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Research Paper

AI-Powered Chatbot: Enhancing User Interaction and Information Accessibility at SPMVV

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Abstract: Artificial Intelligence (AI) has revolutionized various industries, with chatbots emerging as one of its most practical applications. This paper explores the different types of AI, categorizing them based on capabilities and functionality. It further discusses how AI-driven chatbots are transforming multiple domains, including education, customer service, and entertainment. By reviewing existing research, the study highlights the advantages and challenges of implementing chatbot technology in real-world scenarios. A significant focus of this paper is the development of a chatbot system for Sri Padmavati Mahila Visvavidyalayam (SPMVV). The chatbot is designed to assist users by responding to frequently asked questions using predefined rules and keyword-based recognition. The implementation is carried out using Python and Flask, ensuring efficient and dynamic responses to user queries. The methodology involves natural language processing techniques to enhance the chatbot's accuracy and relevance. The chatbot is deployed on the PythonAnywhere platform, enhancing accessibility and automation. The results indicate that the chatbot significantly improves access to information, reducing the need for manual assistance. Users benefit from quick and accurate responses, making communication more efficient. Future enhancements may include the integration of machine learning algorithms to refine responses over time and improve the chatbot's adaptability to complex queries. This study contributes to the growing field of AI-driven conversational agents and their practical applications in academic environments.

Keywords: Artificial Intelligence, Chatbot System, Keyword-Based Recognition, Natural Language Processing.

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1. Introduction

Artificial Intelligence (AI) is nothing but a computer system performing tasks by using human intelligence. It incorporates various techniques such as Machine Learning (ML), Natural Language Processing (NLP), Computer Vision, and Robotics [1], [2].

The study of logic and reasoning, from ancient times to today, played a key role in creating the programmable digital computer in the 1940s. This machine, built on mathematical concepts, inspired scientists to explore the idea of making an electronic brain [3].

AI can be divided into two main categories based on its capabilities and functions [1].

Based on Capabilities:

- **Narrow AI:** It is designed to handle specific tasks or a limited range of activities. These AI systems are developed and trained for a particular purpose and are also referred to as Weak AI.
- **General AI:** In this type of AI, machine and human being will be more or less equal but still have some differences. This kind of AI we can see in the movies and the robots.
- **Super Intelligent AI:** This type of AI Systems will be better than human intelligence in virtually every aspect.

Based on Functionalities:

- **Reactive Machines:** These AI systems operate purely on real-time inputs, lacking the ability to store memories or utilize past experiences to influence decision-making.
- **Limited Memory:** These are unable to predict what happened in the past, but to form decisions using memories. It means these machines can look into the past.
- **Theory of mind:** These machines can recognize and interpret human beliefs, emotions, and expectations.
- **Self-Awareness:** These machines, often referred to as human equivalents, do not yet exist. Their development would mark a significant breakthrough in the field of AI.

The modern era of technology has greatly impacted society. Chatbots, as advanced virtual assistants, have become widely popular in conversational services. These software programs use natural language understanding and processing to interact with users. Chatbots go beyond helping users with tasks like booking movie tickets or finding nearby restaurants—they also serve as a source of entertainment, contribute to home automation, provide business strategy advice, and assist in various other ways [4].

2. Survey of literature

This section explores recent studies on education and research involving ChatGPT from both educator and learner perspectives. Additionally, we examine published research utilizing ChatGPT across various educational domains, such as science, medicine, and engineering.

A. Bahrini et al. [5] conducted experimental study to compare performances and to check effectiveness of GPT-3.5 and GPT-4, and found that the latter performance significantly better. Rudolph et al. [6] discussed about the challenges and opportunities of using ChatGPT in education.

In this paper [7], the authors conducted test on the mathematical abilities of ChatGPT are evaluated using GHOSTS and manually curated datasets. GHOSTS is the first dataset, presented in natural language, that is developed and maintained by professional mathematicians. Their experimental study suggests that ChatGPT's mathematical abilities are less effective compared to those of an average mathematics student. ChatGPT does not provide correct solution but often understands the question. The paper [8] discusses ongoing research on the impact of ChatGPT usage within a university's Department of Education.

