

## **AI BASED DISCOURSE FOR BANKING INDUSTRY**

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### **INTRODUCTION:**

A banking chatbot is an AI-based conversational bot that supports bank customers in real time and functions like a virtual assistant. A banking chatbot can keep clients from being required to address a human client service delegate utilizing a mix of man-made brainpower and question-answer blends.

The new automation initiatives in the banking sector that are centred on conversational banking are led by chatbots. Chatbots and other conversational banking tools enable banks to automate consumer interactions wherever they are and in whatever shape they take, where ATMs and applications previously provided machine-based support.

Banking organisations are facing more pressure to shift digitally. Customers want encounters to seem personalised and distinctively human, but they also desire automated experiences with self-service options. Natural language processing (NLP) is used by Watson Assistant to assist in taking the call. Create chatbots using AI that provide prompt, accurate responses. Reduce wait times, time-consuming information searches on the internet, and facilitate meaningful human contacts.

Prior to cell phones, a live customer service representative was needed for the majority of banking inquiries. Customers were forced to wait in line or on hold while trying to talk with a teller. Customers can now use chatbots as a self-service digital assistant to do the majority of common tasks.

Chatbots allow clients to conduct standard banking tasks on their own, which allows banks to significantly cut customer assistance expenses. According to research, banking chatbots will save operational costs for banks by \$7.3 billion by 2023, up from \$209 million in 2019.

Most banks are not familiar with their clients. Chatbots can gather client information across thousands of discussions, which they can then utilise to tailor services and inform future strategic decisions. Additionally, the appropriate platform allows chatbots to utilise AI to learn from discussions and deliver better service moving forward.

Banking consumers cannot always reach customer service representatives, but your chatbot can. Customers can use banking chatbots at any time of day or night to get answers to a variety of banking-related questions. Given the continuing effects COVID-19 and labour shortages are having on the workforce, this benefit is even more crucial. Chatbot can respond to a number of basic inquiries about customer accounts or financial services. Chatbots, for instance, can respond to inquiries like "How do I apply for a credit card?"

## **LITERATURE REVIEW:**

Banking chatbots have emerged as an innovative solution to enhance customer service and streamline banking operations. This literature review aims to explore the key themes and findings from recent studies related to banking chatbots. By examining the existing literature, this review seeks to provide insights into the benefits, challenges, and future prospects of implementing chatbots in the banking sector.

### **1. Evolution and Adoption of Banking Chatbots:**

This section focuses on the evolution of chatbot technology in the banking industry and the factors driving its adoption. It examines how chatbots have transitioned from simple rule-based systems to intelligent conversational agents powered by artificial intelligence (AI) and natural language processing (NLP) techniques. The review also explores the motivations behind banks adopting chatbot technology, including improving customer experience, reducing operational costs, and increasing efficiency.

### **2. Benefits of Banking Chatbots:**

This section explores the various benefits that banking chatbots offer to both customers and banks. It discusses how chatbots provide round-the-clock customer support, personalized recommendations, and instant responses to queries. Additionally, the review examines how chatbots can help automate routine transactions, handle account inquiries, and provide financial advice, leading to improved customer satisfaction and enhanced operational efficiency.

### **3. Customer Experience and Satisfaction:**

This section focuses on the impact of chatbots on customer experience and satisfaction within the banking sector. It examines studies that assess customer perceptions, attitudes, and acceptance of chatbot technology. The review explores factors influencing customer satisfaction, such as chatbot responsiveness, accuracy, empathy, and the ability to handle complex queries. It also discusses the role of chatbot design, interface, and user experience in shaping customer perceptions.

### **4. Challenges and Limitations:**

This section discusses the challenges and limitations associated with implementing banking chatbots. It explores issues such as the potential for errors in understanding user intent, language limitations, and the need for continuous learning and improvement. The review also addresses concerns related to data privacy, security, and ethical considerations surrounding the use of chatbots in the banking industry.

### **5. Future Directions and Research Opportunities:**

This section identifies emerging trends and future directions for research in the field of banking chatbots. It discusses advancements in AI, machine learning, and NLP that can further enhance chatbot capabilities. The review explores potential areas of improvement, such as integrating chatbots with other customer service channels, incorporating sentiment analysis, and exploring multilingual support. It also highlights the importance of ongoing research and evaluation to refine chatbot technology in the banking context.

