

# AI-Driven Personal Finance Assistant with Voice, OCR, and Chatbot

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**Abstract** - This project which is concerned with the creation of a personal finance management web application. The principal idea is to assist the users to monitor their expenses, investments, and bills easily. It is hard to keep track of finances on a regular basis to many users and this system aims at making this process less demanding. The software is developed on the Django framework, which is applied to address user log-in, data storage, and safe storage and processing of financial records.

The system has a chatbot to ensure that the communication is easy among the users. The chatbot uses a fine-tuned DistilBERT model with natural language processing in order to provide users with an opportunity to enter queries in an ordinary language. It is able to do functions like the addition of costs, verification of financial records. An OCR module is also included to prevent manual typing of the receipt data. In this module, EasyOCR is used, along with a fine-tuned LayoutLM model trained on the SROIE dataset to extract item information and sums of money on receipt images. The collected data is analyzed by some of machine learning methods. The approaches employed in estimating the return on investment are XGBoost, unusual spending behaviour detection is done by Autoencoder, and Prophet is employed to investigate the spending patterns. Results are also presented in the system in simple graphs and charts to enable the users to comprehend their financial trends. The application is modularly structured such that the features can be updated in the future. Generally, the system assists the users to have a more practical and organized way of handling their finances.

**Keywords** - Personal Finance, NLP, OCR, Speech Recognition, Machine Learning, Chatbot.

## I. INTRODUCTION

Personal finance has gained importance to most individuals nowadays. Nevertheless, the majority of users also rely on the manual system in the form of notebooks or spreadsheets files. Such practices are not very convenient and have to be undertaken on a regular basis. In the long run, users might not remember to update records thus causing errors. Additionally, spreadsheets mostly offer simplistic methods of calculation and fails to provide in-depth insights into expenditure or investments.

Due to these problems, a more convenient and efficient system of managing personal finances is required. In this project, there has been a Personal Finance Management System, which is a web application developed. The system will be developed on the Django system and is aimed at minimizing manual labor. It will assist users to keep track of expenses, investments and bills in an easy manner.

The application facilitates the entry of expenses by means of reception to eliminate manual entry. Receipt images can be uploaded by the users, and processed by applying the methods of OCR. The details that are extracted are item names, prices, and total amounts using EasyOCR and a fine-tuned LayoutLM model. The information extracted is then saved and it is utilized in tracking expenses. This assists users in saving time when using it on a daily basis.

It also has a chatbot feature to enhance the interaction with the users. The chatbot is based on a DistilBERT based model to interpret user messages and answer simple financial questions. It may assist the users in order to add costs or verify stocked financial information. Simplest machine learning is also utilized in the system to analyze financial information. Autoencoder is utilized to identify abnormal spending patterns, Prophet is utilized to find the spending, and the XGBoost is utilized to predict the returns on the investment.

All in all, the system is aimed at automation and simplicity. Speech-based input, receipt scanners, chatbot interactions are features that minimize the effort of the user. The project will offer a convenient and easy to use- personal finance management solution.

## II. LITERATURE SURVEY

This literature review is centered on the wider application of AI to banking and finance including automation, fraud detection, and customer service chatbots in addition to AI governance. It studies the ethical concerns, regulation, and the questions that are involved with the adoption of AI technologies in the financial ecosystem. The rapid emergence of artificial intelligence (AI) technologies has significantly changed the financial service industry, namely around its use in the personal finance management system. The new AI-based

financial applications are aimed at automating the budget, tracking costs, making an investment decision, and financial forecasts, which would consequently enhance decision-making and financial health of the users. Several articles have explored the integration of AI, machine learning (ML), natural language processing (NLP) and optical character recognition (OCR) in the personal finance system.

Ridzuan et al. [1] review the literature on the use of AI in the financial sector including automation, fraud prevention, and chatbots in customer service. In their publication, the authors highlight the importance of regulatory frameworks and ethical concerns to AI-driven financial ecosystems which are gaining prominence. The present paper gives the bigger picture within which AI-powered personal finance assistants operate in a specially related area of governance, transparency, and data privacy.

The use of predictive analytics and automation in changing the budgeting and savings plans is noted in a survey conducted on AI-based personal finance systems [2]. The key functions identified by the authors are smart expense classification, purposeful financial planning and forecasting financial modelling. However, the data integration work, privacy and algorithm bias are problematic to such systems, and that implies the need to have robust and secure system designs.

