

Smart Personal Expense Tracker with Predictive Analytics using Machine Learning

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Abstract— Personal Finance management has become important role in modern digital lifestyles, where each individual frequently struggles to track and predict their spending behavior. Traditional expense-tracking use focuses primarily on manual logging and static charts, offering limited predictions intelligence. Through this research we propose a Smart Personal Expense Tracker that integrates Machine Learning (ML) to provide automatic expense categorization, time-series forecasting, and personalized spending insights. The system combines a user -friendly web interface with backend ML models such as Random Forest, LSTM, Prophet, and OCR-based NLP Modules. Experiment show result which demonstrates that predicative analytics can effectively forecast next – month, how much expenditure will be happened. It also offer alerts for potential overspending. The models improve financial awareness and improve decision making. The system is scalable, deployable, and useful for personal finance management.

Keywords— Expense Tracking, Prophet, Time Series Forecasting, Budget Prediction.

I. INTRODUCTION

Personal finance management has become rapidly increasingly important as individuals deal with the complex spending patterns in the digital economy. Traditional tools often fail to provide predictable insights that help users avoid overspending or managing budgets effectively. The main motive of the project is to develop an intelligent system that tracks expenses and predicts future spending trends. With the rapid shift toward digital payments and online payments or transactions, there will be a high chance that large amounts of data remain unanalyzed. The rapid advancements in data science and machine learning, intelligent systems have emerged as powerful tools for analyzing behavioral patterns and providing accurate predictions. Using such technologies to finance management has significant potential to enhance user experience, awareness and financial discipline. A Smart Personal Expense Tracker involved with predictive analytics can learn patterns from historical data, classify expenses into relevant categories, forecast future expenditures, and deliver personalized insights. These insights maintain users to take control of financial work by understanding where money is spent, identifying unusual spending behaviors and responding proactively to potential overspending.

Instead of simply recording expenses, the system helps users in predicting the financial outcomes of their habits, helping them plan budgets more effectively. The aims to develop an intelligent, user-friendly expense tracking system that combines data processing, machine learning models, and visualization capabilities into a unified platform. The system works on manual tasks through features such as expense categorization using classification algorithms and spending predication through time-series forecasting models like Random Forest and Support Vector Machine(SVM). A dashboard built using frameworks such as Streamlit or Flask allows users to interact with the system using an intuitive interface.

II. LITERATURE REVIEW

Personal Finance management of your life is a important component of finding financial stability and long -term accumulation. Lee at. design an automated expense classification system using Machine Learning. After their study , the classification accuracy in amount reduces the effort .But it fails in the predictive analysis and in long-term financial insights.[1]Smith et al. searches machine learning application in personal finance on predictive modelling for expense forecasting. He introduces the concept of the single-model approaches. But their research lack of user interaction[2].Aishwarya and Hemalatha introduces a smart expense tracking using Machine Learning algorithms for expense categorization and predication. Their system describes the visual insights such as monthly expense and category-wise expense summarise , providing user awareness of spending habits. The study discusses the benefits of automation but lacks budget mechanisms[3].

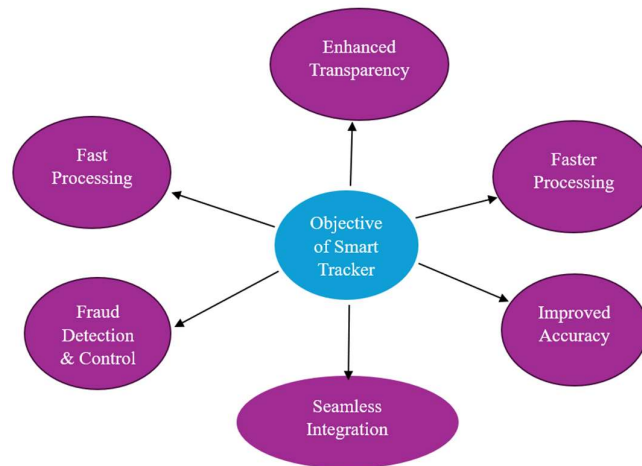


Fig.1 Show the Objective of Smart Tracker using Machine Learning

The figure above shows how the different benefits of the smart Expense Tracker. It mainly contains the features of easy integration which that how different process will perform the process.

