A

MAJOR PROJECT REPORT

On

"Sentiment Analysis on Interactive Conversational Agent/Chatbots"

Submitted to

Autonomous Institute,

Affiliated to The Rashtrasant Tukadoji Maharaj Nagpur University

Department of Emerging Technologies

Bachelor of Technology (B. Tech)

Submitted By

1. **Falguni Kalambe [AM21053]**
2. **Samyak Manwatkar [AM22D002]**
3. **Yash Kakde [AM22D005]**
2. **Vidit Khairkar [AM22D006]**

Guided By

Prof. Ravi Asati

S. B. JAIN INSTITUTE OF TECHNOLOGY, MANAGEMENT AND

RESEARCH, NAGPUR

2023 – 2024

<u>CERTIFICATE</u>

This is to certify that the mini project report entitled **Sentiment Analysis on Interactive Conversational Agent/Chatbots** submitted by **Falguni Kalambe , Samyak Manwatkar , Yash Kakde , Vidit Khairkar** to the **S. B. JAIN INSTITUTE OF TECHNOLOGY, MANAGEMENT AND RESEARCH, NAGPUR** of **B. Tech in (Emerging Technologies)** is a *bona fide* record of mini project work carried out by him/her under my supervision. The contents of this report, in full or in parts, have not been submitted to any other Institution or University for the award of any degree or diploma.

Signature   Signature

Falguni Kalambe   Prof. Ravi Asati
Samyak Manwatkar
Yash Kakde
Vidit Khairkar

Signature of HOD with seal

<u>**DECLARATION**</u>

We declare that this mini project report titled **Sentiment Analysis on Interactive Conversational Agent/Chatbots** of **B. Tech in (Emerging Technologies)** is a record of original work carried out by us under the supervision of **Prof. Ravi Asati** , and has not formed the basis for the award of any other degree or diploma, in this or any other Institution or University. In keeping with the ethical practice in reporting scientific information, due acknowledgements have been made wherever the findings of others have been cited.

Signature

Falguni Kalambe
Samyak Manwatkar
Yash Kakde
Vidit Khairkar

Date

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ABSTRACT

An AI-powered assistant, or chatbot, is a virtual helper that uses artificial intelligence to interact with users. It can answer questions, provide information, and even perform tasks. With its ability to understand natural language, it feels like chatting with a real person. Chatots are used in various applications, from customer service to personal assistants. They can save time and resources by automating repetitive tasks and providing instant support. Their efficiency and availability make them valuable tools in today's fast-paced world. As technology advances, chatbots continue to improve, becoming more intelligent and versatile. Whether it's scheduling appointments, ordering food, or getting recommendations, chatbots are always ready to assist. This project is focusing on creating a chatbot to be used by students to get their queries responded easily from the departmental website. The Departmental Enquiry Chatbot has the capacity to make friendly conversations; respond the course and faculty details; give the link for the academic calendar; answer the frequently asked questions; we present a chatbot system that uses machine learning techniques. So chatbots can learn from users to improve their results. We test our chatbots by testing real-world conversations.The results show that our chatbot can answer simple questions with higher accuracy than more advanced questions. Chatbots are designed to understand sentences, determine their meaning, and continue the conversation as needed, but they cannot capture the user's intent. It can enable the chatbot to not only respond to the user, but also understand them emotionally. Through our researc h, we focus on building a chatbot that responds based on the user's emotions to create a more empathetic and human experience for the user.

