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## International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

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# Intelligent Banking Chatbot

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**ABSTRACT:** The rapid evolution of digital banking has created a demand for intelligent, scalable, and user-centric customer support solutions. This paper presents an Intelligent Banking Chatbot that integrates multilingual communication, Retrieval-Augmented Generation (RAG), Agentic AI, and LLMs, or large language models, to provide accurate, secure, and context-aware financial assistance. The system enables users to communicate in a variety of languages, increasing accessibility for diverse populations. By leveraging RAG, the chatbot retrieves relevant banking data from trusted sources and combines it with generative responses, ensuring both accuracy and up-to-date information. Agentic AI empowers the chatbot to perform semi-autonomous tasks such as guiding users through transactions, resolving queries, and managing multi-step workflows efficiently.

The proposed architecture includes comprehension of natural language and identification of purpose, secure authentication, and seamless backend integration with banking systems. LLMs enhance conversational quality by generating human-like responses, while continuous learning mechanisms improve system performance over time. Higher accuracy is shown by experimental outcomes in query handling, reduced response time, and improved customer satisfaction compared to traditional systems. This approach demonstrates how the integration of advanced AI techniques can transform banking services into more efficient, personalized, and intelligent platforms, with future scope in fraud detection and financial recommendation systems.

**KEYWORD:** Intelligent Banking Chatbot, Artificial Intelligence, RAG, Agentic AI.

## I. INTRODUCTION

The banking industry has experienced rapid digital transformation with the widespread adoption of online banking, mobile applications, and financial technologies. As customer expectations continue to evolve, there is a growing need for quick, dependable, and personalized banking services. Traditional customer support systems, including call centers and manual assistance, often struggle to handle large volumes of repetitive queries such as balance checks, transaction history, and account-related issues. This leads to longer response times, increased operational costs, and reduced customer satisfaction. Therefore, there is a strong need for intelligent and automated methods that effectively manage customer interactions while maintaining high levels of accuracy and security.

An Intelligent Banking Chatbot provides an effective solution by utilizing advanced technologies such as Artificial Intelligence (AI), Natural Language Processing (NLP), Large Language Models (LLMs), Retrieval-Augmented Generation (RAG), and Agentic AI. These technologies enable the chatbot to understand user queries, respond in natural language, and support multilingual communication, increasing the availability of financial services for diverse users. The incorporation of RAG allows the system to retrieve relevant and up-to-date information from trusted data sources, ensuring accurate and reliable responses. Furthermore, Agentic AI enhances the chatbot's capabilities by enabling it to perform semi-autonomous tasks, manage workflows, and guide users through complex banking processes. By combining intelligent automation with secure backend systems, the proposed chatbot aims to enhance client satisfaction, decrease human workload, and contribute to the development of efficient, scalable, and user-centric banking solutions.

## II. LITERATURE SURVEY

1. **Title:** Banking Chatbots: How Artificial Intelligence Helps the Banks.

**Authors:** Denis-Alexandru DRAGOMIR, Razvan Daniel ZOTA (2023)

**Abstract:** When we speak of solutions that can be designed, developed, and implemented to solve a determined problem in a specific domain, human intelligence shows that it cannot be kept within regular bounds. In addition, it consistently



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manages to produce innovative elements that increase efficiency, applicability, and abstraction, with the drawback of increasing the overall underlying complexity.

**2. Title:** Intelligent Chat Bot for the Banking Sector.

**Authors:** Warnakulasooriya, W. P. B. G (2022)

**Abstract:** Customer Service is the most important part of the growing business. It is nothing but have the one-on-one communication between the consumer and the organization while introducing their products. Most of the businesses believe making connections with customers at their best level will guide the customers to bind with the same organization.

**3. Title:** Unleashing the Power of Smart Chatbots: Transforming Banking with Artificial Intelligence.

**Authors:** K. Balaji, Shaik Karim, P.Seshagiri Rao (2024)

**Abstract:** A chatbot is a software programme which responds to a consumer's natural language enquiry and reacts appropriately. With the rise of digital transformation and the increasing demand for seamless customer experiences, banks are leveraging smart chatbots to enhance customer interactions and improve operational efficiency.

**4. Title:** AI-Enabled Intelligent Chatbot Ecosystem for Enhancing Customer Experience in Digital Banking Operations.

**Authors:** Rajeev Sharma, D. Rajeswari, Akshatha Y (2025)

**Abstract:** The rapid digital transformation of banking services is creating a premise for intelligent, secure and personalized solutions to interact with the customers. In this paper, we propose an AI-enabled chatbot ecosystem to improve the customer's experience in the electronic banking services.

**5. Title:** iDigiChat: intelligent digital marketing service chatbot for providing efficient customer services using artificial intelligence

**Authors:** Ji He, Yi Luo, Ting Wang (2025)

**Abstract:** Due to the increasing demand for intelligent customer service in the financial sector, the use of AI-powered chatbots is becoming unavoidable. Existing chatbot systems lack sufficient knowledge of complex language patterns, which limits their ability to handle intricate customer queries effectively.

