A Comparative Study on AI-Based Personal Finance Management Systems

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Abstract: Personal Finance Management (PFM) systems are tracking systems that help people track their expenses, manage their expenses, build a budget plan, and assist in financial decisions. Traditional PFM tools are mainly based on rule-based mechanisms. In Traditional PFM we put our income and expenses manually, which limits automation and adaptability. In this Artificial Intelligence (AI) era, modern PFM system comes with AI features, which are capable of automating expense categorization, predicting the budget plan, financial forecasting, and personalized recommendations. Machine Learning (ML), Deep Learning (DL), Natural Language Processing (NLP), and Explainable Artificial Intelligence (XAI) are the techniques that are used for analysis to evaluate system performance in terms of accuracy, automation, personalization, transparency, and security.

Keywords: Artificial Intelligence, Machine Learning, Deep Learning, Natural Language Processing, Explainable Artificial Intelligence, Financial Forecasting.

I. INTRODUCTION

In modern life, due to the increasing complexity of financial ecosystems driven by digital banking, mobile payments, e-commerce platforms, and diversified income sources, Personal Finance Management (PFM) has become an essential aspect. Present-day people have to manage multiple financial accounts, such as savings, credit cards, digital wallets, and investment portfolios, and they generate a large amount of heterogeneous transaction data. Effectively, traditional manual data entry methods become increasingly challenging for tracking expenses, planning budgets, and achieving long-term financial goals.

The Rule-based manual transaction entry methods are followed by Traditional personal finance tools like spreadsheets or basic budgeting applications. When we consider Traditional Personal Finance Management systems, we face some issues, such as the adaptation of dynamic user behavior and predictive capabilities. Traditional PFM systems provide limited analytical insights into spending patterns and financial risks. In recent studies, it is reported that these limitations reduce user engagement and hinder effective financial decision-making, especially in environments characterized by frequent and real-time financial transactions [2][3].

New possibilities for intelligent personal finance management have been introduced by the rapid advancement of Artificial Intelligence. In this AI era, transaction categorization, analysing historical spending behaviour, forecasting future expenses, and delivering personalized financial recommendations are automated by AI-based PFM systems using Machine Learning (ML), Deep Learning (DL), and Natural Language Processing (NLP) techniques. When we compare AI-driven systems and traditional finance management systems, AI-driven systems are more accurate and efficient than traditional finance management systems. Also, user satisfaction is focused on AI-based Personal Management Systems [4][5].

However, despite the superior performance of advanced AI models, critical challenges related to transparency, trust, and interpretability are introduced by the advanced AI models because of its complexity. To understand the reasoning behind financial predictions and recommendations are sometime difficult for users and stakeholders because many high-accuracy ML and DL models operate as "black boxes". The lack of explainability can be the reason behind low uptake, and it also raises ethical, legal, and compliance concerns in regulated financial environments. For this reason, Explainable Artificial Intelligence (XAI) has emerged as a key research area

aimed at enhancing transparency without compromising predictive performance [1][6].

Existing research on AI-based personal finance systems is extensive but fragmented. System implementation and predictive analytics are focused on some studies, while others emphasize explainability, user satisfaction, or comparative effectiveness against traditional methods. Furthermore, most previous studies have analysed individual systems separately, making it difficult to comparatively understand the strengths and weaknesses of different AI approaches in personal finance management [5][7].

In this context, this thesis is basically a comparative study of AI-based Personal Finance Management systems using existing academic research and reported implementations. By synthesizing findings from established literature, this work aims to identify research gaps, highlight best-performing AI techniques, and provide insights into the future development of trustworthy and intelligent personal finance management systems.

II. LITERATURE REVIEW

Significantly, the evolution of Personal Finance Management systems is influenced by the rapid advancement of Artificial Intelligence. Rule-based traditional finance management tools require manual user data entry. These types of Rule-based traditional finance management have some limitation like Adaptation of changing user behaviour and large-scale financial data. As a result, researchers are increasing their exploration of AI-driven approaches to automate, optimize, and personalize personal finance activities.

Several studies emphasized that Machine Learning (ML) techniques play a crucial role in automating expense categorization and analysing spending behaviour. Learn from historical transaction data and classifying expenses into meaningful categories are key features in an ML-based personal finance system. Also, ML-based personal finance systems have the ability to reduce manual effort and improve accuracy. User spending insights are more actionable in ML-based transaction analytics rather than conventional budgeting tools. Also, it improves overall financial awareness compared to conventional budgeting tools [2]. Although these systems mainly focus on short-term expense tracking. Forecasting and explainability support are limited in this system.