__INTRODUCTION__

In our increasingly digital world, AI-powered assistants, often referred to as chatbots, have become integral parts of our daily lives. These virtual helpers harness the power of artificial intelligence to interact with users, providing assistance and information in a conversational manner. Whether it's answering questions, scheduling appointments, or offering recommendations, chatbots offer a convenient and accessible way to access services and support. With their ability to understand natural language and adapt to user needs, they simulate human-like interactions, making them indispensable tools for businesses and individuals alike. As technology continues to advance, chatbots are evolving to become even more intelligent and capable, promising a future where assistance is just a conversation away. This project is focusing on creating a chatbot to be used by students to get their queries responded easily from the college website. The Departmental Enquiry Chatbot has the capacity to make friendly conversations; respond the course and faculty details; give the link for the academic calendar; answer the frequently asked questions;

 The future work include training the chatbot with more varied data; increasing the scope of the chatbot by adding a speech recognition feature so that users can speak to get responses;

Frequently we tend to tend to pay our time interrelate with numerous chatterboxes on the net, mostly targeted at such functions or just amusement. The chatbots have embedded information that helps them acknowledge the user's question and provide an answer to it. The departmental enquiry chatbot project is developed exploitation algorithms that analyze user queries and understand user message. This method is a web application that provides answers to the student's question. Students would really like simply question through the bot. The program analyzes the user's query and answers. Then the bot responds to the query, as if the real person were asking it. The program responds to the students' question with the help of algorithms

Artificial Intelligence is a tool that enables machines to learn from objects and perform t asks that often require human intelligence. Therefore, AI consultants are computers that use artificial intelligence to help organizations perform various tasks. These assistants ca n assist with data analysis, planning, communications, and many other tasks essential for the smooth running of the department. The benefits of AI-powered data services include increased efficiency, improved accuracy and reduced wor kload.

Identifying jobs that can benefit from artificial intelligence is the first step in adopting th e technology. Organizations that manage large amounts of data, such as finance, marketi ng, and   human resources, will likely benefit from AI-powered data assistance. But AI-powered data services can be difficult to implement in the workplace. One of the biggest challenges is to ensure that employees work comfortably with the help of artificial intell igence. Training and collaboration with the IT department is essential to ensure employe es understand how the technology works and how to use it.

AIMS & OBJECTIVES OF PROJECT

Aim: Sentiment Analysis on Interactive Conversational Agent/Chatbots

Objectives:

Streamline Communication: Facilitate seamless communication within the department by serving as a centralized platform for inquiries, updates, and notifications, thereby fostering collaboration and transparency.

▪ Enhance Efficiency: The primary objective of the AI-powered Departmental Information Assistant is to improve the efficiency of departmental operations by automating repetitive tasks and providing quick access to relevant information.

▪ Improve Decision-Making: Provide timely and accurate information to departmental stakeholders, enabling informed decision-making processes based on real-time data and insights.

▪ Support Organizational Goals: Align the objectives of the AI-powered Departmental Information Assistant with the broader goals and objectives of the organization, contributing to its overall success and competitiveness.

▪ User-Friendly Interface: Develop an intuitive and user-friendly interface for the chatbot, ensuring ease of use for students, faculty, and staff from various colleges.

▪ Information Retrieval: Train the chatbot to efficiently retrieve relevant information such as course schedules, campus events, academic resources, and administrative procedures from each participating college.

▪ 24/7 Availability: Ensure round-the-clock availability of the chatbot to accommodate the diverse schedules of students, faculty, and staff across different time zones.

▪ Personalized Assistance: Incorporate machine learning algorithms to provide personalized assistance to users based on their preferences, academic history, and interaction patterns.

LITERATURE REVIEW

A chatbot is a software that is used to interact between a computer and a human in natural language like humans chat. Chatbots chat with the user in a conversation in place of a human and reply to the user. The goal of this report on chatbot was to resemble a human being in the way they interact, trying to make the user think he is chatting with another human being. The chat bot application helps the students to access the university related information from anywhere with internet connection. This system reduces work of college administration providing information to students and also reduces the workload on the staffto answer all the queries of the students.

"Chatbot Optimization using Sentiment Analysis and Timeline Navigation" , Revista de Informatica Te ´orica e Aplicada - RITA - ISSN 2175-2745 ´ Vol. 30, Num. 01 (2023) 32-43 [1] In this survey author present a chatbot building framework that considers the use of sentiment analysis and tree timelines to provide a better chatbot answer.

