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A Real Intelligent Conversation System (Chatbot) to Support Academic Programs in Faculty of Specific Education - Mansoura University

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ABSTRACT

Conversational AI aims to promote communication in an environment that is similar to a human conversation by making machine-human interactions seem and feel more natural. Both social friend bots and task-oriented bots can be created using conversational agents also known as chatbots. In this study, we suggest building a chatbot that blends natural language processing and artificial intelligence in order to assist students in receiving academic advice and Complete academic requirements. In addition to reducing the need for face-to-face meetings to receive academic help, the system satisfies students' interest in cutting-edge technologies like chatbots and messaging platforms. In order to give students the impression that they are conversing with actual advidor , mobile applications have been employed to create a user experience that is more streamlined and resembles chat programs.The system was well received by the students, as it was easy to use and enhanced their desire for academic guidance. They find it an interesting and engaging experience, especially for those who have tried traditional counseling.

Keywords : Academic guidance , chatbot , natural language processing (NLP), dialogflow , firebase , android application .

I. INTRODUCTION

Due to the remarkable development in the Egyptian education system, there are many academic programs that operate on the credit hour system, which gives the students great freedom in determining the courses they wish to study and also what they want to postpone for another semester. Thus, some negative effects may occur, whether on the cumulative average of the students or on the number of years in which they pass the educational stage. Therefore, academic advising works side by side with the credit hour system because of its importance in providing academic advice to students and helping them achieve their goals.

On the one hand, Academic guidance is the decision-making process that helps students clarify their professional and life goals and develop an educational plan to achieve them through dialogue and information sharing with a consultant. Counseling was provided through one or more face-to-face meetings between students and their advisors or via the Internet. During these meetings, the advisor answers questions the student has about the program, recommends courses the student should take, and advises on study strategies [1] [2].

Academic counseling helps students transition from general education to university, providing social and psychological treatment and advice. It helps students choose their expertise and advance in science and conduct. Personalized guidance and counseling programs help students discuss their goals, understand university rules, and choose the best course of action for their academic and professional prospects[3].

Academic guidance assists students in determining their goals and making informed decisions about their academic and professional futures. It streamlines administrative procedures, ensuring quality services and support according to college standards. The objectives of Academic guidance include supporting students in achieving study plans, monitoring progress reports, and helping them overcome academic difficulties, particularly when transitioning from one level to another [4].

Expert systems automate course advising, allowing staff to focus on strengths and complement expertise, benefiting both staff and students. They address challenges like domain-specific knowledge, voluminous data, and curricular changes, using models like Case-Based Reasoning and rule-based reasoning [5].

Academic advising is crucial for student success, loyalty, and recruitment. Universities invest in training staff to assist students with various inquiries. However, advisers often spend time answering repetitive questions. Efforts to automate academic advising using chatbots and expert systems prioritize functionality over usability [6].

On the other hand, the traditional definition of a chatbot is computer software that interprets user input in natural language and produces pertinent and intelligent responses to send back to the user. Currently, chatbots engage with consumers largely through a text-based interface and are

powered by artificial intelligence (AI) or rules-driven engines [7].

A chatbot is an artificial intelligence program that mimics human conversations using preprogrammed schemas or adaptive machine learning algorithms. They serve various purposes, including informational tools, reservations, marketing, hiring, customer support, and form completion, offering comprehensive FAQs and 24/7 accessibility [8][9][10].

AI chatbots offer quick feedback and NLP-based communication for students [11].

Intent-based chatbots are commonly used in task-oriented systems with multi-turn dialogues. They use multimodal input analysis and response generator units, utilizing advanced NLU techniques and machine learning. These chatbots also incorporate dialogue management functions like dialogue state tracking and dialogue policy optimization. Rapidly developed techniques, such as Rasa and Dialogflow, support users in realizing specific tasks in these flows of dialogues[12].

Chatbot systems offer convenient, interactive communication, but the majority of research mainly focuses on implementation and adaptation, neglecting natural language processing (NLP), knowledge types, and machine learning algorithms. Exploring machine learning or deep learning can improve accuracy and analyze unstructured data [13].

