

FinFlow: A Unified Platform for Streamlined Financial Portfolio Integration and Management

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Abstract

In the fast-paced, ever-changing financial environment of today, consumers are interacting with a growing diversity of financial services and products. From old standards like stocks and mutual funds to new assets in the form of cryptocurrencies and widely used mobile wallets for everyday purchases, today's consumers are constructing sophisticated, multilayered financial portfolios. However, the growing availability of financial products has not been matched by a corresponding evolution in the way these services are managed collectively. Most users are forced to juggle multiple platforms and applications to access and manage different parts of their wealth. Without aggregated dashboards or analytics, it is challenging to obtain a clear view of their asset allocation, risk exposure, or return on investment. The requirement for a hassle-free, cohesive financial management solution has become more important. This paper introduces FinFlow, a platform designed to consolidate all significant asset classes—equities, mutual funds, cryptocurrencies, and mobile wallet balances—into a unified, secure environment. Through the use of APIs, data aggregation technology, and AI-powered analytics, FinFlow offers real-time account synchronization, easy visualization of financial data, personalized analysis, and actionable advice to empower users and promote fiscal literacy.

Keywords: Financial Technology (FinTech), Portfolio Management, Data Aggregation, Machine Learning, Recommendation Systems, Risk Assessment.

1 Introduction

The financial services sector has witnessed a dramatic transformation over the last decade, driven by accelerated digitalization and the emergence of fintech startups. This has democratized finance, granting individuals unprecedented access to a wide array of financial

instruments, including mobile wallets, robo-advisors, cryptocurrency exchanges, and mutual fund platforms [1]. While this offers greater control, it has introduced significant complexity in personal finance management.

Historically, wealth management was centralized within a single institution. Today's financial system, however, is highly decentralized. A typical user may use a brokerage app for stocks, another platform for mutual funds, a separate exchange for cryptocurrencies, and various mobile wallets for daily transactions. These platforms operate in silos, with distinct data structures, reporting protocols, and interfaces. This fragmentation makes it difficult for users to maintain a holistic view of their financial health, monitor net worth, or assess investment performance accurately.

This project, FinFlow, is motivated by the critical need to address the inefficiencies caused by this fragmentation. The primary goal is to create a comprehensive and user-friendly financial management solution that consolidates disparate financial data into a single, intelligent dashboard. By centralizing this information, FinFlow aims to simplify portfolio management, enhance decision-making through AI-driven insights, and provide a seamless, personalized experience across all aspects of a user's wealth.

2 Literature Review

The concept of integrating various financial services onto a single platform is gaining traction as individuals struggle with wealth management across multiple, fragmented systems [1]. Such fragmentation leads to inefficiency and a lack of comprehensive visibility into one's financial health. A consolidated platform like FinFlow addresses this by offering hassle-free integration, simplifying asset management from a single point of access.

The role of Artificial Intelligence (AI) and Machine Learning (ML) in such systems is significant. AI can

enhance user experience by providing personalized recommendations and real-time financial counsel, enabling users to optimize their portfolios [2]. Technologies like blockchain ensure secure and transparent transactions, while big data analytics helps in processing vast amounts of financial information to offer customized advice.

Existing frameworks often utilize recommendation algorithms like collaborative and content-based filtering to suggest financial products. Portfolio optimization models such as Mean-Variance Optimization and the Black-Litterman Model are used to balance risk and return. Despite these advancements, significant research gaps remain, particularly in achieving seamless, real-time data integration across diverse platforms, developing highly personalized financial recommendation systems, and ensuring robust security for multi-asset platforms. Table 1 provides a comparison of various approaches in financial services integration.

Table 1: Comparison of Various Studies in Financial Services Integration

Study	Methodology	Key Findings
		Improved portfolio management through personalized recommendations
Study 1	Collaborative Filtering	Achieved low-latency updates for real-time market data
Study 2	Real-time Data Streaming	Enhanced transaction transparency and security
Study 3	Blockchain	Optimized risk-return profiles for diverse asset classes
Study 4	Mean-Variance Optimization	Better user engagement with personalized financial products
Study 5	Hybrid Recommendation System	

3 Proposed Methodology

The proposed system, FinFlow, is a unified financial management platform designed to aggregate and visualize data from diverse instruments like stocks, mutual funds, cryptocurrencies, and mobile wallets. The core objective is to eliminate fragmentation, enhance user convenience, and provide personalized insights via an intelligent, secure, and scalable dashboard.

3.1 System Architecture

FinFlow is built on a modular three-tier architecture, as depicted in Figure 1.

