants powered by large language models. These tools empower developers to build financial agents capable of handling queries, generating reports, and offering real-time financial planning.

In summary, AI in finance has shifted from passive analysis tools to active assistants that engage with users and help them shape their financial futures. These developments set a solid foundation for building an intelligent personal finance tracker like FinancePal that is capable of real-time learning and guidance.

2.2 REVIEW OF PERSONAL FINANCE APPLICATIONS

Personal finance applications have grown in popularity due to the increasing demand for mobile banking, cashless transactions, and DIY investment platforms. These apps typically offer functionalities such as expense tracking, budgeting, financial goal setting, and reminders for bills or EMIs. Despite their proliferation, not all apps are equally effective in delivering personalized and adaptive financial advice.

One of the earliest implementations in this space was the Fynbot project [13], which utilized a chatbot interface to help users track expenses through conversational AI. While useful, Fynbot's scope was limited to static categorization without adaptive learning. Since then, platforms like Mint, YNAB (You Need A Budget), and PocketGuard have offered advanced features, yet many lack predictive insights and are often restricted by regional banking integrations.

Yu Xie's Android-based finance management system [7] demonstrated the feasibility of localized finance trackers that use cloud-based storage and provide chart-based insights. However, this approach did not employ AI or learning algorithms, which are necessary to personalize and automate recommendations.

Agarwal et al. [3] introduced an AI-powered personal finance assistant that provided user-specific advice and alerts. Their study highlighted the potential of such assistants to increase financial literacy and improve savings behavior through goal-oriented notifications and behavioral nudges.

Applied AI for Finance and Accounting by ScienceDirect [10] focused on the use of alternative datasets and predictive models for understanding consumer financial behavior. These insights enable systems to categorize transactions, detect anomalies, and predict future spending with considerable accuracy.

However, most existing applications fall short in integrating all financial dimensions (income, debt, investments, credit scores) into one seamless experience. Many focus solely on budgeting or expense categorization, ignoring investment recommendations or long-term financial planning. Moreover, few incorporate security protocols or open banking APIs to fetch real-time data automatically.

As such, the review of existing applications reveals that while the foundation for digital personal finance tools exists, most do not offer intelligent, consolidated, and secure solutions tailored to diverse user profiles.

2.3 COMPARATIVE ANALYSIS OF EXISTING SYSTEMS

To build a truly effective AI-based finance tracker, it's important to compare and evaluate existing systems based on their functionality, accuracy, usability, and scalability. Three prominent types of systems are compared here: traditional finance tracking apps, AI-powered budgeting tools, and robo-advisory investment platforms.

Traditional apps like Mint and Goodbudget provide basic income-expense visualizations and monthly budget limits. These apps require extensive manual input and lack the intelligence to adapt to changing user behavior. In contrast, AI-powered budgeting apps —such as Cleo and Olivia—attempt to learn user behavior over time, categorize expenses dynamically, and even provide humor-infused advice through chatbots. Yet, most of these systems are limited in scope and do not integrate predictive financial modeling or investment planning [3][13].

Robo-advisors like Betterment and Wealthfront offer tailored investment portfolios based on user goals and risk profiles. These platforms use financial models and machine learning to optimize investments. However, they often ignore the budgeting and daily expense side of personal finance, leaving a gap in comprehensive financial planning [5].

FinancePal aims to combine the best of all worlds: seamless tracking, predictive analytics, AI-powered investment recommendations, and a consolidated dashboard. Unlike existing systems, it addresses three major gaps: real-time data integration, predictive personalization, and multi-role access (e.g., family, business partners). It also integrates security features such as tokenized authentication and encrypted data storage —often overlooked in conventional finance apps [9][10].

Moreover, the use of platforms like FinRobot [6] and the application of deep reinforcement learning [4] offer significant performance boosts and dynamic learning capabilities that most current apps do not employ. By building a modular and extensible architecture, FinancePal allows future features—like chatbot advisors, API plugins for new financial products, or voice control—to be added without system overhauls.

Thus, the comparative analysis reveals that while several tools serve niche purposes well, none offer the full-stack, intelligent financial support system that FinancePal is poised to deliver.

2.4 GAPS IN EXISTING RESEARCH

While AI in finance has seen considerable development, specific gaps persist in both research and real-world implementation. First, many studies emphasize either budgeting or investment but rarely both in conjunction. This fragmented approach results in applications that offer partial insights, thereby limiting their utility.

Another gap lies in personalization. While tools like robo-advisors adapt to risk profiles, they rarely adjust recommendations based on lifestyle, spending habits, or personal values. Shafiee et al. [2] argue that configurable AI tools are the key to tailoring financial advice effectively, yet most implementations offer one-size-fits-all templates.

Data integration is another concern. Few studies or systems address how to consolidate data from various banks, investment platforms, and loan accounts into one user profile. This limits the system's capability to assess holistic financial health [10].

Security and privacy are also often underexplored. Given that financial applications handle sensitive data, studies must focus on encryption, secure access, and user trust. Only a few papers like those by Bhutta et al. [9] emphasize blockchain or cryptographic security in AI-based financial systems.