K. K. Srinivas et al. [9], explained how dialogue management done in chatbots and then discussed about how chatbots can be an entertainment source for elderly people. The authors of paper [10] introduced a chatbot model that leverages the NLTK library in Python for data preprocessing and utilizes the cosine similarity approach to provide accurate responses to users. In paper [11], they developed chatbot system by employing an ensemble learning method that is random forest algorithm on the extracted features from their prepared dataset.

Ajay Atiyah at el. [12], introduced a new method called B-Point Tree to increase the efficiency of searching for accurate answers by adding an additional data structure to the traditional BTS algorithm. Comparing performance of the B-Point Tree results with traditional BST results they suggested that B-Point Tree outperforms the traditional BST. They also proved that the B-Point Tree is able to enhance the efficiency of a chatbot.

3. Artificial intelligence and chatbots

The development of computers and what we now call artificial intelligence has progressed over more than two centuries through a series of gradual advancements [13]. Artificial Intelligence (AI) is a field that combines multiple disciplines with the aim of automating tasks that currently need human intelligence. Recent achievements in AI include computerized medical diagnostics and systems that automatically adapt hardware to meet specific user needs [14]. The following figure briefly shows evolution of AI.

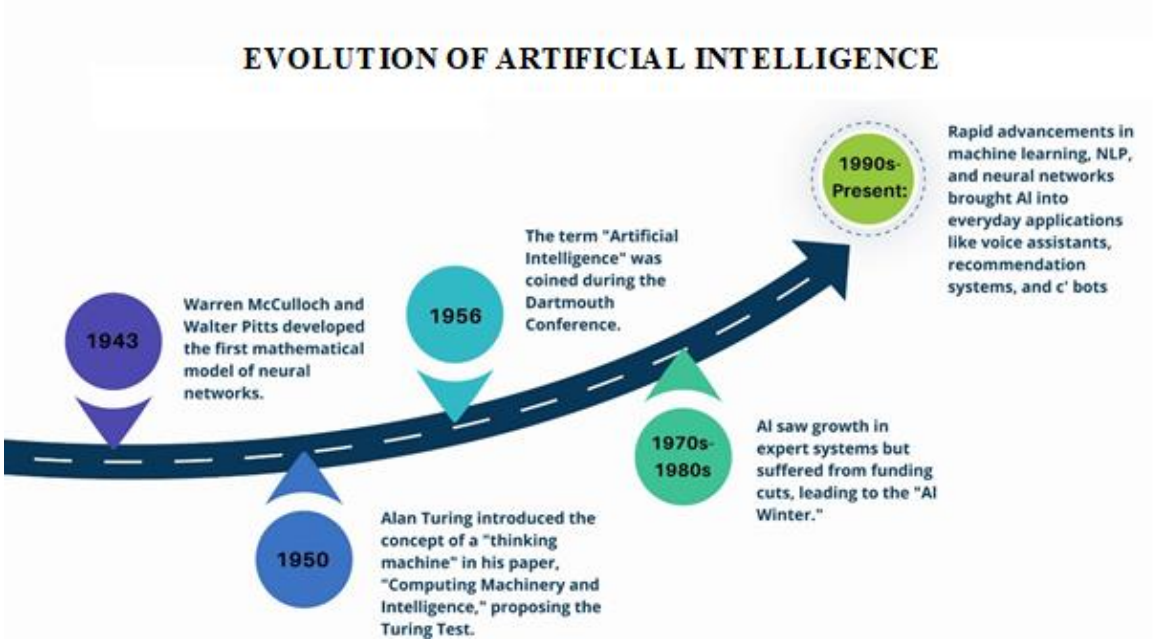


Figure 1: Evolution of Artificial Intelligence

Applications of Atrifacial Intelligence

❖ **Healthcare:** AI is utilized in diagnosing diseases, predicting patient outcomes, discovering new drugs, and creating personalized treatment plans.

❖ **Finance:** The financial sector leverages AI for credit scoring, fraud detection, portfolio management, and financial forecasting.

❖ **Retail:** AI enhances demand forecasting, personalized marketing, and customer service in the retail industry.

