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Implementation of a Web-based Chatbot Assisted Services for Results Information System

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Abstract
An interactive chatbot enabled service for result information system was built in response to the challenges students had dealing with the existing result information system for students' retrieval. The proposed system was created using a natural language processing model, CSS and Tailwind for graphical design, HTML for page alignment, and the flask framework to enable web-based chatbot development easier. According to the results, the designed system received an overall score of 87.35 percent comprehension, 91 percent functionality, 76.63 percent speed, 80 percent interoperability, 88.05 percent engagement, and 87.23 percent scalability.
Keywords: *NLP, Chatbot, Information system, Artificial Intelligence, Agents*

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I. Introduction

The increasingly advancement in technology has really paved way for the market demand of mobile devices which has experienced a whole new phase over the last decades due to the exponential development and application of intelligent features. This feature has replaced several traditional methods of handling operational activities for schools, financial institutions, organizations, and other aspects in a society.

In recent times, Artificial intelligence (AI) is seen to be one of the most important intelligent features that are widely used because of its ability to act and produce results like humans. A major Artificial intelligence technique that is progressively taking the lead in both application and popularity is the use of chatbots. Chatbots can be defined as conversational representatives that make use of natural languages (or human languages) to conduct conversations with human beings. Chatbots can also be referred to as an AI software that is able to communicate with its users in a natural language format through websites, messaging apps, school portals and several other software instruments. Simply, it is a computer programming tool that simulates conversations with humans either through textual or spoken languages. Chatbots ability to comprehend and analyze natural languages context cannot be overemphasized as it uses an AI method known as Natural Language Processing (NLP) for both in analysis and comprehension.

NLP, is also an AI technique that enables chatbots to simply control, understand and interpret users queries in natural languages. It is built from the fields of AI, computer science and linguistics which aim towards achieving easy interactions between computers and users in human languages. Importantly, there is embedded information or large chunk of natural language data being stored in a chatbot database by the programmer to recognize different structures of sentences (Hussain, Folu, and Shrish, 2019).

A Chatbot refers to a chatting robot. It is a communication simulating computer program, it is all about the conversation with the user. The conversation with a Chatbot is very simple, it answers to the questions asked by the user (Dahiya, 2017).

A dialogue system is an automated system that is developed to interact with an end user with natural language. it renders a platform between the end user and the automated application which allows communication with the system in a relatively natural order (Arora, Batra, and Singh, 2012).

Dialog systems consists of two types which includes, the Conversational agents which receives input and sends feedback automatically with natural language examples include but not limited to Chatbot, Virtual personal assistants etc., another type of a dialogue system is the Inter- active Voice Response (IVR) which allows an automated system to communicate with the end user with voice through a keypad. An illustration of the various type of a dialogue system is given in Figure 1.

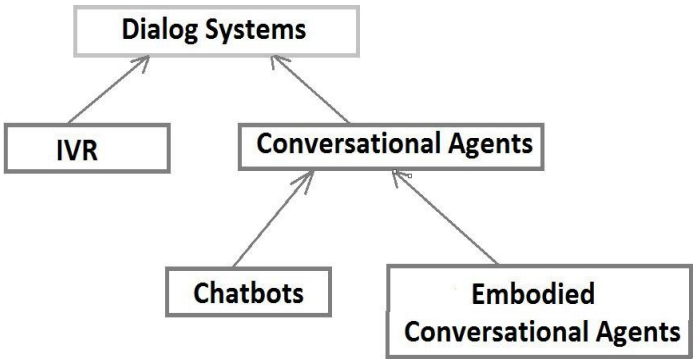

Figure 1: An illustration of the various types of dialogue system (Candela, 2018)

1.1 Chatbot Architecture

A chatbot is made up of four major parts which includes the front-end, knowledgebase, backend, and the data corpus (data that is used to train the chatbot). The front-end is responsible for allowing interactions between the end user and the chatbot, it makes use of Natural Language Understanding (NLU) and Artificial Intelligence (AI) to dictate the end-user's in- tent, the front end indicates the user whenever more information is needed and also gives feed- back to the user's input. The knowledge base contains the knowledge residing within a chatbot and in a format that can be displayed in the frontend (Gregori, 2017).

