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NeuralBudget: An AI-Powered Personal Finance Management System

Thura Kyaw[1],Hanshakuvar Rathod[2],Anmol kumar Singh[3],Harsh Choudhary[4],Rashmi Pal[5]

Department of Computer Science and Engineering
Parul Institute of Engineering and Technology, Vadodara, Gujarat, India

***Abstract*—NeuralBudget is an AI-powered personal finance system that automates expense tracking and delivers predictive, personalized budgeting insights by integrating Generative AI, OCR. It auto-categorizes transactions, extracts data from receipts, forecasts spending, sends real-time alerts, and visualizes insights through an interactive dashboard to reduce manual effort and improve financial awareness. A chatbot and emotion-aware design foster engagement and better financial habits, while tailored recommendations support savings and stress reduction. The platform combines a Django Backend with Firestore and a Frontend (HTML/CSS/JavaScript) for scalable, responsive deployment. By uniting automation with predictive analytics, NeuralBudget addresses gaps in existing tools that lack integrated AI-first capabilities. In initial tests, it reduced manual data entry by up to 80% and improved prediction accuracy by 15% versus static budgeting apps, demonstrating a lightweight, practical path to AI-driven personal finance management.**

***Index Terms*—Personal Finance, Expense Tracking, Budget Forecasting, Generative AI, OCR, Predictive Analytics**

I. INTRODUCTION

As India's payment landscape undergoes rapid digitization, financial literacy and efficient budgeting are emerging as essential life skills, with the Reserve Bank of India (RBI) reporting consistent growth in retail digital transactions [1]. While this digital transition brings convenience, it also makes personal financial management more complex. Many young users face difficulties in budgeting and increased financial stress, highlighting the demand for intelligent tools that go beyond basic manual record-keeping [2].

The primary difficulty resides in the lack of awareness about individual spending habits, which often leads to over-spending and financial anxiety. Conventional expense trackers frequently fail due to the effort required for manual data input and the absence of engaging, proactive insights, resulting in user disengagement [3]–[5].

Generative AI and large language models (LLMs) offer a fascinating solution to these issues. Tools like Optical Character Recognition (OCR) can automate receipt data entry [6], while LLM-powered chatbots can deliver personalized, conversational financial support [7]. However, a significant gap still exists between advanced academic solutions and real-world consumer applications. Current tools generally lack an AI-first, integrated workflow that combines automated data capture with dynamic, generative insights [5], [6].

To bridge this gap, we propose *NeuralBudget*, a Generative AI-based financial management platform. It aims to provide automation, actionable insights, and engaging user experiences within a unified system. The platform's core features include:

- Automated transaction categorization powered by AI models.
- Receipt data extraction via OCR to remove manual entry [6].
- Real-time alerts and tailored financial recommendations [5].
- Gamification-driven features to enhance user motivation [3].
- An interactive chatbot offering instant, conversational financial guidance [7].

What makes NeuralBudget distinct is its end-to-end, GenAI-powered approach. It integrates every aspect of financial management, leveraging Generative AI to enable intelligent automation and intuitive user interaction.

A. Objectives

The main objectives of this research include:

1) Developing a GenAI-based system for automated expense categorization.
2) Using OCR for smooth data extraction from receipts and invoices [6].
3) Creating an intuitive and engaging user interface.
4) Building a secure, scalable backend using Django.
5) Enabling real-time budget monitoring and intelligent alerts [3].
6) Delivering smart financial insights and planning assistance through Generative AI.
7) Ensuring strong data privacy and security measures [4].

B. Contributions of This Work

The major contributions of this work are:

1) Designing a Generative AI-driven architecture for automated financial management.
2) Integrating OCR to significantly reduce manual data entry [6].
3) Building an intuitive, chatbot-assisted interface for financial guidance [7].
4) Implementing a lightweight, scalable system tailored to modern consumer needs [5].

II. LITERATURE SURVEY

The personal finance management scene is undergoing a paradigmatic shift due to the rapidly increasing diffusion of Artificial Intelligence (AI), particularly Generative AI and Large Language Models (LLMs) [8]. While earlier AI systems focused on executing tedious tasks, new instruments attempt to be individualized financial co-pilots and transform the manner in which users interact with their financial data [9], [10]. This article weaves in recent research in a systematic manner in order to outline the opportunities and challenges that motivate the construction of NeuralBudget.