This literature review provides a comprehensive overview of the current state of research on banking chatbots. It highlights the benefits, challenges, and future prospects of implementing chatbots in the banking sector.

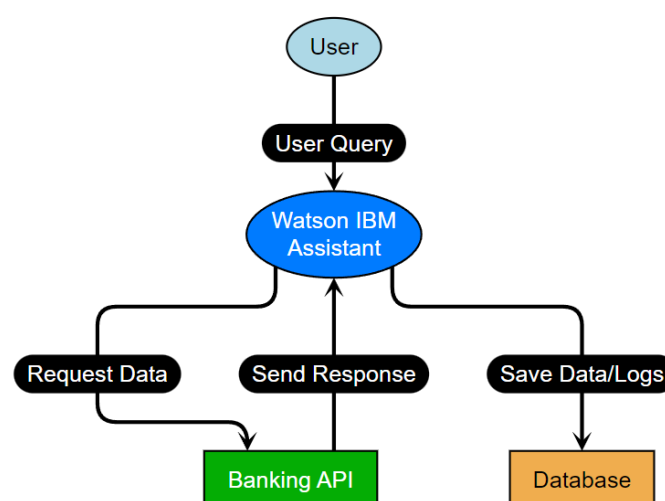
Our proposed methodology involves usage of Watson IBM assistant and to create a conversation flow or dialogue design that outlines how the chatbot will interact with users. Define the possible user inputs, intents (user's intentions), entities (relevant information within user inputs), and appropriate responses from the chatbot.

Within the Watson Assistant dashboard, create a new assistant. Define the assistant's name, language, and other relevant settings. Define the intents, which represent the various user intentions or actions that the chatbot needs to understand. For a banking chatbot, some example intents might include balance inquiry, fund transfer, or creating a new account.

Train the assistant by providing sample user inputs for each intent. This helps Watson Assistant understand and classify user inputs correctly. You can also provide variations and synonyms to improve the assistant's understanding. Create dialogues or flows that define how the chatbot responds to user inputs. Use the Watson Assistant's dialog editor to define the chatbot's responses based on intents and entities. You can also include conditions, context variables, and system responses to create dynamic conversations. Test the chatbot extensively to identify and address any issues or gaps in its understanding or responses. Iterate on the conversation design, intents, and dialogues based on user feedback and interactions.

Integrate the chatbot with your bank's existing systems and channels, such as websites, mobile apps, or messaging platforms. Deploy the chatbot to your desired channels and make it accessible to users. Continuously monitor and analyze the chatbot's performance, user feedback, and interactions to identify areas for improvement.

## THEORETICAL ANALYSIS:



The flow of the chatbot typically starts with user inputs being processed by the chatbot interface. The user inputs are then passed to IBM Watson Assistant, which understands the intents and entities. The dialog management determines the appropriate responses and actions based on the conversation context. If necessary, the chatbot can integrate with banking systems and external data sources to retrieve or update information.

To build a banking chatbot using IBM Watson Assistant, you'll need the following software requirements:

**IBM Watson Assistant:** You'll need access to the IBM Watson Assistant service. This service provides the core functionality for building and managing the chatbot.

**IBM Watson Studio:** It's a development environment, it provides a web-based environment for developing and deploying AI models, including chatbots.

**Web Technologies:** For integrating the chatbot into a website or web application, you may need knowledge of web technologies such as HTML, CSS, and JavaScript.

**Backend Integration:** If you intend to integrate the chatbot with banking systems or external APIs, you may need knowledge of backend programming languages such as Python, Java, Node.js, or others, depending on the requirements of the integration.

**Deployment Platforms:** You'll need a platform to deploy and host your chatbot. IBM Watson Assistant provides options to deploy chatbots on various channels, including web interfaces, mobile apps, messaging platforms, and more. Consider the deployment platform that aligns with your project requirements.

## **EXPERIMENTAL INVESTIGATIONS:**

When conducting experimental investigations for a banking chatbot using IBM Watson Assistant, you can design experiments to evaluate various aspects of the chatbot's performance, user satisfaction, and effectiveness. Here are some experimental investigations you could consider:

### **1. Intent Classification Accuracy:**

Evaluating the accuracy of intent classification by providing a set of predefined user inputs to the chatbot and measuring how accurately it identifies the correct intent. Compare the results against a manually annotated ground truth to determine the intent classification accuracy and assess the effectiveness of the chatbot's understanding of user intentions.