"Sentiment-based Chatbot using Machine Learning for Recommendation System", National Formosa University,August 24th, 2022 [2].
In this research proposed a general framework based on sentiment analysis and machine learning, called Sentiment Analysis and Machine Learning Recommendation Framework (SAMLRF), including data preparation module, sentiment analysis module, recommendation module, human machine module and cloud computing module for a chatbot to facilitate user interaction to make recommendation.

" Analytical and Sentiment based text generative chatbot", 2021 12th International Conference on Computing Communication and Networking Technologies (ICCCNT) | 978-1-7281-8595-8/21/$31.00 ©2021 IEEE | DOI: 10.1109/ICCCNT51525.2021.9580069.[3]. Deep feedforward neural network design shows interest while combining the main points of observational thinking and text. Due to the lightness of the model, user interaction is easy and latency is lower. The acc uracy we recorded during the test was 93.45%. Chatbots can successfully interact with customers while ch ecking their ideas. Chatbots can manage a conversation with a customer but cannot store the message if th e conversation is long.The bot cannot correctly identify sarcasm or mockery in a sentence

"Chatbot for College Website", International Journal of Computing and Technology, Vol.5, Issue.6, pp.2348-6090,[4].
2018. This article introduces using Bing Chatbot to expedite literature reviews. It outlines steps, from creating a literature review matrix to asking nuanced questions, to enhance the review process

" Designing a Chat-bot that Simulates a Historical Figure", Faculty of Automatic Control and Computers university of Bucharest, IEEE 978-0-7695-4980-2013[5].
This systematic review identifies advantages and challenges associated with integrating chatbots in education. Critical gaps in existing research are highlighted, calling for further investigation "Design of Chatbot System for Student Counselling", International Journal of New Innovations in Engineering and Technology, Vol.13, Issue.3, pp.2319-6319,2020.[6].

PROPOSED WORK

1. Requirement Analysis:

• Conduct an in-depth analysis of the communication needs within the department, including inquiries from students, faculty, and staff.

• Identify common queries, recurring issues, and information gaps that the chatbot can address effectively.

2. Platform Selection:

• Evaluate available chatbot development platforms and frameworks to determine the most suitable option based on requirements, scalability, customization capabilities, and integration with existing systems.

• Consider factors such as natural language processing (NLP) capabilities, multi-channel support, and ease of deployment.

3. Chatbot Design and Development:

• Design conversational flows and user interfaces that align with the department's branding guidelines and user experience best practices.

• Develop and train the chatbot's NLP models to accurately understand and respond to user queries, considering the department-specific terminology and context.

• Implement features such as FAQ retrieval, appointment scheduling, resource lookup, event notifications, and feedback collection.

4. Testing and Quality Assurance:

• Conduct thorough testing of the chatbot across various devices, browsers, and communication channels to ensure compatibility and functionality consistency.

• Perform user acceptance testing (UAT) with representatives from different user groups to validate the chatbot's effectiveness and usability.

• Address any bugs, errors, or usability issues identified during testing iterations.

5. Deployment and Training:

• Deploy the chatbot on the department's website, intranet, messaging platforms, and other relevant channels.

• Provide training sessions and documentation for departmental staff responsible for managing and maintaining the chatbot.

• Educate end-users (students, faculty, and staff) on how to interact with the chatbot and leverage its capabilities effectively

6. Evaluation and Reporting:

• Regularly evaluate the impact of the chatbot on departmental communication effectiveness, user satisfaction, and operational efficiency.