Moreover, user engagement is rarely considered. Research often neglects UI/UX design, gamification, and behavioral psychology, which play vital roles in ensuring long-term user retention. Without these, even the most intelligent systems risk abandonment after short-term use.

Finally, real-time analytics and learning mechanisms are rarely embedded. While reinforcement learning shows promise [4][5], its application in personal finance tracking remains underdeveloped.

These gaps create an opportunity for projects like FinancePal to push boundaries and deliver a unified, secure, and intelligent financial experience.

2.5 SUMMARY

This literature review explores the development and current trends in AI-based personal finance applications, highlighting key gaps. Technologies like machine learning and reinforcement learning have enhanced financial tools by providing personalized insights.

We evaluated various personal finance platforms, including expense trackers, budgeting tools, and robo-advisors. While these tools serve specific needs, they often function in isolation, lacking a comprehensive view of users' finances. Most systems exhibit limited real-time data integration, cross-domain analysis, and personalized recommendations, and they inadequately address security and data privacy issues.

Our analysis indicates a need for more real-time learning and user-focused engagement strategies. To fill these gaps, we propose FinancePal—a modular, scalable system that utilizes AI-driven personalization, secure infrastructure, and open banking API integration. FinancePal aims to deliver a cohesive and adaptive financial experience for users, setting the stage for the implementation in the next chapter.

Chapter 3
Methodology

METHODOLOGY

3.1 SYSTEM FLOW AND ARCHITECTURE

The architecture of the AI-based Personalized Finance Tracker is designed to provide a robust, modular, and scalable structure that caters to individual users' financial needs. It ensures seamless user interaction, intelligent processing of data using machine learning, and secure data handling with a cloud-deployed backend. The system combines real-time market data, AI-powered investment logic, and interactive visualizations to guide users in budgeting and investing wisely.

System Architecture Overview

The architecture consists of five major components:

1. Frontend Interface: Developed using HTML, CSS, and JavaScript, it facilitates easy user interaction, input submission, and financial insights visualization.
2. Backend Server: Built using Flask (Python), this layer handles request routing, logic execution, machine learning model invocation, and database communication.
3. Machine Learning Layer: Implements K-Means clustering to categorize users based on income and expense behavior, and suggests personalized investment plans using decision logic.
4. External API Layer: Integrates real-time market data through APIs like Investing.com and yfinance to support informed decision-making.
5. Database Layer: Stores user credentials, financial inputs, expense logs, and ML model outputs using SQLite or MongoDB.

WORKING DESCRIPTION

- Step 1: User Interaction - Users log in and enter data related to income, expenses, and investment preferences via a responsive web form.
- Step 2: Data Processing - Collected data is cleaned and formatted for analysis using Pandas in Python.
- Step 3: Clustering with K-Means - Based on inputs, users are grouped into financial behavior clusters, enabling personalized recommendations.
- Step 4: Investment Suggestions - The system evaluates disposable income and cluster behavior to offer AI-curated investment plans (e.g., SIPs, stocks, mutual funds).

- Step 5: Market Overview - Real-time stock data is fetched using APIs and shown on the dashboard to aid investment awareness.
- Step 6: Financial Dashboard - A visual dashboard presents categorized expenses, investment recommendations, and budget efficiency via interactive charts (using JavaScript and Matplotlib).
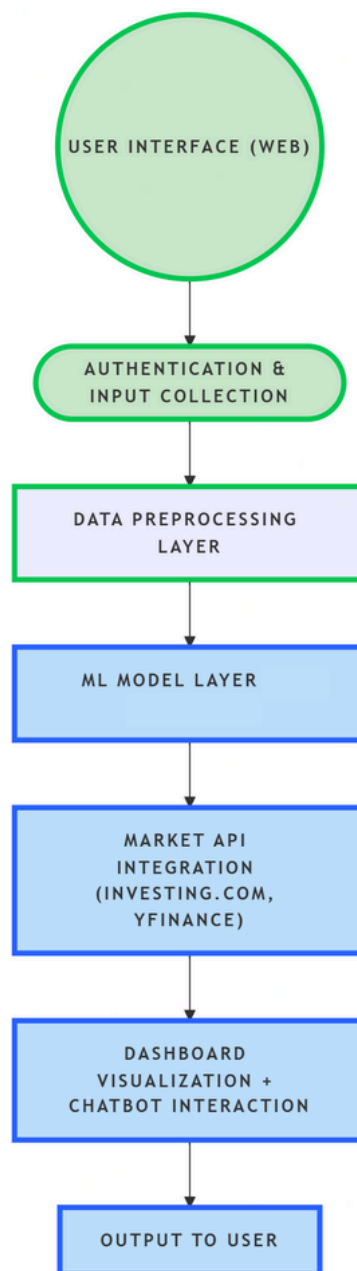

Figure 3.1.1 : Architecture Diagram

3.2 USER INPUT AND REQUIREMENT GATHERING

The success of a personalized finance management system depends heavily on understanding user needs and collecting relevant financial data to deliver tailored recommendations. This phase focuses on capturing essential user information and requirements to build a responsive, intelligent, and user-friendly application.

