*A Survey On : Chatbot Methodologies*

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*Abstract*—In today's world, people are constantly looking for new information and ways to learn. However, it can be time-consuming and difficult to find the answers we need through traditional methods, such as books, search engines, and online Encyclopedias. Chatbots can provide instant answers to questions in a variety of sectors, including banking, retail, travel, healthcare, and education. Chatbots are computer programs that are designed to simulate a conversation with human users. They are powered by artificial intelligence (AI) and natural language processing (NLP) technologies, which allow them to understand and respond to human language. Chatbots can be used to answer questions, provide information, and complete tasks. In this Paper Long Short-Term Memory (LSTM), Natural Language Generation (NLG), Supervised Machine Learning (SVM), Model Driven Engineering (MDE), Dialogue Management, Human-in-the-Loop (HITL), Audio-Frame Mean Expression (AFME), Random Forest, Support Vector Machine (SVM), Recurrent Neural Network (RNN), and Convolutional Neural Network are just a few of the cutting-edge methodologies covered in the papers mentioned here. These techniques are used to create chatbots with more complex natural language comprehension and response capabilities. This paper's objective is to review and contrast several chatbot development approaches in order to determine which is optimal for certain applications. Finally this paper concluded that there are various methodologies and algorithms to make a chatbot but every method has its own priority based on the specific task requirement.

Keywords—CHATBOT, ARTIFICIAL INTELLIGENCE, NATURAL LANGUAGE PROCESSING

# Introduction

Chatbots are computer programs that use conversational AI technology to simulate conversation with human users. They are often used in Health care services, customer service applications, where they can answer questions, provide support, and resolve issues. Chatbots can also be used for other purposes, such as marketing, sales, and education. . Chatbots can also be used for other purposes, such as marketing, sales, and education. Chatbots can make our lives easier, more convenient, and more enjoyable in a number of ways. They can answer our questions 24/7, provide personalized recommendations and suggestions, automate many customer service tasks, reach customers on a variety of channels, and personalize the customer experience by learning about each customer's preferences. Chatbots are still under development, but they have the potential to revolutionize the way we interact with machines. They are a powerful tool that can be used to improve customer service, reduce costs, and increase efficiency. Students who are struggling with a particular concept or who need more individualized attention can benefit from chatbots in education. Chatbots can make learning more engaging and participatory, which can improve students' learning experiences and increase their interest in the material. Not all difficult concepts are easily understood by all students. Some students may grasp concepts quickly when a teacher teaches them, while others may not have as strong of a grasp of concepts. This can lead to students falling behind in their studies. Additionally, students who are absent from school or who have difficulty learning in a traditional classroom setting could also fall behind in their studies. Chatbots can help students learn at their own pace and get the help they need when they need it. They can also be used to provide personalized feedback and track student progress. Chatbots have the potential to make education more accessible and personalized, which could help to reduce the need for teachers in some cases.

However, it is important to note that chatbots are not a replacement for teachers. Teachers still play an important role in providing guidance and support to students, and they can help to ensure that students are learning the material in a meaningful way. This paper discusses the key technologies that are available for building chatbot for education purpose. In this paper, The vanishing gradient problem is addressed by storing long-term information in a memory cell. Three gates—the forget gate, the input gate, and the output gate—control the memory cell. Natural Language Generation (NLG), which produces natural language text by using structured data as input. From labeled data, Supervised Machine Learning (SVM) learns that each data point has a known result or label Model. Driven Engineering (MDE), a potent chatbot development platform, may assist businesses in creating high-quality chatbots more quickly and effectively. Dialogue management, which uses both a statistical model and a rule-based system, is in charge of making sure that the discussion goes smoothly and that the system can recognize and react to the user's intent. HITL tasks include fraud detection, object detection, picture classification, and medical diagnosis. AFME (Audio-Frame Mean Expression), a feature extraction approach used in speech processing and music information retrieval, is generated by averaging the values of all samples in an audio frame. A large number of decision trees are built by Random Forest, which then bases forecasts on the trees' consensus votes. Support Vector Machine (SVM) divides the data points into their corresponding classes by locating a hyperplane. And Convolutional Neural Network, both of which have the ability to learn spatial hierarchies in data, is particularly well suited for tasks like picture classification, object detection, and semantic segmentation. There is no one-size-fits-all solution to this problem, and the best approach will be based on the specific circumstances.