• Prepare reports summarizing key performance indicators (KPIs), insights gained, and recommendations for further enhancement or expansion of the chatbot project. By following this proposed work plan, the departmental chatbot project aims to streamline communication processes, enhance user experience, and empower stakeholders with instant

RESEARCH METHODOLOGY

The proposed chatbot system is a web application which gives reply to the question of the user. This system is utilized for talking. A chatbot project is built using artificial algorithms i.e. Naive Bayes' algorithm that analyse user requests and understand the user's message.

The system uses Natural Language Processing (NLP) and built-in artificial intelligence to answer the queries asked by the user. For the chatbot development, we have used Python programming language and NLTK library. It makes it easy to generate automated responses to a user's input with the help of a machine learning algorithm to produce different types of responses.

Students just have to query through the bot which is used for chatting purpose. Chatbot will reply to the query with the help of artificial intelligence. The proposed system will reduce the administration burden and will be able to provide necessary details to students and Faulty online.

Students will get their queries resolved without any hassle to reach out the college administration office. The System will be available for 24/7 to all students and Faculties
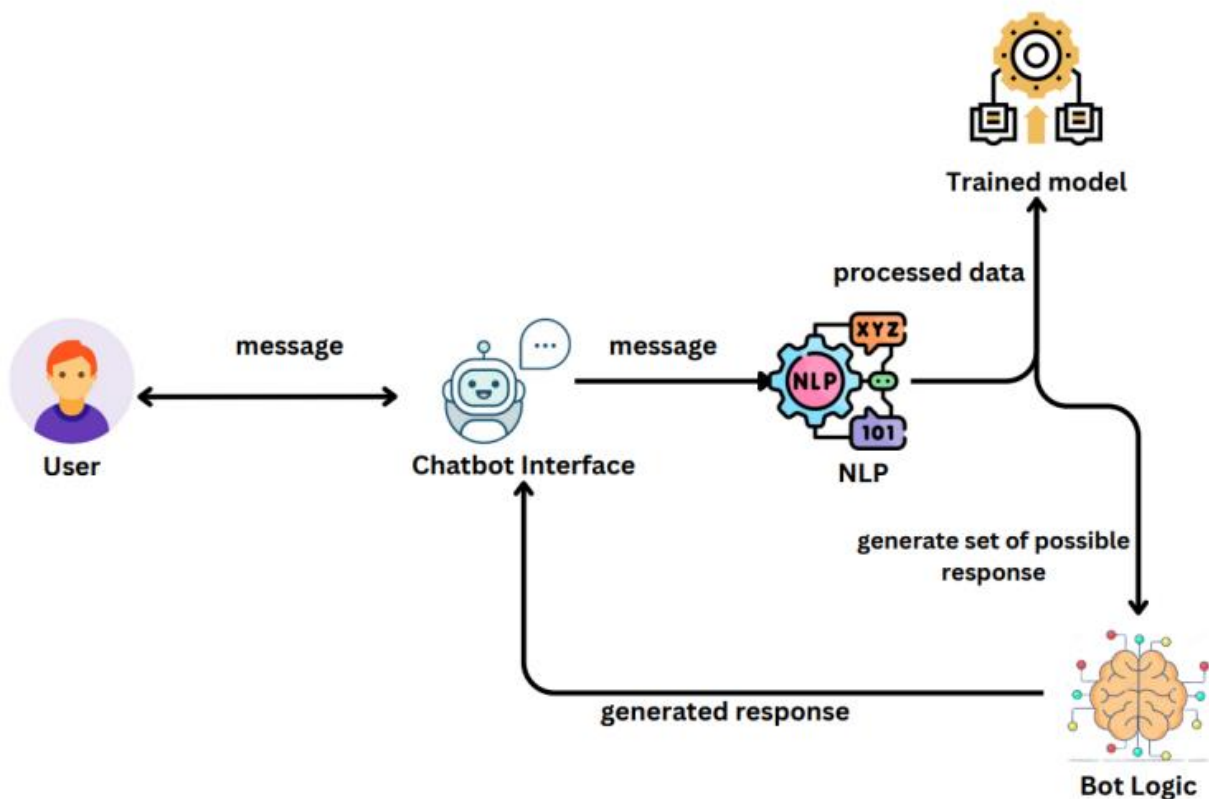
* User: The interaction begins with the user sending a message. This could be a text, voice message, or other form of input.
* Chatbot Interface: The user's message is received by the chatbot interface, which acts as the communication channel between the user and the chatbot.
* NLP (Natural Language Processing): The chatbot's NLP component analyzes the user's message to understand its meaning and intent. This involves tasks like tokenization, stemming, and part-of-speech tagging.
* Processed Data: The processed data from the NLP step is then used to generate a set of possible responses. This might involve using machine learning algorithms or rule-based systems.
 * Trained Model: A trained model, which has been previously taught on a large dataset of conversations, is used to select the most appropriate response from the generated set.
 * Generated Response: The chatbot sends the selected response back to the user through the chatbot interface.
* Bot Logic: The entire process, from receiving the user's message to generating a response, is controlled by the chatbot's logic. This logic determines how the chatbot should respond to different types of messages and situations.
 Input:
 - User message (text)
 - User intent (optional)
 Process:
 1. Text Preprocessing:
- Tokenize the user message
- Lemmatize the tokens
- Remove stop words and punctuation
- Convert to lowercase
2. Intent Prediction:
- Use the trained model to predict the user intent
- Get the top-scoring intent
 3. Response Generation:
- Use the predicted intent to select a response from the database
- Generate a response based on the user message and intent
4. Post-processing:
- Spell check and grammar check the response
- Convert to proper case
Output: - Response (text)
- Confidence score (optional)
 User Message → Text Preprocessing → Intent Prediction → Response Generation → Post-processing → Response

