ALBUKHARY INTERNATIONAL UNIVERSITY
albukhary socialbusiness journal
Vol. 3, Issue 2, 2022

INTELLIGENT CHATBOT FOR UNIVERSITY INFORMATION SYSTEM USING NATURAL LANGUAGE APPROACH

Pica Salsabila Atmauswan, Akibu Mahmoud Abdullahi

School of Computing and Informatics,
Albukhary International University, Alor Setar, Kedah, Malaysia
pica.atmauswan@student.aiu.edu.my
akibu.abdullahi@aiu.edu.my

ABSTRACT

High school students begin applying to university during the senior year or upon completion. This marks the beginning of a complete frustration for students as well as admissions staff. Students have countless questions and problems that need to be answered repeatedly and resolved by the admissions staff. The development of the chatbot was carried out with the aim of solving the problems faced by students interested in enrolling in the university by offering consolidated, authentic and accurate information through a live chat window. In the development, the university Chatbot obtains its knowledge from students frequently asked questions and implement dialog-flow as the platform to design the chatbot. Natural language processing is used to create the components required for developing a university chatbot design. The chatbot application implements a search for answers through questions entered from the user. The chatbot is expected to help prospective students register for admission procedures, study programs, and scholarship information. The chatbot will analyse and match categories based on the knowledge that the chatbot has. The goal of this project is to design a chatbot that can be utilized by students on the university's website to get their questions answered quickly and effortlessly.

Keywords: *chatbot, conversational agent, higher education, admission*

1.0 INTRODUCTION

A chatbot or chatter robot is a conversational software agent that can mimic human conversation via text or audio communications through natural language (Følstad & Brandtzæg, 2017). As there are so many chatbots accessible now and their popularity has grown each with its own distinct architecture and set of functions. Shawar and Atwell (2007) indicate that the original goal of chatbot creation was to mimic humans as closely as possible, but as time went on, the focus shifted to creating practical tools that could assist users in their jobs in a more natural way through the use of natural language. These conversational bots can trick users into thinking they are talking to a real person, but they cannot really learn anything new on the go. According to research conducted in 2017 by statista, millennial internet users spend an average of 223 minutes per day on their mobile devices. It represents a rise over a long period of time. This may indicate that people prefer the mobile chat platform over email, which requires a lengthy response time. Along with the expansion of the world of web services, many of the most recent advancements in website design emphasize the importance of user-friendliness (Toniuc & Groza, 2017). This is when chatbots can be utilized in dialogue systems for a variety of useful reasons including providing customer support and collecting data (Nagarhalli et al., 2020).

According to Nguyen et al (2021), Artificial Intelligence (AI) chatbot obtains all of

its knowledge from human-to-human chats and the more data it gathers, the more effectively the chatbot can provide output. In addition, chatbots communicate with humans through the use of artificial intelligence techniques such as natural language processing (NLP) to comprehend the user's query and respond, this makes the chatbot more user-friendly and trustworthy (Singh et al., 2018). The Higher Education Minister of Malaysia stated that in 2021, the total number of student admissions to public universities increased by 2.4%. Subsequently, Nguyen et al (2021) discussed that the daily influx of general and specific questions from prospective students had an impact on admissions staff, who were frequently bombarded with inquiries from applicants. Since prospective students frequently ask the same questions, the workload of the admissions team is increased. The development of the chatbot was carried out with the aim of solving the problems faced by students interested in enrolling in the university by offering consolidated, authentic and accurate information through a live chat window. The goal of this project is to design a chatbot that can be utilized by prospective students on the university's website to get their questions answered quickly and effortlessly.

2.0 LITERATURE REVIEW

Due to their numerous uses, chatbot systems have gained popularity in recent years. In addition to their vast range of uses, chatbot systems are popular because they are accessible, improve the customer experience, can handle a big number of clients, and are highly cost efficient (Desai, 2019). Several research done, for example, Hill et al. (2015) indicate, that chatbots may provide users with enjoyment, fast feedback, and improve peer communication skills. It is also claimed that the presence of chatbots in education would boost the efficiency of student learning (Wu et al., 2020). Every year, the number of potential students who apply to colleges and universities increases, and The majority of students ask the admissions personnel repetitive questions or inquiries. The majority of the queries are in reference to the application process, information regarding courses, information on campus housing, visa applications for overseas students, and a variety of other topics. Hereafter, It is predicted that implementing a chatbot system in colleges will reduce the need for senior management positions by 70 percent in the future years (Aadeetya, 2020).