# Related Work

S. Venus Jin & Seounmi Youn . (2022). Examine the factors that influence consumers' intention to continue using AI-powered chatbots. Social presence, imagery processing, and psychological ownership are all positively correlated with chatbot continuance intention. This is because these factors all contribute to the consumer's feeling of connection with the chatbot and the products or services it promotes. They used a combination of methods and technologies to collect and analyze data. The authors conducted a survey of 372 participants who had interacted with a chatbot in the past six months and used statistical analysis software to analyze the survey data, Pearson's correlation coefficient to measure the correlations between social presence, imagery processing, and chatbot continuance intention. Using multiple regression analysis, they were able to identify the significant predictors of chatbot continuance intention. The study used path analysis to examine the relationships between social presence, imagery processing, psychological ownership, and chatbot continuance intention. The study provides valuable insights into the factors that influence consumers' intention to continue using AI-powered chatbots. The findings of this study can be used by chatbot designers and developers to create chatbots that are more engaging and effective.[4]

Sanjay Chakraborty, Hrithik Paul et al.(2022). have developed a chatbot named Kiwi that can be used to promote infectious disease prevention and cure. The chatbot uses a variety of technologies and methods, including recurrent neural networks (RNNs), decision trees, machine learning (ML), Python and a deep feedforward multilayer perceptron (MLP) model for infectious disease prediction which is trained on a dataset of infectious disease cases and learns to identify patterns in the data that are associated with different infectious diseases. It can provide doctor contact details, hospital addresses, oxygen cylinder contact details, disease symptoms, prevalence, diagnosis, and treatment procedures and concluded that It uses TensorFlow to build an NLP model that can predict the correct answers to user queries, even if they are not in the training dataset.[5]

Vorada Socatiyanurak, Nittayapa Klangpornkun et al.(2021).describe the development and evaluation of a chatbot that provides legal guidance to sexual violence victims and survivors. The chatbot, called LAW-U, was developed using a combination of NLP, ML, and text summarization to train LAW-U. They first used NLP to extract the keywords from the Supreme Court cases. Then, they used ML to train the chatbot to identify the most relevant Supreme Court cases for each user's input, and also uses NLU to understand the user's query and identify the relevant legal issues, Information retrieval (IR) to retrieve the Supreme Court decisions that are most relevant to the user's query. Finally, they used text summarization to summarize the Supreme Court cases for the user. The chatbot can answer questions about a variety of legal topics related to sexual violence, such as the rights of victims, the available legal remedies, and the process of filing a lawsuit. The authors evaluated LAW-U with a sample of sexual violence victims and survivors. The results showed that LAW-U was able to provide accurate and helpful legal information. The authors concluded that LAW-U has the potential to be a valuable resource for sexual violence victims.[6]

Silvia García-Méndez et al.(2021).describes the development and evaluation of an entertainment chatbot for elderly people with limited abstraction capabilities. The chatbot, called EBER, was developed using a combination of artificial intelligence techniques, including NLG, combination of NLG, sentiment analysis, and a spatial representation of the word space to provide users with a personalized and engaging experience. EBER is designed to provide entertainment to elderly people. It can read news, tell jokes, and play games. EBER can also adapt its responses to the user's mood. The authors evaluated EBER with a sample of elderly people with limited abstraction capabilities. The results showed that EBER was able to provide entertainment and companionship to the participants. The authors concluded that EBER has the potential to be a valuable tool for the digital inclusion of elderly people.[7]

Henry Boateng Essel, Anastasios A. Economides et al.(2022). proposed a research study that explores the integration of an AI-powered teaching assistant chatbot in a multimedia course in higher education. The chatbot used a quasi-experimental design to compare the performance of two cohorts of students: the experimental cohort, which interacted with a teaching assistant chatbot, and the control cohort, which interacted with the course instructor. There is a need to enhance chatbot capabilities with natural language processing and machine learning algorithms for personalized learning paths and real-time feedback. The study found that the students who engaged with the chatbot had significantly better academic results than the students who did not. This suggests that chatbots can be a valuable tool for supporting student learning.[8]

