ChatGPT in education

1. **Introduction {with citations}**

* 1. **What is a chatbot? And short history**

A chatbot is a computer program that understands the user input and gives a sensible and human readable response through the messaging application. To understand the user input, it uses Natural Language Processing (NLP) and machine learning techniques and generates the responses. Nowadays chatbots are used for many things. Since it can be programmed for automated responses, companies use it for customer service, which helps to reduce the support costs.

The first chatbot was created in 1966 by Joseph Weizenbaum. It was designed to have conversation with psychotherapist. This bot passed the Turing test that means human beings are unable to distinguish the machine from another human. Chatbot now uses more advanced NLP and AI which make it more powerful.

* 1. **What are the significances of chatbot?**

Chatbot is advanced nowadays. With advancement come advantages and disadvantages. Some of its significances are explained below:

* **Real-time Feedback and Guidance:**

Self-paced learners can receive real-time feedback and guidance from Chat GPT as they progress through course materials and resources. This allows students to stay on task and deal with any problems they encounter.[1]

* **Cost-effective:**

Chatbot is a cheap and one-time investment instead of human resource. It reduces costly problems caused by human error. It can give responses to a huge amount of user input without any error once programmed.

* **Convenient and flexible learning:**

Self-study learners can use Chat GPT to learn at their own pace and in their own way because they can converse with chatbots whenever it's convenient for them.[1]

* **Availability:**

Once the chatbot is programmed it is available 24/7. It is useful for customer service and support as users get support outside office hours, which helps user experience.

* **Improved Use of Open Educational Resources:**

Chat GPT can provide customized suggestions and advice on how to effectively use these resources so that self-directed learners can find and use open educational resources help. This allows students to take advantage of a wide range of online learning tools and materials.[1]

* 1. **What are types of chatbot?**

Chatbot is programmed to have conversations with human users to understand the user input that provides readable and sensible responses. To understand these user input, we have many types of chatbot. Some of them are explained below:

* **Rule-based chatbots:**

Rule-based chatbot gives response on basic of predefined set of rules recognizing the user input. It uses if/then logic to have a conversation with user. It is mostly used in customer service and support in organizations. It is created by developers and is based on specific keywords or patterns in user inputs. It analyzes the user input text and tries to match with pre-defined rules if not found. It uses a decision tree and generates the response accordingly.[2]

* **AI-based chatbots:**

AI based chatbot are those chatbot that are trained to have human-like

responses using a Natural Language Processing (NLP). It can gather data from user behaviors. It is constantly learning from the conversation with the users which improves the quality of response over time. It can be used for many industries like customer service, sales and marketing.[2]

* **Hybrid chatbots:**

Hybrid chatbot is combination of both rule-based chatbot and AI based chatbot. It uses a rule-based chatbot to generate responses for the frequently asked input and AI-chatbot for the response that doesn’t have pre-defined rules which makes it more powerful from both of chatbots.[2]

**1.4 What is ChatGPT ? Discuss along with its history and differences with normal**

**chatbots.**

ChatGPT is an advanced chatbot created by Open AI using GPT technology. Designed for personalized conversations in natural language. ChatGPT is a language model created by Open AI using GPT-3. It will be spoken in a casual and natural way, like everyday conversation. ChatGPT is built upon prior research in characteristic language training and artificial intelligence. GPT-2 could produce human-like content that was difficult to distinguish from real writing. Open AI released GPT-3 in 2020, an upgraded version of GPT-2, as the largest and most powerful language model to date. ChatGPT was created as a language model designed for conversation by refining an existing model. It builds on previous work that improved GPT-2 and GPT-3 models by Open AI. These models produced impressive content that was hard to tell apart from human writing. ChatGPT is designed for conversation. This AI uses vast amounts of data to understand human language and engage in meaningful conversation with users. Regular chatbots respond to specific requests based on pre-programmed rules. ChatGPT uses advanced language processing for relevant responses. ChatGPT can respond and converse with users. It contextualizes conversations and responds accordingly. ChatGPT uses more data than regular chatbots. ChatGPT is a major advance in conversational AI and natural language processing.

ChatGPT is an AI system by Open AI using GPT architecture. The system understands human speech and can converse with users after being trained on vast amounts of data. ChatGPT is more human-like than typical chatbots. ChatGPT is more human-like than other chatbots. ChatGPT is different from traditional chatbots. Chatbots follow programmed rules and respond to specific requests. Chatbots follow rules and respond to requests. ChatGPT uses NLP to respond based on previous interactions. ChatGPT employs NLP techniques to comprehend the context and provide suitable responses from past exchanges. ChatGPT relies on more data for its model training than traditional chatbots. Diff. between ChatGPT & traditional chatbots: less training data. In short, ChatGPT is a game-changer in the realm of NLP and Conversational AI. In short, ChatGPT is a significant advancement for NLP and Conversational AI.

**1.5 How does ChatGPT works? Explain with diagram.**

ChatGPT has progressed NLP capabilities, counting the capacity to get it and create human-like content. This could be valuable in analyzing code because it permits the show to get it the aim behind the code and to recognize potential bugs based on the dialect utilized. [3]

**Input:**

The discussion starts with a beginning client provoke or message given to ChatGPT.

**Encoding:**

The tokenized input is passed through an encoding layer, which changes over the tokens into numerical representations that the demonstrate can get it. The tokenized input is passed through an encoding layer, which changes over the tokens into numerical representations that the demonstration can handle. The demonstration forms the encoded input tokens in conjunction with the setting of the discussion so far. The demonstration takes the encoded input tokens at the side of the setting of the progressing discussion. This permits the show to get the discussion history and produce relevantly pertinent reactions.

