Boujee on a Budget 3.0

Project Report

CSI 5130
Artificial Intelligence
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1.0 Abstract

Throughout generations, individuals have struggled with personal finance management, specifically budgeting properly. This project presents an AI-powered budget tracker designed to classify spending behaviors and provide personalized insights. Its ability to operate manually by logging in expenses and calculating their spending, will give back a full report on their overall financial spending. Utilizing KMeans to perform clustering, Boujee on a Budget provides visualizations, spending summaries and cluster analyses, enhancing clarity and user engagement. The application operates fully locally, ensuring data privacy, and features user-friendly interfaces with manual category selection and customizable spending summaries. Additional functionalities include importing different results from Excel (.csv) and generating timestamped visual reports for record-keeping. My personal experiences with budgeting inspired this approach, with the goal of building an application to help both myself and others manage finances more effectively.

2.0 Introduction

Gen Z is experiencing something that other generations haven't dealt with before - over consumerism. With the power of social media, individuals see others' lavish lifestyle and crave it as their own. They see the overconsumption of others and are influenced by their actions, not realizing the long term effects of their harmful spending habits and inconsistent budgeting practices. With the rise of AI, why wouldn't we use it as a tool to implement into our day-to-day lives. Boujee on a Budget is an AI budget tracker that allows individuals to track their daily spending and see where exactly their money is going. The AI budget tracker tracks your Expense, selects a Category and records the input into Recorded expenses and Summary Spending. It allows the user to set a Monthly Budget and show the results through a bar graph, cluster plot, and through cluster insights.

Boujee on a Budget addresses these issues of over spending by utilizing AI to take logged expenses and understand their spending behavior through data-driven insights. The tracker utilizes KMeans clustering to categorize spending patterns, providing users with a clearer view of their financial habits. Manual category selection ensures that users maintain control over their data inputs, while visualizations and summaries make complex data easily understandable. Features such as Excel imports (.csv files), timestamped plots, and local data processing contribute to both usability and privacy.

The results produced by Boujee on a Budget demonstrate the effectiveness of integrating AI techniques into personal finance management tools. Cluster visualizations and improved spending summaries provided actionable insights, while the fully local setup ensured secure data handling. This project offers a practical, user-friendly solution for anyone aiming to improve their budgeting habits through the power of AI.

3.0 Related Work

When constructing Boujee on a Budget 3.0, the inspiration came from a project I previously worked on in Professor Tianle Ma's - Object-Oriented Computing. For our final project in that course, I made a Java based budget tracker that simply calculated users' budgets and it outputted how much remained from the budget. I decided to take it a step further in this course, by implementing AI using KMeans to perform clustering, implementing interactive graphs, clustering, and excel sheets (.csv files).

The first budget tracker that was used for inspiration was Money Manager. Created by Realbyte, this desktop and mobile application allows users to have full control over their personal finances with optional cloud syncing. The features included on the application that are similar to Boujee on the Budget include, manual expense logging, customizable categories, visual reports and summaries, budget planning, import and export (excel) for .csv files, and privacy ("Money"). Having all of these features implemented on Boujee on a Budget is crucial for the user to experience a user-friendly application that is actually useful and can be implemented into their day-to-day life. Although Money Manager shares a familiar focus on certain features of their application, it does not extend to AI-powered insights or behavioral clustering, in which my application integrates to provide more actionable financial insights.

Another budget tracker that had an influence on Boujee on a Budget was the conversational AI-based financial assistant - Cleo AI. Cleo AI brings AI-driven spending insights to personal finance but depends on cloud data integration and lacks user-controlled data input or behavioral clustering ("The Blog"). Boujee on a Budget builds on similar AI principles while prioritizing privacy, manual control, and clustering insights for more tailored financial guidance. In terms of specific AI types, Boujee on a Budget utilizes unsupervised machine learning (KMeans clustering) - meaning it does not require labeled data or predefined categories. It identifies patterns from the users spending and groups the data based on the similarities of the spending habits. While Cleo AI used machine learning and natural language processing (NLP) to run an AI chatbot as a conversational interface to provide insights and guidance on the users spending habits, budgets, and manage finances.

