CA2 Report – AI-Powered Personal Expense Tracker & Predictor

Course: AI for Banking and Finance
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Repository Link: Private GitHub Repository – AI_EXPENSE_ANALYZER

a. Need Analysis / Statement of Need

In a world where all transactions are done electronically, people tend to lose control over their spending habits easily. Common expense tracking using manual methods or off-the-shelf finance apps tend not to deliver AI-driven insights that enable users to budget sensibly.

It uses data analysis and machine learning to help users make smarter financial choices.

The system not only keeps track of spending but also forecasts future spending habits, helping users prepare for the future.

Key Problems Identified are as follows:

- Lack of intelligent, personalized financial insights in traditional expense apps

- Difficulty visualizing spending distribution and trends

- Absence of predictive analytics for upcoming expenses

Proposed Solution:
A web app built with Streamlit that brings together data visualization, expense categorization, and machine learning to predict spending in one simple and easy-to-use tool.

b. Technical Functionality

The tool conducts a suite of integrated financial analytics and AI-driven predictions in Python and Streamlit. Its modular design guarantees simplicity and scalability.

Core Functionalities:

1. Data Upload & Preprocessing:
   Users upload .csv expense datasets which are cleaned and prepared using Pandas and NumPy.

2. Interactive Dashboard:
   Real-time visual insights using Plotly and Matplotlib for:

   - Total Income, Expenses, and Profit

   - Category-wise expense breakdown (Pie/Bar charts)

   - Account-based and monthly summaries

3. AI-Powered Expense Prediction:
   A Decision Tree Classifier (scikit-learn) is trained to predict the expense category based on previous spending patterns (features like amount, type, and subcategory).

4. Modular Design:

   - main.py → Entry Streamlit interface

   - analysis_dashboard.py → Visualization & analytics logic

   - prediction_module.py → Machine learning model and predictions

   - dataset/ → Contains sample Kaggle-based dataset

   - config/requirements.txt → Project dependencies

5. Ease of Deployment:
   Can be executed locally or hosted on Streamlit Cloud.

Tech Stack Overview:

Component	Technology Used
Frontend	Streamlit
Backend	Python
ML Model	Decision Tree Classifier
Libraries	NumPy, Pandas, Plotly, Scikit-learn, Matplotlib
Dataset	Kaggle-based Expense Dataset
Deployment	GitHub / Localhost

Table.1 Tech Stack

c. Architecture

The architecture has a data-driven modular structure, which integrates user interaction, analytics, and AI inference into an efficient pipeline.

System Flow:

User → Streamlit Frontend → Pandas/Plotly (Data Analysis) → ML Model (Decision Tree) → Expense Prediction Output

Architectural Layers:

1. User Interface Layer:
    Developed using Streamlit, providing intuitive upload, visualization, and prediction functionalities.

2. Data Processing Layer:
    Manages CSV ingestion, data cleaning, feature extraction, and summary statistics generation through Pandas.

3. Machine Learning Layer:
    Trains and executes the Decision Tree model to identify patterns and predict expense categories.

4. Visualization Layer:
    Uses Plotly and Matplotlib for real-time, dynamic graphs and category-wise expense charts.

5. Output Layer:
    Displays predicted categories and statistical insights for better budget management.

d. Usage / Scope

Usage Instructions:

1. Clone Repository:

2. git clone https://github.com/hasithaa02/AI_EXPENSE_ANALYZER.git

3. cd AI_EXPENSE_ANALYZER

4. Install Requirements:

5. pip install -r config/requirements.txt

6. Run Application:

7. streamlit run src/main.py

8. Upload Dataset:
   Upload your expense .csv file following the same column structure as in the sample dataset.

9. View Dashboard & Predictions:
   Look at how money is spent, see if there are profits or losses, and check what the AI thinks about expense types.

Scope for Future Enhancements:

- Budget Alerts & Personalized Suggestions:
  Tell users when they're spending too much.

- RAG-based AI Query System:
  Integrate conversational insights like "Where did I spend most last month?"

- Multi-user Cloud Storage:
  Store data securely for long-term financial tracking.

- Mobile App Version:
  Deploy through Streamlit Cloud or FastAPI backend for accessibility.

e. Impact Overview Statement

This project shows how Artificial Intelligence can help with managing personal money. By using data analysis and predictions, people can learn more about how they spend their money.

