e-ISSN:2582-7219

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH IN SCIENCE, ENGINEERING AND TECHNOLOGY

Volume 7, Issue 11, November 2024

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 7.521

© 2024 IJMRSET | Volume 7, Issue 11, November 2024| DOI: 10.15680/IJMRSET.2024.0711101

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 7.521| ESTD Year: 2018|

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

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

Chatbot using Natural Language Processing

N. Mohan Rao, R. Tejaswini, M. Mounika, P. Mounika, G. Mukesh,

Prof. Thanish Kumar

Department of CSE (AIML), Malla Reddy University, Hyderabad, India

ABSTRACT: A chatbot is an AI powered program designed for conversations with humans on messaging platforms. It learns from user inputs and responses, evolving over time with minimal initial knowledge. By leveraging Natural Language Processing (NLP), chatbots automate and improve human computer interactions. They can assist website users by processing simple queries, classifying them, and providing appropriate responses. Built using tools like PyTorch and NLTK, these chatbots reduce the need for human intervention, operate 24/7, and continually update themselves.

KEYWORDS: Natural Language Processing, Chatbot, Artificial Intelligence, Machine

I. INTRODUCTION

A chatbot using Natural Language Processing is a application designed to simulate human conversation through text or voice interactions. NLP, a branch of artificial intelligence, enables chatbots to understand human language by analyzing and processing text inputs to determine the user's intent, extract relevant entities, and generate appropriate responses. By continuously learning from interactions, these chatbots improve over time, providing personalized and responsive service that meets the needs of users across various domains.

II. LITERATURE REVIEW

2.1 Evolution of Chatbots

The history of chatbots dates back to ELIZA, developed in the 1960s, which could simulate basic conversations using pre-defined templates. Since then, advancements in machine learning and NLP have led to the creation of more sophisticated systems such as Apple's Siri, Amazon's Alexa, and OpenAI's ChatGPT. These systems leverage deep learning to interpret and generate human-like responses.

2.2 NLP in Chatbots

NLP is central to chatbot development, enabling the understanding and generation of text. Techniques like tokenization, lemmatization, and part-of-speech tagging are used to process user input. Recent innovations, including transformer models like BERT (Bidirectional Encoder Representations from Transformers), have significantly improved intent recognition and response accuracy.

2.3 API Integration in Chatbots

APIs enhance chatbot functionality by providing access to external databases. are widely used for retrieving weather data and movie information, respectively. Prior studies demonstrate their effectiveness in delivering reliable data, which can be customized through chatbots for specific user needs.

2.4 Current Limitations

While existing chatbots excel in specific domains, multi-domain systems often face challenges such as intent misclassification, slow response times, and limited contextual understanding.

© 2024 IJMRSET | Volume 7, Issue 11, November 2024| DOI: 10.15680/IJMRSET.2024.0711101

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 7.521| ESTD Year: 2018|

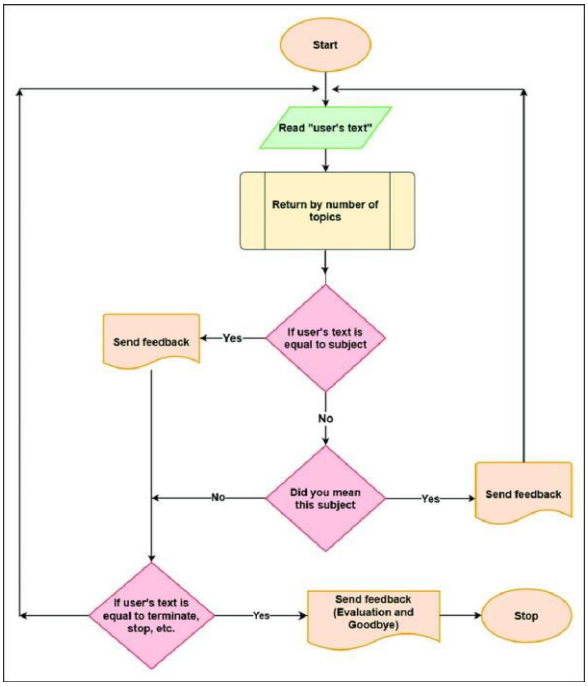
International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

III. PROBLEM STATEMENT

Despite advancements in Natural Language Processing (NLP), developing chatbots that accurately understand, interpret, and respond to diverse user inputs remains a challenging problem. Existing NLP-based chatbots often struggle with issues such as intent misclassification, entity recognition errors, lack of contextual awareness, and limited ability to handle ambiguous or complex queries, resulting in a subpar user experience. Moreover, existing solutions often struggle with understanding nuanced or ambiguous user queries, resulting in irrelevant or inaccurate responses.