USER INPUT COLLECTION

Upon registration and login, the application gathers specific user data required to drive financial analysis and AI-based investment logic. The inputs are collected through interactive web forms built using HTML, CSS, and JavaScript.

Primary Inputs Collected from Users:

Table 3.2.1 : Primary Input Collection

Input Field	Description
Monthly Income	Total monthly earnings of the user (used to calculate budget & investment capacity).
Risk Appetite	User's tolerance for investment risk (Low, Medium, High).
Monthly Expenses	Users can input or upload categorized expenses manually (e.g., Food, Rent, Travel).
Financial Goals	Optional field for setting goals such as saving for travel, retirement, or education.
Time Horizon	Duration for which the user intends to invest or save money.
Savings Preference	Whether the user prefers saving in banks, mutual funds, SIPs, or other instruments.

REQUIREMENT GATHERING

To ensure the system meets user expectations and functions effectively, functional and non-functional requirements were identified based on literature, surveys, and target user profiles.

Functional Requirements:

1. User Authentication – Secure login and registration system.
2. Expense Entry and Tracking – Form for monthly expenses.
3. AI-based Recommendations – Suggestions for budget allocation and investments using K-Means clustering.
4. Dashboard – Visual display of expense categories, income distribution, and suggested investments.

5. Market Data Display – Real-time insights of Nifty 50 and stock trends via API.
6. Chatbot Assistant – AI-driven interaction to answer financial questions.

Non-Functional Requirements:
1. Scalability – The system should support multiple concurrent users.
2. Security – User data must be encrypted and stored securely.
3. Performance – Fast response time for ML model execution and data retrieval.
4. Usability – Intuitive and responsive UI for a seamless experience.
5. Maintainability – Modular code design for easy updates and improvements.

3.3 Model Selection (ML Algorithms: K-Means Clustering)

To provide personalized investment and budgeting recommendations, the proposed system leverages K-Means Clustering, a widely used unsupervised machine learning algorithm. This model helps group users based on financial behavior, enabling the platform to recommend customized financial strategies.

Why K-Means?
K-Means Clustering was chosen because:
- It effectively segments users based on similar income, expenses, and risk appetite.
- It is computationally efficient and easy to implement.
- It provides interpretability and can adapt as new users are added.
- It's widely used in financial systems for customer segmentation, risk profiling, and behavioral clustering.

Model Description
K-Means Clustering is an iterative algorithm that divides data into k clusters. Each data point is assigned to the cluster with the nearest mean (centroid). The centroids are recalculated until convergence is achieved.
Algorithm Steps:
1. Select the number of clusters k.
2. Randomly initialize k centroids.
3. Assign each user data point to the nearest centroid.
4. Recalculate centroids as the mean of assigned points.
5. Repeat steps 3-4 until centroids no longer change significantly.

Input Features for Clustering :

Table 3.3.1 : Input Features

| Feature	Description
Monthly Income	Determines available funds for savings and investment.
Total Monthly Expenses	Helps assess spending behavior.
Risk Appetite	Encoded as 0 (Low), 1 (Medium), 2 (High).
Savings Ratio	(Income - Expenses) / Income.

Optimal k Selection :

The Elbow Method is used to determine the optimal number of clusters. The Within-Cluster-Sum-of-Squares (WCSS) is calculated for different k values, and the "elbow point" (where the reduction in WCSS slows down) is selected as the ideal number of clusters. In our system, k = 3 was found to be optimal, representing:
- Cluster 1: High Income – Low Expense – High Risk (Aggressive Investor)
- Cluster 2: Balanced Income – Balanced Expense – Medium Risk (Moderate Investor)
- Cluster 3: Low Income – High Expense – Low Risk (Conservative Saver)

Outcome of Clustering :

After clustering, each user is tagged with a financial persona, which helps the system:
- Suggest an appropriate budget split.
- Recommend saving or investment instruments (e.g., SIPs, FDs, mutual funds).
- Deliver tailored advice via the AI chatbot.
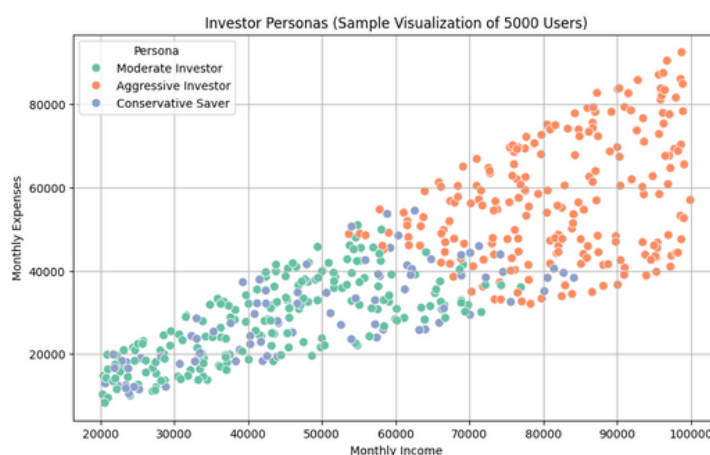
Figure 3.3.1 : User Behavior - Clustering

3.4 Tools & Technologies Used

The development of the personalized finance tracker system incorporates a combination of modern technologies and tools from the fields of software engineering, data science, and artificial intelligence. These tools ensure the system is scalable, responsive, intelligent, and user-friendly.