Brown and R. Taylor investigated predicative analytics techniques for budget forecasting in consumer finance. Both focus on the role of regression and time-series models in financial planning. The study focusses the issue of real -time adaptation to user behaviour[4].Zhao et.al focus on time -series forecasting techniques in financial system using deep learning models. They majorly design the system based on the LSTM – based models for the prediction of the Finance[5].Chen et al. discuss the anomaly detection techniques in financial transactions using machine learning. Through their research they basically focus how to demonstrates effective detection of abnormal spending pattern[6].Kumar et al. developed a personal finance management system that applies Long Short -Term Memory(LSTM) network to predict the future expense based on past data . Through their research ,they majorly focus on how deep learning model effective in recognizing long-term spending trends and seasonal variations[7].Bhavana B.R et al. discuss an AI -Based wealth advisory system that uses predicative analytics for budget planning. The system discovers income and expense to recommend the increase budget for user. The model focuses on the approach of static model and does not dynamically adjust the behavioural changes[8].T.S Walia ,R.S Chimombe and A.K Singh discover wealth Guardian a machine learning – based expense management System. They use the algorithm of support vector Machine and Random Forest Models. The system finds future expense and alert users about potential overspending[9]. A.Visalatchi , J.Yuaraj and K.Giri Prasana developed an automated classifier using Natural Language Processing(NLP) and machine learning techniques to

find data and categorise them .The main advantage of system is that it reduces the manual efforts and increase the accuracy[10].R.Patel, S. Mehta , and K.Shah proposed an AI-Based financial management tool that integrates expense predication. The system discusses financial recommendations but does not contain behavioural characteristics[11].Anderson et.al proposed machine learning in consumer finance ,focusing on predictive analytics and user behaviour modelling. The study basically discusses the importance the importance of explainable AI for designing the financial system[12].Sharma and Gupta design a study on predictive financial analytics using machine learning models. They basically focus on the potential of AI in correcting financial decision -making. After that this feature fails the lack of adaptive and personalized finance[13].S.Kadu, D.Joshi and A.Patil proposed Expensify AI , it contains an AI -powered expense tracker that uses OCR and machine learning feature to automate expense data provided . They basically have the featured of expense recording [14].Nandikanti design a smart expense and goal tracking system that combine machine learning -based predication . Their research shows the features of improved financial planning and provides awareness . The study fails the lack of behavioural spending analysis[15].Manas ,S.K .Shivashankar, P.Prasanna design an AI-based personal finance management system that contains the expense budget and predictive analytics .He introduces the mechanism of machine learning which provide alerts for overspending[16].

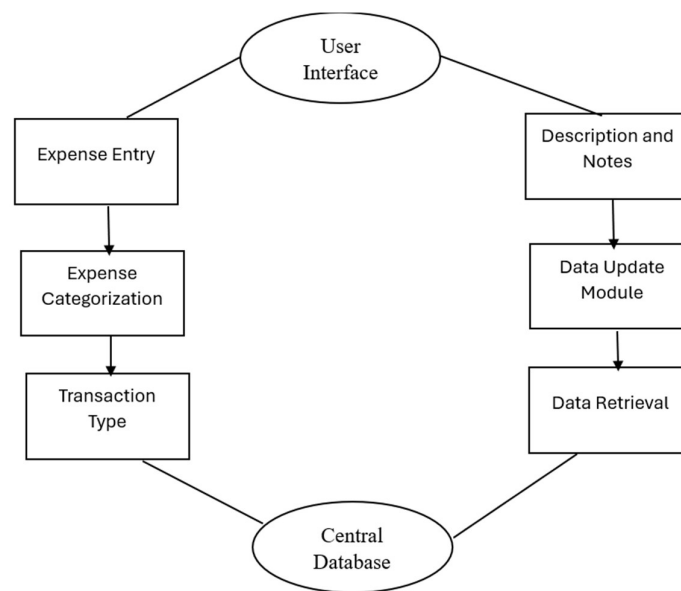


Figure.2 Block Diagram

It basically discusses the procedure how expense tracker will be happened

III. METHODOLOGY

The methodology for designing the Smart Expense Tracker combine Flask technology for web development with machine learning algorithms for predication and classification. It basically involves Five main stages-Data Preparation, Model Selection, Model Evaluation, Scheduling tools, Visualization feature and Predication.

A. Data Collection and Data Preprocessing

This Step basically involve the method how we get the dataset for developing . This step contains how we collect data like bank statements, receipts, invoices etc. This feature occupys how we take steps to make sure the security. This method have the features of encryption .It contain the API needed for the automation process from online sources to reduce the manual work . After collecting the main stage involve is to be processing of data .It contain the process of transformation , standardizing and enriching raw data to make it ready for use in machine learning ,data analytics and data processing.

B. Model Selection

The method contains the features of selection of machine learning model which provides the high predication correct value, low computational complexity , performance on the real data. Model such as Random Forest and

Support vector Regression is best for the designing the project. Through model selection main motive is to multiple classification feature ,Low training efficiency and time and it must be suitable for many transactional data.

