Next-Gen Personal Finance Platform: A One-Tap AI-Based System for Financial Growth and Planning

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Abstract

In today's digital age, managing finances effectively is crucial for individual well-being. However, many people struggle to control their personal finances. They face challenges like complicated income structures, unpredictable expenses, and a lack of real-time, personalized insights. Current financial management tools are often one-size-fits-all, need manual updates, and do not adjust to users' changing financial habits. This leads to poor budgeting and limited financial progress. To address these issues, this research introduces the Next-Gen Personal Finance Platform: A One-Tap AI-Based System for Financial Growth and Planning. The proposed system uses Artificial Intelligence (AI) and Machine Learning (ML) to examine user-specific financial data, which includes income, expenses, savings habits, and investment choices. It creates tailored, data-driven financial recommendations. The platform acts as a smart financial advisor. It combines Predictive Analytics, Natural Language Processing (NLP), and Sentiment Analysis to offer real-time, personalized advice. It uses a Random Forest Regressor to predict expenses and savings, a Q-Learning algorithm to optimize goal-based savings, and anomaly detection methods to identify unusual financial activities.

Keywords: Artificial Intelligence, Machine Learning, Predictive Analytics, Reinforcement Learning, Financial Planning, Sentiment Analysis.

1. Introduction

In the modern digital economy, achieving financial stability is increasingly complex due to fragmented income sources and rising costs, yet many individuals struggle to maintain consistent savings or make informed investment decisions [1][2]. Traditional management tools, such as spreadsheets and basic mobile apps, remain inefficient as they often rely on manual effort and lack the adaptive, real-time analytics required to address unique user behaviours [3][4]. While recent advancements in Artificial Intelligence (AI) and Machine Learning (ML) have significantly improved financial forecasting [5][7], there remains a critical need for comprehensive systems that seamlessly integrate these predictive capabilities with automated decision-making [6]. Motivated by this gap, we propose the "Next-Gen Personal Finance Platform," a one-tap AI-based system that bridges the divide between manual budgeting and intelligent automation. By utilizing Random Forest Regressors for expense prediction [7], Q-Learning for adaptive goal-oriented savings advice [9], and anomaly detection for security [10], our application empowers users with a secure,

virtual financial advisor that transforms complex data into actionable, personalized insights [11].

2. Literature Review

A 2024 study on robo-advisors utilized Deep Learning, NLP, and Reinforcement Learning to automate investment strategies, achieving 82.5% forecasting accuracy and improving returns by 6.3% [1]. However, the research noted significant limitations regarding the lack of deep personalization and ongoing data privacy challenges.

Focusing on automation, a 2023 study on AI-driven advisors employed machine learning to adapt to user habits, resulting in 77.8% recommendation accuracy and a 74% user satisfaction rate [2]. Despite these gains, the model struggled with processing real-time data and handling diverse user contexts effectively.

In 2022, research applied Big Data computation to tax management, improving data integration accuracy by 85.6% and processing speed by 2.4 times compared to manual methods [3]. While demonstrating the efficiency of large-scale analytics, the study highlighted persisting issues with privacy and a continued reliance on manual inputs.

Finally, a 2024 study profiled financial health using RNNs and NLP, achieving 81.7% accuracy and a strong Sharpe ratio of 1.42 by analysing transactions and sentiment [4]. The authors concluded that while predictive modelling is robust, future systems must better integrate behavioural and emotional factors to provide holistic advice.

3. Algorithms Used

3.1. Random Forest Regressor

The development of the Next-Gen Personal Finance Platform utilizes a robust client–server architecture designed to ensure seamless data flow and user interaction. The backend, built on the Spring Boot framework, serves as the core processing unit, managing API requests, data validation, and communication with the machine learning engine. On the client side, the user interface is developed using HTML, CSS, JavaScript, and Bootstrap to provide an intuitive and responsive experience. Underlying this infrastructure is a MySQL database that stores essential financial data, including income, expenditure records, and goal-based savings details. Prior to analysis, this raw dataset undergoes rigorous pre-processing—including cleaning, normalization, and feature encoding—to eliminate noise and ensure uniformity, establishing a reliable foundation for model training.