Gunasekara & Vidanage (2019) stated in their paper that traditional technologies such as machine learning cannot be applied to the construction of chatbots for smaller domains due to a lack of data in the domain and a lack of conversation-related training. In a study titled Chatbot Using TensorFlow for Small Business, Singh et al. (2018) explain that TensorFlow was used to create the neural network model of the chatbot and natural language processing (NLP) methods were utilized to retain the context of the interaction. Small industries and enterprises may utilize chatbots to automate customer service, as chatbots will address consumer questions. However, in the paper's findings section, it is mentioned that the machine learning strategy to create a bot for a smaller domain does not produce reliable results since machine learning does not comprehend the meaning of phrases. The chatbot only learns how to reply to people based on past interactions.

Ranoliya et al. (2017) proposed their research to the development of a chatbot system that can respond to frequent questions concerning colleges. Artificial Intelligence Markup Language (AIML) is proposed for chatbot development and the researcher outlines the numerous tags supplied by the language and their application in the building of chatbot systems. In addition, a comprehensive comparison is made with the two prior techniques for constructing a chatbot system for colleges, and it is asserted that the usage of artificial intelligence markup language has several advantages over this system. The research also says that chatbots can be created by integrating Latent Semantic Analysis (LSA) and Natural Language Processing (NLP). According to him, this will facilitate a more natural interaction between clients and the chatbot. With Latent Semantic Analysis, AIML will be able to provide more

frequent appropriate solutions in response to altering query patterns. Eventually, AIML will concentrate on enhancing dialogue by modifying the patterns of Frequently Asked Questions (FAQ). Researchers use Frequently Asked Questions (FAQ) as a resource to compile information about universities based on the demand felt by university staff.

Thakkar et al. (2018), in their research titled as Erasmus- AI chatbot construct a chatbot for answering questions about university information. The authors created Erasmus as an end-to-end cloud-based system beginning with api.ai now known as Dialogflow, Mlab (MongoDB cloud), and IBM Bluemix (webhook API). The AI Chatbot was created with the sole intention of lowering students' search times and making websites friendlier and more informative, which is crucial in these hectic times. Using artificial intelligence algorithms that evaluate user searches and comprehend user messages, the researcher created this chatbot. However, their chatbot's response time was rather slow since it utilized an excessive number of cloud services.

Eaglebot is another literary work that can be contrasted with others (Rana, 2019). The authors devised and implemented a method for semantic search based on the information obtained on a university's website in order to respond to users' enquiries about the university. One of their solutions involved retrieving papers and selecting paragraphs from those texts using BERT. It is a scalable chatbot system that employs three distinct methods for route selection, with Dialogflow serving as the primary architecture. However, Eaglebot is still limited in some respects due to request limitations in the Dialogflow chatbot architecture, and the bot was only accurate 56% of the time.

Furthermore, Santoso et al. (2018) advocated using Natural Language Processing to create chatbots (NLP). The construction of a chatbot is meant to operate as a conversational agent and as a service for prospective students, with the goal of assisting them in locating the information asked during the university application process without requiring a response from the admissions officer. In their writings, authors create chatbots utilising Dialogflow and natural language processing. The chatbot can synthesise information such as admission procedures, university rankings and study programme accreditation, service availability, university environment, and so on using 166 intents and test methods based on phrase forms.

3.0 METHODOLOGY

In the development, the university Chatbot obtains its knowledge from students' frequently asked questions about Albukhary International University. The question data will be obtained in collaboration with the Scholarship Unit, Admission and Academic Management Department (AAMD), and the International Student Unit (ISU). The material will be compiled into frequently asked questions (FAQ) comprising information about scholarship information, course information, admission procedures, and student visa information. After the dataset is collected, the authors determine the intent and entity of each collected question. Chatbots use intents and entities to generate responses from semi-structured text, such as frequently asked questions, while replying to simple questions. Then, the specially shared intents and entities will be used in Dialogflow for chatbot development. However, it must be acknowledged that the chatbot domain for universities is smaller than the commercial chatbot domain. As a result, when developing a university chatbot, keep in mind that the methods or tools used may alter the desired results due to a lack of data in the field as well as a lack of conversational training (Gunasekara & Vidanage, 2019).