- **Frontend:** Developed using React, the frontend provides a user-friendly interface for data visualization, portfolio tracking, and interaction. It includes a dashboard, interactive charts, and a chatbot for financial queries.
- **Backend:** Built with Node.js and Express, the backend handles business logic, data processing, and API integrations. It includes modules for user risk assessment, portfolio analysis, data aggregation, and recommendation generation.
- **Database:** A MongoDB database stores user data, transaction histories, and aggregated financial information. It is designed to handle large

volumes of structured and unstructured data efficiently.

Communication between the tiers is secured using AES-256 encryption to protect sensitive financial data.

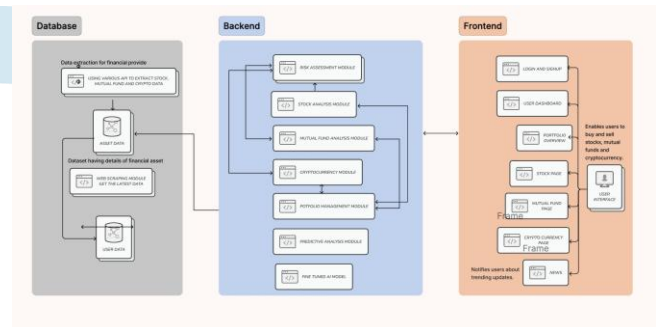


Figure 1: Proposed System Architecture of FinFlow

3.2 Key Features

The proposed system includes the following features:

- **Unified Dashboard:** A single, consolidated view of the entire financial portfolio, including holdings, transactions, and performance analytics.
- **Integrated Transactions:** Ability to execute buy, sell, and transfer transactions across different asset classes directly from the platform.
- **Personalized Insights:** Advanced analytics and AI-driven reporting tools to offer customized recommendations based on user goals and risk tolerance.
- **Robust Security:** Implementation of industry-standard security protocols, including multi-factor authentication and end-to-end encryption.
- **Educational Resources:** A repository of articles, tutorials, and webinars to enhance users' financial literacy.

4 System Design and Datasets

The design of FinFlow focuses on creating a robust and scalable solution for portfolio management. The system's structure is visualized through several standard modeling diagrams. The Data Flow Diagram (DFD) in Figure 2 illustrates the movement of data across modules, from external sources to the recommendation engine. The Entity-Relationship (ER) diagram in Figure 3 details the underlying data model, outlining key entities such as users, portfolios, assets, and their interconnections.

4.1 Datasets

To power its analytical engine, FinFlow utilizes datasets from major domains of the Indian financial market. These datasets, summarized in Table 2, enable a unified analysis and recommendation system that integrates diverse financial instruments.

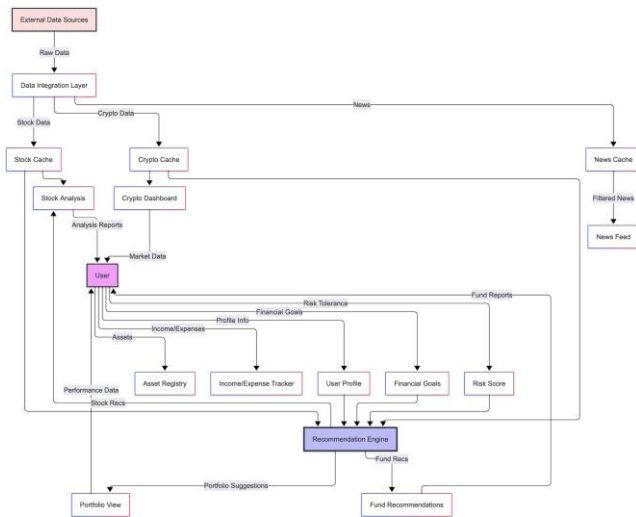


Figure 2: Level 1 Data Flow Diagram (DFD) of Fin-Flow

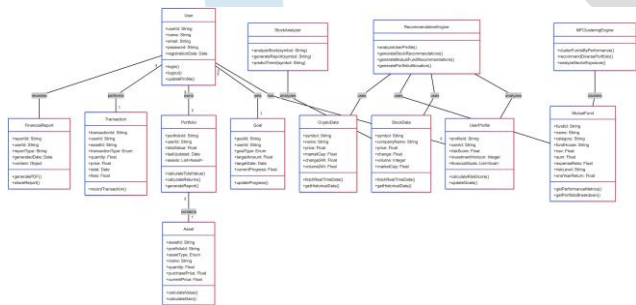


Figure 3: Entity-Relation (ER) Diagram of FinFlow

5 Implementation and Results

5.1 Data Preprocessing

The preprocessing phase is crucial for transforming raw, heterogeneous financial data into a structured format suitable for analysis. User data was collected via secure forms, while market and news data were sourced from APIs like Yahoo Finance, CoinCap.io, and Google News. The preprocessing pipeline is detailed in Table 3.