Antonello Meloni, Simone Angioni et al.(2023). proposed AIDA-Bot which is a conversational agent that can interact with SKGs. It is based on parsing, query building, and answer generation. AIDA-Bot has been implemented in four different ways: as an Alexa skill, a web application, a Telegram bot, and an NAO humanoid robot. The algorithm proposed in the paper is called the Natural Language Query Processing (NLQP) algorithm. This is a novel approach to interacting with knowledge graphs, as it allows users to interact with it in a natural language way. This gives output by using user entities like telegram, browser etc.. There is need to develop more advanced natural language processing (NLP) techniques to enable chatbots to understand and respond to more complex queries.[9]

Lenin Medeiros and Tibor Bosse et al.(2022). proposed a chatbot to reduce stress levels by mapping stress features and providing strategies to provide emotional support to the user input. Here, text mining and NLP are used to combine the stress features with the strategies. The experiment is conducted in three groups which the support is given by the chatbot or human is nothing. Interacting with chatbot can decrease stress levels and the chatbot gives equal support to human interaction.[10]

The authors of the paper Silvia T. Acuna and Oscar Dieste,(2022). have proposed the use of chatbots in education. The paper presents a systematic mapping study on chatbot usability evaluation. It analyzes over 700 sources and identifies 28 primary studies. Statistical tests such as ANOVA, MANOVA, t-tests, Wilcoxon tests, and Mann-Whitney tests for data analysis. By using these tests, we can enhance the user experience with the chatbot. The paper provides insights into the benefits of conducting experiments to evaluate chatbot usability and suggests future directions for research in this field. Based on the findings, the paper suggests future directions for research in chatbot usability evaluation guiding researchers towards areas that require further investigation.[11]

Addi Ait-Mlouk and Lili Jiang,(2020). proposes a knowledge graph-based chatbot that can understand natural language queries and generate SPARQL queries to retrieve information from knowledge bases. The KBot architecture consists of three main components: a user interface, a natural language understanding (NLU) module, and a knowledge base access module. The paper also describes the implementation of KBot which was implemented using Jena and evaluated on a dataset of natural language queries. It was able to understand and answer the majority of the queries correctly. The paper concludes by discussing the limitations of KBot and the future work that could be done to improve it.[12]

Daniel Carlander-Reuterfelt et al.(2020). proposes a chatbot that can answer questions about data science and machine learning. The chatbot is called JAICOB.The paper begins by discussing the challenges of building a chatbot for data science then propose an architecture for JAICOB that addresses these challenges.JAICOB uses natural language understanding (NLU), code generation, and dialogue management to understand natural language queries, generate code, and maintain conversations with users. The paper concludes by Despite these challenges, the use of cognitive assistants in education has the potential to revolutionize the way we teach and learn[13]

In this paper, Liang Zhang,Yan Yang,Jie Zhou,Chengcai Chen and Liang He .(2020).propose a retrieval-polished response generation method for chatbots which is a two step process. The method first retrieves a set of candidate responses from a large dataset of text and code. The candidate responses are then polished by a language model to improve their fluency and informativeness by using Keyword Matching, Natural Language Processing (NLP)techniques .The authors evaluated the proposed method on a variety of tasks and showed that it can generate more fluent and informative responses than traditional chatbots. The conclusion of the paper is that the proposed method is a promising approach for generating fluent and informative responses for chatbots.[14]

Gwendal Daniel,Jordi Cabot,Laurent Deruelle and Mustapha Derras.(2020). introduce Xatkit, a low-code chatbot development framework that supports multimodal interaction. Xatkit is designed to make it easy to develop chatbots without requiring a lot of code or knowledge of natural language processing. Xatkit is a modular, low-code, multimodal chatbot development framework which uses Natural Language Processing (NLP) techniques to understand the user's intent and generate responses that are relevant and coherent, Machine Learning (ML) algorithms to learn from user interactions and improve the performance of the chatbot over time, Deep Learning (DL) algorithms to train language models that can understand and generate human language more accurately. This means that it is made up of smaller, independent components that are easy to customize and extend. They concluded that Xatkit is a powerful and easy-to-use chatbot development framework. The authors suggest that future work on Xatkit could focus on improving its natural language processing capabilities, user interface, and integration with other systems.[15]