**Translating and Examining:**

The model creates a likelihood dissemination over the conceivable other tokens, showing the probability of each token being the following within the reaction. To create a reaction, ChatGPT employs an inspecting method, such as top-k testing or core inspecting, to choose the next token based on its probabilities. The demonstration creates a likelihood conveyance over the conceivable following tokens, showing the probability of each token being the another within the reaction.

**Reaction Era:**

The chosen token is included in the continuous discussion, and the method rehashes to create ensuing tokens until a fitting halting condition is met. The chosen token is included in the discussion, and the method is rehashed to produce consequent tokens until a suitable halting condition is met.

**Yield:**

The produced tokens are changed over back into human-readable content and displayed as the model's response. The created tokens are changed over back into human-readable content and displayed as ChatGPT's reaction to the user.

A picture containing text, font, screenshot, handwriting

Description automatically generated

Figure: Workflow Diagram of ChatGPT[4]

**2. Literature review**

**2.1 ChatGPT and its applications**

ChatGPT is an advanced chatbot created by Open AI using GPT technology. Designed for personalized conversations in natural language. Since ChatGPT was published it is a favorite among students and teachers. It helps students to learn and find answers to the questions easily and quickly. ChatGPT is also famous among programmers as it helps to debug the error in code. The goal of ChatGPT is to equip the program to identify and fix coding mistakes in contemporary works by comprehending the correlation between code and errors. ChatGPT proposes code solutions based on error analysis. ChatGPT offers software support using NLP, data representation, and design. After prep, the demo offers code fixes using its understanding of code and errors. ChatGPT can suggest a fix for code errors with data. Programming, design, and development proposals. ChatGPT analyzes performance via data quality, system design, and bug priorities. ChatGPT detects bugs through code analysis. Catch early bugs, save time and money. ChatGPT finds coding errors by checking the code. The demo identifies coding errors through its recognition abilities. With snippets and errors, the show grasps the relationship. Collects accurate data and detects potential errors during development. Chat GPT finds and explains input code errors. Explains the issue source to programmers.[3]

ChatGPT might also play a vital role in Health-education. As it advises on improving health and preventing illness through examples. It's early screening provides crucial info on mammograms and colon screenings for treatable illnesses which reduce the risk of chronic diseases by managing stress, blood pressure, and cholesterol, and avoiding tobacco and excessive alcohol. It provides tips and info on wellness techniques. It supports health experts and educators to improve community well-being in rural and urban areas. It provides information on public health programs and services, their respective populations, and targeted health outcomes and gives information on program qualifications, costs, and available coverage for services. [5]

ChatGPT aids analysts to identify key articles by creating abstracts and providing relevant records on specific topics and keywords. ChatGPT enables easy drafting of inquiries, proposals, and other documents with a specific style and tone. ChatGPT helps analysts analyze large content information, such as social media posts and news articles, by identifying patterns and gaining insights. ChatGPT helps researchers stay updated by summarizing academic papers, reports, and other documents. ChatGPT is customizable for domain-specific questions, aiding analysts with fast and efficient answers. [6]

**2.2 ChatGPT and its Pros/Cons/Limitations**

Everything that is used by us human have advantages and disadvantages with its limitations. ChatGPT itself is never good or bad. How users use it defines its behavior. Its pros, cons and limitations are described below with some examples:

**Pros**

Students learn at their own pace and style. Lang Aptitude Improvement. ChatGPT assists 4,444 learners in enhancing their language proficiency through chatbots and virtual tutors. Chatbots provide instant feedback on language skills. ChatGPT reviews papers and assignments automatically. Saves time and gives instant feedback to students. ChatGPT aids students in research by answering queries, recommending resources, and simplifying intricate concepts. Increase critical thinking. ChatGPT prompts class discussions for critical thinking and meaningful conversations among students. Make chatbots and virtual assistants using ChatGPT for inclusive classroom participation. ChatGPT transforms education through customized learning, and automation for teachers, fostering critical thinking and accessibility, and enhancing language skills. Use ChatGPT as a learning tool, not a teacher replacement. [7]

**Cons**

Students may become excessively reliant on AI tools like ChatGPT, leading to a lack of critical thinking and independence in learning. ChatGPT can copy conversations but can't replace real-life social and emotional interactions. Excessive use of ChatGPT can harm social skills and empathy. ChatGPT's answers may be inaccurate due to biased information. Using ChatGPT without proper authorization may cause plagiarism and academic fraud. Preparing ChatGPT demands ample knowledge of student data protection and security concerns. ChatGPT can't replace human instructors who provide emotional support and adapt to individual student needs. In education, use ChatGPT as a tool to support learning, not replace teachers or critical thinking skills, considering its potential drawbacks. [7]

Limitation

GPT models rely on training data but don't understand the context. GPT use raises concerns about moral issues. GPT technology's classroom use may lead to over-dependence and decreased critical thinking. GPT in education needs technical prerequisites like fast internet, computers, and specialized software that could challenge a few schools and students. Teachers and students require training, support, and additional resources for the effective use of GPT technology in classrooms. Managing hurdles is crucial for the ethical, optimal, and equitable use of GPT in education. Ensure diverse data, teach critical thinking, and use GPT in education. [7]

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[7] V. Božić, “Chat GPT and education”, doi: 10.13140/RG.2.2.18837.40168.