Table 3.4.1 : Programming Languages

Tool	Purpose
Python	Core backend language used for machine learning model development and data processing.
Javascript	Enhances interactivity and dynamic content on the front-end.
HTML5 & CSS3	Used for building a responsive and clean user interface.
Flask	Lightweight Python web framework to serve the ML models and APIs.

Table 3.4.2 : Libraries & Functionality

Library	Functionaity
Scikit-learn	For implementing K-Means clustering and evaluating models.
Pandas & NumPy	For data manipulation, cleaning, and feature engineering.
Matplotlib & Seaborn	To visualize data distributions and cluster results.

Table 3.4.4 : APIs and External Data

API	Usage
Investing.com / Yahoo Finance API	Provides real-time stock market and Nifty 50 data for investment decision-making.
Chatbot Framework (Google Gemini)	Integrates the finance assistant to handle user queries in natural language.

Chapter 4
Implementation

IMPLEMENTATION

4.1 FRONTEND DESIGN (HTML, CSS, JS)

The frontend of the application is designed to offer a clean, intuitive, and responsive user experience, ensuring accessibility across various devices. Technologies such as HTML5, CSS3, and JavaScript were used to develop a lightweight yet dynamic interface. Users can easily:

- Register and log in securely through user-friendly forms with input validation.
- Input financial details, including monthly income, expenses, and risk appetite, through well-structured input forms.
- Visualize categorized expenses using interactive pie charts generated with JavaScript libraries like Chart.js.
- Monitor investment recommendations and real-time market updates directly from the dashboard.

The dashboard is responsive and adapts to various screen sizes, providing consistent usability across desktops, tablets, and mobile devices. Special attention was given to a minimalistic design approach, using clear typography, a consistent color palette, and logical content placement.

This ensures users with varying levels of financial and technical knowledge can easily interact with the application without confusion.

Overall, the frontend seamlessly bridges user inputs with backend processing while maintaining simplicity, clarity, and engagement.

4.2 BACKEND LOGIC (PYTHON, FLASK)

The backend of the AI-based finance manager handles business logic, user data, AI model integration, and external API requests. Developed in Python using Flask, it supports scalable RESTful APIs for frontend interaction. API endpoints manage expense data, investment advice, market data, and user authentication, with JSON used for communication.

Libraries like Pandas, NumPy, and scikit-learn enable financial calculations, data transformation, and AI inference. The AI model for investment recommendations is hosted and accessed via Flask routes. The expense management module categorizes and summarizes user data, while the market data module fetches updates from Investing.com APIs.

This backend setup ensures efficient data processing, AI integration, and secure financial management for users

4.3 CHATBOT INTEGRATION FOR INVESTMENT ADVICE

A key feature of this application is the AI-driven chatbot that offers personalized investment advice based on user queries. The chatbot was integrated into the application using natural language processing (NLP) models developed in Python and interfaced via Flask API endpoints. Users could input investment-related questions or risk preferences, which the chatbot processed to return suitable financial advice.

The chatbot backend was powered by a pre-trained NLP model fine-tuned on financial text datasets. Flask routes managed the reception of user queries from the frontend, processed them through the NLP model, and returned responses in real time. As recommended by Yang et al. [6], integrating AI models through modular APIs facilitated scalable, efficient AI services.

The chatbot's intelligence lay in understanding user intent, assessing financial context, and generating tailored recommendations. It leveraged rule-based decision trees and AI prediction models for portfolio suggestions, aligned with strategies discussed in Wang and Yu [5] and Huang et al. [4], where reinforcement learning and inverse optimization were applied to financial advisory systems.

User queries and AI responses were logged for performance evaluation, and security measures were applied to prevent injection attacks. This AI chatbot enhanced the platform's utility by providing interactive, human-like financial guidance and fostering user engagement [3].

4.4 EXPENSE TRACKING MODULE

Effective personal finance management requires systematic tracking of expenses and budgeting insights. This module allowed users to log expenses by category, view summaries, and analyze trends through graphical dashboards.

The module's frontend provided a user-friendly form for entering transaction details such as amount, category, and date. Data validation was handled via JavaScript before being sent to the backend. Flask routes received this data and stored it in the application's database.

Python's Pandas library processed transaction data to compute monthly summaries, category-wise spending breakdowns, and percentage trends. Expense data was aggregated in real time, and the results were delivered back to the frontend in JSON format for visualization through Chart.js.

This module's functionality aligns with similar implementations in personal finance apps, where real-time expense monitoring empowers users to identify spending patterns and control unnecessary expenditures. Shafiee et al. emphasized that financial literacy improves significantly when users visualize their expenses dynamically.