Paula Maddigan And Teo Susnjak.(2023). focuses on using Large Language Models (LLMs) to convert natural language queries into data visualizations (NL2VIS). It confirms that LLMs are effective in this NL2VIS task when supported by well-engineered prompts. It provides an overview of the paper's structure and organization. These LLMs are pre-trained deep-learning models based on transformer architectures. Future research could focus on conducting user studies and obtaining feedback from end-users to assess the real-world usability and user-friendliness of NL2VIS systems like Chat2VIS.[16]

Yang Ye, Hengxu You and Jing Du.(2023).proposed "Improved Trust in Human-Robot Collaboration With ChatGPT". The study explores the use of ChatGPT, an AI language model, in human-robot collaboration (HRC) to enhance trust and performance. A human-subject experiment with 15 participants was conducted, comparing fixed verbal commands and ChatGPT-controlled robot assistance in an assembly task. It uses a "dual-stage impedance control" algorithm for understanding the robot arm's movement. Future research should explore effective HRC workflows, enhanced AI model training could address issues related to miscommunication and inaccurate decisions. The Reduced cognitive load was observed when working with ChatGPT. Finally, The study demonstrates the potential of ChatGPT in improving trust and performance in HRC.[17]

Angelo Salatino and Francesco Osborn.(2023).proposed the response given by the chatbot by integrating knowledge graphs and Conversational Agents. Here, the Conversation Agent is a computer program that understands natural language and gives responses. Knowledge graphs are the databases that store the graphs related to text, images, and videos. The authors developed a chatbot named AIDA -Bot to give responses. They used natural language processing techniques, such as named entity recognition, entity linking, and semantic parsing, to extract relevant information from the user's queries and map them to the knowledge graph. The result of the project is to answer the queries related to scientific articles, researchers, and institutions.[18]

In this paper, the authors,Tzu-Yu et al.( 2023). propose a multimodal chatbot for intelligent manufacturing. The chatbot is designed to help workers with tasks such as assembly, maintenance, and troubleshooting. It can understand natural language queries and provide answers or instructions in a variety of ways, including text, speech, and images. The YMC model is a simple yet efficient way to capture video features for user intent classification task. The results of the experiments showed that the YMC model can achieve slightly better performance than the model that applies YOLOv3. This is because YOLOv4 is a more accurate object detection model. They believe that the chatbot has the potential to improve the efficiency and productivity of manufacturing operations.[19]

Giovanni Almeida et al.(2023).proposes a Computational Meaning Processing(CMP) methodology for managing and evolving the content of chatbot systems. Which is based on the experiences acquired with the development of Evatalk, the chatbot for the Brazilian Virtual School of Government and divided into three phases: manage, build, and analyze. The paper evaluated the proposed methodology by applying it to the development of the Evatalk chatbot. The results showed that the methodology was effective in improving the chatbot's performance, reducing its human hands-off rate, increasing its knowledge base, and keeping the user satisfaction stable.[20]

Shahid, M. A. Hossain, S. S. I. Ahad, M. B. M. Al-Mamun, and N. K. Alam. (2022) proposed Survey on Detecting Fake News Spreaders". In the digital age, online social networks (OSNs) like Facebook and Twitter are central to modern life, serving as platforms for communication, self-expression, and news consumption. It emphasizes the significance of detecting and categorizing fake news spreaders on social media platforms. This outlines the primary categories used to classify spreaders based on source, propagation, and target features. Researchers may use machine learning algorithms like Random Forest, Support Vector Machine (SVM), or deep learning models such as RGA, based on the requirements of their experiments and the type of features they are analyzing. Future work should focus on developing platform-independent classifiers for detecting fake news spreaders across various social media platforms.[21]

Kulothunkan Palasundram ,et al.(2023)proposed "Enhancements to the Sequence-to-Sequence-Based Natural Answer Generation Models". In recent years, the field of artificial intelligence (AI) has seen remarkable progress. AI, often called machine intelligence, focuses on creating computer systems capable of performing tasks traditionally reserved for human intelligence. The NLP algorithm with Seq2Seq Model With Attention mechanism for answer generation and Seq2Seq Model Prediction (Beam Search) used for this paper. The future work includes enhancement of data and use of advanced algorithms, Fine-tune model parameters to maximize performance Conducting real-world testing, and considering scalability for practical deployment. Finally, Artificial intelligence (AI) has made significant strides, enabling machines to perform tasks once exclusive to human intelligence.[22]