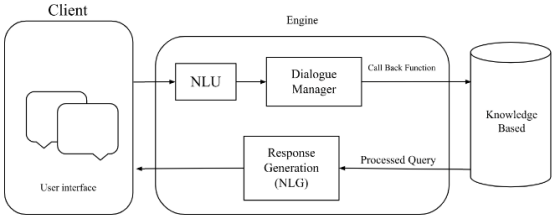

FIGURE 1

Chatbot Architecture

Based on Figure 1. Chatbot architecture, the author formulates the components needed in developing a university chatbot design using natural language processing which is then explained further below:

- The process begins with a user request to the chatbot via a website, such as "What language is spoken in college?" After the chatbot receives the user's request, the Language Comprehension Component analyses the questions that are input to the chatbot to infer information related to intents and entities.
- The Natural Language Understanding (NLU) component of the chatbot system is used to define the context of the user's speech. This can be achieved by using keyword extraction or word markers so that the chatbot can understand what the user is typing and is provided as an output value. Natural Language Comprehension is specially designed for interpreting text.
- Dialog Management is a core component of chatbots. Once the chatbot has determined the best interpretation, it must decide how to proceed. It can immediately act on new knowledge, remember what it has understood and wait to see what happens next, ask for more context information, or seek clarification. When the request is understood, the execution of the action and fetching of data occurs. It receives output from the Understanding Natural Language component and generates a user-facing reply. This requires an external information source to generate replies and manage flows. Unrefined text replies generated by the Dialog Manager will be sent to the Text component of Natural Language Generation. The Dialog Management component maintains and updates the conversation context which consists of the current intent, identified entities, or missing entities needed to fulfil user requests.
- The knowledge base component will formalize the data in order to offer the conversation management component with data easily. This component can hold information pertinent to the domain. The chatbot conducts the required actions or obtains the desired data from its data sources, which may be a database, also known as the chatbot's Knowledge Base. After going through the knowledge base to generate a response, the query is then processed.
- Natural Language Generation (NLG) is a subcomponent of Natural Language Processing that generates natural language text answers using non-linguistic representations. Due to the machine-processable qualities of the semantic web paradigm, Natural Language Generation is considered a semantic/conceptual representation of current findings. The results of the query are given to the user via natural language generation and the user ultimately receives a response based on the intent specified in the knowledge base.

The user will initially log in to the system after clicking on the chatbot provided on the college website. The chatbot system greets the user and requests their email address. The chatbot then begins conversing with the user. When a user chooses a chatbot to receive responses to his questions in the bot index system, the chatbot displays a page with several college-related alternatives and determines the category of the user's questions. The chatbot's task is completed if the user's query is addressed. Additionally, the chatbot system invites the user to enter the question in words during the question-asking process if the user is dissatisfied with the rule-based response. The chatbot then delivers an appropriate response. The database is first accessed by means of a user query. The user gets the right response if the query is legitimate. The chatbot will prompt the user to inquire about the college if the question is unfounded. The chatbot will ask the user for feedback following the conversation. To better understand their experiences with the chatbot, users are asked for comments. The bot will thank the user and offer a window where the user can type more questions if the user provides positive feedback. If the user delivers unfavourable input, the bot will ask for further details so it can respond appropriately.

Additionally, usernames are stored which later allows administrators to more easily monitor user behavior. The user will be prompted in the final section to indicate whether any additional questions need to be raised. If not, the chatbot will present a concluding statement. However, if it is not finished, the user will be prompted to start the process over.

4.0 EXPECTED OUTCOMES

The developed chatbot will be placed on respective university websites. As far as the chatbot is concerned, it will be first implemented in Albukhary International University. As a source of information, prospective students will be able to understand and access necessary information including admission procedures, study programs, and scholarship. Users need to access the chatbot menu on the university website. The chatbot application implements a search for answers through questions. Thus, users then need to type their question as an input into the provided box. After that, the input will be searched throughout the database based on the selected category and each keyword within question. The chatbot will analyze and match these categories based on the knowledge that the chatbot has been trained. When the analysis process is complete, the chatbot will send an output to the users in the form of the answer they are looking for. If the answer is not available, the chatbot will notify the user based on the knowledge specified in the default fallback intent.

5.0 CONCLUSION

In conclusion, Chatbots can be a very useful facility for prospective students looking for information related to admission information at the university they are aiming for. Chatbots can also be a means of updating information on prospective students and universities. Furthermore, the main target is prospective students but it will be useful for existing students who also need this information. By implementing a chatbot, prospective students can get direct information needed in finding information related to frequently asked questions without contacting administrative staff who are sometimes slow to reply because of the large piles of questions asked. This system will also be sustainable which can benefit both students and the university admissions team in terms of the effectiveness of the work system.