❖ **Manufacturing**: AI improves quality control, predictive maintenance, and supply chain management in manufacturing processes.

❖ **Transportation**: AI helps optimize routes, enhance traffic management, and reduce fuel consumption.

❖ **Education**: AI plays a role in personalizing learning experiences, increasing student engagement, and offering diverse educational resources.

❖ **Marketing**: AI enables customer segmentation, tailored recommendations, and real-time audience analysis.

❖ **Gaming**: AI contributes to personalized gaming experiences and the development of intelligent game characters.

❖ **Security:** AI is applied in facial recognition, intrusion detection, and cybersecurity threat analysis.

❖ **Natural Language Processing (NLP):** AI facilitates speech recognition, machine translation, and sentiment analysis.

3.2 Chatbot

Chatbots are conversational tools that performs routine tasks efficiently and provides effective customer service that does not involve physical human resources. By 2030, increase in the global Chatbot market size is projected to reach multimillion figures. Chatbots are better than search engines in the aspect of subjective judgement, advice, or prediction of consequences.

Figure 1: History of Chatbot

Here are some of the best chatbots of 2024.

❖ **Microsoft Copilot**

❖ **ChatGPT**

❖ **Anthrophic's Claude**

❖ **Chatsonic by Writesonic**

❖ **Gemini**

❖ **Perplexity.ai**

❖ **Jasper**

❖ **You.com**

❖ **Socratic by Google**

❖ **HuggingChat**

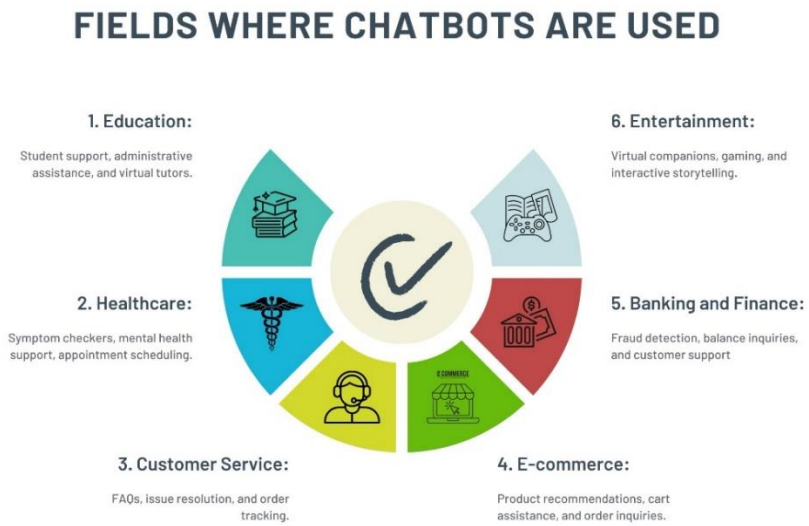


Figure 2: Various Chatbot in Different Fields

4. Methodology for chatbot system for sri padmavati mahila visdvavidylayam (spmvv)

The proposed system is a web application which gives responses to the question of the user. A chatbot is built using Keyword-based Rules Algorithm in python language which is more suitable for NLP applications.

Keyword-based Rules Algorithm is a powerful method for processing text data based on the presence of specific keywords. By adding more rules and keywords, the algorithm to be extended to handle more complex scenarios.

Sri Padmavati Mahila Visvavidyalayam offers a wide range of undergraduate, postgraduate, and doctoral programs across various disciplines. The primary objective of SPMVV is to empower women through quality education, fostering their intellectual, cultural, ethical, and social development.

Tokenization and normalization done using spaCy's NLP pipeline to process user input. After that checking the processed input against predefined keys in the rules dictionary. If a match is found, a random response from corresponding list is selected and returned to the user. This methodology provides a simple yet effective way to create a basic chatbot capable of responding to a variety of specific queries related to the SPMVV.

The major tasks involved in Chatbot model for SPMVV are as follows.

Step1: Collecting relevant data from Sri Padmavati Mahila Visvavidyalayam.

Step 2: Prepare dictionary from the collected data.

Step 3: Developed Interface for Chatbot of SPMVV using Flask framework.

