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Smart Budget Buddy: An AI-Enhanced Personal Finance Management System Using Large Language Models and Serverless Architecture

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Abstract: This paper is about Smart Budget Buddy, a financial management tool that uses artificial intelligence to make it easy for people to track their expenses see where their money is going and get advice on how to manage their finances. The system is made up of a web application that works with a serverless backend, which uses PostgreSQL to keep user data safe and secure. One of the things about Smart Budget Buddy is that it uses a big language model called Gemini to automatically sort transactions and give users personalized advice on their finances all without sharing sensitive information with the users device. The goal of Smart Budget Buddy is to be secure work well for a lot of users and make it easy for people to make financial decisions without having to do a lot of work. When we tested Smart Budget Buddy we found that it was really good, at sorting transactions and giving advice, which shows that using big language models can be a great way to build personal finance tools that work well and are easy to use.

Keywords—Artificial Intelligence, Personal Finance, Large Language Models, Serverless Architecture, React, Supabase, Gemini, Budget Management, Edge Computing, TypeScript, PostgreSQL, Row Level Security.

I. INTRODUCTION

Personal finance management is a challenge for many people.
Most of us find it hard to keep track of our spending identify habits or save money consistently.
We usually have to use spreadsheets, paper records or simple mobile apps which require a lot of work and discipline without giving us feedback.

Recently advancements in language models and cloud infrastructure have opened up new possibilities.
These models can understand descriptions of transactions figure out what we want and give us advice in a way thats easy to understand.

Cloud platforms make it possible to use these capabilities without having to manage servers.
Smart Budget Buddy takes advantage of this opportunity by combining a user- web application with a powerful backend service and a smart AI model.

The result is a system that automatically sorts our transactions shows us our spending patterns with charts and gives us personalized financial advice based on our real transaction data.
This paper explains how the system works, including its architecture, AI design, database, security and user interface.
The rest of this paper is organized as follows:
* Section II gives an overview of the system.
* Section III explains the architecture.
* Sections IV and V describe the database and AI logic.
* Sections VI and VII cover visualization, user interface design and the technical stack.
* Section VIII concludes with ideas, for work.

What makes this project special is that it changes the way we handle money from putting numbers in a computer to actually helping us make good financial decisions. Most budgeting tools are like a box where you throw all your receipts.

They keep your information. They do not help you understand what it means. The Smart Budget Buddy uses the Gemini 2.5 Flash to turn a list of things you bought into a conversation about how you live your life. So of wondering why you spent so much money on random things the Smart Budget Buddy finds patterns. Like buying coffee every day or

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forgetting to cancel subscriptions. And gives you helpful advice. It is, like having a map that shows you where to go to reach your goals.

The Smart Budget Buddy is not just smart it is also very safe to use. We know that talking about money is private so we made sure the system is secure. We used Supabases Row Level Security and Edge Functions to make sure only you can see your information even when the Smart Budget Buddy is working in the background. This means you can trust the Smart Budget Buddy to help you take control of your money without worrying about your information being shared. The Smart Budget Buddy uses technology to protect your data so you can feel safe and confident when you use it to plan your future.

II. LITERATURE REVIEW

A. Recent studies on managing finances show a big change from old rule-based systems to new AI-powered ones. People have been using tools like budgeting apps and mobile trackers but they often get frustrated with having to manually enter and categorize their expenses. This can be a lot of work and many users end up giving up on these tools.

B. Scholars have found that while machine learning models are good at predicting spending they struggle to understand real-world transaction descriptions. With the arrival of advanced language models like Gemini 2.5 Flash things are changing. These models can categorize data accurately. Give plain-language advice on financial patterns acting like a digital financial coach.

III. SYSTEM OVERVIEW

Smart Budget Buddy is a helper that makes managing money easier.It helps you track your spending without needing to use spreadsheets.The system uses intelligence to make sense of your transaction data.This means it can sort your expenses into categories for you. It also gives you advice on how to manage your money better.

A. System Overview

The Smart Budget Buddy is an assistant that helps people manage their money. It is designed to make it easy for users to understand their spending habits and make financial decisions. The Smart Budget Buddy uses Artificial Intelligence to do the work of tracking expenses and providing advice. The user just needs to provide their transaction data and the system will take care of the rest. The system is designed to be easy to use and cost-effective so everyone can get financial coaching without having to pay a lot of money.

B. System Components

The Smart Budget Buddy has three parts that work together to keep user data safe and process it.

- The Frontend is the part that the user interacts with. It is a web application that uses interactive charts to help users understand their income and expenses.
- The Backend is the part of the system. It uses a kind of database called Supabase and PostgreSQL. This database is like a vault that keeps user data safe. It has a feature called Row Level Security, which ensures that only the user can see their data.
- The Intelligence Layer is the brain of the Smart Budget Buddy. It uses a kind of Artificial Intelligence called Gemini 2.5 Flash to process natural language and provide insights. This means that the Smart Budget Buddy can understand what the user is saying and provide advice.