Backend safeguards ensured that user-submitted data was sanitized and authenticated. The module could be further expanded to incorporate predictive analytics for future expense forecasting, a feature recommended in several AI-driven finance studies.
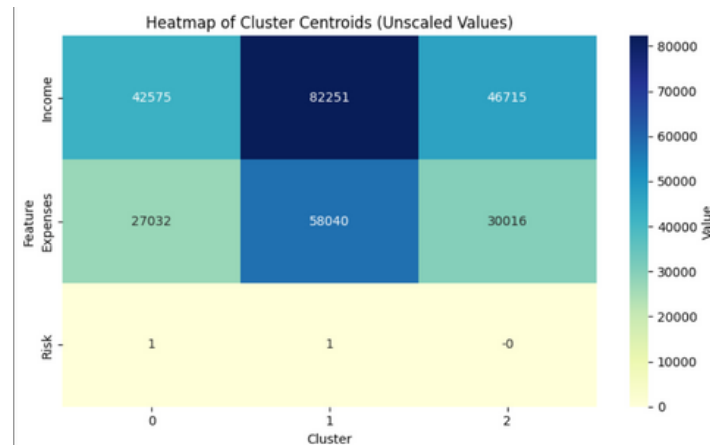

Fig 4.4.1 Heatmap of Spendings of users

4.5 REAL-TIME MARKET DATA INTEGRATION (INVESTING.COM API)

To help users make informed financial decisions, the application integrated real-time market data. The Investing.com API was chosen for its reliable and comprehensive financial data coverage, including stock indices, currency rates, and commodity prices.

A dedicated Flask service periodically fetched market data using scheduled API calls. JSON responses were parsed and processed using Python scripts to extract relevant financial indicators. This data was then served via API endpoints to the frontend, where JavaScript dynamically updated market panels without requiring page reloads.

This feature was crucial for delivering timely financial insights, as highlighted in financial applications leveraging real-time data streams [1][10]. Wang and Yu [5] noted that AI and real-time market intelligence improve the effectiveness of robo-advisors and investment systems.

Security measures included API key management, encrypted data transmission, and failover handling for API downtime scenarios. The data retrieval logic was optimized to avoid excessive API calls while ensuring data freshness for end users.

Chapter 5
Result and Discussion

RESULT AND DISCUSSION

This section presents the results achieved during the development and testing of the AI-based web application, directly mapped to the objectives outlined earlier.

5.1 Development of Web-Based Platform for Centralized Financial Tracking

The application successfully provides a centralized platform where users can register, log in, and manage their financial data. Users can input income, record expenses, view categorized breakdowns, and receive financial insights from a single dashboard, achieving a smooth user experience across devices.
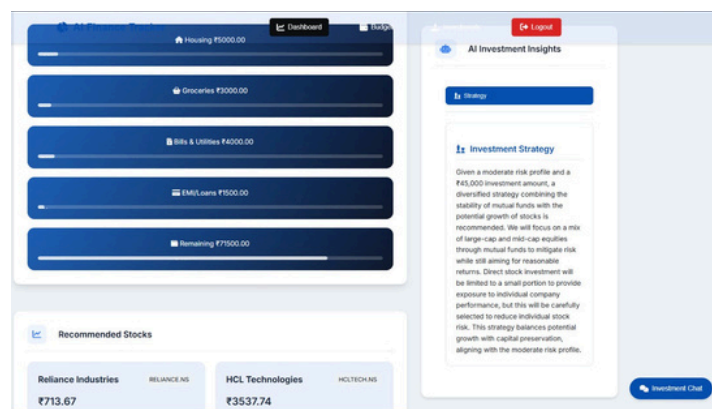
Screenshot 5.1.1 Expense Tracking

## 5.2 Personalized Financial Insights Using AI

AI models such as Decision Trees and Random Forests were implemented to analyze user behavior patterns, income levels, spending habits, and risk appetite. Based on the analysis, personalized financial advice and tailored budget planning were generated. This helps users receive custom strategies instead of generic financial suggestions
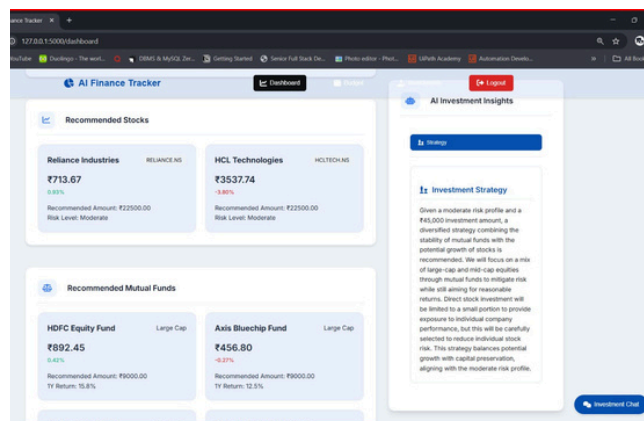
Screenshot 5.2.1Chatbot Recommendations