Overall, Boujee on a Budget draws inspiration from state-of-the-art applications like HomeBank and Cleo AI. Applying new AI methods learned in class, I was able to push beyond their capabilities and deliver advanced behavioral insights and clustering that these platforms have yet to explore.

4.0 Data

As this project is designed to be fully local and offline, it does not utilize a pretrained model or external dataset. Instead, the data is entirely user-generated, where individual users input their own expense records through the application interface. This approach ensures that the data is highly personalized and specific to the user's financial activities. While there is no fixed external dataset, the structure of the data remains consistent, consisting of transaction date, amount, description, and manually assigned category. Prior to processing the data, local changes are applied through cleaning and formatting along with feature scaling procedures for better visual representation of spending patterns.

The data is captured dynamically as users interact with the system, meaning the volume of data scales naturally over time. For development and testing purposes, a small sample dataset of approximately 20–50 transactions was initially used to validate the application's functionality. However, the design supports continuous expansion, with users free to log new expenses at any time. The data is further prepared by standardizing numerical features like transaction amounts, which allows the KMeans clustering algorithm to detect patterns in spending behavior. Categories are manually selected by users at the time of entry, ensuring accuracy and relevance.

Overall, the project emphasizes clean, user-driven data collection and localized processing. This approach not only protects user privacy by keeping all data on-device but also maintains flexibility, as each user effectively builds a unique dataset that reflects their personal financial habits. The structured yet adaptable nature of the data enables the system to deliver meaningful insights and visualizations tailored to individual users, without dependence on external data sources or pretrained AI models.

5.0 Methods

The main focus of this project is to build an AI-powered budget tracker that provides personalized financial insights, without relying on external APIs or pretrained models. To achieve this, I designed a fully local system that allows users to input their own transaction data, processes this data through machine learning techniques, and outputs both visual summaries and behavioral insights. This method aligns well with the project's objectives of data privacy, user personalization, and offline accessibility.

The primary approach involves three main components: manual data entry, preprocessing and clustering analysis, and visualization of spending patterns. Manual entry ensures that the data remains user-specific and accurate, as users select categories at the time of entry rather than relying on automated or error-prone detection. The user spending patterns were investigated through KMeans clustering analysis during the implementation stage. The data goes through preprocessing steps before clustering applied by using StandardScaler to normalize numerical features to ensure equal influence from different transaction values. The KMeans clustering algorithm functions effectively for data segmentation because it identifies clear groups of spending behaviors between people who pay small amounts frequently and those who pay large sums occasionally(“Standardscaler”). Users receive practical financial understanding from this system to understand their money routines.

Alternative methods were considered during development. For instance, I explored the possibility of rule-based categorization or even more complex machine learning models, such as decision trees or neural networks. However, these approaches either required larger training datasets or risked overcomplicating the system. The unpredictable volume of user-generated data makes KMeans an appropriate unsupervised learning method because it provides a flexible and easily manageable approach with understandable results. Local processing and visual output enabled me to implement concepts from the semester I learned. Figures such as bar charts for category spending, scatter plots for cluster visualization, and time-series graphs for spending over time enhance the interpretability of results and help users understand their budgeting patterns at a glance.

Overall, this method balances simplicity with functionality. It ensures user data privacy, supports incremental data growth, and provides meaningful insights into personal finances. By combining core concepts of data preprocessing, unsupervised machine learning, and visualization, the approach effectively addresses the problem of helping users track and analyze their spending habits in an intuitive and accessible way.

6.0 Experiments

Testing Methodology:

Method of Testing: Black-box testing was performed to evaluate the core functionality of the application. I provided a variety of inputs (including budget amounts, expenses, etc.) and observed how the application responded. The expected results were compared to the actual outputs to determine whether the tests passed or failed. I did not look into the internal structure or logic of the code, only focusing on how the application performs from a user interaction perspective.

Unbiased Testing: We asked users (friends, family, and campus peers) who had no prior knowledge of the internal workings of the application to perform the tests. They were provided no assistance beyond the instructions on what to test, ensuring that the testing was unbiased.