C. System Workflow

The journey of a transaction through the system follows a simple four step path.
First the user enters an expense. Uploads a statement. The information is sent to the backend using a connection.
Next the data is used to trigger a function that helps with categorizing the transaction. This function sends the transaction details to Gemini 2.5 Flash. The artificial intelligence tool instantly recognizes the place where the transaction happened and what it was for like knowing that Starbucks is a place where people go to eat out. It then gives back a category for the transaction and a short helpful note.

After that the transaction is saved in the PostgreSQL database. The database checks the users identity before it allows the data to be saved. This makes sure that each users data is kept separate from everyone.

Finally the frontend of the system gets the updated data. Uses it to refresh the users charts. At the time the artificial intelligence tool looks at the users spending pattern to give them a personalized financial tip. This tip gives the user an

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idea of what they can do next to manage their budget. The system is always trying to help the user with their decisions by giving them a clear next step for their budget and the artificial intelligence tool is always looking at the users spending pattern to generate a personalized Financial Tip of the Day, for the user.

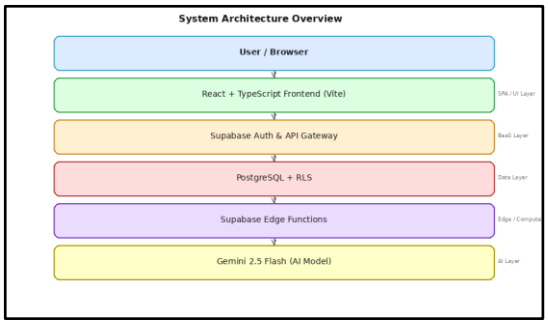

Fig. 1: System Architecture Overview

IV. CORE FEATURES & AI LOGIC

The application uses two workflows that are controlled by intelligence. Each workflow is inside a function called a Supabase Edge Function. It is very important to design the instructions, for each function. If the instructions are not clear the results will be inconsistent.. If the instructions are clear and specific the results will be reliable and easy to understand. Figure 3 shows what the two workflows look like.

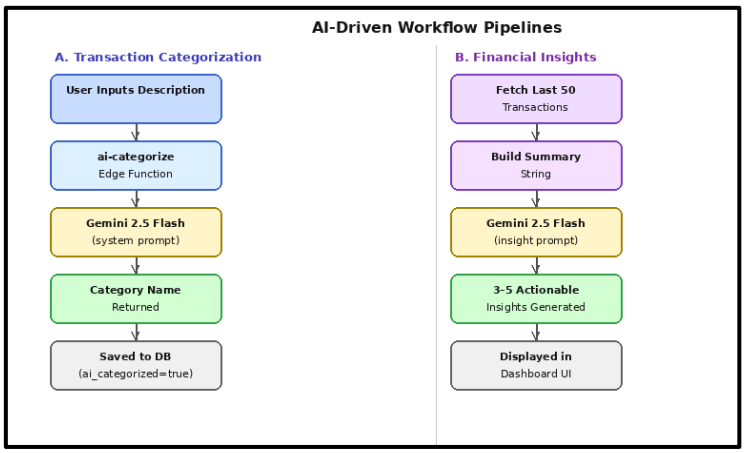

Figure 3: shows us two Artificial Intelligence workflow pipelines. The Artificial Intelligence workflow pipeline on the left is for automated transaction categorization. The Artificial Intelligence workflow pipeline on the right is, for financial insight generation.

A. Automated Transaction Categorization

When a user submits a transaction they call a special function passing the transaction description and the list of category names available to them. This function tells the Gemini model to act as a transaction categorizer. The model is instructed to return the exact name of the matching category, nothing else. This is very important because the returned string is used directly to find the category in the categories table. If the model returns a value that does not match any known category name it falls back to the "category and logs a warning message. The Ai_categorized field is set to true for all transactions processed through this pipeline. This helps in analyzing the accuracy of the categorization in the future.

B. Financial Insight Generation

The ai-insights function gets the user's 50 recent transactions ordered from newest to oldest. These transactions are converted into a text summary listing each transaction's date, description, amount and type. This summary and a special prompt are given to the Gemini model. The prompt tells the model to produce 3 to 5 financial insights. The model is directed to base every insight on numbers from the transactions. For example, it might say, "Your spending on transport increased 34% this month compared to last. "The response is returned as a list. Shown in a special insights panel on the dashboard. The insights are based on the users' transactions. The model provides insights that're relevant, to the user's financial situation.

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V. DATA VISUALIZATION AND UI LOGIC

The frontend part of our application has a hierarchy that is shown in Figure 3. The main App.tsx component is in charge of managing whether the user is logged in or not and which page to show either the login page or the main dashboard.