5.3 Recommendation of Savings and Investment Strategies

The system provides users with smart savings and investment recommendations based on their financial goals and risk profiles. Suggestions are dynamically generated to align with individual needs, whether conservative, moderate, or aggressive financial plans.
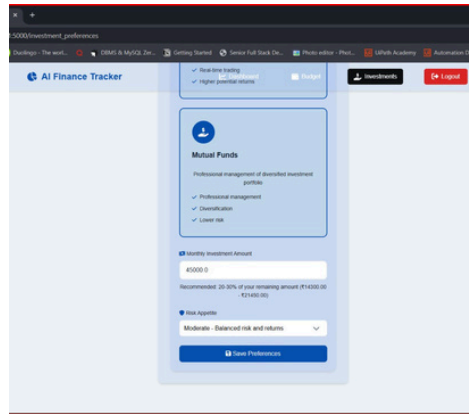
Screenshot 5.3.1 Investment Preference

5.4 Real-Time Data Visualization

Interactive charts and dashboards were created using libraries such as Matplotlib and Chart.js. Users can view:

- Expense distribution via pie charts
- Monthly income vs. expense analysis through bar graphs
- Investment growth projections
- Savings goals tracking

This real-time visualization helps users better understand and plan their financial journeys.

Screenshot 5.4.1 Salary Breakdown

5.5 Secure User Authentication and Data Encryption

A secure login and registration system was implemented using Flask-Security and password hashing algorithms. Data encryption techniques were applied to user records to ensure the confidentiality and integrity of personal financial information, building user trust and complying with standard security practices.
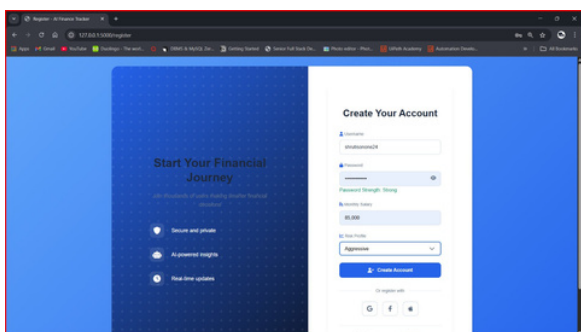
Screenshot 5.5.1 New User Registration
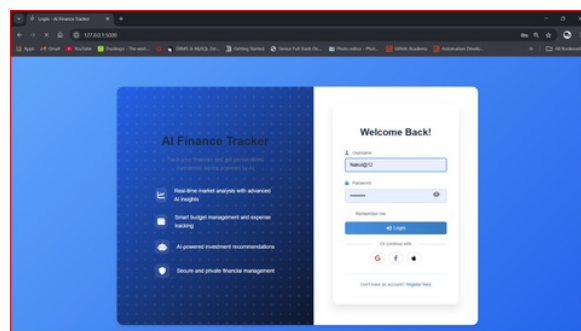
Screenshot 5.5.2 Login Page

5.6 Real-Time Integration with External APIs

Real-time stock market insights were integrated using the Investing.com API and yfinance library. Future planning includes extending integration with bank feeds and investment platforms via secure APIs. The current system fetches live market data, enabling users to track NIFTY 50 stock performance and make informed investment decisions.

5.7 Comparative Study: Gemini vs ChatGPT

Feature	Gemini	ChatGPT
Model Type	Multimodal	Primarily Text LLM
Response Quality	More factual	Empathetic
Emotional Understanding	Moderate	High
Personalization	Limited	Good with prompt tuning
Availability	Limited access	Widely accessible
API Flexibility	Good	Very good
Suitability for Financial Ability	Basic support	Better Support

5.8 Challenges Faced

- Understanding diverse financial profiles due to varied income and expense patterns.
- Balancing useful advice without giving legal or investment guarantees.
- Ensuring complete data privacy while handling sensitive financial information.
- Dealing with incomplete or inaccurate user inputs during conversations.
- Personalizing suggestions based on different user risk appetites.

Summary

The AI-based Financial Assistant successfully achieved the major objectives set at the beginning of the project. It is capable of generating personalized financial advice based on user income, expenses, and risk preferences while maintaining privacy and data security. Despite challenges such as handling incomplete inputs and balancing advice within legal boundaries, the system provides a helpful, user-friendly, and secure experience. Overall, the project demonstrates the potential of AI in supporting better financial planning for individuals.

Chapter 6
Conclusion & Future Scope

CONCLUSION AND FUTURE SCOPE

6.1 CONCLUSION

The proposed AI-Based Personalized Finance Tracker offers an innovative solution for modern-day financial management by combining user-centric design with the power of artificial intelligence. Through intelligent user segmentation using K-Means Clustering, the system delivers actionable insights on budgeting, expense control, and investment planning based on individual financial behavior.

By integrating real-time market data and providing AI-driven recommendations, the application enhances financial literacy, encourages responsible spending habits, and fosters long-term savings and investment discipline. The clean user interface, dynamic visualizations, and chatbot assistant ensure a seamless and engaging experience for users across financial backgrounds.

This project demonstrates the potential of merging machine learning with fintech to democratize financial awareness and empower users to take charge of their economic well-being.