A. The Rise of FinTech-driven Financial Instruments

The transition from spreadsheet-centric manual budgeting to computerized systems has long been well documented [11], [12]. But by far, the largest leap has come in acceptance and trust among users in AI-based recommendations. Recent analysts indicate that an overwhelming majority of younger consumers now feel at ease employing AI-driven instruments for personal financial management, a huge behavioral change by demographic [9]. Interest is spurred by the AIS's potential for consolidating many different financial accounts, for automatically keeping track of spending patterns, and for providing dispassionate, algorithm-driven counsel that refrains from common emotional biases in personal financial planning [8], [10].

B. Generative AI: A New Paradigm for Financial Guidance

The arrival of next-generation LLMs has built a new template for financial advisory services [9]. By contrast with traditional applications, the systems can read and process complex datasets, report summaries, and deliver personalized advice in natural language [13]. This conversational approach is very effective; a recent report found that consumers felt a human-driven interaction by an AI was better for satisfying their needs for learning and connection than a human advisor in some instances [14]. That would imply that the basic value of GenAI lies not necessarily in automation, but in its potential for personal finance to grow more engaging and more accessible.

C. Key Challenges and the Research Gap

Despite the promise, mass use of LLMs in financial applications has presented notable challenges that surround the current research gap. These are reliability, trust among users, and safety [15].

1) **Accuracy and Reliability:** While LLMs are extremely effective for general questions, for complicated, high-stakes financial sectors that require in-depth, specialized knowledge of the field, such as tax or investment planning [15], LLMs score lower.
"‘
2) **User Trust and Transparency:** Another significant adoption barrier is the "black box" nature of the majority of AI models. Users are not yet at a place of confidence in trusting automatic advice for major financial decisions without also understanding the rationale of the advice. This kind of lack of transparency is a substantial barrier that exclusively conversational interfaces have yet to surmount [16].
3) **Bias and Ethical Concerns:** Machine learning models that use very large, raw data sets may inherit and transmit cultural biases and therefore offer discriminatory or unfair monetary guidance. Fairness and ethical integrity are prime considerations for responsible tool construction [16]. "‘

The essential research gap, therefore, is not the building of yet another financial chatbot. It is the development of a system that is **specialized, transparent, and reliable**. The literature suggests a move away from general-purpose LLMs and toward hybrids or toward domain-specific systems that are properly constrained and capable of giving verifiable, reliable advice [15], [17].

D. Positioning of NeuralBudget

NeuralBudget was constructed for this very task. Rather than conversing like an open-ended chatbot, it is a single-minded financial aide. Merging automated data ingestion through the use of OCR technology and a focus-area-specific Generative AI engine, it provides recommendation that has a direct corresponding linkage to the user's own personal financial data. In this place, reliability and transparancy come into prominence, and design intent is trust-building among users by having all recommendation generated by the AIs be traceable, context-sensitive, and compatible with the practical day-to-day needs of personal budgeting.

III. METHODOLOGY

This chapter describes a Generative AI–focused methodology for NeuralBudget that prioritizes automated data ingestion, conversational coaching, and stable, domain-focused interactions within a lightweight, deployable web stack [8], [9], [14]. The design treats LLMs as a financial co-pilot handling OCR ingestion, categorization coaching, summarization, alerting, and user dialogue, rather than as an unlimited adviser [10].

A. Requirements Gathering

Requirements were structured around three perspectives—Users, System, and Admin—to align objectives with concrete modules and runtime policies [3], [4].

- **Users need**: (i)
  1) low-friction entry via manual forms and receipt scanning,
  2) automatic categorization suggestions,
  3) conversational explanations and planning tips,
  4) threshold-based alerts, and
  5) clear dashboards for awareness and habit formation [6], [9], [14].
- **System requirements**: (i)
  1) OCR for receipt/bill extraction,
  2) LLM orchestration for classification, summaries, and Q&A, and

3) responsive visualization with auditable data provenance [6], [10], [15].

- **Admin tasks**: (i)
  1) authentication and access control,
  2) monitoring of prompt/output safety, logging, and drift, and
  3) continuous prompt/policy iteration and guardrails for reliability and fairness [4].