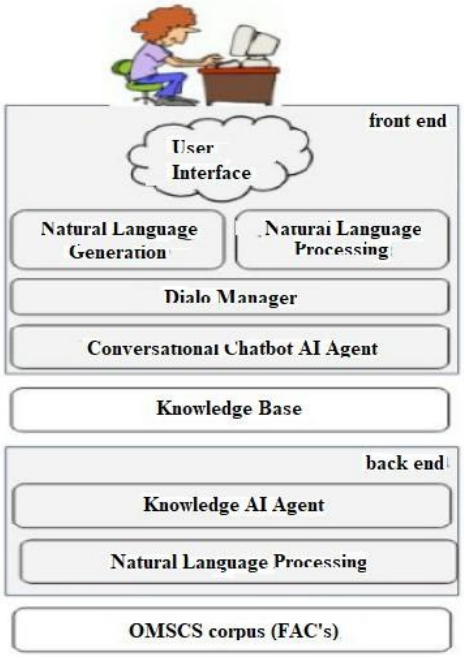

Figure 2: Components of a Chatbot (Gregori, 2017)

Types of Chatbots

Chatbots can be classified into different types, such as:

Rule-based chatbots: these are simple chatbots that deliver answers to questions based on pre-defined rules. It reacts in a predetermined way to particular questions. They excel at giving users with answers to frequently asked questions.

Intelligent Chatbots: This form of bot uses machine learning to interpret the inquiries and commands of its users. They are programmed to understand specific terms and, over time, to learn to understand and interpret a wider range of user questions.

AI-powered chatbots: These bots are usually cleverer in their responses to users' questions, as they combine rule-based chatbots with intelligent software programs. They can remember discussions and grasp customer preferences because to its AI capability. It is feasible to understand consumers using a combination of natural language processing (NLP), machine language, and artificial intelligence (AI).

In Nigeria, educational institutions, particularly at the higher level, have shifted from paper-based information management to web-based information management, where student and possibly school information may be

accessible via a school portal. Regardless, there is undoubtedly a series of incompetence in school portals in accurately and promptly providing college-related information to students, which may include information about student results, cultural activities and events, exam timetables, multiple locations and departments around school, and guidelines on paying tuition fees; school registration (especially for newly admitted students).

While efforts have been made to allow students to access material on the internet, more effort is needed to develop approaches that will aid in the updating of daily trends in the classroom. Furthermore, schools have replaced this ineffectiveness with a physical conversational agent (school personnel), which will unavoidably result in inefficiencies, rigidity in accessing information due to possible crowding or limited staff, and response time delays. As a result, a technique is required to address these numerous setbacks faced by pupils, necessitating the use of a chatbot.

The mechanisms through which students receive results, updated information, and rules about college-related activities are strenuous in most Nigerian universities. Despite the university's web portal's effectiveness, it is generally ineffective since it lacks various desirable features; hence, a chatbot-assisted service can overcome numerous restrictions. Because of the multitude, this produces an unfriendly climate for both employees and students. As a result of massive workloads and limited manpower, it also increases inefficiencies and ineffective services provided by employees.

With the aforementioned issues that students encounter, the creation of a chatbot to aid students becomes important, where the chatbot has AI competence in understanding, interpreting, and replying to student queries efficiently and at a low cost. The major goal of this study is to create a web-based chatbot-assisted result information system that allows students to check their grades on a specific exam, learn when an exam is planned, and receive comments on any exam.

II. Related Works

This section discusses some related works on chatbot assisted services.

Hussain, Folu, and Shrish (2019) designed and studied the factors influencing chatbot adoption for family planning-related information. The chatbot was created using a decision-tree structure to provide comments on a specific topic, and the medium for communication was a mobile phone's Short Message Service (SMS). The Unified Theory of Acceptance and Use of Technology (UTAUT) model was used to assess the factors that influence end-users' adoption and use of chatbots. The results show that "attitude toward using chatbot" and "reduced anxiety in acquiring information" are the two most important factors influencing chatbot adoption for family planning-related information.

Neema (2019) created an interactive health information chatbot for non-communicable diseases using natural language processing in Dar Es Salaam Tanzania. The chatbot was built utilizing the Facebook Application Programming Interface (API), BotSociety, PHP, Botman Framework, and Dialogflow. Satisfaction, usability, responsiveness, efficiency, and accuracy of the chatbot were all assessed, and the results were positive.