6.2 FUTURE SCOPE AND ENHANCEMENTS

While the current system provides foundational tools for personalized financial tracking and planning, several promising opportunities exist for future development and innovation. These include enabling automated income and expense tracking through bank and UPI integration with financial APIs like Razorpay, Plaid, or India Stack; implementing advanced predictive and investment modeling using K-means for expense forecasting and reinforcement learning for real-time portfolio optimization and AI-driven investment strategies; incorporating gamification and goal setting through savings challenges, badges, and visual progress tracking to enhance user engagement; deploying cross-platform mobile apps using React Native or Flutter with real-time notifications for spending alerts, investment tips, and financial milestones; and enhancing the chatbot with large language models (LLMs) like GPT for more intelligent financial interactions, while ensuring data privacy and compliance through AES encryption and adherence to GDPR standards.

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RESEARCH ARTICLE	OPEN ACCESS

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Abstract :

Managing personal finances is a common challenge faced by individuals, often leading to inefficient budgeting and uninformed investment decisions. This paper presents an AI-based personal finance tracker designed to offer personalized investment suggestions and expense tracking. The system leverages machine learning to analyze user data and provide customized financial recommendations based on salary and risk appetite. Additionally, the integration of real-time market data from Investing.com API enhances investment decisions. The proposed solution aims to empower users with data-driven insights, improving financial planning, savings, and investment efficiency.

*Keywords***:** Personal Finance, Artificial Intelligence, Investment Planning, Expense Tracking, Financial Chatbot.

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1. INTRODUCTION

Managing personal finances is a complex and often overwhelming task for many individuals. With the rising cost of living and increasing financial responsibilities, it has become essential to develop effective strategies for income allocation, expense tracking, and investment planning. However, most people lack the necessary financial knowledge and discipline to manage their finances efficiently. Traditional financial planning methods often involve seeking advice from friends, family, or financial advisors, but such approaches may not always align with an individual's specific financial goals and risk tolerance.

The proposed system integrates machine learning algorithms and real-time financial data to offer personalized investment suggestions, track expenses, and provide financial insights tailored to individual user profiles.

The primary objective of this research is to develop an intelligent financial assistant that simplifies financial decision-making by providing users with data-driven insights.

By leveraging AI and real-time market data, the system empowers users to optimize their financial strategies, improve savings, and make informed investment decisions.

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2. PROBLEM STATEMENT

Many individuals face significant challenges in managing their finances effectively due to multiple factors, including the lack of personalized investment strategies, inefficient expense tracking, limited awareness of investment opportunities, and difficulty in maintaining a balance between expenses and investments. Often, people rely on generic financial advice or word-of-mouth recommendations, which fail to align with their unique financial goals, risk tolerance, and income levels, resulting in suboptimal investment decisions and potential financial losses. Additionally, the absence of a structured expense-tracking mechanism makes it difficult for individuals to monitor their spending habits, leading to excessive expenditures, poor budgeting, and an overall lack of financial discipline. Furthermore, the widespread lack of financial literacy prevents people from understanding various investment options, limiting their ability to analyze stock market trends and make informed investment choices. As a result, many individuals either overspend without saving adequately or remain overly cautious, missing out on potential wealth-building opportunities. Addressing these challenges requires an AI-driven financial management system that provides personalized investment planning, real-time market insights, structured budgeting tools, and financial guidance tailored to individual needs, ultimately enabling users to achieve long-term financial stability and growth.

3. OBJECTIVES

1.To simplify personal finance management by providing a centralized platform for tracking income, expenses, and investments.

2. To empower users with AI-driven insights that enable them to make informed financial decisions based on their financial profile.

3. To provide personalized investment recommendations using machine learning models, ensuring that users invest in assets aligned with their risk appetite.

4. To integrate real-time market analysis by incorporating live stock market data, keeping users updated on Nifty 50 stock performance and global market trends.

5. To enhance budgeting capabilities by offering an user friendly expense tracker that helps users visualize their spending habits and achieve personalized financial goals.

6. To integrate a AI based chatbot which helps user solve the general queries related to finance.

4. METHODOLOGY

AI-Powered Investment Suggestions - Investment planning is one of the most crucial aspects of financial management, as it directly impacts an individual's wealth-building potential. The system employs advanced machine learning algorithms to analyze the collected financial data and generate personalized investment recommendations. These recommendations are tailored based on several factors, including income level, financial goals, risk tolerance, and market trends.

The machine learning model is trained on historical financial data, including stock market performance, investment trends, and economic indicators. It classifies users into different investor profiles, such as conservative, moderate, or aggressive, based on their risk appetite.

For example, a user with a low-risk tolerance may receive investment suggestions focusing on fixed deposits, bonds, and index funds, whereas a high-risk investor may be recommended equity-based investments, mutual funds, or cryptocurrency portfolios.

Furthermore, the AI system continuously refines investment recommendations by incorporating real-time market data and user behavior patterns. As users engage with the platform and modify their financial goals, the AI model adapts accordingly, ensuring that investment strategies remain aligned with their evolving financial needs. This dynamic investment planning approach enables users to maximize returns while minimizing risks, making financial planning more accessible and effective.

Live Market Overview & Stock Insights -A key component of informed investment decision-making is access to real-time stock market insights. Many individuals lack financial literacy and struggle to analyze stock market trends, often leading to missed investment opportunities or poor financial decisions. To bridge this gap, the AI-based financial management system integrates the Investing.com API, which provides users with live stock market updates, particularly focusing on Nifty 50 stocks.

