

# Intelligent Assistance Chatbot for University Admission Services

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**Abstract**—Education sector is in need of change since information technology requires all businesses to transform, especially in the service system. In higher education, student admission services, it is necessary to deliver outstanding services to make sure the prospective students are satisfied. These prospective student's fulfilment is not only from the education's quality, it should be followed by the provision of consulting and excellent guidance service. This paper proposes the development of chatbots, implementation of chatbots and optimization of chatbots taken from various previous research literatures. Therefore, using this research the university can further develop chatbots as intelligent assistants for helping prospective students discover the important and necessary information and retrieve it at any time.

**Index Terms**—Artificial Intelligence, Service, Chatbot, Sustainability

## I. INTRODUCTION

Recent advances in technology have driven the emergence and proliferation of chatbots, which are intelligent computer programs that can interact with users. Chatbots can play the role of virtual advisors using the concepts of *automatic speech recognition systems*, machine learning, and artificial intelligence (AI) [1]. Rahman, Al Mamun and Islam [1] also have presented a brief introduction about cloud-based chatbots technology along with chatbots programming and programming challenges in the current and future era of chatbots. The use of chatbots is now marked as a form of service provided by the company in maximizing good service for all users. As reported by the computer info page in 2019, several cloud-based chatbot services in Indonesia such as Bjtch as a vendor from (BNI, Coca-Cola), Vutura Chatbot Indonesia (Telkom University, Telkom Indonesia), Inmotion, Botika, Language.ai, Kata. ai and many others. Chatbots (also called "digital assistants") can chat with users in a variety of ways including text-based entities, voice user interfaces, and embodied conversation entities [2].

Chatbot services are now marked as one of the solutions in optimizing services for service or product users. It cannot be separated from the education sector such as universities.

As mentioned by [3] universities need to deliver outstanding service to make sure the prospective students are satisfied. This service can be in the form of information needed by prospective students regarding registration information, tuition fees or for active students who need services and information directly related to their studies. The lack of optimal web-based services provided by universities related to responses to questions that arise or information needed by students indicates poor or less optimal services.

There have been many previous studies discussing chatbot-based artificial intelligence for instance, Elon University used AI to help the student to track their previous class or course and help students implement detail of their class's strategy [4]. By reaching out to the students when they have not finished the assignment as the deadline passed, Georgia State University reduced summer disbursement by more than 20% with the development of Pounce. Pounce is a chatbot created by AdmitHub [5]. As stated in [6], they found that pop-up chatbots are proficient in providing fast service for confused customers by embedding the pop-up chatbot to their website, the chat reference usage is escalated, user experience and satisfaction is improved. P.Hsu, J.Zaho, K.Liao., T.Liu and C.Wang in [7] build Allergy Bot to provides users with feeding options without unnecessary questioning. This chatbot recommends accessible menus at restaurants, make simple response tasks and increase the tempo for the questioners. There is also study that implemented a chat bot with a self-adaptive mechanism [8] to interact with on-line shoppers for enhancing customer satisfaction and shopping experience. implementing a self-adaptive mechanism in the form of a chatbot that interacts with on-line shoppers greatly improves the customer and shopping experience. As previously stated in [9], chatbot could give the information of different rates for car booking, make an order/reservation, and modify the pick-up location on existing reservations. Lasek and Jessa [10] found that hotels that use chatbots experience sales growth. Holotescu [11] found implementation of MOOCBuddy (a chatbot) provides on-line learners with storytelling interactions

associated with knowledge that is available online. Also, Calvert in [12] mentioned that deployments chatbot to respond the questioner and have different advantages compared to human being, the advantages are chatbot cannot be weary, chatbot cannot be distracted with ridiculous questions, chatbot provides consistency of services, also the chatbot output is not decreasing time after time.

With all the advantages that produce by chat in various line of business, universities seem to need to implement a chatbot-based service information system. The use of this technology in university will provide the ability of the faculty and staffs to be more effective and efficient during the communication with prospective students and active students. With what being said above, this paper will discuss chatbot-based artificial intelligence for service optimization in universities.