II. RELATED WORK

I.ACADEMIC GUIDANCE

Gutiérrez, et al [14] proposed a learning analytics dashboard for academic advising. Comparative and predictive analysis had been used to support the decision-making process of academic advisors. The efficiency of the tool in the decision-making process of the consultants was evaluated by applying it to two different institutions of higher education. The results showed the effectiveness of the tool in making more accurate and efficient decisions compared to traditional methods.

Noaman, et al [15] developed an electronic academic advising system, combining face-to-face advising with internet technologies, aiming to simplify and enhance education outcomes by providing convenient, convenient advice anytime, anywhere.

Amador, et al [16] aimed to assist higher education students in communicating with university employees and asking for help from them, including their academic advisors. Facebook was used to receive students' messages and publish the advisors' opinions. The results showed that Facebook has a significant impact on supporting academic affairs in higher education institutions.

Laghari, et al [17] had suggested a system based on Java programming that lets students select the best courses for them based on their expertise areas, course status, and available semesters. Registration was restricted to the courses with the highest rankings, and the first field is given preference.

II.CHATBOT

Nguyen, et al [11] investigated users' perceptions of using the Dialogflow framework and its relationships with service awareness, task-technology fit, output quality, and TAM variables. Results show that perceived ease of use and usefulness positively influence behavioral intention. Service awareness and output quality are reliable predictors of perceived usefulness, while task-technology fit positively affects ease of use.

Anwarulloh, et al [18]. The study developed a chatbot application for virtual teaching physics, using interviews and questionnaires for data collection. Using smartphones for communication, the chatbot increased students' interest in learning and confirmed its effectiveness in making the educational process more interactive.

Huang, et al [19] had carried out a thorough search and found 25 empirical studies that looked at chatbot use in language learning. The advantages and disadvantages of employing chatbots for students' language acquisition were identified using the inductive grounded approach. For our analysis of the social affordances of chatbot use in language learning, we employed Garrison's social presence theory. Our research identified five pedagogical applications for the technology, including five technological affordances—timeliness, usability, and personalization—as well as three technological uses—interlocutors, simulations, transmission, helplines, and suggestions. Chatbots appeared to promote social presence among students through emotive, honest, and coherent dialogue. There are several issues with deploying chatbots, including technological constraints, the novelty effect, and cognitive burden. For effectively implementing chatbots, a set of basic design principles is suggested.

Colace, et al [20] A mechanism has been created to assist university students in some courses. The primary goal was to build a specialized architecture, a model to handle communication, and to provide the learner with the appropriate responses. In order to do this, a system that can identify questions and provide answers to students by utilizing natural language processing methods and domain-specific ontologies has been developed. Finally, an experimental campaign was run following the use of the model to show how effective and enforceable it was.

Kuhail, et al [21] had presented a chatbot with personality for academic counseling had been well thought out. empirical results of a test where students interacted with three different

chatbots. Each of the three basic traits—agreeableness, conscientiousness, and extraversion—has one of the three variants discovered by psychologists. The experiment looked at how users' perceptions of the chatbot's engagement, authenticity, and usability were affected by its personality. We also investigated the impact that gender had on how the chatbots' personalities were perceived by the pupils. According to our research, chatbot personality positively affects both planned involvement and perceived chatbot authenticity, but student gender has little bearing on students' opinions of chatbots.

Barus, et al [22] had created a chatbot with commonly asked questions (FAQ) in mind. The prototype design for chatbot apps is based on Dialogflow "Natural Language Understanding (NLU) technology". Agents, intentions, entities, contexts, events, fulfillment, and integration must all be taken into consideration before a chatbot discussion can be created. The test results indicate that the chatbot is probably suitable for use and approval. With more diverse terms added to the Intent, accuracy will rise. The accuracy of the chatbot will, however, decrease if the vocabulary used to express ideas has a lot of acronyms or is in a local or foreign language. Chatbot responses must stop sounding robotic, and additional library services like new member registration must be employed, along with the system implementation and system maintenance phases.