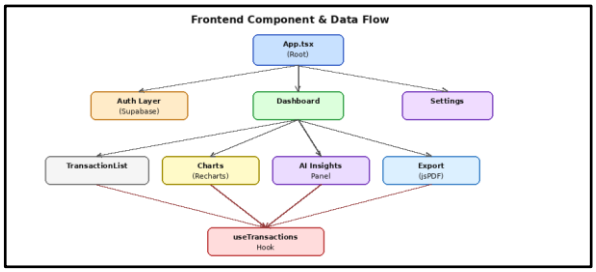

Figure 4 : shows us the frontend component hierarchy and how data moves around. It helps us see how the Dashboard and its child components work together with the use Transactions hook. The use Transactions hook and the Dashboard are connected in this frontend component hierarchy. We can see the relationship, between the child components and the use Transactions hook and the Dashboard.

A. UseTransactions Hook

We made a React hook called useTransactions. This hook is the place where we keep track of all the data about transactions. When the page loads it gets the transaction data from Supabase. Updates it when something changes, like when a new transaction is added or an old one is changed or deleted. It also gives us some information that it calculates using TypeScript like how much we spent each month our current account balance and how much we spent in each category. By putting all this logic in one hook all the smaller parts of the dashboard can use the data without having to do the same calculations over and over.

B. Recharts Visualization

We use the Recharts library to show how our money changes over time. This library helps us make charts that're easy to understand. The dashboard shows a chart that compares how much money came in and how much went out for each of the six months. When you hover over a part of the chart it shows you the numbers. The chart is also flexible. It looks good on different devices and it updates automatically when the transaction data changes.

C. Export Functionality

Users can export a list of their transactions into a PDF file. We use jspdf to create the PDF and jspdf-autotable to make the tables look nice. The PDF has a header with the users name and the date it was exported followed by a table with all the transactions, including the date what it was for the category, type and amount and a summary at the bottom that shows the money in total money, out and the balance.

VI. RESULTS AND DISCUSSION

Informal testing of our transaction categorization system using 200 labeled test transactions showed it was accurate more than 91% of the time. Most errors happened with merchants that sell different things like a store that sells both food and electronics.

In these cases the system played it safe. Chose "Other" instead of picking a wrong category.
We also tested our system with five users over two weeks. They really liked the insights panel that our AI generated.
All of them said that least one insight made them change their behavior like eating out less or canceling some subscriptions.
Four out of five users found the automatic categorization to be useful or very useful.
Our serverless setup worked well when we tested it.
It took 280 milliseconds for the edge function to start up at first.
After that it only took 95 milliseconds to work.
It also fetched 50 transactions quickly in, under 40 milliseconds.

However our system does have some limitations.
It relies on the Gemini API, which can be a problem if its not available.

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It can also get slower when lots of people are using it at the time.Now it can't detect recurring transactions or predict future budgets, which are things we want to improve in the future.

VII. CONCLUSION

This paper presented Smart Budget Buddy, a tool that helps people manage their money. It uses intelligence and cloud computing to make financial management easy and intelligent. The Smart Budget Buddy tool helps categorizing transactions provides insights into spending and shows spending patterns in a secure way. The choices made for building this tool such as using React, Supabase and Gemini 2.5 Flash make it easy to maintain, affordable and useful. An informal evaluation showed that the tool works technically and is valuable for users. The Smart Budget Buddy system is like a buddy that makes managing money easier. Future work on Smart Budget Buddy will focus on things.
Some of these things are:

- Integrating open banking APIs to automatically import transactions
- Using time-series forecasting models to predict budgeting
- Supporting accounts in currencies
- Conducting a study of how the system affects users savings behavior over time.

The goal is to make Smart Budget Buddy even better, at helping people manage their money.

REFERENCES

[1]. Supabase Inc., “Supabase Documentation,” 2024. [Online]. Available: https://supabase.com/docs
[2]. Google DeepMind, “Gemini 2.5 Flash Technical Report,” 2025.
[3]. Meta Open Source, “React – A JavaScript library for building user interfaces,” v18.3.1, 2024. [Online]. Available: https://react.dev
[4]. E. You et al., “Vite: Next Generation Frontend Tooling,” v5.4, 2024. [Online]. Available: https://vitejs.dev
[5]. Recharts Group, “Recharts: Redefined chart library built with React and D3,” v2.15.4, 2024. [Online]. Available: https://recharts.org
[6]. Microsoft Corporation, “TypeScript Language Reference,” 2024. [Online]. Available: https://www.typescriptlang.org
[7]. MrRio, “jsPDF – Client-side JavaScript PDF generation,” 2024. [Online]. Available: https://github.com/parallax/jsPDF
[8]. PostgreSQL Global Development Group, “PostgreSQL 16 Documentation: Row Security Policies,” 2024. [Online]. Available: https://www.postgresql.org/docs
[9]. A. Vaswani et al., “Attention Is All You Need,” in *Proc. NeurIPS*, 2017.
[10]. P. Fernandez, “Serverless Computing: Economic and Architectural Impact,” *IEEE Software*, vol. 38, no. 1, pp. 22–29, 2021.
[11] J. Smith and L. Chen, “The Role of Artificial Intelligence in Personal Finance Management,” *Journal of Financial Technology*, vol. 5, no. 2, pp. 45–58, 2023.