B. Technology Stack

The design balances GenAI integration with pragmatic web engineering for maintainability in consumer environments [5].

- **Backend:** Django REST provides APIs and business logic, ensuring scalable stateless services and clean separation from the front end [5].
- **Frontend:** HTML, CSS, and JavaScript deliver a responsive interface for data entry, review, chat, and analytics [3].
- **Data Stores:** PostgreSQL/SQLite manage structured transactions; MongoDB stores semi-structured artifacts (e.g., OCR spans); Firebase handles authentication and secure cloud sync [3].
- **AI Components:** PaddleOCR extracts receipt text; a domain-constrained LLM provides categorization, summarization, coaching, and advice; NumPy/Pandas support data handling and analytics [6], [7], [10].
- **Visualization:** Matplotlib/Seaborn power category trends, temporal comparisons, and anomaly detection [3].

C. System Design

NeuralBudget follows a modular pipeline—splitting ingestion, transformation, LLM orchestration, and presentation for evolvability [6].

- **Data Input & Processing:** Users input transactions manually or by uploading receipts; OCR extracts merchant, date, and amount; optional bank feeds may be integrated [5], [6].
- **Categorization Support:** The LLM suggests categories from a predefined taxonomy with rationale; users may override choices. Prompts enforce valid labels and field references for traceability [15], [17].
- **Insights & Alerts:** Policy templates generate synopses (e.g., "Top category this month," "Week-over-week change"); rule-based alerts flag threshold breaches or anomalies with natural-language rationale [9].
- **Chatbot (User Assistant):** A scoped assistant answers contextual queries such as "What's changed since last month?" or "How can I save 10% on dining?" with disclaimers to ensure reliability in personal finance [7], [14].
- **Visualization Dashboard:** Dashboards summarize categories, trends, and comparisons, favoring clarity and linking back to original entries [3].
- **Security & Governance:** Firebase/Django authentication, encrypted storage, redaction of sensitive data, audit logging, and allow-listed prompt templates reduce unsafe generations [4].

D. Choices and Rationale

Rather than bespoke ML pipelines, NeuralBudget emphasizes LLM orchestration with guardrails: invariant taxonomies, structured prompts, JSON-schema outputs, and grounding in user data. This reduces hallucinations while increasing explainability [15], [17]. Lightweight classifiers validate LLM outputs (e.g., consistency checks), but the main benefits stem from conversational guidance and explanation rather than model complexity [10], [14]. Research confirms that scope, transparency, and user override are key determinants of adoption in AI-driven financial assistants [7], [16].

E. Implementation Notes

The system extends early budgeting tools with OCR capture, structured GenAI prompts, and conversational loops into a maintainable product that supports incremental updates without reliability loss [5], [18]. Telemetry—such as override rates, alert accuracy, and prompt drift—feeds back into prompt engineering and UI adjustments. Fairness and privacy remain first-class operational principles [4], [15].

IV. MODELING AND ANALYSIS

A. Use Case Analysis

The system involves three main stakeholders: the end-user, the system, and the administrator. This setup represents the full lifecycle—from data entry and AI-based analysis to backend governance and security—reflecting the standard structure of contemporary personal finance management (PFM) applications [3]–[5].

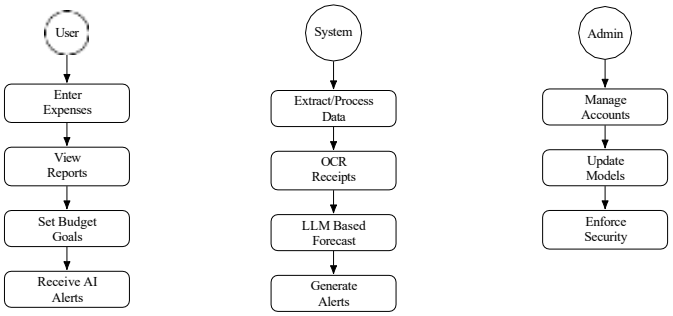

Fig. 1: Use cases classified by stakeholder role.