All the studies discussed in the previous section were positive about electronic academic advising, its significance, and how well it contributes to enhancing the educational process, making it simpler, and offering academic advice. Other studies focused on chatbots in education and how well they contribute to enhancing the educational process or assisting in it in any way. How can the educational process be transformed into a smart educational process? They also discussed a variety of techniques for creating an extension system that is compatible with the level of technological advancement we have attained. To create a smart academic advising system based on Processing natural language and artificial intelligence, we will propose a system in this study that combines the benefits of electronic academic advising with the features of chatbots. Through this system, we hope to assist students at various stages of their university education in getting academic advice as well as following up on and completing their academic assignments. Through the use of current technology and mobile applications, students can better fulfill their academic objectives and have more flexible and convenient study periods.

III. THE PROPOSED SYSTEM

This section discusses the proposed system's chatbot component, including techniques, methods of work, and implementation, showcasing its significance in the system's overall functionality.

To show you how the recommended system is structured, we'll start by giving you a block diagram. Next, we'll go through each part of the system's operation in detail. We will first provide a block diagram to help you understand the proposed system's structure.

The block diagram of the suggested system had depicted in Fig.1

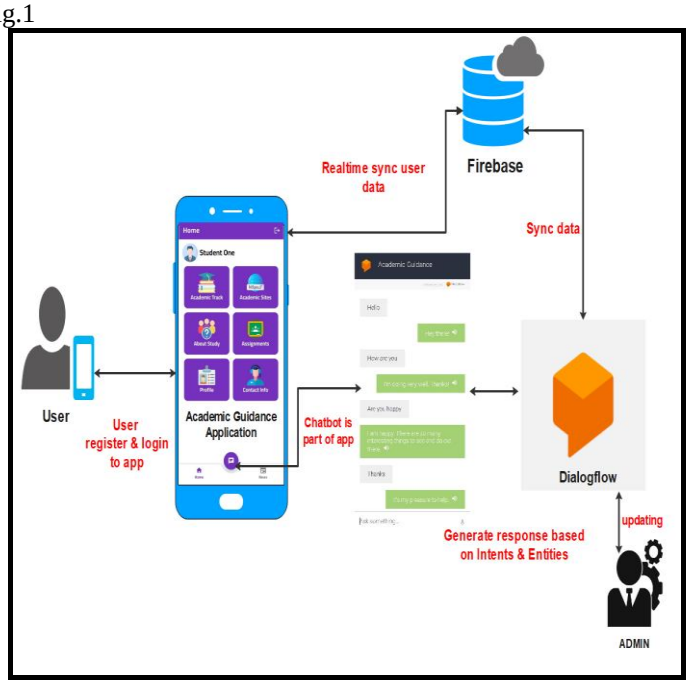

Fig.1 Block Diagram of Suggested System.

The proposed system consists of several stages or basic elements :-

A. User (Student).
B. Mobile Application.
C. Dialogflow (Natural Language Understanding Platform).
D. Firebase (Realtime Database).
E. Admin (Technical Person).

A. USER

In this case, the user is a college student. No student who has ever had no registration at one of the levels can register his data in the application since the registration processes are related to a database that holds data on students at each level. As a result, before accepting or rejecting, the student enters his information and checks that it has been added successfully to the database.

B. MOBILE APPLICATION

Because a large majority of smartphones in the study's category run the Android operating system, a mobile application that is compatible with all used devices has been made specifically for it.

C. DIALOGFLOW

Dialogflow is a natural language comprehension platform for designing and integrating conversational user interfaces in mobile apps, online applications, devices, and voice response systems. It analyzes client inputs, answers questions verbally or virtually, and provides engaging interactions[23].

D. FIREBASE

Firebase Realtime Database is a cloud-based database that synchronizes data to connected clients in real-time, stored as JSON. It is shared across JavaScript, Android, and Apple platforms, ensuring the latest data availability[24].