### **2. Entity Extraction Accuracy:**

Assess the accuracy of entity extraction by providing user inputs containing specific entities, such as account numbers or transaction amounts. Measure how accurately the chatbot extracts the relevant entities from the inputs and compare against a manually annotated ground truth. This evaluation helps determine the chatbot's ability to accurately identify and extract crucial information from user inputs.

### 3. Response Accuracy and Completeness:

Evaluate the accuracy and completeness of the chatbot's responses by providing a set of user inputs and comparing the generated responses against a set of expected responses or expert evaluations. Measure the response accuracy in terms of providing correct and relevant information, as well as the completeness of the responses in addressing user queries or requests.

### 4. User Satisfaction and Experience:

Conduct user surveys or interviews to gather feedback on user satisfaction and experience with the chatbot. Use standardized scales, such as the System Usability Scale (SUS) or the User Experience Questionnaire (UEQ), to assess various aspects of user satisfaction, including ease of use, effectiveness, and overall user experience.

### 5. Error Handling and Fallback Mechanisms:

Test the chatbot's error handling and fallback mechanisms by intentionally providing inputs that contain ambiguous queries or out-of-scope requests. Evaluate how well the chatbot handles such situations and whether it provides appropriate error messages or prompts to guide the user.

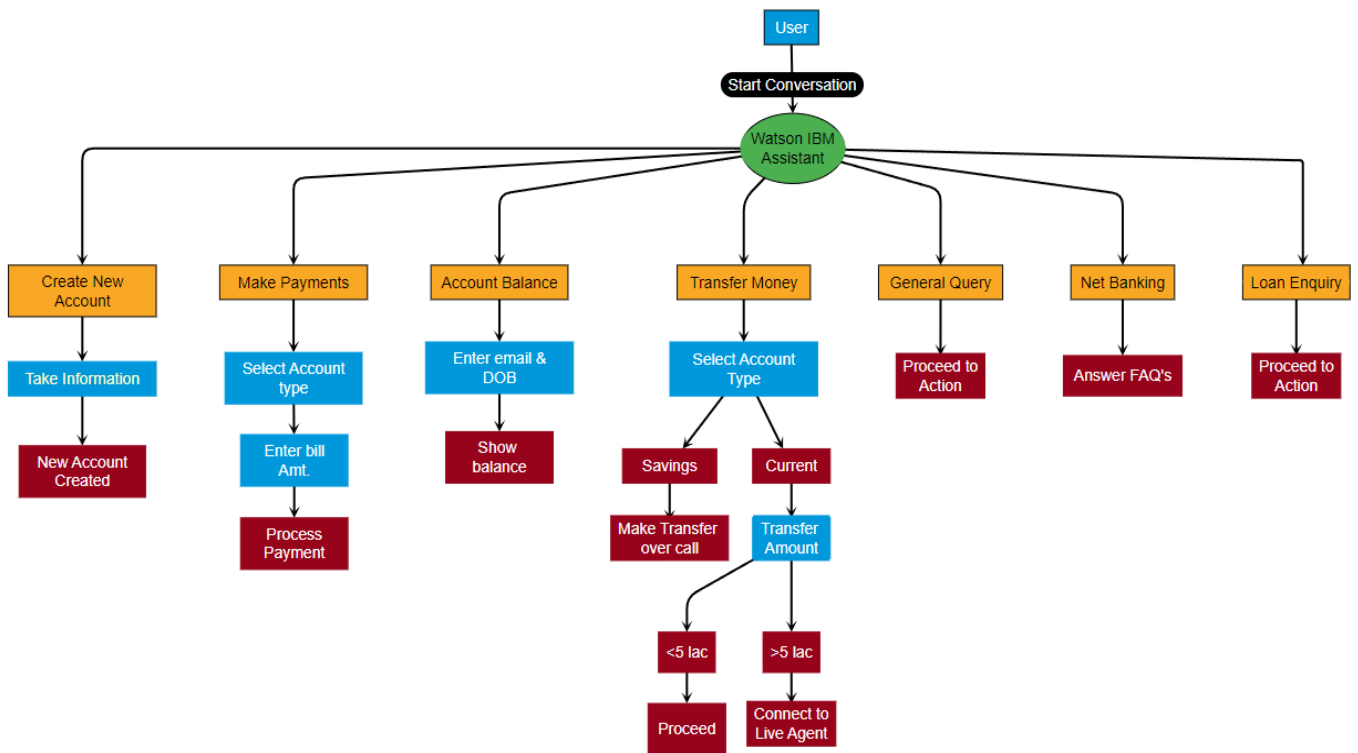
### 6. Contextual Understanding and Continuity:

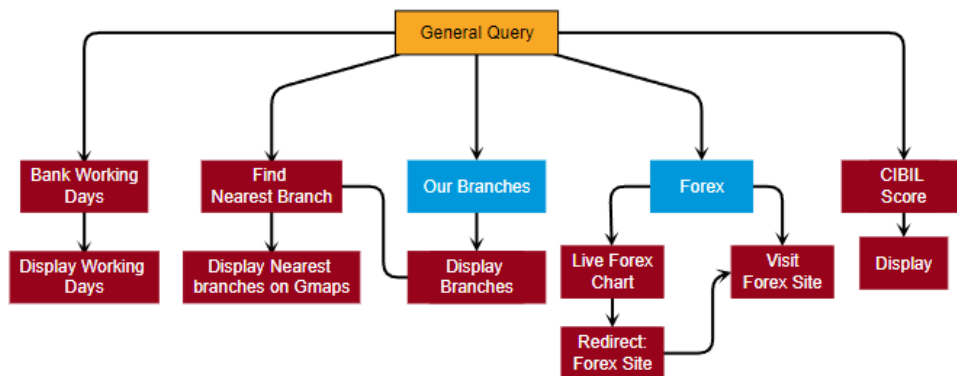
Assess the chatbot's ability to maintain context and provide continuous conversations across multiple interactions. Evaluate how well the chatbot remembers user context and can respond appropriately to follow-up queries or requests from users.