Test Cases:

Testing #1:

Test #	**Description**	**Input**	**Expected Output**	**Actual Output**	**Pass or Fail**
1 Allyson	Testing budget creation and display.	- New Budget: - $5000 Monthly budget.	Budget added successfully and displayed in the app.	- Created a monthly budget of $5000.	PASS
2 Jake	Testing input validation for negative budget amounts.	- New Budget: Home, inputted -$122, -$99.	Error message: "Amount cannot be negative."	-Message Displayed: “Over Budget by $122, -$99.	FAIL
3 Cece	Testing adding expenses to a budget.	- Created a new expense called “$10 on chipotle” for the food category.	Expense successfully added to the "Food" category and displayed.	- Added an expense of chipotle for $10 and Sushi for successfully, logged under “Recorded Expenses”	PASS
4 Jianni	Testing remaining budget calculation.	- Added “Office Space” as budget for $5000 (set for monthly budget) - Added expense “Desk, Chair & Computer”,	Remaining budget: (Budget - Total Spent)	- Remaining budget showed as “$3280.00 Remaining” (it calculated $5000-1720).	PASS

		totally to $1720.			
5 Maria	Testing the Show Clusters	- Added different expense under the categories of Food, entertainment & Transport	Cluster Insights will show the Expense Clusters for each category	- The Cluster Insight reported back 3 different expense clusters as Cluster 0: 6.0 expenses, Total: $770.00, Cluster 1: 2.0 expenses, Total: $3000.00, Cluster 2: 1.0 expenses, Total: $3000.00	PASS
6 Donovan	Testing that user cannot add an expense with an empty name.	User didn’t fill in the “Enter the Expense” box and only selected a category - Food.	Does not allow user to add expense without a name	- After trying to add an expense without a name and only wouldn’t allow the user to go through, status came back as “Could not understand the expense amount.”	PASS
7 Joelle	Testing the Show Spending Plot button functionality	After the user added some expenses, they clicked on the Show Spending	Will show a bar graph, based on Category and Total Spent	Users were able to see a bar graph labeled “Spending by Category”	

		Plot. Selected Categories, Food, Other, Rent, & Utilities.		and show the categories for Food, Other, Rent, & Utilities.	
8 Lucas	Testing leaving the page to see if data will save functionality.	User exited the page.	User will enter back in the page and will be able to see their data logged.	User was redirected to a blank screen, but once they added another expense, they were able to see all of their saved data.	PASS
9 Meghan	Testing the Show Clusters Plot button functionality	After the user added some expenses, they clicked on the Show Spending Plot. Selected Categories, Food, Other & Rent	User will be able to see their different clusters in a dot plot graph, each cluster having a different shade of pink. The graph will be based off of Transaction Index & Amount Spent	User was able to see their 3 clusters, Food, Other & Rent shown plotted and shown in their respective groups	PASS
10 Jacob	Test that clicking the “Reset all Data” button	User clicked on reset all data	User page will be refreshed and everything will be blank	User was redirected to the original page with everything	PASS

*Note: For Test Case #2 (Jake), I did end up fixing the error message to be "Amount cannot be negative.” It will show up correctly in the demo.

7.0 Conclusion

To conclude, Boujee on a Budget 3.0 is a budget tracking application that utilizes AI implementations to track expenses, set monthly budgets all while displaying visuals of their expenses using clusters and graphs. I was able to implement in my budget tracker KMeans for clustering that provides a method to group and render spending patterns, real-time spending summaries with budget limit warnings, and excel data import & export option becomes available for users who want to analyze their data outside the application and add previous data saved elsewhere into their budget tracker. This project taught me to use the new skills I learned from this course to take my code to another level and implement AI systems in my application to bridge the gap between technology and user interaction.

In terms of the future, I would suggest transitioning my project to a web application as well as mobile app integration, making it more accessible for users. Another feature I would like to add to my application is to create a payment gateway integration for direct expense tracking with the users bank account. This way my application can give the best budget report back to ensure our user is getting the help they need. A feature I could improve on is the user authentication and ensuring strong encryption. Currently the budget tracker saves all the users data based on writing all the transaction information to a local file—specifically a JSON file—every time a user logs a new expense or updates something. Meaning that I would change it to where it is the users login information would be saved to a database and carry all of the information there.

The final extension I would like to add to my application is to polish up on the advanced graph reports, giving detailed breakdowns of financial data with more clear and concise graph types.

8.0 Works Cited

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