Ardiana, Joni, and Udayana (2020) developed a mobile chatbot application using the Artificial Intelligence Markup Language (AIML) approach, the HIV counselling chatbot was developed using four phases of development; User requirement, System design, System development and System evaluation. The chatbot application used black box testing approach to test the func- tionality of the system.

Palkar, Maurya, and Balpande (2017) suggested an intelligent career counselling bot, which was built with the Android studio kit, a pattern matching algorithm, and a relational database management system table.

To promote drug adherence, Fadhil and Schiavo (2017) created a conversational interface. The chatbot recognizes the time and amount of medication, and it was integrated with a web application so that the healthcare provider may monitor the patient's condition and intervene as needed. Telegram API, Microsoft Bot Framework, APImedic, Ruby, and Ruby on Rails framework were used to create the chatbot.

Comendador, Francisco, Medenilla, Sharleen, and Serac (2015) created "Pharmabot," a pediatric generic drug consultant chatbot, which was implemented using Visual C# for the graphical interface (front end) and Microsoft Access (MS Access) for the back end. The chatbot was tested on two sets of people: experts (pediatricians) and students (pharmacy students). The results revealed that the built system is extremely user-friendly, accurate, and consistent.

Bushra and Nadesh (2020) created a diagnostic chatbot to assist primary health care providers. The chatbot was created using a decision tree algorithm that allows users to simulate a diagnosis of their ailment based on the symptoms they are experiencing.

A smart health care prediction chatbot was presented by Jayashree, Monika, Preetha, and Piraisoodan (2020). The chatbot was created using an AIML algorithm that predicts illness based on the user's symptoms and provides contact information for a doctor for further consultation.

III. Methodology

The development specification, high-level model design, flowchart, and process flow diagrams are all covered in this part.

Table I: System / Development Specification

S/N	Environment
1	Python Programming Language v3.7
2	Hyper Text Markup Language (HTML)
3	Flask v1.1.1
4	Tailwind CSS
5	Dependencies: Numpy v1.9.2, Chatterbot v1.0.5, pyYaml v3.11, NLTK v3.5, Chatterbot_corpus v1.2.0
6	Anaconda IDE
7	Web browser
8	Connected device

3.1 High Level Model

The high-level model of the system only depicts how the system development environment will seem.

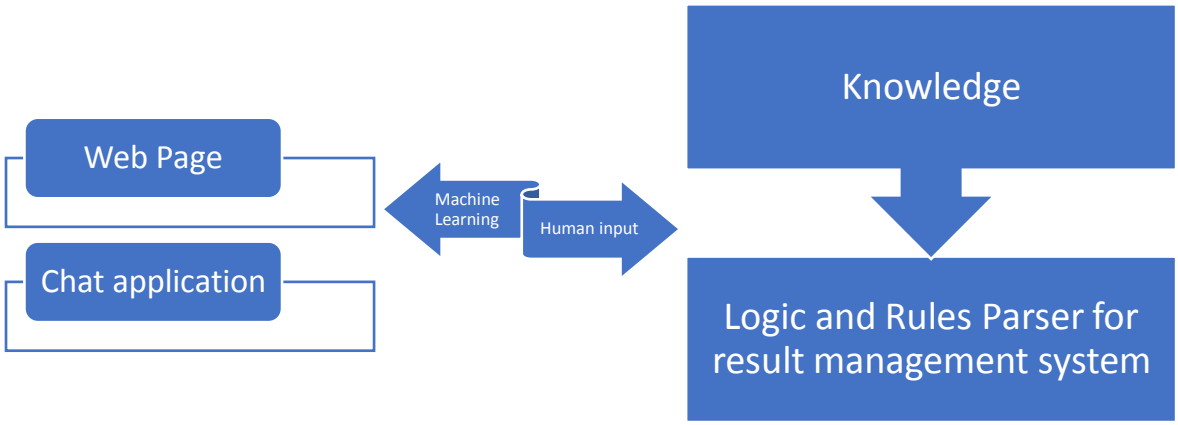

Figure 3: Anatomy of the result chatbot system

The architecture of the result chatbot system is depicted in Figure 3. The chatbot system retrieves information from its knowledge base and connects it to the inference engine at this point. The connection explains the relationships throughout the full evolved system. This design's dataflow easily explains the chatbot's concept.