## II. LITERATURE REVIEW

### A. Artificial Intelligence

According to [13], "Face-to-face communication allows user to interact with often complex services via messages or something they do every day". There are limitations to using this type of technology because interactions can only be carried out to the knowledge of the user. For example, artificial intelligence technology can only answer direct questions such as, "When does registration start? How much is the registration fee?" then the Artificial Intelligence (AI) conversation can only respond with a basic answer or date. Next, the level of artificial intelligence connects the contextual aspects of conversation with the ability to interpret unstated user needs. By integrating user behavior, curriculum pace, and progress, AI can intervene (anticipate the need for intervention) and "push" the user to the next best course of action or refer the user to the next step [14].

Artificial Intelligence in the context of this research is a chatbot that is used to assist college admissions in maximizing services for students and prospective students. This AI level will help students keep pace towards graduation, complete required paperwork, and more. Chatbots can also benefit institutions by providing data that can be used for scheduling, program analysis, and other decision making to make institutions more successful.

### B. Chatbot

Based on [15] chatbots is a chatting application designed with artificial intelligence to be able to answer simple or complete conversations. According to the type, chatbot could be used in the form of text and audio; in this research chatbot is the focus. The chatting application could give different responds towards the request or questions from the user. [16]

According to [17] it is explained that chatbots is a computer program capable of having similar conversations with people. Chatbots often used for automate or optimize business processes. There are simple and complex chatbot types, the purpose is to exploit a wide spectrum of artificial intelligence.

A simple bot is to handle simple orders or requests from the user. During the communication with the user, this algorithm gives a pre-programmed response to a given input as output. For instance, the question about the products or other information. In this research, the chatbot referred to is the university admission service.

### C. PEAS (Performance, Environment, Actuator & Sensor)

PEAS stands for Performance, Environment, Actuator and Sensor which is a full part of the agent. An agent is anything that is able to see, interpret and know its environment through sensors (Sensors) and act (acting) through the help of actuators [18]. Russell further classifies the nature of agents into three parts, 1) Rational as an agent that considered to act most correctly, 2) Autonomy which is an agent taking action to modify future perceptions to obtain information, last 3) reactive as an agent that conclude environmental aspects that hidden before taking selective action.

## III. RESEARCH METHODOLOGY

This research uses a literature study approach, by taking samples of scientific papers that have been published. The author will present the findings and model recommendations from the chatbot that has been implemented in previous research. Sampling in this study by utilizing articles, papers published on the page *Google Scholar*, then the paper is checked again on *Scimago* to see the journal's achievement index. After the sample has been collected, the next step is to carry out library research and then analyze the chatbot adoption system at several universities that have implemented it and then take recommendations and conclusions.

## IV. DISCUSSION

Research that reviews the optimization of service systems using chatbots in various business sectors has previously been carried out, for example [6], evaluating the performance of pop-up chatbots inserted on medical website web pages. In reference [7], designed a chatbot that provides food allergy information for restaurants. There is also [8] presenting a chatbot that acts as a store assistant that interacts with and recognizes customer personality traits based on search and shopping preferences. Negi, Joshie, Chalamallay and Subramaniam in [9] built a task-oriented system (chatbot) that enables human-machine conversations that respond to customer requests. Lasek and Jessa [10] compared the performance of chatbots on different hotel/guesthouse websites. Holotescu [11] examines the role of chatbots in enhancing the learning experience in massive open online courses (MOOCs). Calvert in [12] inspect the various uses of robots, including chatbots, in performing repetitive tasks such as responding to customer inquiries. The use of Chatbots at the university level is strongly suggested by several previous studies (e.g., Santoso *et al* [19]; Almahari, Bell and Merhi [20]; Gbenga [20]; Chandra and Suyanto [21]; Patel, Parikh, Patel and Patel [23]; Le Hoang Shu *et al* [24]; Hien, Cuong, Nam, Nhung and Thang [25]). Chatbots are able to optimize services and make users satisfied without

having to wait for a response from employees as seen in Santoso *et al* [19] and Chandra and Suyanto [22]. It was mention in other previous study that *Artificial Intelligence* will generate more data to provide a clearer picture of the teaching and learning process, which allows more accurate information recommendations, and the use of AI can improve service quality [23].