C. Model Evaluation

Model evaluation requires to obtain the performance of the trained model through validation techniques. It involves the step of categorizing the performance such as accuracy , precision ,recall and F-1 score. It is very optimizing process to evaluate the model accuracy and error rate. Through this evaluation it describes the graphical representation of the model . It defines the value which is false positive or false negative.

D. Scheduling Tools

The stage basically defines how a software component run automatically to define tasks. It is process which contain the tool to automate the task such as data processing , model execution and alert generation . It basically contains the Linux ,Python Libraries .It define process of the expense data update , Budget overspending checking ,alert generation and Model retraining.

E. Visualization and Deployment

Visualization is the process of presenting data, predictions and alerts in graphical form. It is basically design so that user can easily understand their spending Financial. The method describes the Month-wise expense trends ,category -wise spending distribution , predict your expense in future. This method is usually done using Flask or Matplotlib. The Next thing is deployment which the process of making developed machine learning system available in the real world . This contains the use of the AWS or Azure ,any Database and Scheduler. Deployment has the security and scalability of the application such as Load balancing method. The below figure3.shows how the different ways to get the expenditure using the Expense technique.

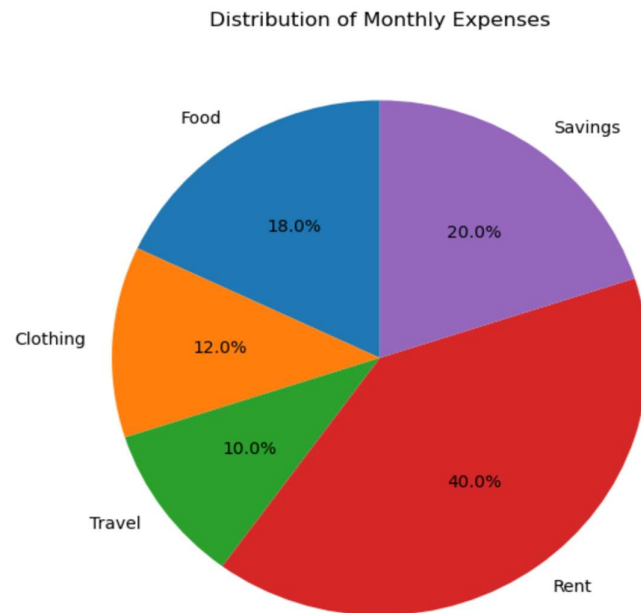


Fig 3. Showing the Expenditure according to Smart Technique

IV. RESULT AND DISCUSSION

The developed A smart expense tracking system finds the excellent features in accurate recording, categorizing and analysing the data. The integration of the Random Forest, SVM and many more methods provide the complete details of the classification and predict future spending. The system calculated the quantitative and Qualitative metrics. The project basically provides the result in user feedback, and it is scalable to all the human being. The system processes the large amount of the data. The user found high level of satisfaction and engagement with automated feature. This method provides valuable feature to the user.

TABLE I. COMPARISON TABLE

S. No.	Year	Title	Methodology	Limitation
1	2025	Expense Tracker Management System Using Machine Learning.	Uses Ensemble Learning For regression-based Expense prediction.	Inaccuracy is detected in the system and not suitable for real life.
2	2025	AI driven expense tracker system.	Real time tracking and uses AI for forecasting.	It has the computational load very high.
3	2024	CNN enhanced expense tracker system.	Implements CNN for anomaly detection.	Requires high dataset for accuracy.
4	2024	Personal finance management using the Machine learning algorithms.	Uses Decision tree, Regression and Random Forest for giving results.	High dimensional data is required or it will give the inaccuracy.
5	2023	Expense and Goal tracker using the ML based models.	Uses SVM and Random Forest for goal based prediction.	It lacks prescriptive advice for high Consistency.
6	2023	Expense tracker using the Naïve Bayes.	Uses Naïve Bayes for the classification of the images.	It is very much limited to the SMS based text.
7	2022	Predictive analysis in the Finance Tracker.	Implement RNN also called Recurrent Neural Network for prediction.	High complexity is involving in the training of the model.

V. CONCLUSION

Observing your everyday expense can set aside you cash. It basically helps in monetary of the product what you want to wish. It is mostly providing many chances to save your money by giving some moment of life. It helps in predicating the day-by-day expense tracker. We created an excellent feature in comparison to the other expense tracker. Basically, made insight of using the modern technology. Basically reduces the manual work. Providing monthly planning of the upcoming future. Through this project we have learned the many techniques which reduces human efforts in modern day life It teaches many machine learning approaches which the approach.

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