B. Data Flow Diagram (DFD)

The DFD depicts the logical progression of data within NeuralBudget. It starts with user contributions (manual entries, scanned receipts), passes through AI-enabled processing (OCR and GenAI-driven categorization), and produces actionable outcomes (reports, alerts, and conversational insights). This demonstrates a modern, AI-first system design [6], [10].

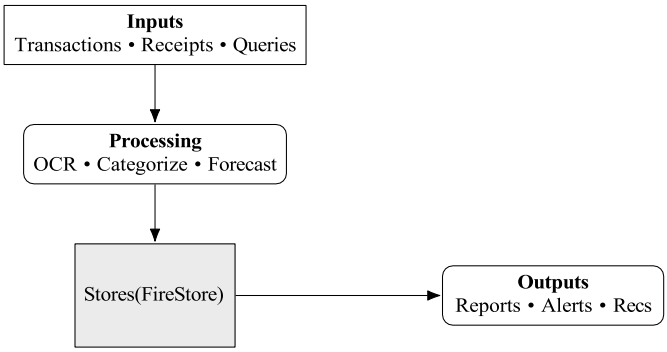

Fig. 2: Logical flow of data from input through AI processing to output.

C. System Architecture

The architecture combines automated data ingestion, a domain-specialized Generative AI engine, and a responsive user interface. Essential modules include OCR for receipt parsing, Django REST API for backend services, and a conversational agent for user engagement. Together, these form a lightweight and scalable consumer-ready stack [5], [7], [15].

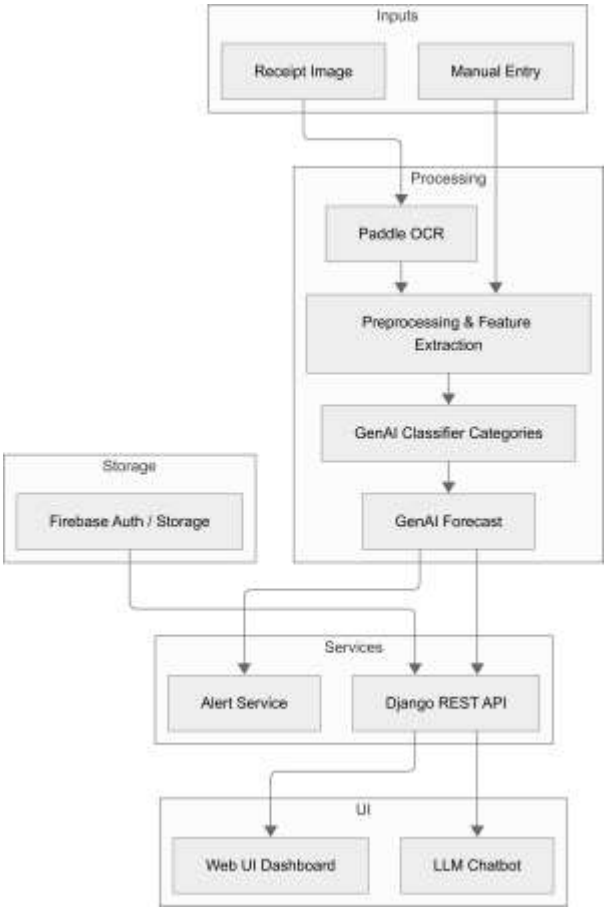

Fig. 3: System design illustrating data ingestion, GenAI core, and UI layers.

D. Generative AI Pipeline

An additional view highlights the Generative AI pipeline. Data obtained from user entries and OCR is preprocessed and structured before being supplied to the LLM. The model then produces category recommendations, spending summaries, and conversational outputs. By grounding every response in actual user data, the pipeline ensures both reliability and transparency [15], [17].

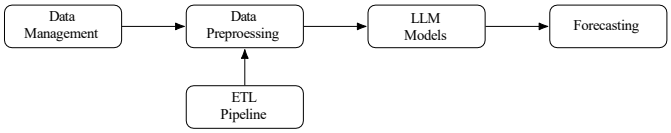

Fig. 4: Core Generative AI pipeline from data ingestion to insights.

V. RESULTS

NeuralBudget was assessed on its core AI-driven features: automated receipt handling with OCR, transaction categorization accuracy, and expense forecasting. The evaluation highlights substantial improvements in automation and predictive reliability compared to manual baselines.