### 7. Real-World Testing:

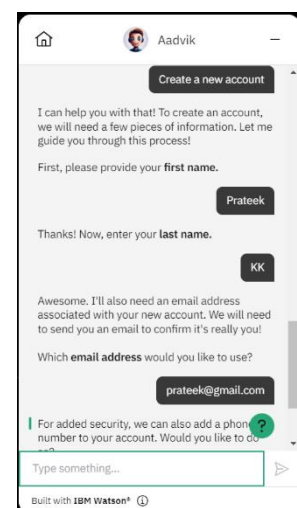
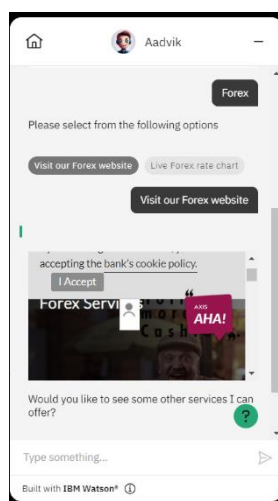
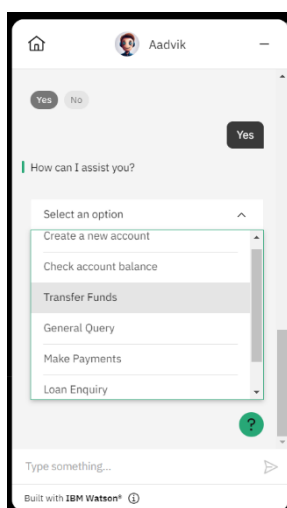
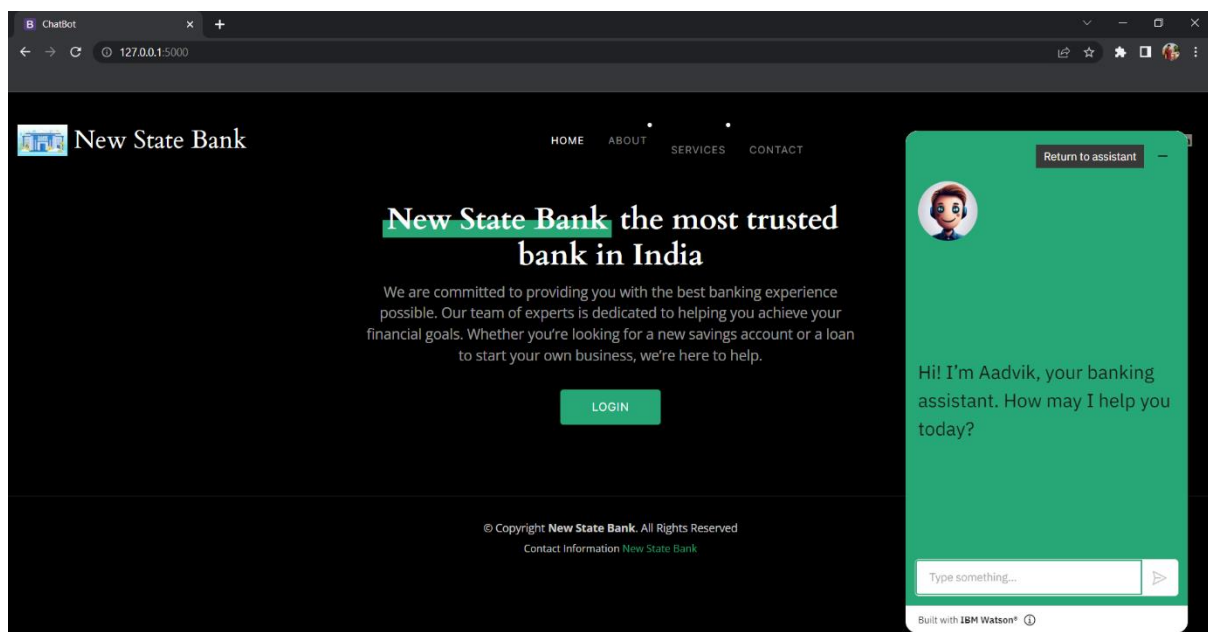
Conduct live testing of the chatbot with a subset of real bank customers or employees. Collect feedback and monitor user interactions to evaluate the chatbot's performance in real-world scenarios, identify any unforeseen challenges, and gather insights for further improvements.

## FLOWCHART:





## RESULT:



## **ADVANTAGES AND DISADVANTAGES:**

### Advantages of Banking Chatbots:

1. **24/7 Availability:** Banking chatbots can provide round-the-clock customer support, allowing users to access services and information at any time, even outside of traditional banking hours. This enhances customer convenience and accessibility.
2. **Instant Responses:** Chatbots can provide instant responses to customer inquiries, reducing waiting times and improving overall customer experience. Users can quickly get answers to frequently asked questions, check account balances, or perform simple transactions without the need to wait for human assistance.
3. **Scalability:** Chatbots can handle multiple conversations simultaneously, making them highly scalable. They can efficiently serve a large customer base without requiring additional human resources, enabling banks to handle high volumes of customer interactions efficiently.
4. **Cost Savings:** By automating customer interactions, chatbots can help banks reduce costs associated with customer support and call center operations. Banks can allocate human resources to more complex tasks while using chatbots to handle routine inquiries and transactions.
5. **Personalization:** Advanced chatbots can utilize machine learning and artificial intelligence algorithms to learn from user interactions and provide personalized recommendations or offers. They can analyze customer preferences, transaction history, and behavioral patterns to deliver tailored suggestions and assistance.

### Disadvantages of Banking Chatbots:

1. **Limited Understanding:** Chatbots may struggle with understanding complex or ambiguous user queries. They can sometimes misinterpret user intents or fail to extract essential information accurately. This can lead to frustration and inconvenience for users, particularly when dealing with complex banking inquiries or requests.
2. **Lack of Human Touch:** Chatbots lack the human touch and empathy that some customers may prefer. In situations that require emotional support or complex problem-solving, customers may still prefer speaking with a human customer service representative.
3. **Security and Privacy Concerns:** Chatbots handle sensitive customer information, such as account details or personal data. Ensuring the security and privacy of this information is crucial. Any vulnerabilities in the chatbot's security measures can pose risks to customer data and can be exploited by malicious actors.
4. **Technology Limitations:** Chatbot technology, although continuously improving, still has limitations. They may struggle with understanding nuanced language, recognizing sarcasm or humor, or handling complex conversations that involve multiple topics or context switches. Advanced functionalities, such as natural language understanding, may require significant development effort and expertise.