To enhance predictive capabilities for financial time-series analysis, Deep Learning (DL) models are also explored by researchers. By implementing regression-based and sequence learning models in forecasting future expenses and identifying long-term financial patterns, Studies highlight the potential of DL techniques. Manasa S, S.K. Shivashankar, P. Prasanna, and H.P. Mohan Kumar proposed an AI-based personal finance management system in their paper. They use machine learning models to predict future expenses and generate budget alerts, demonstrating improved decision support [3]. Although they improved prediction accuracy, high computational complexity and limited transparency are suffered by these systems.

AI-based PFM systems have been expanded further by the implementation of Natural Language Processing. This type of system extracts contextual information like merchant names and user queries from transaction descriptions using NLP techniques. Some Studies proposed that user dependency on manual inputs is reduced when we implement NLP techniques in transaction analysis. Also, NLP-driven transaction analysis improves classification accuracy [2]. Although intent recognition errors are one of limitation of this type of system. And this type of system also failed in multilingual transaction handling.

Financial behaviour and satisfaction were significantly improved by the User-centric evaluations of AI-based personal finance tools. Compared to traditional finance management methods, savings rates, better expense control, and greater goal completion are higher in AI-driven personal finance tools [5]. Although the effectiveness of AI-based tools is highlighted in this study. Behavioural outcomes are the primary focus in this study. And the study provides limited technical insights into underlying AI models.

Due to trust, transparency, and regulatory requirements, explainability is a critical concern in AI-driven financial systems. Survey-based research on Explainable Artificial Intelligence (XAI) emphasizes that black-box AI models are highly accurate. But black-box AI models have some limitation like a lack of interpretability. Niklas Bussman etl. published a study based on Explainable AI in Frontiers in Artificial Intelligence. The importance of post-hoc explainability techniques, such as SHAP, and the feature importance analysis is highlighted in this study. And these techniques improve transparency in financial decision-making [6]. In Another survey study [7] the researchers focus on black-box model interpretability. Ethical and practical concerns of Black Box Models are highlighted in this study. They authors proposed that explainable models are especially important in financial applications. They also proposed that these types of systems have the ability to handle highly sensitive user data.

Overall, it is indicated by literature that in terms of automation, prediction, and user engagement, AI-based PFM systems are more acceptable than traditional finance tools. Individual components such as expense categorization, forecasting, user interaction, or explainability in isolation are the focus of most existing studies. A unified framework to compare AI-based PFM systems is still missing. Most systems are not evaluated using common performance dimensions. Because of this, fair comparison is difficult. This gap in research motivates the present thesis. The thesis aims to compare the existing studies based on AI-based Personal Finance Management systems.

III. ANALYSIS OF METHODOLOGIES

We select some existing studies related to Artificial Intelligence (AI)–based Personal Finance Management (PFM) systems. On the basis of objectives, AI techniques, functional scope, strengths, and limitations of the reviewed systems, we prepare a structured comparative analysis.

A. Machine Learning–Based Personal Finance Systems:

The application of Machine Learning (ML) techniques is investigated by several studies. These studies proposed some systems that use Machine Learning (ML) techniques to automate expense categorization, budgeting, and spending behavior analysis. These systems learn from historical transaction data. And these systems primarily aim in reducing manual financial tracking. We found some research reported in IJERT and IRJMETS, which are based on AI-based Personal Finance Management Systems. When we compare AI-based PFM to traditional rule-based tools, these researches demonstrate that ML-based approaches significantly improve categorization accuracy and provide meaningful spending insights [3], [4].

However, ML-based systems come with some issues, Such as:

- These ML-based systems primarily focus on short-term expense analysis and basic alerts.
- Advanced forecasting capabilities is a issue with this type of system.
- Also, ML-based systems often rely on limited datasets, which limits their ability to scale. And it also reduces real-time adaptability.
- But there is a problem: these ML-based systems primarily focus on short-term expense analysis and basic alerts.

B. Deep Learning–Based Forecasting Approaches:

We found that some studies focus on Deep Learning (DL) models and Long Short-Term Memory (LSTM) networks for financial time-series forecasting. These models overcome the limitations of conventional ML techniques. These techniques show better performance than traditional statistical methods. These approaches predict future expenses more accurately. And these techniques also identify long-term spending patterns [2].