IV. SYSTEM DESIGN



V. METHODOLOGY

A. Planning

This phase is important to consider the requirements for carrying out the literature review, considering the information search sources, the research questions and the search criteria.

B. Conduct of the review

In this phase, the methodological selection of the information from the main studies is carried out according to the inclusion and exclusion criteria.

The following NLP methods are employed:

- Preprocessing: Includes tokenization, stop-word removal, and stemming to normalize input text.
- Intent Recognition: A fine-tuned transformer model classifies user queries into intents, such as "Weather Query" or "Movie Suggestion."
- Named Entity Recognition (NER): Identifies entities like location names or movie genres to refine API .

C. Results of the review

In this phase, the results of the studies selected for review in each of the information sources are presented in summary. These results will serve for our research proposal.

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 7.521| ESTD Year: 2018|

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

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

D. Testing and Evaluation
Measure the accuracy, precision, recall, and F1-score for intent recognition and entity extraction tasks.
Use evaluation metrics like BLEU, ROUGE, or perplexity to assess the quality and relevance of generated responses.

VI. EXPERIMENTAL RESULTS

Evaluating the performance of an NLP-based chatbot involves several quantitative and qualitative metrics to assess the accuracy of intent recognition, quality of responses, and user satisfaction. Here's a breakdown of typical experimental results observed when testing a chatbot built with NLP techniques .High-performing intent recognition models generally achieve accuracy levels around 85-95%, depending on the complexity of the use case and data quality. Models like BERT or other transformer-based models typically outperform traditional models (e.g., logistic regression or SVM) by 5-10%, especially in cases where intent overlap is high. Transformer-based models handle nuanced language better and can recognize overlapping intents more accurately.

VII. CONCLUSION

This application will assist users who access the website. The development of chatbots using Natural Language Processing (NLP) marks a significant advancement in conversational AI, enabling efficient, human-like interactions between users and systems. NLP-powered chatbots provide enhanced capabilities, such as understanding complex user queries, retrieving contextually relevant information, and offering dynamic responses.

VIII. FUTURE ENHANCEMENT

Future advancements in NLP-based chatbots aim to create more contextually aware, emotionally intelligent, and adaptive conversational agents that deliver a human-like experience. A major area of development is enhanced context management, where chatbots can remember user preferences and interaction histories over long-term sessions, leading to personalized interactions. Integrating emotion and sentiment analysis from multiple cues (text, tone, facial expressions) will allow chatbots to adjust their responses dynamically, creating a more empathetic and engaging conversation.

REFERENCES

[1] REFERENCES Daud, Mohd Fadzil, et al. "Assessing Mechanical Engineering Undergraduates' Conceptual Knowledge in Three-Dimensional Computer-Aided Design (3D CAD)." Social and Behavioural Sciences, vol. 56, no. Ictlhe, 2012, pp. 1–11.
[2] Mondal, Anupam, et al. "Chatbot: An automated conversation system for the educational domain." 2018 International Joint Symposium on Artificial Intelligence and Natural Language Processing (iSAI-NLP). IEEE, 2018, pp. 1-5.
[3] Khan, Rashid, and Anik Das. "Build Better Chatbots." A complete guide to getting started with chatbots- Apress (2018).
[4]Ahmad, Nahdatul Akma, et al. "Review of chatbots design techniques." International Journal of Computer Applications, vol. 181, no. 8, pp. 7–10, 2018.

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH

IN SCIENCE, ENGINEERING AND TECHNOLOGY

| Mobile No: +91-6381907438 | Whatsapp: +91-6381907438 | ijmrset@gmail.com |

www.ijmrset.com