Martha T. Teye 1, et al. (2022). proposed Understanding Culture, Context and Environment in Emotion Detection. Emotions are essential in human social life, and their detection is crucial in human-AI interactions. They introduce the concept of the AFME algorithm for emotional validation and outline the data preprocessing steps. The paper explores using Convolutional Neural Networks (CNN) for emotion recognition in both speech and facial expression data. The authors propose an Audio-Frame Mean Expression (AFME) algorithm to validate and improve emotion predictions. Emphasizing the significance of both speech (audio) and image frames associated with speech, the paper highlights the role of context, rate of speech, and non-verbal communication cues. Future research should focus on differentiating features in emotion recognition among diverse demographic groups.[23]

Rita Roy, Mohammad Dawood Babakerkhell,et al. (2022) study investigates the attitudes and intentions of teachers and students regarding the adoption of AI-based robots in Indian universities for educational purposes. The study utilizes three established theories, namely the Technology Acceptance Model (TAM), Theory of Planned Behavior (TPB), and Technology Readiness Index (TRI), to analyze the factors influencing intention with the help of the NLP Algorithm. Future work may focus on the practical implementation of research findings, including policy recommendations and real-world applications. The study found that teachers and students in an Indian university generally have a positive attitude towards adopting AI-based robots in education[24]

Soufia Kausar, Bilal Tahir, And Muhammad Amir Mehmood (2022) introduce the Push-To-Trend framework for identifying trend promoters in Twitter hashtags. And highlights the language-independent nature of the framework, making it applicable to various languages. It discusses the framework's potential for demographics and sentiment analysis. It makes use of classifiers such as Logistic Regression (LR), Decision Tree (DT), and Random Forest (RF) for performance evaluation. It needs to extend the framework to analyze trends and trend promoters across multiple social media platforms, such as Facebook, Instagram, or YouTube. This expansion would provide a more comprehensive view of online trend dynamics.[25]

Chen Li 1,(Member, Ieee), et al. (2022) proposed "ToD4IR: A Humanised Task-Oriented Dialogue System for Industrial Robots".ToD4IR is introduced as a humanized task-oriented dialogue system for industrial robots. The system is designed to assist with manufacturing tasks and enhance user experience. It incorporates conversation strategies and small talk principles for natural and engaging interactions. The document presents the IRWoZ dataset, which is the first industrial-oriented dialogue corpus. The core algorithm for the dialogue system is likely based on pre-trained language models and transformer architectures, as is common in many modern natural language processing (NLP) applications. Future work includes expanding the IRWoZ dataset to cover more industrial domains and tasks and coherence of dialogues generated by ToD4IR.Finally,the system holds promise for improving human-robot interactions in manufacturing settings through natural and task-oriented dialogue.[26]

Quoc-Dai Luong Tran,Anh-Cuong Le,And Van-Nam Huynh (2023) are proposed the chatbot Conversational Model the main objective of this chatbot is to achieve two objectives: 1) utilizing contextual information to generate accurate and relevant responses, and 2) implementing strategies to make conversations like human. Here there are algorithms used that is deep reinforcement learning and adversarial learning. The authors developed a module based on deep reinforcement learning to maximize the utilization of contextual information. This can be done by authors by using a policy gradient method to learn to generate responses by maximizing the expected result. And also the authors used adversial Learning framework to generate the response like human in the adversial Learning framework there are two models 1.generator Model generates samples that are intended to be similar to the real data, while the discriminator model tries to distinguish between the generated samples and the real data. Adam optimization algorithm and a hierarchical recurrent encoder-decoder model is also used for generative context-aware query suggestion. The final result of the project is to generate responses like human generated. The future work is to explore the use of more advanced deep reinforcement learning algorithms, such as actor-critic methods to improve the performance of the model.[27]

The authors of this project are Angel Antonio Martinez-Garate, et al. (2020) are propose the use of Model-Driven Development (MDD) approaches for the development of conversational agents or chatbot. The project was conducted using a systematic mapping study (SMS) approach which is organized into five stages. The authors applied MDD to conversational agent development by formulating a set of research questions and extracting the data of interest from the publications. The final result of this project is a systematic mapping study (SMS) that provides an overview of the state of the art in the field of automation of the development process of conversational agents through Model-Driven Engineering techniques. Model-Driven Approaches refer to a software development paradigm that emphasizes the use of models to represent the system being developed.[28]