Step 4: Interface communication with dictionary is made.

Step 5: Tested Chatbot with some frequent usage questions.

Step 6: Revise the process until correct answers are produced by the Chatbot.

Step 7: Deployed the Chatbot system in python-anywhere platform.

Working of Chatbot system for SPMMV is given in the following steps:

Step 1: The chatbot application runs and waiting for user response.

Step 2: Read the input provided by the user and tokenize the input text into individual words

or phrases

Step 3: Use Spacy model to tokenize and analyse the input query

Step 4: Iterate through the keys in the rules dictionary

Step 5: For each key, check if it is a substring of the processed query

Step 6: If a match is found, select a response from list of responses associated with the

highest matched keys

Step 7: If no match is found, return a default response indicating that the query is not

understood and give pop-up message to know about whether user wants to continue

or exit

Step 8: Repeat the above steps until user exit

Step 9: waiting for next user.

The following diagram illustrates how Chatbot System works to the user

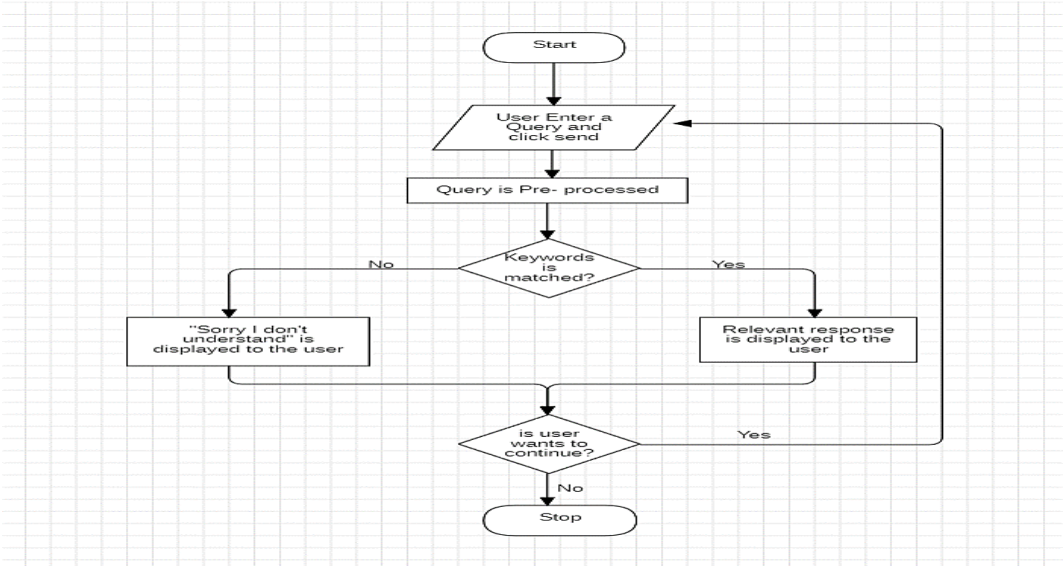
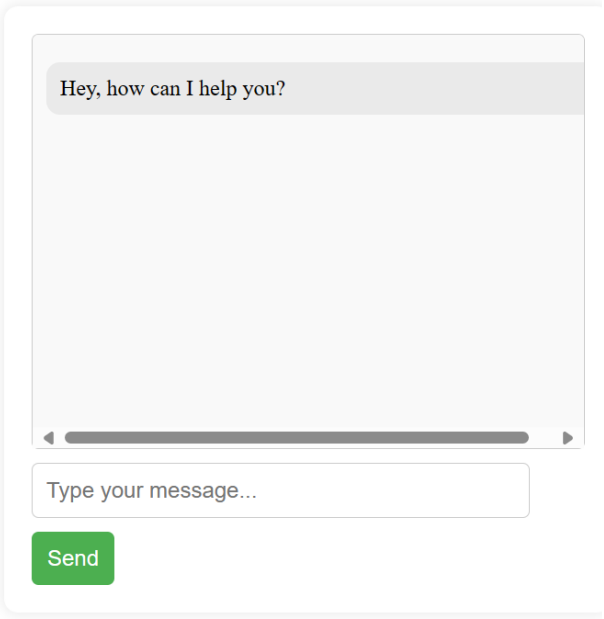