Note that this is a simplified architecture, and you may want to add additional components or modify the existing ones to suit your specific use case.

RESULT

The results of this project are measured in whether sentiment analysis and active learning is correctly implemented or not. Sentiment analysis correctly recognizes the user's query such as positive, negative, and neutral by storing all the conversations in the database. These results are used to add empathy to the bot. However, the system was partially successful in adding empathy to the bot. It is because, although large amount of data was added to include some common answers to the queries which are off scripts and to add empathy to the bot (so that it understands what is the current mood of the user and responds accordingly), since scope of these queries is vast, the system requires more rigorous data to handle all the questions which are out of script. Where the bot understood that I am in a negative sentiment, so it answered with a proper response. But, it did not understand the meaning of 'I am excited' since bot did not have any training data related to the typed query

<u>CONCLUSION</u>

The development and implementation of the departmental chatbot represent a significant milestone in enhancing communication, efficiency, and user experience within the departmental ecosystem. Through meticulous planning, collaboration, and innovation, the project has successfully addressed the diverse communication needs of students, faculty, staff, and administrators.

The departmental chatbot serves as a centralized and accessible resource, providing instant assistance and information retrieval for various inquiries, ranging from course-related questions to administrative procedures and resource lookup. Its intuitive interface and natural language processing capabilities have transformed the way stakeholders interact with departmental services, offering convenience and responsiveness round the clock.

Moreover, the integration of the chatbot with existing departmental systems and platforms has facilitated seamless access to up-to-date information and services, while maintaining data security and privacy standards. By leveraging machine learning algorithms and user feedback mechanisms, the chatbot continuously evolves to adapt to changing user needs and preferences, ensuring relevance and effectiveness over time.

The project's success is further exemplified by its positive impact on communication efficiency, user satisfaction, and operational productivity within the department. Stakeholders have embraced the chatbot as a valuable tool for simplifying tasks, reducing response times, and fostering a more connected and informed community.foundation for future enhancements and expansion of its capabilities.

In conclusion, the departmental chatbot project stands as a testament to the department's commitment to leveraging technology for the benefit of its stakeholders, ultimately contributing to a more efficient, responsive, and collaborative environment conducive to academic and operational excellence.