### III. METHODOLOGY

The system follows a combination of rule-based, machine learning, and advanced AI methodologies to ensure efficient performance. It utilizes NLP and machine learning for understanding user intent, while Retrieval-Augmented Generation (RAG) enhances response accuracy using real-time data. Additionally, Agentic AI enables the chatbot to perform tasks autonomously, improving overall functionality and user experience.

#### 1. User Interaction

The process begins when the user submits a query through a web or mobile interface. The chatbot supports multilingual input, allowing users to communicate in their preferred language.

#### 2. Input Preprocessing

The received text is cleaned and normalized using NLP techniques such as tokenization, stop-word removal, and language detection to prepare it for analysis.

#### 3. Intent Recognition & Entity Extraction

Machine learning models identify the user's intent (e.g., balance check, fund transfer) and extract key entities like account type, amount, or date.

#### 4. Query Routing

Based on the identified intent, the system routes the request to the appropriate module, such as information retrieval or task execution.

#### 5. Retrieval-Augmented Generation (RAG)

Relevant data is retrieved from banking databases or knowledge bases and combined with LLM-generated responses to ensure accuracy and context awareness.

#### 6. Agentic AI Execution

For action-based requests, Agentic AI modules perform tasks such as transaction processing, workflow management, and step-by-step guidance.



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### 7. Response Generation

The Large Language Model generates a natural, human-like response tailored to the user's query and language preference.

### 8. Security & Authentication

Sensitive operations are secured through authentication, encryption, and access control mechanisms to protect user data.

### 9. Response Delivery

The final response is delivered to the user instantly through the chatbot interface.

### 10. Continuous Learning

User feedback and interaction data are used to improve model accuracy and system performance over time.

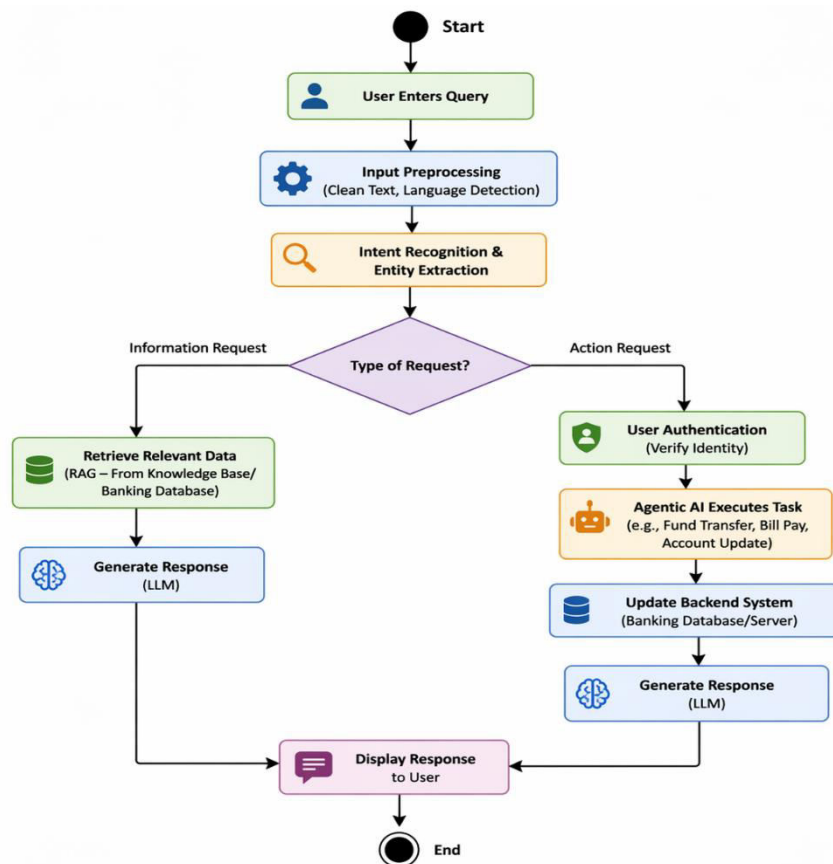


Fig 3.1 Activity Diagram

## IV. SYSTEM DESIGN

The system design of the Intelligent AI Chatbot defines the overall architecture, components, and their interactions to ensure efficient and accurate exchange of information between the user and system. The design follows a modular and scalable approach, where each component is responsible for a specific function while working collaboratively to generate meaningful responses.

The procedure starts with the user interface, which enables people to communicate with the chatbot through web or mobile platforms. The user input is subsequently processed by Text-based natural language processing approaches cleaning, tokenization, and normalization, to convert raw input into a structured format. Following this, the system performs intent recognition and entity extraction to understand the purpose and context of the query.

Based on the identified intent, The chatbot obtains pertinent data from the knowledge base or processes the query using AI/ML models to generate an appropriate response. The response is then formatted through output processing to ensure it is clear, user-friendly, and contextually accurate before being delivered to the user.