DL-based systems often achieve high predictive accuracy. However, they require heavy computational resources. These systems usually function as black-box models. Their decision-making process is hard to explain. This lack of explainability reduces user trust. As a result, their adoption in real-world personal finance applications is limited [2].

C. NLP-Based Personal Finance Management Systems:

We found that some researchers integrate Natural Language Processing in their PFM systems. NLP helps to process unstructured transaction descriptions and enhance user interaction. NLP improves transaction classification accuracy by understanding context. The context comes from merchant names and payment descriptions [6].

Natural Language Processing (NLP) has been integrated into several PFM systems to process unstructured transaction descriptions and enhance user interaction. Studies indicate that NLP improves transaction classification accuracy by extracting contextual meaning from merchant names and payment descriptions. NLP-based conversational interfaces improve accessibility. NLP-based systems are especially helpful for users with limited financial literacy. [6].

However, several challenges still remain, such as:

- Intent recognition is not always accurate.
- Transaction text can be ambiguous.
- Handling multilingual data is also difficult.
- These issues reduce overall system reliability [6].

D. Explainable Artificial Intelligence in Finance:

Some existing studies identified that explainability is a critical requirement for AI-based financial systems. Many survey-based and conceptual studies discuss Explainable Artificial Intelligence. These studies emphasize transparency in financial systems. Building user trust is a major focus. Regulatory compliance is also essential. These factors play an important role in financial decision-making [1].

But the problem is that most XAI-focused studies remain largely conceptual. Many focus on narrow financial domains, such as credit scoring. As a result, they do not offer full personal finance management solutions [1].

E. User Satisfaction and Comparative Evaluation Studies:

Some studies use a comparative approach. These studies compare AI-based PFM tools and traditional finance methods. Users show higher satisfaction when using AI-driven tools. Financial awareness also improves. Users spend less time on financial management [5][7].

These studies highlight the behavioural benefits of AI-based systems. However, they often lack detailed technical analysis, such as:

- AI model performance is not examined deeply [7].
- Explainability is also not fully addressed [7].
- Data privacy concerns receive limited attention [7].

Table 1: Comparison of Performance

Paper Name	AI Techniques Used	Primary Focus	Strengths	Limitations
Explaining the Unexplainable: A Systematic Review of Explainable AI in Finance [1]	Explainable AI	Transparency in finance	Trust, interpretability	Conceptual focus
AI-Based Personal Finance Manager with Spending Insights [2]	ML, DL (LSTM)	Expense forecasting	High prediction accuracy	Low explainability
AI Based Personal Finance Management System [3]	ML	Budgeting, alerts	Simple automation	Limited dataset

AI-Driven Personal Finance Management: Revolutionizing Budgeting and Financial Planning [4]	ML, Analytics	Spending insights	Personalization	Security concerns
AI Driven Personal Finance Management Tools [5]	Comparative AI	Tool comparison	Broad coverage	No implementation
Explainable AI in Fintech Risk Management [6]	ML, NLP	Transaction analysis	Improved usability	NLP accuracy issues
A Survey of Methods For Explaining Black Box Models [7]	ML, DL, NLP	User satisfaction	Behavioural improvement	Limited technical depth

IV. CONCLUTION

We try to present a comparative study of existing studies based on AI-based Personal Finance Management systems. The paper tried to evaluate different Artificial Intelligence techniques used in financial applications. The results show clear advantages of AI-driven approaches. Automation is significantly improved. Accuracy is higher. Personalization is also enhanced. These benefits are greater than those of traditional rule-based finance management tools.

Machine Learning techniques play a crucial role in expense categorization and behavioural analysis. We find that Deep Learning models provide superior forecasting capabilities. Natural Language Processing improves usability. It also increases accessibility. Explainable Artificial Intelligence helps with transparency. It also builds user trust. Although some challenges remain unresolved in existing studies. These challenges are data privacy, explainability, scalability, and system integration.

In conclusion, the comparative analysis shows strong potential for AI-based Personal Finance Management systems. At the same time, it highlights existing limitations. There is a clear need for integrated solutions. These solutions must be transparent. They should also be user-centric. The findings of this study offer useful insights. These insights can guide future research. Future work can focus on building comprehensive systems. Trustworthy intelligent personal finance solutions are the goal.

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