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A Literature Review on chatbots in education: An intelligent chat agent.

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Abstract

The class size in a university often impacts on how an educator delivers the material, and how students interact in the class. Small class size often allows students and educators to interact and have a more positive rapport. Class size in many universities however, are quite large. This places an additional workload on the lecturer, and makes fostering this interaction more difficult. These large class environments are transitioning to be integrated with online components. And student often expect support responsiveness in line with other online platforms. Learners place importance on their communication need and consider being treated as individuals, as a highly important contributing factor for enhanced academic performance and satisfaction

Chatbot for education has great potential to complement human educators and education administrator. Forex example, it can be around the clock tutor to answer and clarify any questions from students who may have missed class, a chatbot can implement either by ruled based or artificial intelligence based chatbots can learn and become smarter overtime and is more scalable and has become the popular choice for chatbot researchers recently.

Now days the use of chatbot is popular in large of applications especially in systems that provide an intelligence support to user. In fact, to speed up the assistance, in many cases, systems are equipped up with chatbots that can interpret the user questions and provide right answers.

Keywords: *chatbot. Chatbot in education. Learning process. Higher education*

Introduction

A chatbot (or chatterbot) is a software that talks with a user (human): it is a virtual assistant able to answers a number of user questions. Providing the correct responses. In the last few years there has been a fast growing up of the use of chatbots in various fields. Such as health care, Marketing, education, supporting systems, major

companies have developed several chatbots both for industrial solutions and research: some of the most famous are *Apple Siri, Microsoft Cortana, Facebook M, and IBM Watson*. (Colace, et al, 2018) these are just some of the most popular systems. There is a wide range of less famous chatbots that have a greater relevance for research and for their application, some of which will be discussed in the next chapter.

Perhaps the most common application of a Chatbot, often seen and used in many online websites, is in the form of a “personal assistant”. In addition to personal assistants, Chatbots can be used for a range of services. These include booking taxis, filing complaints, offering medical advice, offering fashion advice, and simply being a conversationalist (Brandtzaeg & Følstad, 2017). With the ability to integrate Chatbots with most messaging platforms such as Facebook messenger and Skype, they are becoming more accessible to everyone.

One application of a chatbot was the Intelligent Healthcare Chatbot, HECIA. She was a chatbot stationed in a medical centre, designed to save time for medical staff. It is said that 4500 hours per year were spent by medical staff directing patients to the correct area of a hospital. HECIA was designed to direct patients to different areas of the hospital, as well as take symptoms as input, and either offer a diagnosis or direct the patient to a doctor that could assist in making diagnosis (Kasinathan, Xuan, Wahab, & Mustapha, 2017). The potential of chatbots as an online tutor to provide assistance and answers to queries and questions by students is an interesting proposition and has great potential. Questions answering chatbots are intelligent systems that able to converse with humans using natural language while providing answers. (Palasundram, Sharef, Nasharuddin, Khairul & Azman, 2019).

As previously said, one chatbot field of application is educational. Recently there has been an increase of chatbots for e-learning platforms to support student learning. Chatbot technology can be considered an important innovation for e-learning: in fat they are turned out to be the most innovative solution in filling the gap between technology and education. The implication of between technology and education. The implication of chatbots create an interactive learning experiences for the student, like the one-one interaction with the teacher. (Colace, et al, 2018)

Common uses of chatbots

Initially chatbots were developed to be entertaining and to mimic human conversation. This is still a popular reason when developing chatbots, but since the popularity with the technology has gone up, so has the different uses. The chatbot technology has then been used for many things, like for retrieving information, answering questions, helping make fact-based decision, as a shopping assistant, as a museum guide, language partner, or in education, among other things.

The chatbot can be used as a tool to learn and practice a language. There are many perks of having a chatbot as a conversational partner when learning language, for example a it could allow a student to practice their language skills anytime, it would not mind repeating the same material several times, it can incorporate both text, speech which might help a student with both their reading, writing and listening skills. However, the chatbot as a language tool also has a few disadvantages. The responses of a chatbot are often predictable, redundant or retain no memory of previous responses. (Roos, 2018).