Dalvi et al. [3] developed a financial assistant on the basis of AI that can be utilized to robotize the daily financial processes such as tracking income, monitoring expenses, and personal financial recommendations. This paper by them shows how financial insights can be created and informed decision-making assisted by machine learning algorithms. Similarly, Rajawat et al. [4] proposed a personalized financial advisory system, responsive to user behaviour according to machine learning models, therefore, enabling the dynamic budgeting and investment plans.

The application of the OCR technology in the financial application is also discussed in the recent studies. An example of OCR application to develop an expenses tracking system is a design proposed by Shaharudin [7] who intends to read the information on the receipts regarding the transaction details and thus save on the manual entry of the information. The study concludes that OCR is far much efficient and convenient to operate. Furthermore, another more recent study that integrates OCR and machine learning demonstrates that document comprehension models such as LayoutLM can retrieve structured financial data in receipts and invoices with high accuracy as a result, offer automated expense classification, and analytics [8].

The use of conversational AI in the financial systems has also been of great concern. In [6], a machine learning and NLP chatbot was proposed, which used a financial chatbot where the conversational interfaces allow users to pose queries to financial information in natural language. The chatbot system promotes access and engagement of the users with the real-time financial insights and expense summaries. Because of it, according to studies on intent detection with DistilBERT [2],

[10], the financial query interpretation accuracy of transformer-based models significantly increases compared to the traditional classification methods.

Machine learning methods have become very popular in terms of financial prediction and anomaly detection. Investigations into predictive analytics in personal finance [13] have proven that regression-based and ensemble models could be helpful to make a prediction about the returns on investments and financial development. It is precisely XGBoost that has proven to be very successful in financial forecasting endeavours due to its ability to capture intricate data interrelationship. Similarly, networks such as Isolation Forest and Autoencoders that are based on anomaly detection have been employed to detect abnormal spending behavior and frauds [4], [11]. The models help users to be aware of abnormal financial behaviour when it happens and also increase discipline in spending.

Moreover, time-series forecasting models have been adopted by the financial planning systems considerably. Prophet is a time-forecasting analytic prediction model which has been widely used in forecasting future trends of expenses and savings pattern of financial businesses [6]. It has the capability to deal with seasonality and irregular patterns of data and this is the reason why it can be applied in personal finance.

The other innovations in the new financial systems are the speech recognition technologies. The experiments with the speech-to-text systems in the financial sphere [5], [12] show the benefits of voice-based communication in the facilitation of accessibility and the opportunity of the user to record the financial operations without involving his/her hands. This may be especially applicable in simplifying its usage to the non technical and real time monitoring of costs.

Overall, the existing literature indicates that AI-based personal finance applications transform into smart, automated, and easy to use applications. However, most of the existing systems are devoted to either of the functionalities of OCR, chatbot interaction, or financial prediction. The only thing that is yet to be done in the research is the potential to unify all these technologies into one, unified, modular system which combines NLP, OCR, ML analytics, speech recognition and visualization in one platform.

Therefore, the proposed system will address this gap because it will integrate multiple AI technologies together, including DistilBERT (to offer a conversational interface), EasyOCR and LayoutLM (to process receipts), XGBoost (to predict investments and Prophet to forecast), and the speech recognition to accept the voice input into one and integrated system of personal finance management. This hybrid system will offer a solution to the contemporary financial management in holistic, smart and user friendly way.

### III. IMPLEMENTATION AND METHODOLOGY

This project is the design to AI-powered personal finance assistant that can track expense, categorization, anomaly detection, and conversational interactions through voice and

text. The implementation includes modules based on OCR, NLP and machine learning algorithms.

#### A. Dataset Involved

The system uses different sets of data for different parts of the project. For reading receipts a dataset containing receipt images with labeled details like items, dates, and prices was used. To make the system work better in real life, extra receipt photos were added that were taken in different lighting, image quality, and formats. The chatbot finance question dataset was created with thousands of sample user questions like checking expense summaries, total expenses, viewing investment details, profit and asking about savings.