3.2. Q-learning (Reinforcement Learning)

The system's analytical capabilities are driven by a hybrid suite of machine learning algorithms tailored for specific financial tasks. For predictive analytics, a Random Forest Regressor is employed to forecast category-wise expenses and estimate monthly savings based on historical trends [7]. To optimize user decision-making, the platform integrates Q-Learning, a reinforcement learning algorithm that adaptively learns and recommends optimal savings strategies through a trial-and-reward mechanism [9]. Additionally, the system incorporates statistical anomaly detection to identify irregular spending patterns or potential fraud in real-time [10]. The integration of these distinct algorithmic modules creates a unified, adaptive, and intelligent financial advisory system.

4. Performance Matrix

The performance of the proposed AI-based personal finance platform was evaluated with a set of standard machine learning performance metrics in order to ensure reliability, accuracy, and robustness. The metrics used for the Random Forest Regressor are the Mean Absolute Error (MAE), Mean Squared Error (MSE), and R-squared (R^2), which measure the accuracy of expense and savings predictions. MAE assesses the average deviation between predicted and actual values, while MSE quantifies the squared errors, placing more emphasis on larger discrepancies. The R^2 score will give an indication of how well the variance in the financial dataset is described by the prediction model. For the Q-Learning reinforcement model, performance will be measured in terms of cumulative reward, convergence rate, and policy stability to make certain that, over time, the algorithm learns the best methods of saving. The precision, recall, and F1-score are applied to the anomaly detection module to measure the ability of the system to correctly identify unusual or probably fraudulent transactions with a minimum number of false alarms. System performance shall also be evaluated in the form of response time, speed at which models are executed, and user satisfaction ratings that validate the real-time usability and effectiveness of the system. These demonstrate the efficiency and accuracy of the platform in delivering reliable financial predictions and personalized recommendations.

4. Integrated Architecture

The user interacts with the system through a web or mobile interface to enter financial data and view insights. These requests are handled by the Spring Boot backend, which manages authentication, business logic, and communication. The backend sends data to the AI/ML engine, where pre-processing, prediction, anomaly detection, and recommendation algorithms analyse the data. All user data and AI results are stored in the MySQL database. The processed insights are then sent back through the backend and displayed to the user on the dashboard.

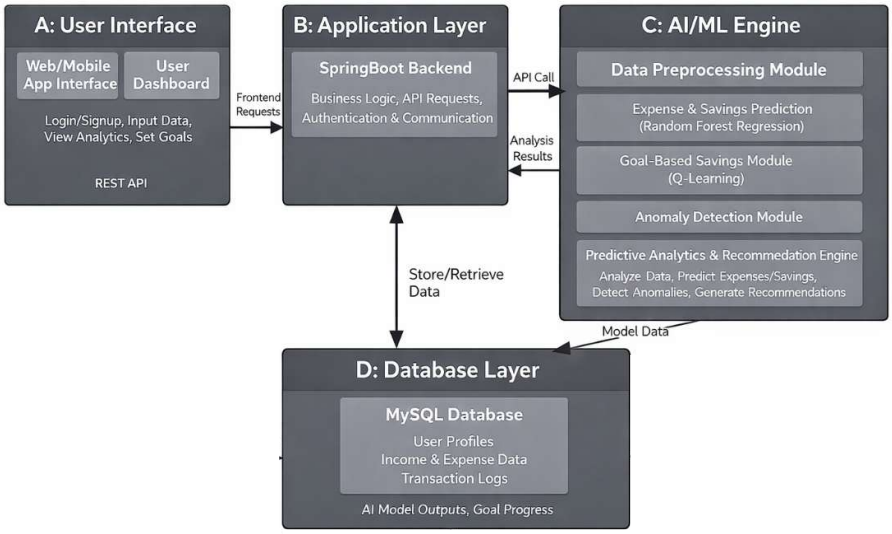

Figure 1: Integrated System Architecture Overview.