As mentioned, a chatbot can be used as an information retrieval tool, in order to answer a user's questions on a specific topic. This kind of chatbot has a wide range of applications, from interactive FAQ to helping a customer make decisions. An example of a bot like this is the YPA, a chatbot used to provide users with information from the British Telecom's Yellow pages. The user might ask for a plumber with an emergency service, and the chatbot will search its knowledge base and retrieve an address, or if none was found, ask for additional details.

When it comes to chatbots in education, states that it is important to remember that the teacher is the backbone of the teaching process and the learning technology may act as an amplifier but not a replacement. One example is that the when a chatbot is used to answer student questions, the teacher can use generated log files of the conversations to see what the students are having issues with and what their weaknesses are. (Shawar and Atwell, 2007 cited by Roos, 2018). Thus, the teacher can use a chatbot to look for problems as the students use it to solve them.

The potential of Chatbots in education

In particular, the use of chatbots to enhance student interaction is becoming mote popular in a world where tech-savvy students rely heavily on social media and instant messaging platforms, such as slack and Facebook Messenger. Chatbots have the potential to provide standardized information to students instantaneously.
Using chatbots is possible to adapt the speed at which a student can learn without being too pushy. (Palasundram, et al, 2018) Chatbot can also be used as a source of social learning, in fact students from different backgrounds can share their views and perspectives on a specific matter while the bot can still adapt to each one of them individually. This technology can improve engagement among students and encourage interaction with the rest of the class by assigning group works and projects like teachers usually do. (Roos, 2018). Chatbot can help teachers in their homework. Often are used as online assessments: if a class there are many students, give attention to each one of them becomes very demanding for teachers, while chatbots can work with multiple students and groups at the same time. They also can work as a support to teachers by identifying spelling and grammatical mistakes, checking homework, assigning projects and especially keeping track of progress and achievements of each student. (Colace, et al, 2018) Chatbot aims to be an e-Tutor for students.

Literature Review

Considering the advantages, the review of a handful of research done by scholars in the use of Chabot for tutoring is summarized below.

A. Customized learning:

Personalized attention to students advances their results as the tutors get to knowledge of the domain where the learners are fragile in. The availability of personal educators to individual students of different capacities can conceive larger number of professionals. Students can acquire deeper knowledge of their interests. Technology Mediated Learning (TML) is defined as “an environment in which the learner’s interactions with learning materials (readings, assignments, exercises, etc.), peers, and/or instructors are mediated through advanced information technologies”. Chatbot

mediated learning is also considered as a branch of TML where the study is personalized and students can dynamically use these bots for their learning. (Thomas, 2020).

The chatbots assess the discernment of the students and provides the subsequent lecture. For instance, the Summit Learning Project uses chatbots to identify the weak areas of students and adapt to their leaning style and help them manage the modules. The chatbots further conducts quizzes and submits the results to the tutors, who provide immediate feedback to the students. This is accomplished through digital forums.

B. Spaced Interval Learning:

Spaced Interval learning helps students polish up what they have studied until then. The students can recall what they have memorized. Super Memo is an application that reminds students when they are about to forget. It uses an algorithm to monitor the frequency mode in which the learning happens and repeats subjects already covered.

C. Assessment of composition skills:

Currently, educators tend to assess the students through Multiple-choice questionnaires easing their tasks. A student can be assessed better based on their writing and composition skills which can be acquired through essay writing. This has been explored through an automated evaluating system where the researchers have executed unsupervised machine learning on performing robotic assessment and have also done an analysis on the performance of the robot which was analysed using an amalgam of combination of term frequency inverse-document function (tfidf) with cosine Euclidean distance.

A real time study was conducted on a set of medical students, where the web tutoring program increased their test scores and cognitive efficacy to three-fold the size which was measured in Cohen's D effect size (95%) and confidence interval (CI)[1].