R. Rajkumar and V. Ganapathy (2022) are proposed a Bio-Inspiring Learning Style Chatbot Inventory using Brain Computing Interface to improve the efficiency of E-Learning. E-learning is the online Learning through the internet. The authors classify the learning styles by conducting two experiments using EEG signals and machine learning. They also implemented VARK questionnaires to classify the learners as introverts or extroverts based on their learning performance. EEG signals are used to analyze the learning styles of individuals and classify them into visual or audio learners. VARK is a learning style inventory that categorizes learners into four different types based on their preferences for visual, auditory, reading or writing and kinesthetic learning. The algorithms used are Naive bayes and J48.Naive bayes is used to classify learners as visual or audio.J48 is a decision tree used for classification and regression. The future work of chatbot is working with AR and VR technologies. This chatbot helps learners to study easy.[29]

The authors Andrej Miklosik, Nina Evans, et al(2021).are conducted an review of existing research on chatbots and their implications for digital business transformation. They take the high-quality journal research papers in order to summarize the current state of research on chatbots identify their role in digital business transformation. The authors identify several areas where chatbots can enhance digital business transformation including customer relationships management (CRM), customer service, sales and marketing, e-commerce, and learning management systems (LMS).The paper focus on identifying the areas where chatbots can be deployed in digital business transformation and the benefits they provide. To conduct this research the authors followed a well-established protocol developed by Hao for Systematic Literature Review. The authors also searched several databases including Scopus, Web of Science, and Google Scholar for relevant studies on business. The authors identified 74 papers from 54 different journals that met their inclusion criteria and analyzed the data to answer their research questions. The final result of the paper provides valuable insights into the growing research on chatbots and their impact on business.[30]

The authors of this paper are E.H.-K. Wu et al. (2020) are proposed a hybrid model K-12 E-Learning Assistant Chatbot and discuss its advantages and constraints in E-Learning platforms. The authors propose a chatbot model that combines retrieval-based and generative-based approaches to provide assistance to K-12 students in E-Learning platforms. The chatbot is designed to understand and solve learning-related problems in online education. The retrieval-based model uses a keyword matching algorithm to identify relevant responses from a pre-defined set of responses while the generative-based model uses a neural network to generate responses based on the input query. The authors also use the QANet model for question answering and the SQuAD Evaluation performance for evaluation. SQuAD stands for Stanford Question Answering Dataset which is a large-scale reading comprehension dataset developed by Stanford University to give queston-answer pairs. By using this chatbot there will be easy way for education at anytime anywhere. Additionally, chatbots can provide personalized assistance to students, helping them to learn at their own pace and in their own style. Chatbots can also be available 24/7 providing students with immediate feedback and support.[31]

The author of the paper is John Levi Martin(2023) and the paper explain about ethico-political universe of ChatGPT, an AI tool and the challenges of creating ethical and unbiased AI tools. The paper discusses the attempts to make AI tools "ethical" and "unbiased", and how these attempts can have unintended consequences. The author also examines the underlying model and corpus on which ChatGPT was trained, and analyzes the responses generated by the tool. The paper includes detailed appendices that provide additional information on the methodology used in the investigation. The author also discusses the need for ethical considerations in the development of AI tools and raises important questions about the role of AI in society.[32]

The authors of this project are Kulothunkan Palasundram, et al. (2021) They proposed a multitasking-based Seq2seq model to generate meaningful and relevant answers to the questions given by the user. So to give the answers the authors take eight different models to give answers. In these eight models, they found SEQ2SEQ++ given the most relevant answers and low errors. In this project, different techniques and methods are used by the different models such as global attention mechanism, ternary answer classification, first-word and last-word predictions, and dynamic task loss weight calculations to improve the accuracy and relevant answers. The final result is that SEQ2SEQ++ can produce answers with higher correctness, and lower errors on the datasets compared to other models. The advantage of this project is SEQ2SEQ++ model gives more accuracy to questions asked by the users[33]