6.0 REFERENCES

Følstad, A., & Brandtzæg, P. B. (2017). Chatbots and the new world of HCI. interactions, 24(4), 38-42.

Shawar, B. A., & Atwell, E. (2007, January). Chatbots: are they really useful?. In Ldv forum (Vol. 22, No. 1, pp. 29-49).

Statista, "Millennials: daily mobile access 2017," Statista, 2018. [Online]. Available: https://www.statista.com/statistics/283138/millennials- daily-mobile-usage.

Toniuc, D., & Groza, A. (2017, September). Climebot: An argumentative agent for climate change. In 2017 13th IEEE International Conference on Intelligent Computer Communication and Processing (ICCP) (pp. 63-70). IEEE.

Nagarhalli, T. P., Vaze, V., & Rana, N. K. (2020, March). A review of current trends in the development of chatbot systems. In 2020 6th International Conference on Advanced Computing and Communication Systems (ICACCS) (pp. 706-710). IEEE.

Nguyen, T. T., Le, A. D., Hoang, H. T., & Nguyen, T. (2021). NEU-chatbot: Chatbot for admission of National Economics University. Computers and Education: Artificial Intelligence, 2, 100036.

R. Singh, H. Patel, M. Paste, and N. Mishra, "Chatbot using TensorFlow for small Businesses 1," 2018 Second Int. Conf. Inven. Commun. Comput. Technol., no. Icicct, pp. 1614–1619, 2018.

Carvalho, M., Zainal, F., & Tang, A. (2022). Student admissions to public universities increased 2.4% to 181,901 last year, says minister. The Star.

https://www.thestar.com.my/news/nation/2022/03/24/student-admissions-to-public-universities-increased-24-to-181901-last-year-says-minister

Le Hoanh Su, T. D. H., Thi-Yen-Linh, T., Thi-Duyen-Ngoc, N., Bao-Tuyen, L., & Ha-Phuong-Truc, N. (2020). Development of an AI Chatbot to support admissions and career guidance for universities. International Journal of Emerging Multidisciplinary Research, 4(2), 11-17.

Lee, C., Jung, S., Eun, J., Jeong, M., & Lee, G. G. (2006, May). A situation-based dialogue management using dialogue examples. In 2006 IEEE International Conference on Acoustics Speech and Signal Processing Proceedings (Vol. 1, pp. I-I). IEEE.

Santoso, H. A., Winarsih, N. A. S., Mulyanto, E., Sukmana, S. E., Rustad, S., Rohman, M. S., ... & Firdausillah, F. (2018, September). Dinus Intelligent Assistance (DINA) chatbot for university admission services. In 2018 International Seminar on Application for Technology of Information and Communication (pp. 417-423). IEEE.

Gunasekara, L., & Vidanage, K. (2019, October). Uniontbot: Semantic natural language generation based api approach for chatbot communication. In 2019 National Information Technology Conference (NITC) (pp. 1-8). IEEE.

Polatidis, N. (2014). Chatbot for admissions. arXiv preprint arXiv:1408.6762.

Bhartiya, N., Jangid, N., Jannu, S., Shukla, P., & Chapaneri, R. (2019, July). Artificial neural network based university chatbot system. In 2019 IEEE Bombay Section Signature Conference (IBSSC) (pp. 1-6). IEEE.

Ranoliya, B. R., Raghuwanshi, N., & Singh, S. (2017, September). Chatbot for university related FAQs. In 2017 International Conference on Advances in Computing, Communications and Informatics (ICACCI) (pp. 1525-1530). IEEE.

Le Hoanh Su, T. D. H., Thi-Yen-Linh, T., Thi-Duyen-Ngoc, N., Bao-Tuyen, L., & Ha-Phuong-Truc, N. (2020). Development of an AI Chatbot to support admissions and career guidance for universities. International Journal of Emerging Multidisciplinary Research, 4(2), 11-17.

Bhartiya, N., Jangid, N., Jannu, S., Shukla, P., & Chapaneri, R. (2019, July). Artificial neural network based university chatbot system. In 2019 IEEE Bombay Section Signature Conference (IBSSC) (pp. 1-6). IEEE.

Adamopoulou, E., & Moussiades, L. (2020, June). An overview of chatbot technology. In IFIP International Conference on Artificial Intelligence Applications and Innovations (pp. 373-383). Springer, Cham.

Thakkar, J., Raut, P., Doshi, Y., & Parekh, K. (2018). Erasmus AI chatbot. Int. J. Comput. Sci. Eng, 6(10), 498-502.