IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Personal Finance Assistant with AI-Powered Budgeting

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Abstract:

Managing finances can be daunting due to the complex financial landscape, lack of financial literacy, and difficulty tracking expenses or budgeting. Existing tools often need more personalization, rely on static budgeting, and provide generic investment advice. To address these limitations and enhance financial literacy and management, this paper proposes the development of an AI-powered personal finance assistant. The proposed assistant will utilize machine learning and natural language processing to provide a comprehensive financial overview, personalized insights and recommendations, and educational content tailored to users' needs. Key features include automated expense tracking, customized budgeting aligned with income and spending patterns, tailored investment advice based on risk appetite and goals, and proactive notifications about significant financial events. Specific metrics for evaluation will include improvements in financial literacy measured by pre- and post-use tests, quality of financial decision-making, user satisfaction scores, task completion rates, feature utilization, and user engagement levels. The expected outcomes include improved financial acumen, optimal financial decision-making, achievement of monetary goals, and secured financial futures for users.

Keywords:

Artificial Intelligence, Personal Finance, Financial Literacy, Web-based Applications, Financial Management

1 Introduction

Managing personal finances is becoming increasingly challenging due to financial landscape complexities, lack of financial literacy, and difficulties tracking expenses or creating effective budgets. Conventional finance tools lack personalization, rely on static budgeting, and provide generic investment advice. This paper proposes developing an AI-powered personal finance assistant to address these limitations. The assistant will provide a comprehensive financial overview, personalized insights using machine learning, and educational content to enhance financial literacy. By automating expense tracking, creating adaptive budgets, offering tailored investment recommendations, and providing proactive notifications, the proposed assistant aims to transform financial management.

1 Literature Review

The integration of artificial intelligence (AI) capabilities in personal finance management has garnered increasing research attention, accentuating technology's potential in addressing intricacies in financial processes and decision contexts faced by individuals. This literature review analyzes scholarship on the application of web-based tools, responsive systems, AI techniques, financial literacy initiatives and intelligent assistants to inform the development of an AIpowered personalized finance solution.

1.1 Web-based Financial Applications

Web-based platforms offer automation capabilities to streamline financial workflows. Sari et al. [10] developed an online application using PHP and MySQL for a boarding house in Indonesia to integrate planning, budgeting, auditing and billing. At the same time, they were overcoming limitations in manual bookkeeping, usability assessments, security and comparisons with existing solutions that needed to be improved. Personal Budgeting Research

Personal budgeting is an integral yet complex financial process. Examined theoretical links between budgeting and consumption-saving biases, showcasing associated self-control issues. However, consistency in real-world budget adherence and tracking efforts necessitate further investigation. Specific budgeting approaches also vary with individual biases and trade-off perceptions. Additional research on overcoming budgeting difficulties could elevate financial outcomes.

2 Methodology

A diverse range of methodological approaches have been implemented across the examined studies on AI in personal finance management. Several works have adopted qualitative techniques like grounded theory and design science research. Grounded theory, encompassing in-depth personal interviews and rigorous thematic analysis of gathered data, facilitated an exploratory investigation into factors influencing investment choices. Conversely, following design science guidelines enabled the development and evaluation of an intelligent virtual assistant model for financial management.

Additionally, quantitative analytic approaches were shared, including correlation analysis, regression models, and hypothesis testing. These statistical techniques established relationships between financial literacy and risk preferences, analyzed determinants of economic behaviour, and evaluated knowledge components underlying financial competence. Specifically, logistic regression assessed connections between literacy and behaviour among students.

Additionally, web analytics and usability assessments were conducted to evaluate responsive systems for university budgeting and financial reporting. Performance and usage metrics provided insights into system effectiveness. Overall, the collective methodology encompassed diverse techniques tailored to examine specific aspects of AI integration for personal finance through appropriate conceptual frameworks like technology acceptance models, grounded theory guidelines, and design science research principles.

3 Expected Outcomes

The proposed AI-powered personal finance assistant is expected to deliver the following outcomes:

- Provide users with a comprehensive overview of their
  finances through automated data aggregation and analysis.

- Create adaptive and personalized budgets tailored to users' income streams and spending patterns using machine learning techniques.
- Offer customized investment recommendations aligned with users' risk appetite, time horizon, and financial goals using predictive analytics.
- Include educational modules to improve users' financial literacy on topics like budgeting, saving, and investing.
- Send proactive notifications about significant events or trends impacting users' finances to promote optimal decisions.
- Safeguard user privacy through encryption and access control measures.
- Demonstrate ease of use, utility, and effectiveness through extensive field studies across user demographics.

By delivering these outcomes, the assistant can provide an intelligent, secure, and comprehensive platform for managing all aspects of personal finances. Users will be empowered to make informed financial decisions, achieve goals, and gain financial acumen.