# Model Analysis and Discussions

**Table1**: **Comparing Method Accuracy Results**

|  |  |  |  |
| --- | --- | --- | --- |
| **S No** | **Authors** | **Methods** | **Accuracy** |
| 1. | Sanjay Chakraborty, Hrithik Paul et al.(2022). | Long-Short Term Memory | 94.32% |
| 2. | Vorada Socatiyanurak, Nittayapa Klangpornkun et al.(2021). | Rule-based reasoning, Human supervision | 88.89%, |
| 3. | Silvia García-Méndez et al.(2021). | Artificial Intelligence Markup Language, Natural Language Generation | 79.99% |
| 4. | Daniel Carlander-Reuterfelt et al.(2020). | SVM is a supervised machine learning | 85.37% |
| 5. | Gwendal Daniel,Jordi Cabot,Laurent Deruelle and Mustapha Derras.(2020). | Model Driven Engineering (MDE) techniques,machine learning | 90% |
| 6. | Henry Boateng Essel, Anastasios A. Economides et al.(2022). | Quasi-Experimental Design | 70% |
| 7. | Antonello Meloni, Simone Angioni et al.(2023). | Quasi-Experimental Design | 71.7% |
| 8. | Paula Maddigan And Teo Susnjak.(2023). | Large Language Model(LLM) | 71.7% |
| 9. | Kulothunkan Palasundram ,et al.(2023) | Recurrent Neural Network(Rnn),Convolution Neural Network(Cnn) | 81% |
| 10. | Martha T. Teye 1, et al. (2022). | Audio-Frame Mean Expression(Afme) | 82.59% |
| 11. | E.H.-K. Wu et al. (2020 | Retrieval-Based Model,Generative-Based Model | - |
| 12. | John Levi Martin(2023) | Ethical And Political Considerations Surrounding AI | - |
| 13. | Silvia T. Acuna and Oscar Dieste,(2022). | Usability questionnaries,Eye tracking |  |
|  | 67.9% |  |  |
| 14. | Lenin Medeiros and Tibor Bosse et al.(2022). | Mapping Of Stressors To Support Strategies Used |  |

The table shows the results of a study on the accuracy of different methods.The majority of the studies in the table were conducted in 2020-2023, suggesting that this is an active area of research.There is a wide range of accuracies reported in the table, indicating that there is no single "best" method.The best method for a particular task may depend on the specific data and requirements.