E. ADMIN

This system has designated a technical person as the administrator, who is in charge of implementing all system upgrades, particularly those involving DialogFlow. Later on, we'll go into greater detail regarding these modifications.

A flowchart of the suggested system may be found below. Fig.2

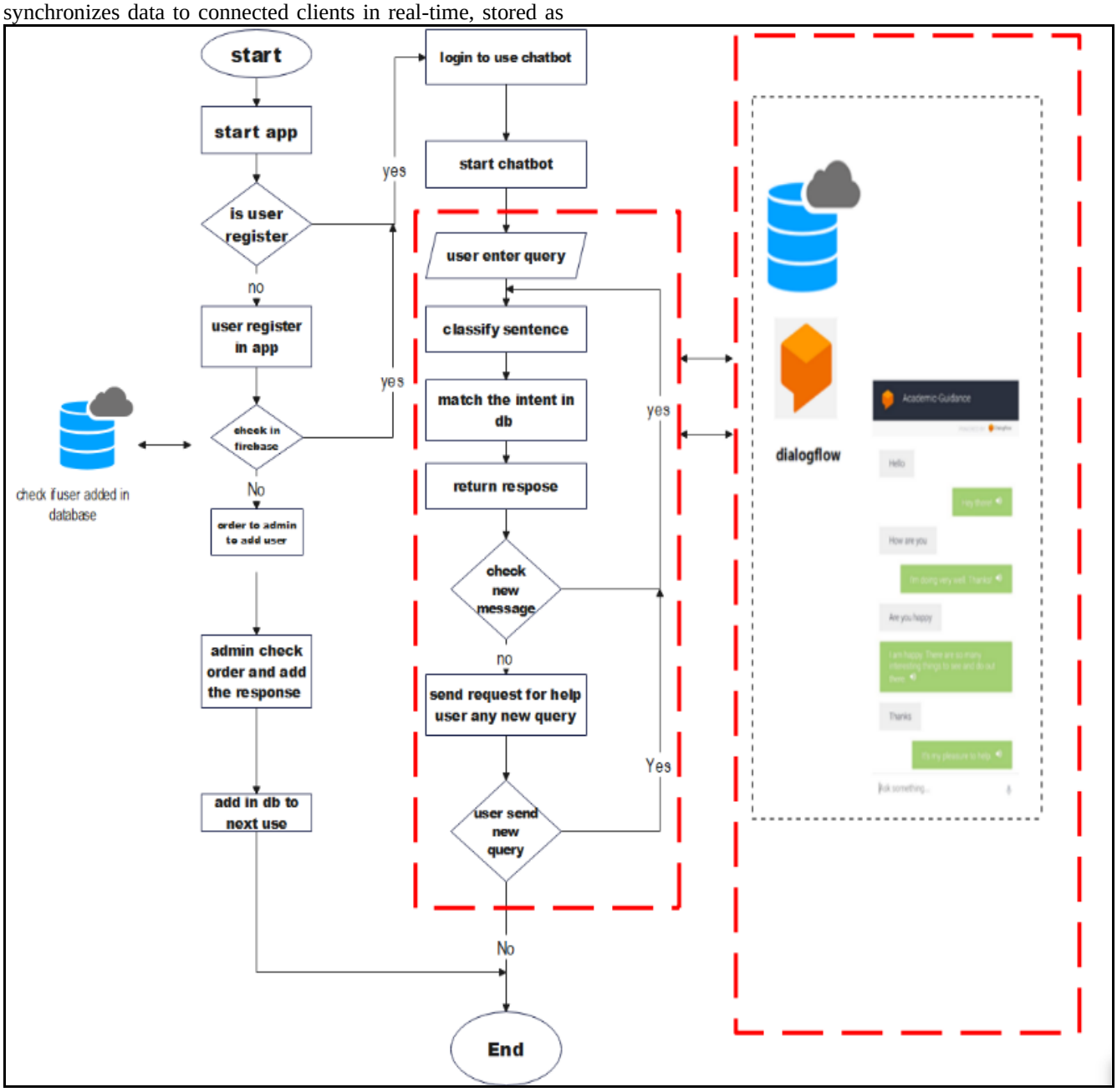

Fig.2 Flowchart of The Proposed System

The architecture that follows shows the steps involved in using the proposed chatbot. Fig.3