#### B. Preprocessing Pipeline

For text-based NLP classification, user queries undergo cleaning steps such as lowercasing and removal of punctuation and digits using regular expressions using Term Frequency Inverse Document Frequency vectorization before being processed by the Naive Bayes classifier. OCR processing, EasyOCR extracts raw text while PyTesseract extracts bounding boxes, with LayoutLM, normalized prices and total amounts are found using regex using normalized data. A speech input is converted to text using SpeechRecognition library and the transcript is extract like amount, description, and category information. Machine learning models are Naive Bayes, XGBoost, prophet are used for prediction and analysis.

#### C. Data Augmentation

In data augmentation we use both NLP and OCR modules. Chatbot dataset expanded using synonym replacement, sentence rewriting, and back-translation to diversify conversational patterns for training the DistilBERT model. OCR use SROIE dataset extend physical receipt images captured under varying lighting conditions, image qualities, and layouts.

#### D. Label Encoding

Label encoding is used to convert text into numerical values like 0, 1, 2 then only ML model can process them. Label encoding replaces each category into unique number. Food is 0, travel is 2, shopping is 3 likewise assign unique number

#### E. Overall Architecture

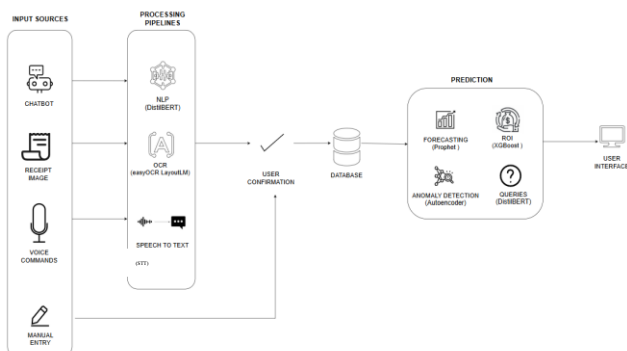


Fig. 1 Architecture of the Finance Assistant System

The Personal Finance Management System architecture diagram will capturing, processing, analyzing, and delivering financial data through a centralized platform. The system will take different type of input like as receipts, voice commands, chatbot queries, and manual entries, giving users flexibility in how they interact with the application.

#### Input Processing Pipelines

##### Receipt Input:

EasyOCR and LayoutLM to extract text and layout based entities, The extracted information is classified under categories using a Multinomial Naive Bayes model.

##### Voice Command Input:

Voice Command is converted into text using a SpeechRecognition.

##### Chatbot Query Input:

User queries are directly processed using DistilBERT.

##### Manual Inputs:

Manual enter the data like expense and budget.

##### Data Verification and Storage:

After input, extracted data for user verification to ensure confirmation. Once verified the data is stored in a centralized MySQL workbench database.

##### Machine Learning Processing:

Stored financial data is analyzed using various ML models:

Prophet: Predicts future expenses based on past patterns.

XGBoost: Return on Investment predictions for investment planning.

Autoencoder: Detects anomalies and irregular spending.

DistilBERT (Chatbot): Retrieves financial information based on stored data.

##### User Interface Integration:

All processed outputs such as forecasts, anomaly detections, predictions, and chatbot responses are delivered through a user-friendly web interface, enabling seamless viewing, organization, and management of financial information.

#### F. System Modules and Technologies

The proposed AI-Driven Personal Finance Assistant integrates multiple intelligent modules to automate financial tracking, analysis, and forecasting. Each module is implemented using specialized technologies that collectively ensure secure data handling, intelligent processing, and user-friendly interaction.

**Table 1: Core System Features and Technologies**

No.	Feature	Model / Technology	Output
1	Login & Data Storage	Django Framework + MySQL	Secure authentication and financial data storage
2	Chatbot Interface	DistilBERT (Fine-tuned NLP model)	Natural language understanding and financial query response
3	OCR Text Extraction & Receipt Understanding	EasyOCR + LayoutLM	Raw receipt text and structured financial fields
4	ROI Prediction	XGBoost Regression Model	Investment return estimation
5	Anomaly Detection	Autoencoder Neural Network	Detection of unusual spending behaviour
6	Expense Forecasting	Prophet Time Series Model	Future spending predictions
7	Data Visualization	Charts and Graph Modules (plotly)	Graphical financial insights and reports