FUTURE SCOPE

The chatbot is an AI-based chatbot that receives questions from users in audio or textual format, converts the audio into text format, tries to understand the question by processing the text using NLP, and finds an appropriate answer to the question. In natural language processing, human language is divided into several pieces so that the grammatical structure of statements and the meaning of those pieces can be analyzed and understood in context to the whole conversation. This lets computers read and understand spoken or written text in the same way as humans. For example, when the chatbot receives the question "How many departments are there in the college?" it will answer "The college has 6 departments". The main objective is to reduce the burden on the college faculties by deferring the responsibility of answering the visitors' doubts regarding the college to the chatbot by creating a web-based chatbot that can be incorporated with the college website and can answer the users' text as well as audio-based queries. The goal is to provide visitors and faculty a quick and easy way to have their doubts answered as well as offer the developers the means to incorporate new information in the chatbot's information repository.

Future development is to expand the assumptions made to evaluate predictive models for various de cisions that require consideration of human Factors .We have thought that in future we will add real time attendance, PDF in it which will be helpful for the students.

<u>REFERENCES</u>

- Chatbot Optimization using Sentiment Analysis and Timeline Navigation , Revista de Informatica Te ´ orica e Aplicada - RITA - ISSN 2175-2745 ´ Vol. 30, Num. 01 (2023) 32-43 ,[1]
- Sentiment-based Chatbot using Machine Learning for Recommendation System, National Formosa University,August 24th, 2022, [2]
- "Analytical and Sentiment based text generative chatbot", 2021 12th International Conference on Computing Communication and Networking Technologies (ICCCNT) | 978-1-7281-8595-8/21/$31.00 ©2021 IEEE | DOI: 10.1109/ICCCNT51525.2021.9580069 [3]
- E. Haller and T. Rebedea ,"Chatbot for College Website", International Journal of Computing and Technology, Vol.5, Issue.6, pp.2348-6090,.2018.[4]
- " Designing a Chat-bot that Simulates a Historical Figure", Faculty of Automatic Control and Computers university of Bucharest, IEEE 978-0-7695-4980-2013[5].
- S. B. Sonawane, A. S.Badwar, R. H. Dalvi, G. N. More and S.A., Talekar, Design of Chatbot System for Student Counselling", International Journal of New Innovations in Engineering and Technology, Vol.13, Issue.3, pp.2319-6319,2020.[6].
- P. Jain,"College Enquiry Chatbot Using Iterative Model", International Journal of Scientific Engineering and Research (IJSER),Vol.7, Issue.1, pp.2347-3878,2019. [7]
- N. Hatwar, A. Patil and D. Gondane, "AI BASED CHATBOT", International Journal of Emerging Trends in Engineering and Basic Sciences (IJEEBS) ISSN (Online) 2349-6967 Volume 3, Issue 2 (March-April 2016). [8]
- A. Prajapati, P. Naik, S. Singh and A. Kale, "Android Based Chatbot For College",International Journal of Scientific & Engineering Research, Vol.9, Issue.4, pp.2229-5518, 2018. [9]

BIBLIOGRAPHY

- Chatbots for eCommerce: Learn how to build a virtual shopping assistant -Amit Kothari (Author), Rania Zyane (Author), Joshua Hoover (Author)
- Zero to Bot: Create a simple curator chatbot using API.AI — A Guide for Non Programmers
- An Introduction to the Microsoft Bot Framework: Create Facebook and Skype Chatbots using Microsoft Visual Studio and C#
- A Corpus Based Approach to Generalising a Chatbot System: Applying Simple Natural Language Processing Techniques to Build Knowledge Base of ALICE Chatbot System
- Artificial Intelligence: Understanding A.I. and the Implications of Machine Learning -Smart Reads (Author)
- Designing Bots: Creating Conversational Experiences
- 8.Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow by - Geron Aurelien