E. Easing tasks of tutors:

[1] Kerfoot BP,. Baker H, Jackson TL, et al. A multi-institutional randomized controlled trial of adjuvant web-based teaching to medical student. Acad Med

It is a false assumption for teachers who think the chatbots may take up their job and they will be laid off. It only simplifies tasks for them by helping students with frequent queries and assessing them personally. Teachers can equip themselves with the latest research during the supplementary time they get. Ashok Goel, is one among the initial educators who used this method and developed his own chatbot and named it Jill Watson. Jill attempted to answer the students through an online forum dispensing all available information including technical doubts.

F. Integration of chatbots to classrooms:

Apart from standalone chatbots, there has been an increase in the integration of these chatbots in social platforms such as Facebook, Google classroom and so on. Based on the category, language and development platform chatbots used for education in Facebook has been studied in and the efficacy has been evaluated. Quality allocation was tabulated using Analytic Hierarchy Process (AHP).

G. Appealing methods of online education:

How effective can chatbots be in education, also relies on its attractive design. Reeves, B. & Nass, C. (1996) exemplified in their investigation that most of the humans consider social platforms such as televisions, computers and internet as their fellow beings and treat them with more respect. This finding led few researchers to think with ingenuity to impart knowledge as a dignitary or an influential person from the past. To elaborate, in the research conducted in 2014, a talkbot labelled Freudbot was built using non-proprietary software called AIML (Artificial Intelligence Markup Language) and ELIZA kind of control features. The highlighting feature of Freudbot was that it communed with the learners as a famous personality from history. Though it provided neutral results, it was assumed to be more promising for the future online education.

Conclusion

To summarize, there has been a lot of investigations on the use of the artificial conversational entity over ages and the research still continues for enhanced results and switch over to a digital era. While there are limitations to its usage that includes lack of funds and qualified teachers, this paper reviews previous literatures where

chatbots benefitted the students and teachers simultaneously which outweighs the limitations and promises a better education.

The review ends with the conclusion which looks at the research questions and the aim, and summarizes the found answers and the key points of the discussion. The aim of the research was to further the development of educational chatbots by reviewing what had been done and summarize this knowledge. This would be done by finding out what capabilities the chatbot might have in an educational context and if it could stand on its own or if it required additional technology to add pedagogical value in education. This aim was boiled down to the open-ended questions: What roles can AIML-based chatbots take in an educational context? and What features can AIML-based chatbots have in an educational context? This question has been answered thoroughly in this review but the answer might be summarized as: The features and uses of AIML-based chatbots are many, and they seem only to be limited by what we humans might imagine it doing. It is a flexible and diverse tool, simultaneously simple and complex, limited only by the inventiveness of its creator. It can work well on its own and provide educational value, but may reach even better results when combined with other technology. A more specific answer might be that a chatbot can be used as a tutor, a student evaluator, for questions and answers, to communicate with a teacher or simply for natural conversation. The chatbots capabilities can be expanded by including it in other systems such as e-learning systems, virtual environment or library system (or other database heavy systems) or by adding augmenting technology like text-to-speech technology, linguistic tools or animation.

A real case has been investigated developing a Chatbot for the students of Fundamentals of Computer Science and Computer Networks courses. The results obtained by the experimental campaign are satisfying and show the good perspective of this kind of approach. Further developments involve the application of the proposed approach in various contexts and an improvement of e-learning platform and these findings provide further evidence to suggest that chatbot programming (especially on the Facebook Messenger) is still in its early stages. The future research can be dived into two more fields. The first id to focus on the developers support to create and offer tools that allow any teacher to integrate chatbots into their classes without difficulty,

and provide educational chatbot guidelines to successfully support coaching methods and students learning. The second field is a content analysis of the actual conversations with students. It is technically possible to store, collect and analyze conversations from both macro and micro angles.

I hope this review will promote further research among other stakeholders in using chatbots on educational process.

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