Figure 3: Flowchart for Working Model of Chatbot System of SPMVV

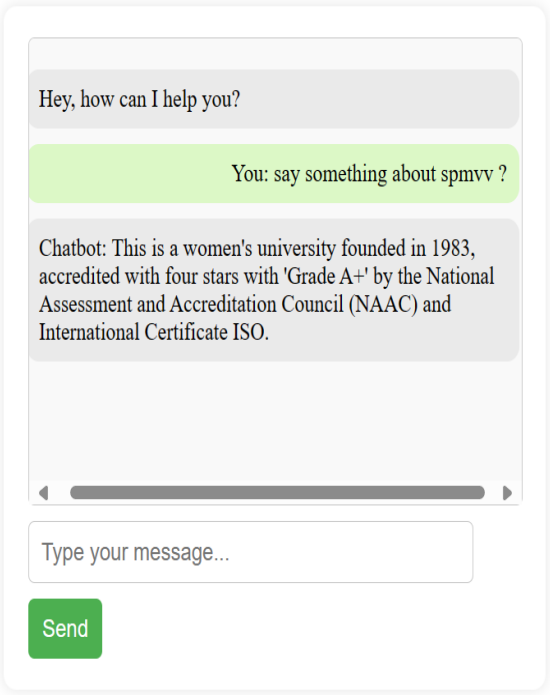
5. Results

The Chatbot is to carry out a conversion between human and machine. The following figure shows the simple pop-up interface for chatbot system. Firstly, a chatbot will displays a welcome message then a user can type and submit the query and bot will provide an appropriate answer to the user's query.

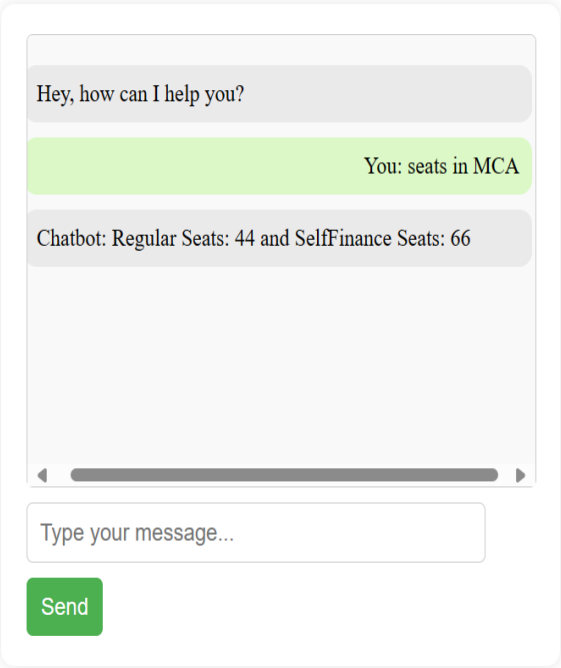
The following gives sample chatting from the user.



In the following figure "say something about spmvv?" this question is asked by the user and correct answer is given by the chatbot.



In the following figure "Seats in MCA" is the query asked by the user and correct answer is given to the user.



6. Conclusion

This study highlights the growing impact of AI-driven chatbots across various sectors and their transformative potential in enhancing communication and accessibility. By categorizing AI based on capabilities and functionalities, we established a foundation for understanding chatbot development. The implementation of a chatbot system for Sri Padmavati Mahila Visvavidyalayam (SPMVV) demonstrates how rule-based and keyword-recognition approaches can effectively address user queries.

The results indicate that the chatbot improves access to information, reduces manual assistance, and enhances user engagement through quick and accurate responses. While the current implementation relies on predefined rules, future improvements could incorporate machine learning algorithms to enhance adaptability and response accuracy. This research contributes to the field of AI-driven conversational agents, showcasing their practical applications in academic environments.

Moving forward, integrating advanced NLP models, expanding the chatbot's knowledge base, and leveraging user feedback can further refine its capabilities. As AI continues to evolve, chatbot systems like this will play an increasingly vital role in streamlining information access and improving user experience in various domains.

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