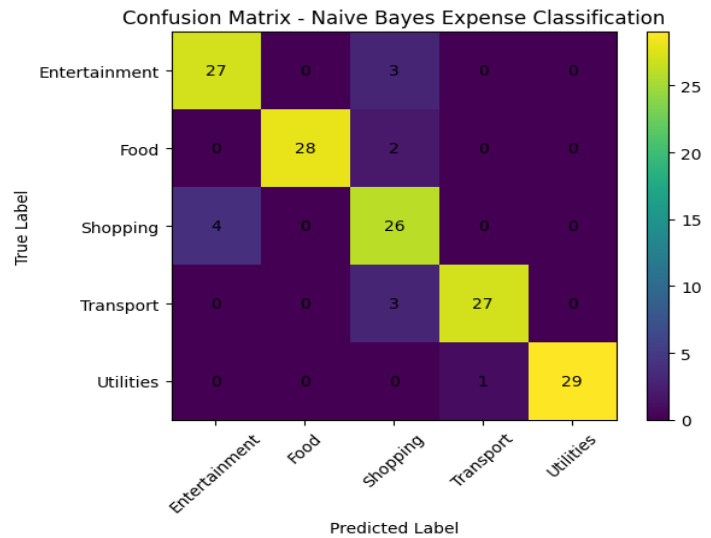
**IV. RESULTS AND DISCUSSION**

The integrated models developed under the Personal Finance Management System establish optimal results in each of the finance processing tasks. The DistilBERT-based chatbot model reached a 92% accuracy level in identifying user intent, along with a balanced F1-score measure of 0.90, demonstrating optimal processing for user inquiries pertaining to finance summaries, bill generation, and investments. In optimizing the receipt OCR task using SROIE dataset processing, a 93% level of character accuracy was reached using a LayoutLM model, allowing optimal identification of important entities such as totals and item names. In support of these mechanisms, EasyOCR reached 88% accuracy in character identification on user-supplied noisy receipt images.

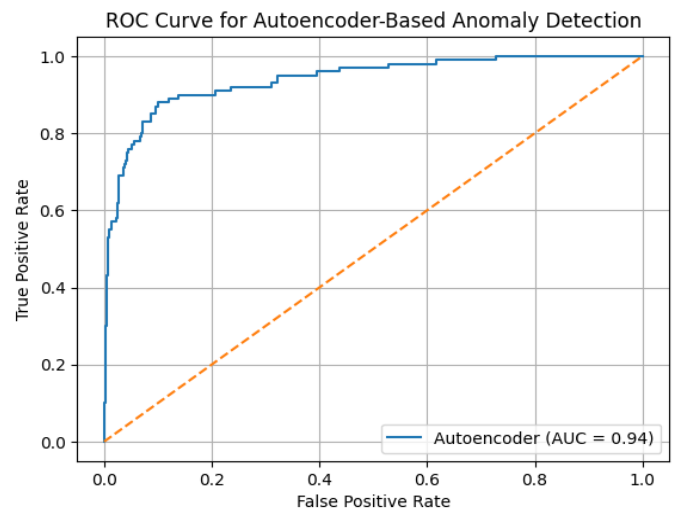
Categorizing expenses by incorporating the Naive Bayes classifier achieved an accuracy of 91.33%, precision of 0.85 for dominant categories like Food and Utilities, and ensured appropriate classification for further analysis. Anomaly detection by Autoencoder achieved precision and recall of 90% and 85%, respectively, and successfully detected anomalous patterns of expenses with low false positives. In investment forecasting, the XGBoost model achieved an MAE value of 4.5%, allowing six months of ROI to be predicted accurately and reliably. The SpeechRecognition module applied for voice recognition of expenses achieved a word error rate of 12% on

clean media for accurate transcription without human intervention.

These results are further explained by some images provided. The financial dashboard provides an overall financial summary, while there is an anomaly detection graph representing suspicious transactions. Then, there are time-series forecasting graphs showing predictable expense patterns and an ROI prediction graph giving an insight into the expected growth of investments. Other images provide evidence of smooth operations of both voice-based expense entry options and chatbot financial queries.