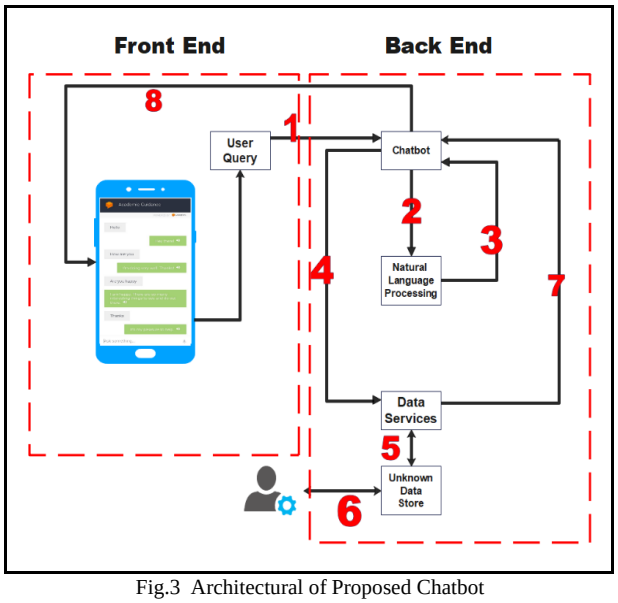

Fig.3 Architectural of Proposed Chatbot

In the following steps we will explain how it works:-

1- The user enters their query on the chatbot's home page.
2- The chatbot sends the inquiry to dialogflow for natural language processing.
3- The NLP engine parses a word to extract the user's purpose and entities, which it then sends back to the chatbot.
4- Intent is used to ask for the right services, whereas entity information is used to set the right data.
5- When there aren't any appropriate responses or the data is unknown, it is sent to the administrator for approval and the inclusion of appropriate responses; after that's done, it may then be used again and will be recognized.
6- The supervisor either approves or disapproves the query, and if approved, the query and any pertinent responses are subsequently put to the databases. He is also in responsible of updating the data with all modifications.
7- The chatbot receives relevant responses from the data service.
8- A chatbot arranges data into a suitable answer for user display.

IV. EXPERIMENTAL RESULTS

Experimental results describe the parts and characteristics of a suggested system and concentrate on implementation details and system architecture. The system was created utilizing the DialogFlow framework for natural language processing and the Android mobile application development language.

- When the system boots up, the splash screen, which displays the software's name, appears. A user needs to register before using the system for the first time. If not, he can log in.Fig.4

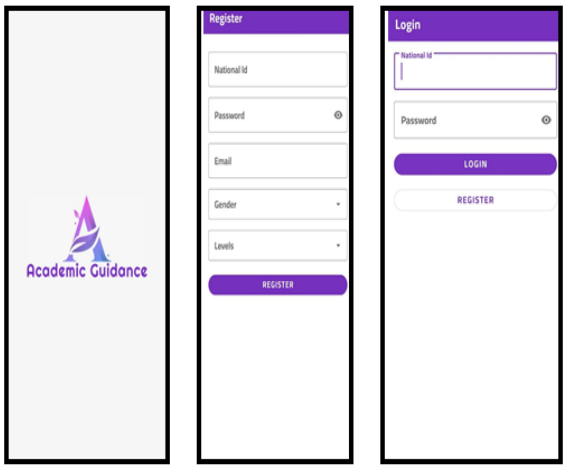

Fig.4 Splash & Register &Login Screens

- After authenticating into the system, the user can communicate with the chatbot at any time. Therefore, responses are generated based on the user's intent. The screens that follow give an illustration of the intentions and entities that were included in DialogFlow, once an agent was developed and included in the system. Fig.5