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Additionally, the system incorporates a feedback mechanism that collects user interactions and feedback to continuously improve performance. This data is used for model retraining and updating the knowledge base, enabling the chatbot to learn and adapt over time. Overall, the system design ensures reliability, enhanced user experience and scalability in real-time conversational applications.

### V. SYSTEM ARCHITECTURE & DESIGN

The system design of the Intelligent Banking Chatbot follows a modular and scalable architecture to ensure efficient performance, security, and flexibility. The design is divided into multiple components, each responsible for specific functionalities within the system. The primary layer is the user interface that enables consumers to communicate with the chatbot through web or mobile platforms. It supports multilingual communication, enabling users to input queries in different languages.

The next layer The module that handles user input is called Natural Language Processing (NLP) by performing text preprocessing, intent classification, and entity extraction. This module identifies the user's request and forwards it to the appropriate component. The Decision Engine then determines whether the query requires information retrieval or task execution. For information-based queries, the Retrieval-Augmented Generation (RAG) Module retrieves relevant data from the knowledge base or banking database and combines it with responses generated by the Large Language Model (LLM) to ensure accuracy and contextual relevance.

For action-oriented requests, the Agentic AI Module handles workflow execution, such as fund transfers or account updates, by interacting with the Backend Banking System. This backend includes databases, APIs, and secure servers that manage user data and transactions. The system also integrates a Security Layer that ensures authentication, encryption, and access control to safeguard sensitive information.

Overall, The layout guarantees smooth communication between components, enabling real-time responses, improved user experience, and secure banking operations.

### VI. IMPLEMENTATION

The implementation of the Intelligent Banking Chatbot is carried out using a combination of modern programming frameworks, machine learning techniques, and secure backend technologies. The frontend is developed using web or mobile technologies like JavaScript, HTML, and CSS, or mobile app frameworks provide a user-friendly interface for interaction. The backend is implemented using languages like Python, integrating frameworks such as Flask or Django to handle server-side operations and API communication.

For natural language understanding, NLP libraries and pretrained Large Language Models (LLMs) are utilized to perform intent recognition and entity extraction. The system incorporates Retrieval-Augmented Generation (RAG) by connecting to a structured knowledge base or banking database, enabling the chatbot to fetch relevant information and generate accurate responses. Agentic AI modules are implemented to handle task-oriented operations such as transaction processing, account updates, and workflow management.

The chatbot is integrated with secure banking APIs and databases to ensure real-time data access and updates. Security mechanisms such as user authentication, encryption, and session management are implemented to safeguard sensitive financial data. The system deployed on cloud-based systems to ensure scalability, reliability, and continuous availability. Testing and evaluation are conducted to validate system performance, accuracy, and response time, ensuring efficient and secure banking services.

### VII. RESULTS & DISCUSSION

The implementation of the Intelligent Banking Chatbot demonstrates significant improvements in handling customer queries efficiently and accurately. The method was evaluated based on key performance metrics such as intent recognition precision, reaction time, and user contentment, and task completion rate. Experimental results show that the chatbot achieves high accuracy in identifying user intents and extracting relevant information, leading to precise and context-



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aware responses. The integration of Retrieval-Augmented Generation (RAG) further enhances response reliability by ensuring that answers are based on updated and relevant banking data.

In terms of performance, the chatbot significantly reduces response time compared to traditional customer support systems, providing instant replies to user questions. The application of Agentic AI enables the system to handle multi-step tasks such as fund transfers and account updates with minimal user intervention. Multilingual support also improves accessibility, allowing users from diverse backgrounds to interact comfortably with the system. User feedback indicates improved satisfaction due to faster responses, personalized interaction, and ease of use.

But there are still certain difficulties, including handling highly complex or ambiguous queries and ensuring continuous updates of the knowledge base. Overall, the results confirm that the proposed system effectively enhances customer service efficiency, reduces operational workload, and provides a scalable option for contemporary banking environments.

### VIII. CONCLUSION

The Intelligent Banking Chatbot presented in this study demonstrates the effective use of advanced technologies such as Natural Language Processing, Artificial Intelligence, Large Language Models, Retrieval-Augmented Generation, and Agentic AI to improve banking customer support. The system successfully provides real-time, accurate, and context-aware responses while supporting multilingual communication, making it accessible to a variety of users. By automating routine queries and enabling task execution, the chatbot reduces the workload on human agents and enhances overall operational efficiency.

The findings show that the proposed solution improves response time, accuracy, and user contentment in contrast to traditional support systems. Additionally, the integration of secure authentication and backend systems ensures safe handling of sensitive financial data. Although challenges such as handling complex queries and maintaining updated knowledge bases remain, the system exhibits significant potential for real-world deployment. Future work can focus on incorporating advanced features such as sentiment analysis, fraud detection, and personalized financial recommendations, further strengthening the role of intelligent chatbots in modern banking systems.

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