5.Lack of Personalized Advice: While chatbots can offer personalized recommendations based on user data, they may not have the depth of knowledge or expertise that a human financial advisor possesses. Customers seeking complex financial advice may prefer interacting with human professionals who can provide tailored guidance based on individual circumstances.

Overall, while banking chatbots offer numerous advantages in terms of availability, speed, and scalability, they still have limitations in terms of understanding complex queries and delivering personalized advice. Banks should carefully consider the strengths and weaknesses of chatbot technology and strike a balance between automation and human interaction to provide the best customer experience.

## **APPLICATIONS:**

Banking chatbots using IBM Watson Assistant have various applications that enhance customer experience, streamline operations, and provide efficient banking services. Here are some common applications of banking chatbots:

1. Account Balance and Transaction Inquiry: Chatbots can provide users with instant access to their account balances, transaction history, and recent activities. Users can inquire about specific transactions, check their account balances, or request transaction summaries without the need for manual navigation through banking interfaces.

2. Fund Transfers and Payments: Chatbots enable users to initiate fund transfers between accounts, make bill payments, or set up recurring payments. Users can provide instructions to the chatbot regarding the desired payment or transfer details, and the chatbot can securely process the transaction.

3. Product and Service Information: Chatbots can provide information about banking products and services, including details about various account types, loan options, interest rates, credit cards, or investment opportunities. Users can ask questions, compare options, and receive recommendations based on their preferences and financial needs.

4. Customer Support and FAQ Assistance: Chatbots can handle common customer inquiries and provide support for frequently asked questions. They can assist users with issues such as lost cards, account lockouts, PIN resets, or general banking queries. Chatbots can offer self-help options or escalate complex queries to human representatives when necessary.

5.Account Opening and Onboarding: Chatbots can guide users through the process of opening new bank accounts, including capturing necessary information, verifying identities, and providing guidance on required documentation. They can streamline the onboarding process, reducing the need for manual paperwork and physical visits to bank branches.

6. Loan Applications and Mortgage Calculations: Chatbots can assist users in applying for loans, providing information on eligibility criteria, interest rates, repayment terms, and required documentation. They can also help users calculate mortgage payments, loan EMIs (Equated Monthly Installments), or provide estimates for loan amounts based on user inputs.

7.Financial Planning and Budgeting: Chatbots can offer basic financial planning advice, budgeting tips, and goal setting assistance. They can help users track expenses, set savings

targets, or provide insights into spending patterns based on transaction data. Chatbots can also offer personalized suggestions to improve financial management.

8. **Fraud Detection and Security:** Chatbots can proactively monitor and alert users about potential fraudulent activities or suspicious transactions in their accounts. They can provide security tips, educate users about common scams, and guide them on best practices to protect their financial information.

These are just a few examples of the wide range of applications for banking chatbots using IBM Watson Assistant. The flexibility and capabilities of chatbots allow banks to deliver personalized and efficient services to their customers while reducing operational costs and enhancing customer satisfaction.

## **CONCLUSIONS:**

The development of an AI-based discourse system for the banking industry using IBM Watson Assistant offers a significant advancement in customer service and convenience. The project focused on creating a chatbot capable of guiding customers in creating bank accounts, answering loan queries, addressing general banking inquiries, and providing information about net banking.

By leveraging the power of Watson Assistant, the project aimed to provide an intelligent and responsive chatbot that can understand and respond to a wide range of user queries effectively. The system's conversational capabilities allow customers to interact with the chatbot naturally, receiving prompt and accurate information without the need for human intervention.

Throughout the project, careful consideration was given to the design of the conversation flow, ensuring that it aligns with the objectives of the chatbot and addresses common customer needs. Dialog flows were created for each specific task, such as account creation guidance, loan queries, general banking inquiries, and net banking-related questions.

The chatbot's functionality was developed by training Watson Assistant using a combination of intents, entities, and dialog nodes. The training process involved providing sample user queries and their corresponding intents, allowing the chatbot to learn and understand different user inputs accurately.