According to study in [26], the chatbot have many advantages, one of them is aims to help applicants enter university and be more effective, other than that chatbot also save time and resources for students and admissions staff. Moreover, it is proven that building a user-motivated chatbot has a positive effect on user satisfaction and technology adoption. This type of chatbot developed by [26] is to add support for bilingualism so that applicants can ask questions in English or Arabic, and the chatbot will respond according to the input language. Later, social cues were added to provide a human-like interaction with applicants. From [21], the researchers found that by adopting chatbot-based artificial intelligence enable to decrease reception workload because a chatbot could respond basic information thereby, reducing the number of calls and letters that must be responded to. Adopting this solution will improving the quality and the service will be more efficient and real-time in the education area.

#### A. The Use of Artificial Intelligence Chatbots for Higher Education

Overall, the use of chatbots has now been widely adopted by various universities in the world such as Germany [26], [19], Poland [21], Pakistan [28], Nigeria [21] and at Georgia State University [29], based on the results of a chatbot implementation review, overall application is made with the following conditions:

- When the applicants are off campus these features and functions can be performed at home. The ultimate goal of this feature is to give answers for most Frequently Asked Questions in the course of the admission phase.
- The feature is designed with the provision that an applicant can ask about information on various majors and facilities at the university.
- Questions asked by applicants when they are at the admission office, for example about required documents, scholarship, financial aid and of course tuition fees.
- In addition, chatbots are built with the ability to track details about applicants such as their name, nationality, type of high school and also chosen major. These details allow the applicants to get custom and personal tailored responses as opposed to letting them access or find the answer from the university web page.
- Prospective students are allowed to ask chatbot regarding admission tryouts before enrolling to the university.
- The chatbot provides sample questions to applicants as well as the purpose and cost of the test.

- Chatbots are made capable of answering questions regarding available facilities and extracurricular activities available on the website.
- Chatbots can not only answer admission process questions, but also act as academic advisors to new applicants. It provides assistance to prospective new students by informing them about the various faculties and majors offered at the university, the courses taken in each department per semester, as well as the opportunities of each course taken.
- The chatbot was developed with the aim of helping prospective students with university admission inquiries in a timely, reliable and efficient manner so as to improve the existing system. Services using chatbots are recommended not only to stop at services outside the campus, but also to be able to provide complete information to prospective students who directly visit the university, in this case making the chatbot able to pay attention to several features that must be added to the application, such as road directions, can be in the form of maps or maps. from each building or faculty in the university.

#### B. Understanding PEAS in Artificial Intelligence

PEAS usually used to categorize similar agents together. The scope of the PEAS system consists of the environment, actuators and sensors of each agent. The highest performance agent is called a rational agent, namely an agent who considers all possibilities and chooses to take a very efficient action, for example taking a short path with high efficiency and low cost. In the Table 1, the PEAS method will be explained for UIN Sunan Kalijaga Chatbot program.

TABLE I  
PEAS CHATBOT UIN SUNAN KALIJAGA

<b>Agent</b>	Chatbot
<b>Performance Measure</b>	Information about UIN Sunan Kalijaga, Questions and Answers
<b>Environment</b>	UIN Sunan Kalijaga Admission, Student
<b>Actuator</b>	Registration Information, Tuition Fees, Scholarship Information, Questions About UIN Sunan Kalijaga.
<b>Sensor</b>	User Questions.

From Table 1 it can be seen that UIN Sunan Kalijaga Chatbot has classified PEAS system criteria chatbot application as an agent, the performance measure is describing information related to UIN Sunan Kalijaga by question and answer. The environment is the domain around the agent at all times, they are admission of UIN Sunan Kalijaga and Students. Meanwhile, the actuators are information about registration at UIN Sunan Kalijaga, scholarship information, tuition fee information, and other questions related to UIN Sunan Kalijaga admission. Lastly for the sector are user questions.

#### C. Design of UIN Sunan Kalijaga Chatbot

This chatbot that we develop is called Admisi-UIN-Chatbot to answer questions regarding the college admissions process asked by prospective students and the parents of highschoolers.

Admisi-UIN-Chatbot can answer questions written in Indonesian. Previously, applicants needed to open the university web page and find a way to eventually connect to the people at admission. They need to make time because the admission office has open hours. Therefore, Admisi-UIN-Chatbot has been equipped with an adequate amount of data and guidance in order to assist prospective students and parents of high-schoolers through the admissions process.