5.2 Algorithm Implementation

Key algorithms were implemented to power FinFlow’s core functionalities:

- **User Risk Assessment:** A composite score is calculated based on user demographics, financial status, and behavioral responses. The algorithm is shown in Algorithm 1.
- **Portfolio Diversification:** Asset allocation is performed based on the user’s risk profile, with mutual funds diversified using hierarchical clustering.
- **Stock Price Prediction:** A dual-model approach using Prophet for seasonal trends and ARMA for trend prediction was implemented.

Table 2: Datasets for Indian Financial Market Analysis

Dataset Name	Source	Description	Duration
NSE Stock Data Volume,	NSE	Daily price, and OHLC data	2010-2024
Mutual Fund NAV Data	AMFI	NAV, fund type, fund house details	2015-2024
Crypto Price Data	CoinGecko / WazirX API	Daily historical prices in INR	2017-2024

Table 3: Financial Data Preprocessing Pipeline

Data Type	Processing Techniques	Purpose
User Data	Missing value imputation, normalization	Accurate risk scoring
Stock Prices	Min-Max scaling, technical indicators (RSI, MACD)	Model-ready time series input
Mutual Fund Data	Sorting, Filtering, Clustering	Diversification
Cryptocurrency Data	Volatility calculation, trend detection	Risk profiling
News Articles	Stopword removal, sentiment scoring (FinBERT)	Sentiment analysis

5.3 Performance Evaluation

The performance of the predictive models was evaluated using standard metrics. The stock forecasting models (Prophet and ARMA) and the sentiment analysis model (FinBERT) were assessed for precision, recall, F1-score, and accuracy. The results, summarized in Table 4, demonstrate high accuracy and reliability, confirming the effectiveness of the chosen models for financial analysis and prediction.

Table 4: Model Performance Comparison

Model	Precision	Recall	F1	Accuracy
Prophet	0.85	0.83	0.84	0.87
ARMA	0.88	0.85	0.86	0.89
FinBERT	0.90	0.88	0.89	0.91

The system was also validated through a series of test cases covering core functionalities like risk profiling and sentiment analysis, all of which passed successfully.

6 Conclusion and Future Scope

6.1 Conclusion

FinFlow successfully addresses the challenge of financial fragmentation by providing a comprehensive, integrated portfolio management platform. By efficiently aggregating real-time data from stocks, mutual funds, and cryptocurrencies, the system empowers users to make informed investment decisions. Key features such as user risk profiling, predictive modeling with Prophet and ARMA, and sentiment analysis using FinBERT provide deep analytical capabilities. The secure and scalable MERN stack architecture ensures that FinFlow is a robust and adaptable solution, demonstrating significant value in helping users achieve their financial goals through data-driven, personalized insights.

Algorithm 1 User Risk Assessment**Input:** User Profile ‘user’**Output:** Risk Score ‘final_score’, age_score $\leftarrow \max(0, 10 - (user.age - 25) \times 0.2)$ 12: $dti_score \leftarrow 10 - \min(8, \lfloor user.dti_ratio/10 \rfloor)$ 3: $inv_score \leftarrow user.investment_exp_score$ 4: $behav_score \leftarrow user.behavioral_resp_score$ 5: $final_score \leftarrow 0.2 \times age_score + 0.25 \times dti_score +$ 6: $0.3 \times inv_score + 0.25 \times behav_score$ 7: **return** round(final_score, 2)

6.2 Future Scope

While FinFlow has achieved its core objectives, several enhancements can further improve its functionality:

- **Real-time Trading Integration:** Integrate with brokerage APIs (e.g., Zerodha, Upstox) to enable direct trade execution.
- **Advanced Sentiment Analysis:** Expand sentiment analysis to include multilingual support and asset-specific tracking.
- **Tax Planning Module:** Implement a module to help users optimize tax savings based on their investment patterns.
- **AI-Powered Risk Management:** Use reinforcement learning to dynamically adjust user risk profiles based on market conditions.
- **Mobile Application:** Develop a cross-platform mobile app using React Native for greater accessibility.

These enhancements would solidify FinFlow’s position as a leading, user-centric financial management platform.

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