Impact Highlights:

• Better Understanding of Spending:
People can see where their money goes in different areas and over time.

• More Intelligent Decisions:
Predictions help people use their money in better ways.

• AI-Driven Financial Help:
Turns simple spending records into smart advice.

• Works Well for Real-World Use:
This app can be used by banks, financial apps, or dashboards that work for many users.

In short, it brings together old methods of managing money with new AI technology to help with better financial planning. It assists people in making wiser money decisions by using actual data.

STREAMLIT WORKING DASHBOARD:

Select Feature

🔴 📊 Expense Dashboard
⚪ 🤖 AI Expense Prediction

💸 AI-Driven Expense Analyzer

📈 Expense Insights Dashboard

Dataset Preview

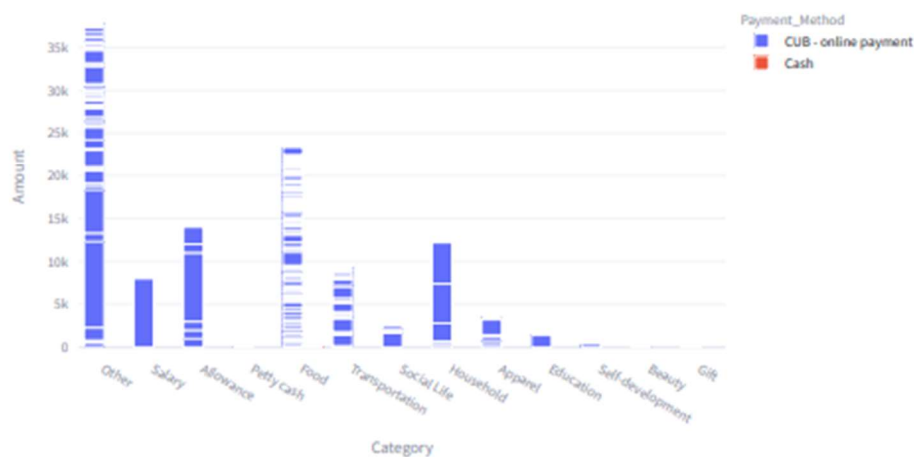|	Date	Category	Amount	Type	Payment_Method
0	03-02-2022 10:11	Food	50	Expense	CUB - online payment
1	03-02-2022 10:11	Other	300	Expense	CUB - online payment
2	03-01-2022 19:50	Food	78	Expense	CUB - online payment
3	03-01-2022 18:56	Transportation	30	Expense	CUB - online payment
4	03-01-2022 18:22	Food	67	Expense	CUB - online payment

Total Income (₹)
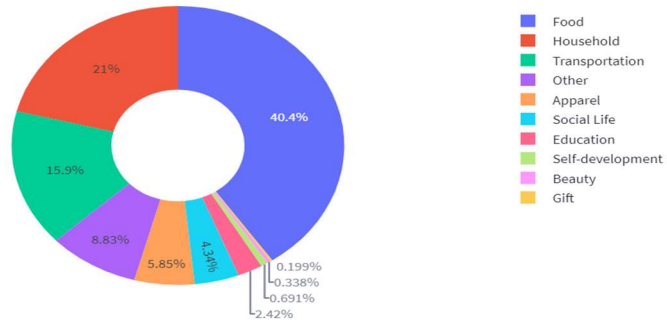## 54,754.00

Total Expenses (₹)
57,918.28

Net Profit (₹)
-3,164.28

Income and Expense by Category

Category-Wise Expense Split

Expense Distribution

Legend:
- Food
- Household
- Transportation
- Other
- Apparel
- Social Life
- Education
- Self-development
- Beauty
- Gift

Slice labels: 40.4%, 21%, 15.9%, 8.83%, 5.85%, 4.34%, 2.42%, 0.691%, 0.338%, 0.199%

Select Feature
- ○ 📊 Expense Dashboard
- 🔘 💻 AI Expense Prediction

Enter Amount (₹)

| 500 | − + |

Predicted Category: Other

💸 AI-Driven Expense Analyzer

🤖 Predict Expense Distribution Using AI

Preview of Expense Data

	Date	Category	Amount	Type	Payment_Method
0	03-02-2022 10:11	Food	50	Expense	CUB - online payment
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Predicted Expense Allocation

Predicted Allocation by Category