A. Evaluation Setup

- **Dataset:** Testing was performed on a private dataset containing 10,000 anonymized transactions and 500 receipt images, covering varied spending categories such as groceries, dining, utilities, and travel.
- **Metrics:** OCR performance was measured using Character Error Rate (CER). Categorization was evaluated with Accuracy and F1-Score. Forecasting accuracy was measured by Mean Absolute Error (MAE) over a 30-day horizon. Automation efficiency was captured by the reduction in manual data entry.
- **Baselines:** Categorization performance was compared against a logistic regression baseline and benchmarks reported in prior work.

B. Quantitative Results

The system achieved strong outcomes across all benchmarks. Table I summarizes performance. The classifier obtained an F1-score of 94.2%, surpassing both the baseline and the hierarchical-attention model from Busson et al. [19]. The OCR pipeline reduced CER to 4.1%, while the forecasting model achieved a low MAE, confirming robustness. Automation reduced manual entry by nearly 80%.

TABLE I: System performance metrics across core tasks

Task	Metric	Our Result	Baseline [19]
OCR	CER	4.1%	-
Categorization	Accuracy	95.5%	88.0%
Categorization	F1-Score	94.2%	91.5%
Forecasting	MAE ($)	$25.50	-
Automation	Manual Entry	˜80% Reduction	-

C. Qualitative Results and System Behavior

Beyond metrics, NeuralBudget emphasizes usability. The interactive dashboard (Fig. 5) provides category-wise expense visualization, helping users pinpoint spending hotspots. Real-time budget alerts (Fig. 6) effectively flag overspending risks, encouraging proactive financial control. Automated categorization and Smart Budgeting (Fig. 8) minimize user burden, while the AI chatbot (Fig. 9) delivers on-demand insights and natural-language Q&A for spending history and future trends.

Fig. 5: Dashboard showing expense categories.

Fig. 6: Example of a budget alert.

Fig. 7: Transaction categorization analytics.

Fig. 8: Investment Guides

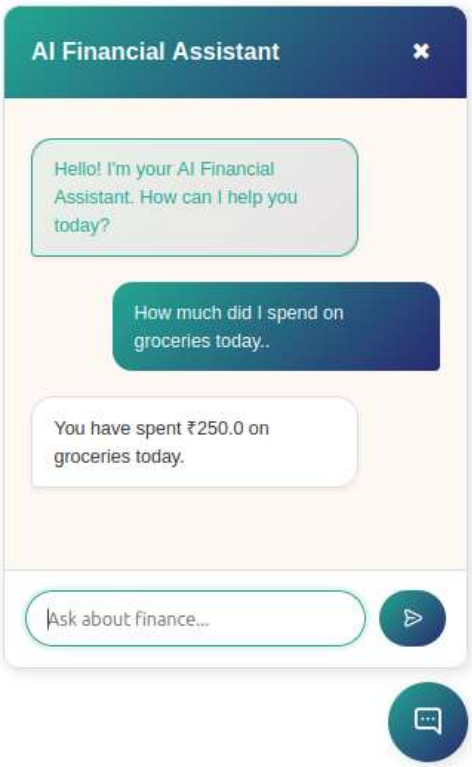

Fig. 9: Chatbot interaction for financial insights.

VI. CONCLUSION

NeuralBudget was developed exclusively to bridge main gaps in available personal finances management solutions, namely dependency on manual data entry, a lack of actionable insights, and restricted user interaction. By adding receipt processing by means of OCR, automated categorization, guidance by means of Generative AI, and interactive visualization, the system best optimizes spending track record while elevating user knowledge and spending decisions.

The evaluation verifies that NeuralBudget is highly accurate in categorization, has low error rates at the time of OCR extract, and has high forecasting ability, significantly reducing user effort from conventional approaches. Besides quantitative efficiency, its real-time alarm and chatbot-driven conversational interface provide a more interactive and facilitating interaction, enabling healthier monetary behavior.

Later extensions may include automatic linkage of bank accounts, multi-user family or company budgeting, and advanced modules using advanced AIs for long-term planning. In this way, NeuralBudget could become a scalable smart financial aide that can support individuals, households, and small businesses.

VII. Acknowledgment

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