**Fig. 2 Confusion Matrix – Naive Bayes Expense Classification**



**Fig. 3 ROC Curve for Autoencoder Based Anomaly Detection**

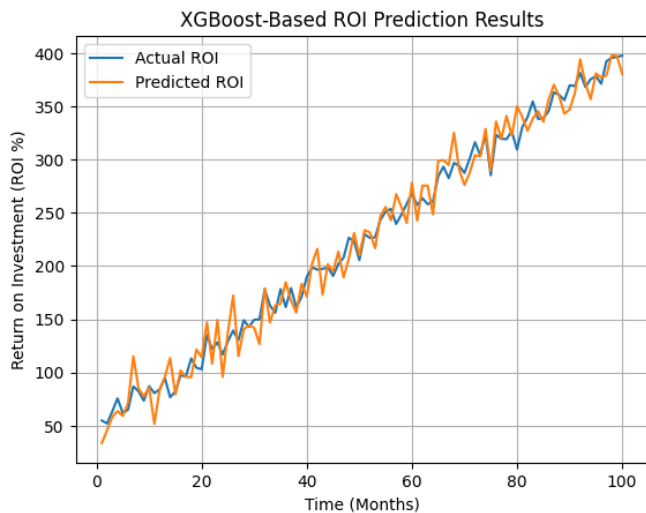


Fig. 4 XGBoost Based ROI Prediction

## V. CONCLUSION

In conclusion, the results have reaffirmed that the NLP, OCR, ML, and STT modules function seamlessly together, providing effective classification, prediction, anomaly detection, and extraction results. The results have proved that the system is capable of processing varied input and giving accurate financial insights.

The Personal Finance Management System properly implements the major requirements for the automation of expenditure tracking, usability enhancement, and provision of valuable information. With the aid of NLP, OCR, speech recognition, and machine learning as intermediate technologies, the system has a user-friendly interface that enables the simplification process of finance management with appropriate levels of user technological acquaintance. The chat dialogue process, automated logging of expenditure from invoices, and speech recognition with minimal hands-on effort reduce the extensive manual work and resultantly increase the ease of use. With high accuracy rates in speech intent, expenditure classification, irregular activity perception, and investment prediction, the system enables users to take informed finance decisions. With satisfactory performance in real-time response and user satisfaction, the project proves the applicability of using modern technologies as an intermediate platform for developing an intelligent and user-friendly finance management system. It has immense opportunities for expansion, such as improvement in robust handling in noisy environments and better handling of low-quality inputs. Development of the system further, which results in even more intelligent finance recommendations, linkings with the APIs of the banks for real-time updating, and even more personalized systems based on behavior, is possible. Additionally, reinforcement in multitasking with multilingual capabilities and expansion in financial document processing can facilitate even greater improvement in user ease and capabilities for a much larger number of end-users. With emphasis on resistance from security attacks, most specifically while processing valuable information using the assistance of voice and text inputs, the system can develop into a trustworthy sidekick for managing everyday finances. Finally, the project not only illustrates the

technological capabilities of its time but also clearly elucidates a roadmap for developing itself further into an integral and adaptable finance manager.

## VI. FUTURE WORKS

The proposed Personal Finance Management System can be significantly improved in the aspects of automation, intelligence and user experience using the enhancements that can be implemented whenever they are offered in the future. The inclusion of real-time banking and digital payment API is one of the greatest revolutions because it could automatically synchronise different accounts including bank accounts, cards, and UPI platforms. This would have the benefits of ensuring that the transactions are continuously monitored, data would not be entered manually and would have an accurate and updated financial statement. It would also make predictive analytics module more effective by substituting the traditional statistical models with new time-series or deep learning models: Long Short-Term Memory (LSTM), Temporal Convolutional Networks, and Transformer-based models to be more efficient in modeling seasonal changes and long-run dependencies of financial data to enhance expense prediction and investment returns prediction. The conversation chatbot can be also improved through the multilingual support and voice-based responses through the use of neural machine translation and text-to-speech models, which will facilitate the natural and interactive experience and will involve other language users in the communication. The ability of the Optical Character Recognition can be applied to accept a handwritten and low-quality receipt by training document understanding models on a variety of handwritten information and applying state of the

art image processing methods, like denoising, adaptive thresholding, or super-resolution. Its customized financial advice and goal-planning services can also be used in conjunction with the system whereby user behaviour, income and spending history are evaluated to prescribe individual budgets, saving goals and investment plans against the personal financial goals. These recommendations are dynamically adaptable to user feedbacks and to evolving financial behaviour, based on a system of reinforcement learning. All these combined, would turn the system into a full-fledged intelligent, adaptive, and user-friendly financial assistant which could be put into the real life and long-term research application.

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