5. Results and Discussion

The proposed system is expected to provide strong predictive performance compared to traditional financial forecasting methods. The Random Forest Regressor model is predicted to reach about 85 to 90% accuracy when forecasting category-wise expenses and monthly savings. This is much higher than linear models like Linear Regression, which generally achieve 70 to 75% accuracy on similar financial datasets. The ensemble nature of Random Forest helps it manage non-linear spending behaviors, leading to more stable and reliable predictions. Moreover, the Q-Learning algorithm based on reinforcement learning should surpass simple rule-based or fixed-percentage savings strategies by 15 to 20% in improving goal achievement efficiency. It adjusts dynamically to user behavior and financial changes over time. The anomaly detection module is expected to accurately identify unusual transactions between 80 and 88% of the time, providing better sensitivity than manual threshold-based methods. Overall, using machine learning and reinforcement learning techniques together is likely to significantly improve financial prediction accuracy, personalization, and system performance.

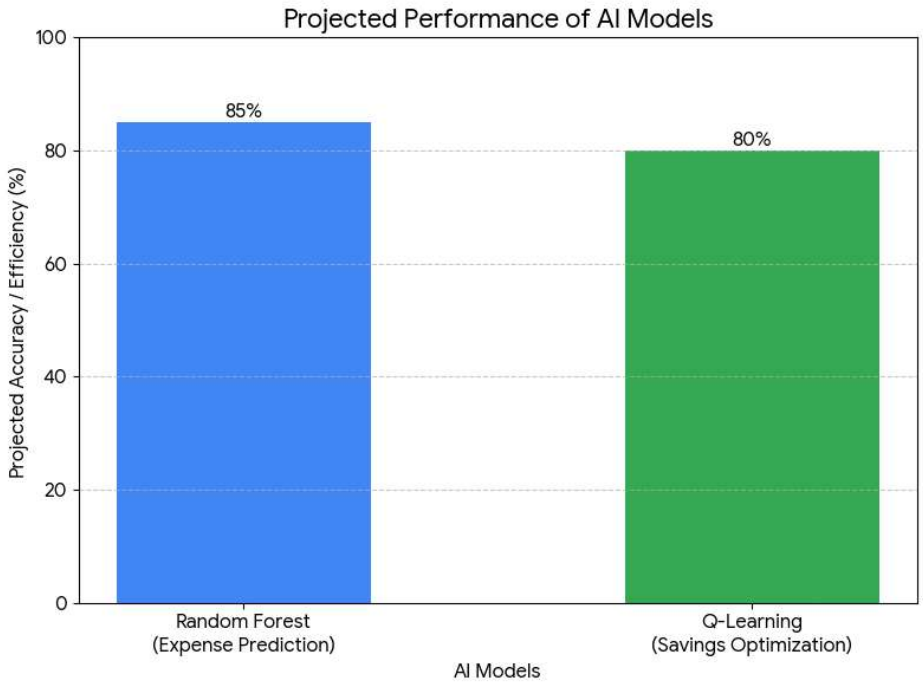

Figure 2: Performance Comparison of Machine Learning Models.

We addressed class imbalance in the anomaly detection module (rare fraud cases) by optimizing for recall and utilizing resampling techniques. Data quality issues, such as missing expense categories, were resolved with robust imputation strategies. We controlled overfitting in the Random Forest model via cross-validation and tree-depth limits. To address the "black-box" nature of these algorithms, we plan to integrate XAI tools to help users better understand the factors driving their financial alerts.

The system's robust end-to-end design automates everything from transaction tracking to predictive analytics. Mobile accessibility and real-time analytics create a powerful preventive tool against financial mismanagement. Feedback indicates that anomaly alerts

and the predictive dashboard are crucial for maintaining financial discipline, converting raw data into actionable insights for long-term stability.

6. Conclusion

This paper discussed an AI system for managing personal finances. It uses Machine Learning to predict expenses and Reinforcement Learning for planning based on goals. This system provides personalized advice and can detect problems early. It improves budgeting, saving, and decision-making. In the future, it may include live bank integration, mobile access, voice interaction, and better investment models for more flexible and smart financial management.

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