**Table2: Chatbot Research Paper Insights**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **S No** | **Authors** | **Methodologies And Algorithms** | **Problems Discussed** | **Challenges** | **Future Reasearch Directio** |
| 1. | Sanjay Chakraborty, Hrithik Paul Et Al.(2022). | Long-Short Term Memory | 1.Lack Of Healthcare 2.Access,Unaffordable Cost | **Data Scarcity And Quality, Algorithm Complexity, Security And Privacy** | 1**.**Developing Models For More Diseases 2.Improving The Accuracy Of Models  3.Deploy The Model In Real-World Settings |
| 2. | Vorada Socatiyanurak, Nittayapa Klangpornkun Et Al.2021 | Rule-Based Reasoning, Human Supervision | 1.Access ToJustice, Sensitive Nature Of TheTopic,Accurate  2.Access To Legal Information,Cultural Barrier | **1.Acceptance And Adoption,** 2.**Security And Privacy** | **1.Developing Chatbots For Different Languages Culture,**  **2.To Promote Healing** |
| 3. | Silvia García-Méndez Et Al.2021 | Artificial Intelligence Markup Language, Natural Language Generation | **Personalized And Socialized** | **1.Familiarity In Digital Technologies,Privac**  **2.Security Concerns** | **1.More Transparency,** **Improve Over Time**  **2.Better User Interfaces** |
| 4. | Daniel Carlander-Reuterfelt Et Al.(2020). | Supervised Machine Learning (SVM) | 1.Social Presence  2.Imagery Processing | **1.Small Sample Size**  2.**Lack Of Control Over Chatbots** | **1.Consider The Cultural Context**  **2.Explore The Role Of Other Factors** |
| 5. | GwendaDaniel,Jordi Cabot,Laurent Deruelle And Mustapha Derras.2020 | Model Driven Engineering (MDE) Techniques,Machine Learning | Flexibility,Complexity | Deployment,Time And Cost | 1,Improvment In Accuracy Of NLU  2.Evaluation Of Xatkit In More Domains |
| 6. | Chen Li 1,(Member, Ieee), et al. (2022) | 1. Dialogue Management  2. Human-in-the-loop (HITL) | 1.Interaction With Industrial Robot  2.Productivity And Safety In The Workplace | 1.To Assist With Manufacturing Tasks  2.Incorporates Conversation Strategies | More Industrial Domains And Tasks |
| 7. | Martha T. Teye 1, et al. (2022). | Audio-Frame Mean Expression(Afme) | 1.Ability to detect emotions  2.Actors of culture, context  3.Environment for evaluating | 1,Cultural bias  2.Environmental factors  3.Lack of data | More factors of culture, context, environment |
| 8. | Shahid, M. A. Hossainet al. (2022) | Random Forest, Support Vector Machine (Svm), | Comprehensive survey for detecting fake news spreaders. | Fake news spreaders can be human or cyborg that are constantly evolving to avoid detection | New detection methods for adversarial attacks |
| 9. | Yang Ye, Hengxu You And Jing Du.(2023).Proposed | Regular Expression Search Algorithm | **1.Trust In Human-Robot Collaboration**  **2.Miscommunication Between Humans And Robots** | 1.**Robustness**  **2.Transparency** | 1.**Enabled HRC Systems**  **2.Developing New Ways** |
| 10 | Kulothunkan Palasundram ,Et Al.(2023) | Recurrent Neural Network(Rnn) Convolutional Neural Network (CNN) | 1. Generic, Meaningless, And Inconsistent Answers. | 1.I**nability To Deal With Rare Words**  **2.Language Model Influence** | **New Training Methods And Datasets** |
| 11 | Lenin Medeiros And Tibor Bosse Et Al.(2022). | Mapping Of Stressors To Support Strategies Used  By The Proposed Chatbot | Providing Emotional Chatbot To Humans | Whether The Response Is Given Computer Generated Or Human Generated | Including More Stress Features And Giving More Realistic Response To Humans |
| 12 | R. Rajkumar And V. Ganapathy (2022) | Naïve Bayes And J Tree Classifier Algorithm(J48) | Chatbot Is Take Long Time To Respond To User Queries Due To Complexity Of Nlp | Less No Of Learners Is Used In The Study,Classification Algarithm Is Depend On The Eeg Signals | Use The Other Psychological Signals,Increase The No Of Learners In The Study,Use Different Machine Learning Algarithms For Better Experience |
| 13 | Kulothunkan Palasundram, Et Al. (2021) | Comprehensive Attention Mechanism (CAM),Diverse Loss (DL) | Difficulty In Identifying Input Sequence Such As Parts Of Speech,Generating Repeated Answers | Difficulty In Handling Long Inputs,Generated Answers Which Are Irrelevant To Question | Taking Differnt Datasets In Different Languages To Enhance Chatbot Response |
| 14 | Angelo Salatino And Francesco Osborn.(2023). | Support Vector Machine (Svm), | Given Data Have Errors And This Effects The Accuracy And Knowledge Graphs | Ntegrating Data Into Knowledge Graph Require Many Data Formats,Understanding Human Language Queries Is A Big Challenge | Adding The Different Queries Types,Integrating More Data Sources  To Develop The Accurate Knowledge Graphs |
| 15 | E.H.-K. Wu Et Al. (2020 | Retrieval-Based Model,Generative-Based Model | The Problem Is Related To E-Learning,Developing And Using Ml Models Is Difficult | Limited Knowledge Of Chatbot Compared To Teacher,For Some Queries The Chatbot Didn't Answer Correctly | Expanding Chatbot Knowledge And Increasing Its Ability To Answer Complex Questions By Using Different Ml Models |

**Chatbot research is a rapidly evolving field, with many challenges and opportunities.** The table provides a snapshot of the current state of research, highlighting the key challenges that need to be addressed and the promising directions for future work.

# Conclusion

In this paper, we have presented a survey of existing chatbots. We have discussed the different types of chatbots, the techniques used in chatbots, and the evaluation metrics for chatbots. We have also discussed the key findings of the survey, the challenges and limitations of existing chatbots, and the future research directions in chatbots. Overall, chatbots are a promising technology with the potential to revolutionize the way we interact with computers. However, it is important to be aware of the challenges associated with chatbots and to use them in a responsible way. With the help of educational chatbots, we can provide 24/7 availability, Personalized learning, Proactive support, Reduced costs, and Improved student satisfaction. Educational chatbots using NLP have the potential to revolutionize the way we teach and learn. They can provide students with a more personalized and effective learning experience, while also freeing up teachers and tutors to focus on more complex tasks

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