3 Data Encryption and Access Control

Our AI-powered personal finance assistant will employ robust data encryption and access control measures to safeguard user privacy and ensure data security. Below are the details of the specific encryption algorithms and access control mechanisms that will be implemented:

3.1 Encryption Algorithms

- **AES (Advanced Encryption Standard)**: AES is a widely recognized symmetric encryption algorithm known for its efficiency and security. We will use AES256, which provides a high level of security by using a 256-bit key. AES-256 is approved by the National Institute of Standards and Technology (NIST) and is commonly used in various industries, including finance, for protecting sensitive data.
- **RSA (Rivest-Shamir-Adleman)**: RSA is an asymmetric encryption algorithm for secure data transmission. We will use RSA with a key size of at least 2048 bits to encrypt sensitive information that must be securely transmitted over networks. RSA will also be used for key exchange to ensure that symmetric keys used in AES encryption are securely shared between parties.
- **SHA-256 (Secure Hash Algorithm 256-bit)**: SHA-256 is a cryptographic hash function used to ensure data integrity. We will use SHA-256 to create unique digital signatures for data, ensuring that any tampering with the data can be detected.

3.2 Access Control Mechanisms

- **Role-Based Access Control (RBAC)**: RBAC will be used to restrict access to data based on the roles of users within the system. Each user will be assigned a specific role (e.g., admin, user, auditor), and permissions will be granted based on these roles. This ensures that users can only access data and perform actions that are necessary for their role.
- **Multi-Factor Authentication (MFA)**: MFA will be implemented to add an additional layer of security. Users will be required to provide two or more verification factors to gain access to the system. This may include something they know (password), something they have (security token), and something they are (biometric verification).
- **Audit Logs**: Comprehensive audit logs will be maintained to track all access and actions taken within the system. These logs will be regularly reviewed to detect and respond to any unauthorized access or suspicious activity.
- **Encryption of Data at Rest and in Transit**: All sensitive user data will be encrypted both at rest and in transit. Data at rest will be encrypted using AES-256, while data in transit will be protected using Transport Layer Security (TLS) to prevent interception and eavesdropping.
- **Granular Access Control Policies**: Fine-grained access control policies will be implemented to ensure that only authorized users can access specific data and functionalities. These policies

will be based on the principle of least privilege, ensuring that users have the minimum level of access necessary to perform their tasks.

By incorporating these encryption algorithms and access control mechanisms, we aim to provide a high level of security for user data, ensuring that user privacy is protected and data breaches are prevented. These measures will help build trust with users and demonstrate our commitment to maintaining their personal financial information's confidentiality, integrity, and availability.

6 Expected Outcomes

The proposed AI-powered personal finance assistant is expected to deliver the following outcomes:

- Provide users with a comprehensive overview of their finances through automated data aggregation and analysis.
- Create adaptive and personalized budgets tailored to users' income streams and spending patterns using machine learning techniques.
- Offer customized investment recommendations aligned with users' risk appetite, time horizon, and financial goals using predictive analytics.
- Include educational modules to improve users' financial literacy on topics like budgeting, saving, and investing.
- Send proactive notifications about significant events or trends impacting users' finances to promote optimal decisions.
- Safeguard user privacy through encryption and access control measures.
- Demonstrate ease of use, utility, and effectiveness through extensive field studies across user demographics.

By delivering these outcomes, the assistant can provide an intelligent, secure, and comprehensive platform for managing all aspects of personal finances. Users will be empowered to make informed financial decisions, achieve goals, and gain financial acumen.

7 Conclusion and Future Scopes

In conclusion, this paper proposes the creation of a personal finance assistant powered by artificial intelligence to tackle the increasing difficulties of managing personal finances effectively. Advanced technologies such as machine learning, natural language processing, and a robust webbased infrastructure are utilized in the proposed solution. This enables users to access a comprehensive, intelligent, and personalized financial management platform. Through extensive research and initial prototyping efforts, the expected outcomes of the assistant have been confirmed, including automated tracking of expenses, adaptable budgeting, customized investment recommendations, proactive notifications, and improved financial literacy. These outcomes aim to empower users to make informed choices, achieve their financial objectives, and secure their financial futures.

7.1 Future Scopes

In the future, we plan to extend our financial services to include loans, insurance, and tax management, allowing users to manage their finances more comprehensively. We will start with market research and partnerships with financial institutions for loans. We will develop an interface for loan applications, integrate credit scoring tools, and conduct thorough testing before launch. Insurance offerings will involve creating an insurance marketplace, integrating risk assessment tools, and providing educational resources, focusing on building user trust and regulatory compliance. Tax management will include developing tools for tracking income and expenses, integrating with financial accounts, and offering in-app support for tax filing, with rigorous testing to ensure accuracy and user adoption.

Additionally, we plan to develop mobile applications to enhance accessibility and convenience, supported by user research and beta testing. Larger-scale user studies will help us refine our services continually, while advanced conversational interfaces and expanded language support will improve user interaction and reach a global audience. Our ultimate goal is to establish our AI-powered personal finance assistant as an

indispensable tool for making optimal financial decisions and achieving financial goals.

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