

## 1. Research Topic Selection

The chosen topic, “Predictive Cash Flow & Expense Alerts and AI-Powered Pre-Budgeting,” addresses an essential aspect of financial management, particularly in the face of modern economic challenges. As living costs rise and economic uncertainties grow, individuals increasingly seek tools to help manage their finances proactively rather than reactively. This project integrates two core elements: predictive cash flow alerts and real-time budgeting advice, aimed at helping users navigate their financial commitments with foresight and control. Through cash flow alerts, users can gain insights into potential shortfalls before they occur, while pre-budgeting advice offers recommendations before a significant purchase is made.

My background in artificial intelligence and my interest in applying AI to financial technology make this topic particularly engaging and relevant to my academic goals. The fusion of rule-based models and AI-driven insights has the potential to revolutionize personal finance by making budgeting tools more predictive, accessible, and responsive. This approach is not only relevant to individual users but also highly applicable in various industries where cash flow stability is paramount. Businesses, particularly small and medium enterprises (SMEs), could also benefit from such predictive tools to manage their cash flow and budgeting requirements. Thus, the project has potential applications beyond individual users, adding value to the financial management industry at large.

## 2.Objective Setting

This project seeks to fulfill three primary objectives:

- Objective 1: Develop a predictive cash flow alert system using a rule-based model. This system will analyze historical data on the user’s spending patterns and upcoming financial obligations to anticipate possible cash shortages. By projecting low-balance scenarios, the system will help users to better manage their cash flow. Users will receive alerts before they face financial difficulties, allowing them to modify their spending or take corrective measures. This objective is vital because it aims to turn cash flow management into a proactive process, helping users make adjustments before reaching a critical low-balance point.
- Objective 2: Implement an AI-powered pre-budgeting advisory tool that provides users with tailored spending recommendations prior to major purchases. This advisory tool will analyze the user’s current financial standing and overall budget health, notifying them if a planned expense could destabilize their finances. By assessing whether or not a particular purchase aligns with the user’s financial goals, the tool encourages mindful spending. For example, if a user’s spending is particularly high in a given month, the feature might prompt them to reconsider a non-essential purchase, thereby promoting financial responsibility.
- Objective 3: Develop a user-friendly interface that consolidates both cash flow predictions and pre-budgeting advice. This objective emphasizes accessibility and ease of use, ensuring that the insights provided by the system are comprehensible and actionable for users. A well-designed interface will enable users to interpret predictive alerts and budgeting recommendations easily, regardless of their financial literacy level. This objective is key to making the project practical and appealing to a broad audience.

## 3. Problem Statement Formulation

The primary problem this project addresses is the lack of proactive tools in the personal finance space that can anticipate cash flow challenges and provide advisory recommendations before a user makes a significant financial commitment. While existing budgeting apps effectively track spending and balances, they often provide static, historical data rather than forward-looking insights. Consequently, users are frequently unprepared for unexpected expenses or financial shortages, as they lack the necessary forecasting tools.

To address this gap, this project will develop a predictive cash flow model based on historical spending data and an AI-driven pre-budgeting tool. By combining these two features, users will be able to approach their finances with a clearer understanding of future cash flow needs and receive real-time budgeting advice. Addressing this problem has significant implications for financial health, as it enables users to prepare for financial challenges and make more informed decisions before they encounter issues. Such a solution could greatly contribute to the field of personal finance by enhancing traditional budgeting tools with predictive capabilities that adapt to individual user patterns.

#### 4. Research Questions and Hypotheses

The project seeks to answer the following research questions, each accompanied by a hypothesis:

- Research Question 1: Can a rule-based model effectively predict when a user may run low on cash based on their historical spending patterns and upcoming expenses?
  - Hypothesis: By analyzing historical spending trends and anticipated expenses, a rule-based model will be able to generate accurate early warnings for potential cash shortages. These alerts will help users proactively manage their cash flow, allowing them to take preventative measures rather than reacting after cash shortages occur.
- Research Question 2: Will the AI-powered pre-budgeting advisory tool reduce instances of high-risk or poorly timed significant purchases?
  - Hypothesis: By offering real-time insights on budget health before a significant purchase, the pre-budgeting tool will encourage users to spend more thoughtfully. It is expected that users who receive pre-purchase recommendations will exhibit fewer high-risk spending patterns and make more strategic financial choices. Answering these research questions will allow the project to assess the impact of predictive alerts and pre-budgeting recommendations on user behavior, offering insights into the value and effectiveness of these features.

#### 5. Motivation and Impact of Research

The motivation for this project stems from a desire to make financial management more accessible, dynamic, and responsive to the needs of individual users. For many people, cash flow management is a constant challenge, and existing budgeting tools often lack the proactive features necessary to mitigate financial stress. This project aims to empower users to make more informed decisions and avoid financial pitfalls by providing predictive alerts and advisory insights.

The potential impact of this research is extensive. By enabling users to anticipate cash flow shortages and receive spending recommendations, this project can help foster healthier financial habits. In the long term, such tools could transform personal finance by shifting budgeting practices from retrospective tracking to proactive planning. The social implications are equally significant: if users can develop better

financial habits, they may experience reduced stress and improved financial well-being, which can positively influence their quality of life. From an industry perspective, tools that emphasize user-centric budgeting and predictive analytics may drive further innovation in fintech, setting a standard for more intelligent and adaptive personal finance solutions.

Ultimately, this project has the potential to contribute both to personal finance management and the fintech industry as a whole, promoting financial stability and empowering users to take control of their economic futures.