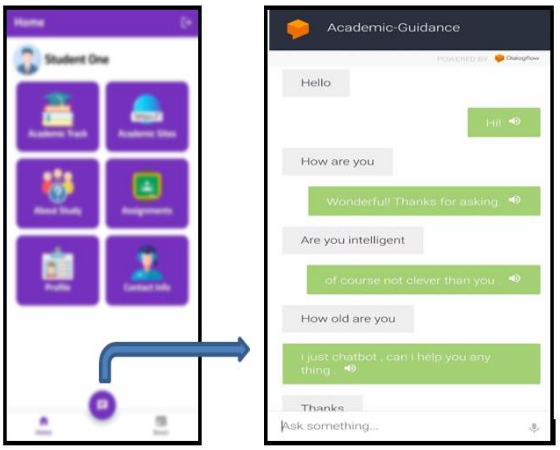

Fig.5 Simple Conversation with User

- After we reviewed the important parts of the system that are related to the study, we will now shed light on DialogFlow and clarify some of the parts that were provided for the flow of dialogue with the user. This part includes some user intentions, entities, and responses.

➢ Intent

Intents categorize end-user intentions for a conversation turn, simplifying them for reusable resources. Dialogflow compares input to intent training phrases for intent matching, only occurring for intents associated with an intent route. Intent detection confidence scores potential matches, with a range of 0.0 to 1.0. If the highest scoring intent has a confidence score greater than or equal to the classification threshold, it is returned as a match[23] .Fig.6

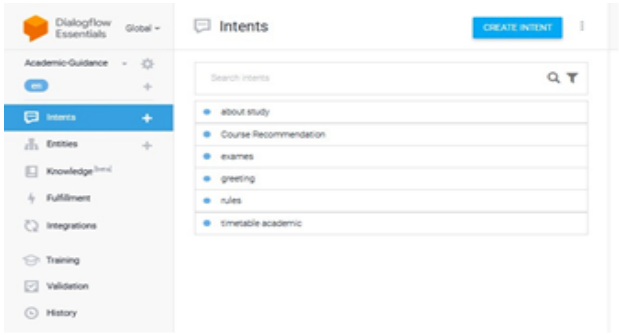

Fig.6 Example of Intent of Proposed Chatbot

➢ Entity

Entity is a term used in documentation and the Dialogflow Console to describe the general concept of entities. It defines the type of information extracted from user input, such as courses. Entity types are created by clicking Create from the Entity Types section of the Dialogflow Console. Each entry provides a set of words or phrases considered equivalent. When editing an entity type, each row of the display is an entity entry, and the term entity entry refers to the Entity type (EntityType.Entity or EntityType_Entity for some client library languages)[23].Fig 7

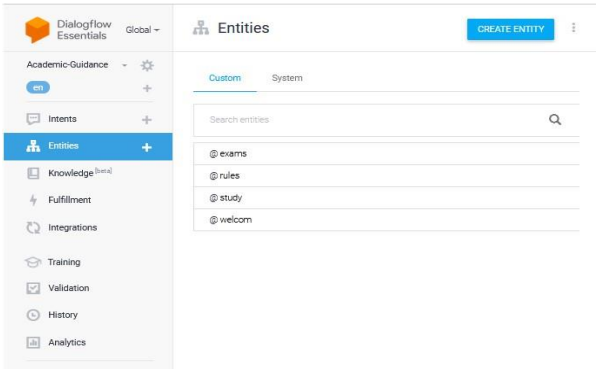

Fig.7 Example of Entities of Proposed Chatbot

➢ Parameters

Parameters are structured data used to capture and reference end-user input during a session. CX parameters are similar to ES parameters but have expanded utility and scope. They can be defined at design-time using the console or API, referenced at design-time using variables, set at runtime using the Dialogflow service, API, or webhook service, or get at runtime using the API or webhook service. Parameter naming follows case-insensitive characters, with Dialogflow treating Apple and apple as the same parameter. Webhook and API client code should also treat parameter names as case-insensitive[23].