By continuously monitoring stock performance, market trends, and economic indicators, the system ensures that users have access to the latest financial data. The stock insights module presents key financial metrics such as stock price movements, historical performance, and financial news updates, allowing users to make data-driven investment decisions.

Additionally, the system offers a visual representation of market trends through interactive charts and graphs, making financial analysis more intuitive.

Users can explore stock performance over different time periods, compare different investment options, and receive AI-generated insights on potential market opportunities.

This real-time market monitoring ensures that users stay informed about financial market dynamics and can adjust their investment strategies accordingly. Future enhancements may include predictive market analysis powered by deep learning models, enabling the system to anticipate market trends and suggest proactive investment strategies.

Expense Tracking & Budgeting - One of the most significant challenges individuals face in financial management is maintaining control over their expenses. Without a structured approach to expense tracking, users often struggle with unnecessary spending, making it difficult to achieve their savings and investment goals. The AI-based financial management system addresses this issue by offering a comprehensive expense tracking and budgeting module.

Users can manually log their daily, weekly, or monthly expenses into the system, categorizing them into predefined or custom spending categories such as groceries, rent, entertainment, transportation, and savings. The system then analyzes spending patterns, identifying areas where users may be overspending and offering suggestions for cost-cutting measures.

The interactive budgeting tool helps users set financial goals, allocate spending limits for different categories, and receive real-time alerts when they exceed predefined budget thresholds. By visualizing spending habits through detailed reports and graphical representations, the system fosters financial discipline and encourages users to adopt healthier financial behaviors.

Financial Summary & Insights - The final stage in the system's methodology involves generating a comprehensive financial summary, providing users with a holistic view of their income, expenses, savings, and investments. The AI-powered dashboard consolidates all financial data into an easy-to-understand format, enabling users to assess their financial health at a glance.

The financial summary module presents key insights such as:

- Monthly income vs. expenses analysis, highlighting surplus or deficit trends.
- Savings rate calculations, helping users evaluate their financial discipline.
- Investment portfolio breakdown, showing asset allocation and projected returns.
- AI-generated recommendations for optimizing financial strategies, including potential investment opportunities or areas to reduce unnecessary spending.

By integrating these insights into a user-friendly interface, the system ensures that individuals, regardless of their financial expertise, can make informed financial decisions. The system also includes goal-setting features, allowing users to establish financial targets such as emergency savings, homeownership, or retirement planning. The AI model continuously tracks progress towards these goals and provides personalized recommendations to help users stay on track.

Future advancements in this module may include AI-powered financial advisory features, where users can interact with a chatbot to receive instant, data-driven answers to their financial queries. Additionally, predictive analytics could be incorporated to forecast users' future financial standing based on their current financial behavior and market trends.
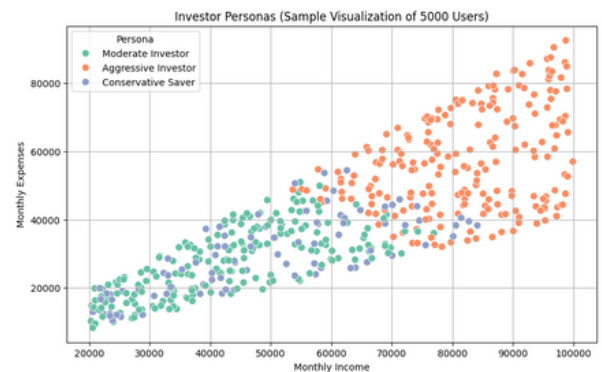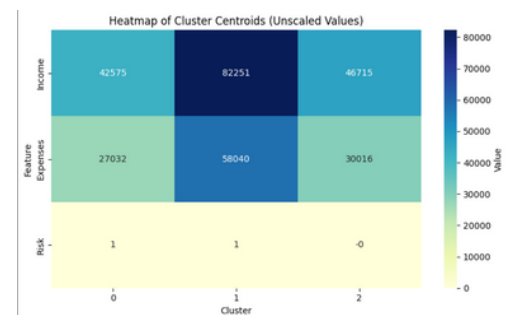

Fig. Clustering based on Expenses

Fig. Heatmap of Clusters

5. CONCLUSION

The proposed AI-based financial management web application provides an innovative solution to common financial challenges faced by individuals. By leveraging machine learning algorithms and real-time stock market data, the system offers users personalized investment recommendations, efficient expense tracking, and financial insights tailored to their needs. The integration of an intuitive expense tracker ensures that users can monitor their spending habits, while real-time market updates help them make informed investment decisions.

This research highlights the importance of AI in financial planning and its potential to revolutionize personal finance management. The system not only assists users in achieving financial stability but also promotes long-term wealth accumulation through data-driven investment strategies.

Future enhancements to the system will focus on improving AI-driven financial advisory services, automating expense categorization using AI models, and incorporating goal-based savings plans. These advancements will further enhance the application's capabilities, providing users with a more comprehensive financial management tool.

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