The project also emphasized extensive testing and refinement to ensure the chatbot's performance and accuracy. Iterations were made to the dialog flow, intents, and training data as needed to enhance the chatbot's ability to provide relevant and meaningful responses.

The project demonstrates the potential of AI and natural language processing technologies to transform customer interactions in the banking industry. The AI-based discourse system developed using IBM Watson Assistant brings increased efficiency, convenience, and personalized assistance to customers seeking account creation guidance, loan information, general banking queries, and net banking support.

## **FUTURE SCOPE:**

This project opens up several exciting possibilities for future scope and expansion. As technology continues to advance, the following are some potential areas of growth and enhancement for this project:

***Advanced Natural Language Understanding (NLU):*** As NLU technologies improve, the chatbot's ability to understand complex user queries and context can be enhanced. Future iterations of the project can explore incorporating advanced NLU models, such as transformer-based architectures, to improve the chatbot's comprehension and accuracy.

***Personalization and User Profiling:*** To deliver more personalized banking experiences, the chatbot can be integrated with customer profiling systems. By analysing customer data and transaction history, the chatbot can offer tailored recommendations, personalized offers, and proactive assistance based on individual customer preferences and behaviours.

***Multi-lingual and Multi-channel Support:*** Expanding the chatbot's capabilities to support multiple languages and communication channels can greatly increase its reach and accessibility. Integrating language translation services and adapting the chatbot's responses to different languages can cater to a broader customer base.

***Emotion and Sentiment Analysis:*** Incorporating emotion and sentiment analysis into the chatbot's capabilities can enable it to understand and respond appropriately to customers' emotions. By detecting sentiment in user queries or responses, the chatbot can provide empathetic and personalized assistance, leading to improved customer satisfaction.

***Voice-enabled Interfaces and Virtual Assistants:*** Integrating voice-enabled interfaces and virtual assistants can provide an alternative interaction mode for customers. By leveraging speech recognition and natural language processing technologies, customers can interact with the chatbot using voice commands, further enhancing convenience and accessibility.

***Integration with Robotic Process Automation (RPA):*** Integrating the chatbot with RPA technologies can automate backend processes and tasks, such as account verification, document processing, and transactional operations. This integration can streamline banking operations, reduce manual effort, and improve overall efficiency.

***Contextual Understanding and Continuous Learning:*** Further advancements in AI technologies can enable the chatbot to have a deeper understanding of user context and maintain context across multiple interactions. This would allow the chatbot to provide more accurate and relevant responses, even in complex and multi-turn conversations. Additionally, implementing techniques for continuous learning can ensure that the chatbot keeps improving its knowledge and performance over time.

***Integration with Voice Biometrics and Security Enhancements:*** Integrating voice biometrics technology can provide an additional layer of security to authenticate customers during sensitive transactions or when accessing account information. This enhances customer trust and reduces the risk of fraud.

***Expanded Banking Services and Financial Advice:*** The chatbot can be expanded to provide more comprehensive banking services, such as investment advice, loan application processing,

credit score analysis, and financial planning assistance. By integrating with relevant systems and databases, the chatbot can become a trusted financial advisor for customers.

***Omnichannel Experience and Integration with IoT Devices:*** Extending the chatbot's capabilities to seamlessly integrate with IoT devices, such as smart speakers, smartwatches, and smart TVs, can provide customers with a consistent and interconnected banking experience across various touchpoints.

## BIBLIOGRAPHY:

**Previous referred websites for the development of this project:**

- [Banking Chatbots: Benefits and Use Cases \(freshworks.com\)](https://www.freshworks.com/blog/banking-chatbots-benefits-use-cases/)
- [8 ways chatbots in banking can improve customer engagement | Engati](https://www.engati.com/blog/8-ways-chatbots-in-banking-can-improve-customer-engagement/)
- [5 Powerful Use Cases of Chatbots in Banking in 2022 - Yellow.ai](https://www.yellow.ai/blog/5-powerful-use-cases-of-chatbots-in-banking-in-2022/)
- [The Power Of Chatbots For The Banking Industry | AutomationEdge](https://www.automationedge.com/blog/the-power-of-chatbots-for-the-banking-industry/)
- [The 13 Best Banking Chatbots \(Reviewed In 2023\) - Netomi](https://www.netomi.com/blog/the-13-best-banking-chatbots-reviewed-in-2023/)
- [Chatbot in Banking – Examples, Best Use Cases and the Future \(haptik.ai\)](https://www.haptik.ai/blog/chatbot-in-banking-examples-best-use-cases-and-the-future/)