➢ Knowledgebase

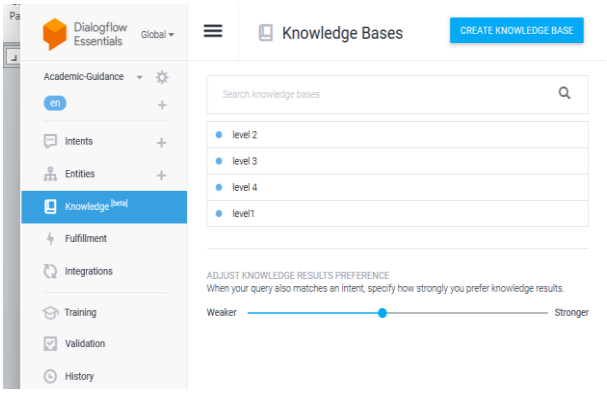

Fig.8 Example of Knowledgebase of Proposed Chatbot

➢ Training

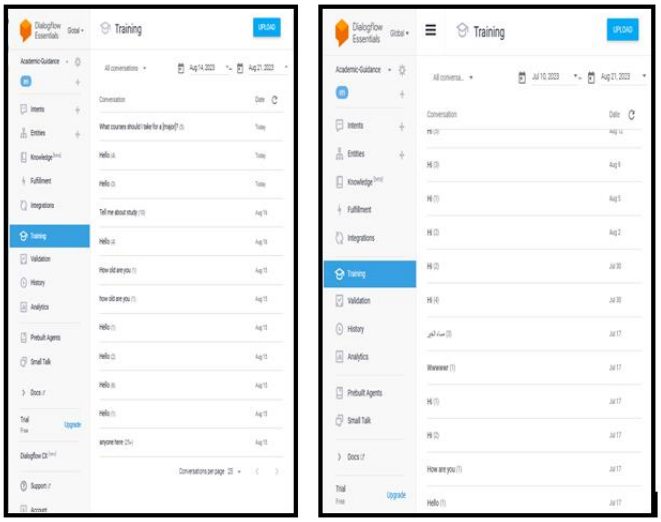

Fig.9 Example of Training of Proposed Chatbot

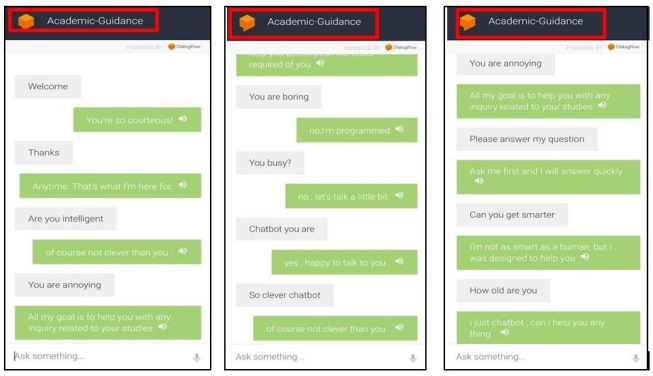

Fig.9 Example of Smalltalk of Proposed Chatbot

V. CONCLUSIONS

Since the Android operating system is the most popular among the groups of students under study, we specifically proposed an academic advising system supported by real chatbots based on artificial intelligence and natural language processing techniques using a platform for building mobile applications and a platform to support natural language processing (Dialogflow). The method seeks to assist students in completing their standards and choosing the best training courses, as well as in obtaining academic support during their study years, which makes the educational process more flexible and challenging. Without the use of traditional technologies, students can get academic guidance whenever and wherever they need it. By giving students a real conversation partner to engage in real dialogue that resembles human interaction, the system had a remarkable effect on increasing students' interest in cutting-edge technologies. It was noted that due to the ease of use of the application, students were keen to use it. The students' willingness to ask questions on the chatbot, as they always do with other chat apps they use on their mobile devices, has only increased their need for academic support.

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