#### D. Chatbot Architecture and Program Implementation

After mapping the chatbot concept and analyzing the importance of the chatbot's role in supporting services for universities, then testing the program with the basic concepts of a chatbot. This chatbot concept as seen in Fig.1 is how a chatbot application work.

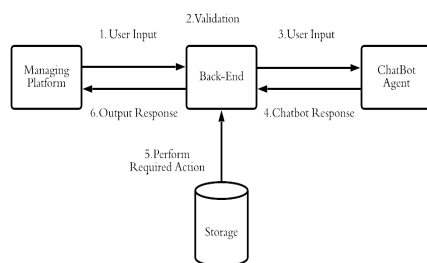


Fig. 1. Chatbot Architecture

In Fig 1.1 there are six chatbot application work processes. Chatbot stands on four main components, they are messaging application, web server, chatbot agent, and database. Proposed working system:

- At the beginning of the process, user input from messaging application will be delivered to chatbot agent.
- In process number 2, validation, this chatbot agent will carry out a process called intent matching process. It is when a chatbot agent sends a matching intent.
- At last, in the Performed Required Action it is when the web server obtains the best possible scenario from matching intent. At the end of this process, the web server will send the chatbot the best possible answer from matching intent.

In implementing chatbot program or application development, the most important to be considered is dictionary that will be used as a reference for interpreting the language used by the user. Universities can limit or add the types of languages that chatbots can detect.

Chatbot application implementation for UIN Sunan Kalijaga Yogyakarta admission services is adapted to general information that is often asked by users or prospective students. For example a question about registration information, scholarship, administration, study program. As seen in Fig. 4, the application will read every word sent by the user then the chatbot will respond according to the questions asked. Chatbot

applications can be easily accessed using several platforms, including Telegram and the web.

The chatbot agent and the web server are the one who is responsible for doing output together. How Admisi-UIN-Chatbot is carried on is by managing user input. The intent matching process starts with translating and validating user input then sent to the chatbot agent from the web server. As shown in Fig. 2 is a list of intent taken from 55 (forty five) Frequently Asked Questions in the UIN Sunan Kalijaga Admission Official Webpage. Intent identification included training phrases or example phrases for what the user might type. For this, Admisi-UIN-Chatbot registered a handful of intent catalogues for handling dialogue between user and the chatbot. To help cataloguing, we create Intent Ontology as seen in Fig. 3 for making traceable and readable list of intent. In the event of intent matching process, chatbot agents score potential matches with an intent detection confidence. After that, there will be only two possible outcomes: It's score is greater than on equal then it is returned as a match, or no-match then it will be handled by Default Fallback Intent. Default Fallback Intent is when a chatbot agent doesn't find the best phrases from user input. In each intent, there are many training phrases that vary from what user might address their intention. It is at the same moment if the user input expression resembles one of these phrases, chatbot agent matches the intent. In addition to intent, entities are also constructed for enhancing the matching process. It is used for identifying keywords and parameters on user input. There are also customized entities for creating custom match data for intent training phrases.

Intent	Entity
1. UIN Sunan Kalijaga	1. UIN Sunan Kalijaga
2. UIN Sunan Kalijaga	2. UIN Sunan Kalijaga
3. UIN Sunan Kalijaga	3. UIN Sunan Kalijaga
4. UIN Sunan Kalijaga	4. UIN Sunan Kalijaga
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9. UIN Sunan Kalijaga	9. UIN Sunan Kalijaga
10. UIN Sunan Kalijaga	10. UIN Sunan Kalijaga
11. UIN Sunan Kalijaga	11. UIN Sunan Kalijaga
12. UIN Sunan Kalijaga	12. UIN Sunan Kalijaga
13. UIN Sunan Kalijaga	13. UIN Sunan Kalijaga
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Fig. 2. Admisi-UIN-Chatbot Intents and Entities

After matching the user's message with the intent, the action will be sent to the web server to be performed. The most appropriate response will be fetched from the database according to the matched intent. Lastly, before sending the response to Telegram to display to the user, the web server performs some minor operations to ensure that the response can be read in a user-friendly manner. In Fig. 4 it can be seen that these operations include splitting the response into chunks, where each chunk is sent as a separate message, as well as inserting spaces and line breaks.



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