## FLASK CODE:

```
import numpy as np
from flask import Flask,render_template

app=Flask(__name__)

@app.route('/')
def bot():
    return render_template('chatbot.html')

if __name__=='__main__':
    app.run()
```

## HTML CODE:

```
<!DOCTYPE html>
<html lang="en">

<head>
  <meta charset="utf-8">
  <meta content="width=device-width, initial-scale=1.0" name="viewport">

  <title>ChatBot</title>
  <meta content="" name="description">
  <meta content="" name="keywords">
```

```

<!-- Favicons -->
<link href="{{ url_for('static', filename='assets/img/favicon.png') }}"
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rel="apple-touch-icon">

<!-- Google Fonts -->
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<link rel="preconnect" href="https://fonts.gstatic.com" crossorigin>
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href="https://fonts.googleapis.com/css2?family=Open+Sans:ital,wght@0,300;0,400;0,5
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bundle.min.css') }}" rel="stylesheet">
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rel="stylesheet">

<!-- Template Main CSS File -->
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</head>

<body>

<!-- ===== Header ===== -->
<header id="header" class="header d-flex align-items-center fixed-top">
<div class="container-fluid d-flex align-items-center justify-content-
between">

<a href="chatbot.html" class="logo d-flex align-items-center me-auto me-lg-
0">

<!-- Uncomment the line below if you also wish to use an image Logo -->


<h1>New State Bank</h1>

</a>

```

```

<nav id="navbar" class="navbar">
  <ul>
    <li><a href="chatbot.html" class="active">Home</a></li>
    <li><a href="about.html">About</a></li>
  </ul>
</li>
  <li><a href="services.html">Services</a></li>
  <li><a href="contact.html">Contact</a></li>
</ul>
</nav><!-- .navbar -->

<div class="header-social-links">
  <a href="#" class="twitter"><i class="bi bi-twitter"></i></a>
  <a href="#" class="facebook"><i class="bi bi-facebook"></i></a>
  <a href="#" class="instagram"><i class="bi bi-instagram"></i></a>
  <a href="#" class="linkedin"><i class="bi bi-linkedin"></i></a>
</div>
<i class="mobile-nav-toggle mobile-nav-show bi bi-list"></i>
<i class="mobile-nav-toggle mobile-nav-hide d-none bi bi-x"></i>

</div>
</header><!-- End Header -->

<!-- ===== Hero Section ===== -->
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  <div class="container">
    <div class="row justify-content-center">
      <div class="col-lg-6 text-center">
        <h2><span>New State Bank</span> the most trusted bank in India</h2>
        <p>We are committed to providing you with the best banking experience possible. Our team of experts is dedicated to helping you achieve your financial goals. Whether you're looking for a new savings account or a loan to start your own business, we're here to help.</p>
        <a href="contact.html" class="btn-get-started">Login</a>
      </div>
    </div>
  </div>
</section><!-- End Hero Section -->

<main id="main" data-aos="fade" data-aos-delay="1500">
</main><!-- End #main -->

<!-- ===== Footer ===== -->
<footer id="footer" class="footer">
  <div class="container">
    <div class="copyright">

```

&copy; Copyright <strong><span>New State Bank</span></strong>. All Rights Reserved

</div>

<div class="credits">

Contact Information New State Bank

</div>

</div>

</footer><!-- End Footer -->

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<!-- Template Main JS File -->

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integrationID: "837deb88-c4bf-44d8-8c39-d62697227d5b", // The ID of this integration.

region: "us-south", // The region your integration is hosted in.

serviceInstanceID: "d6493eba-cb70-4e87-8521-7014d372b3ee",

onLoad: function(instance) { instance.render(); }

};

setTimeout(function(){

const t=document.createElement('script');

t.src="https://web-chat.global.assistant.watson.appdomain.cloud/versions/" + (window.watsonAssistantChatOptions.clientVersion || 'latest') + "/WatsonAssistantChatEntry.js";

document.head.appendChild(t);

});

</script>

</body>

</html>