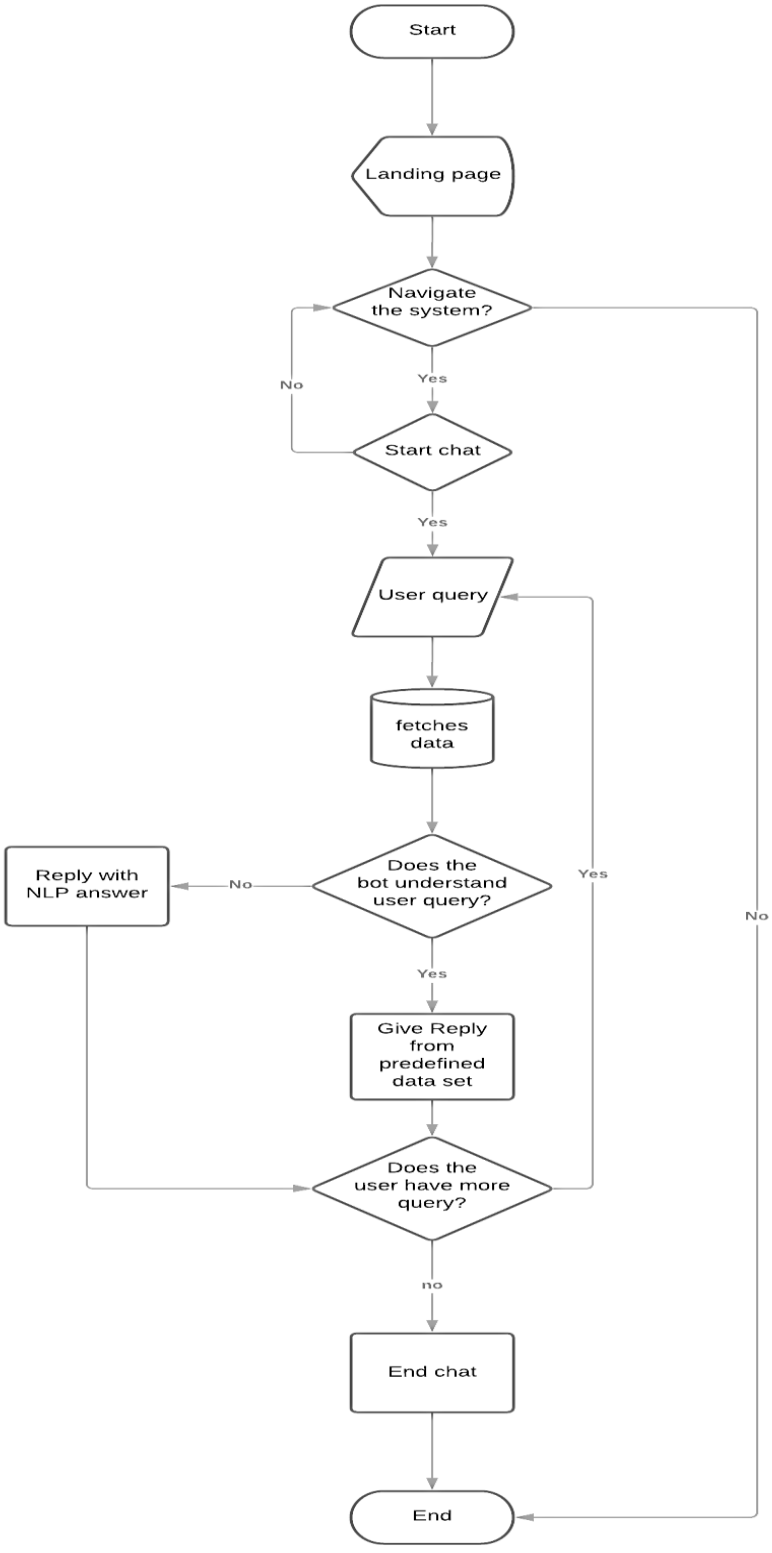

Figure 4: Proposed system flowchart

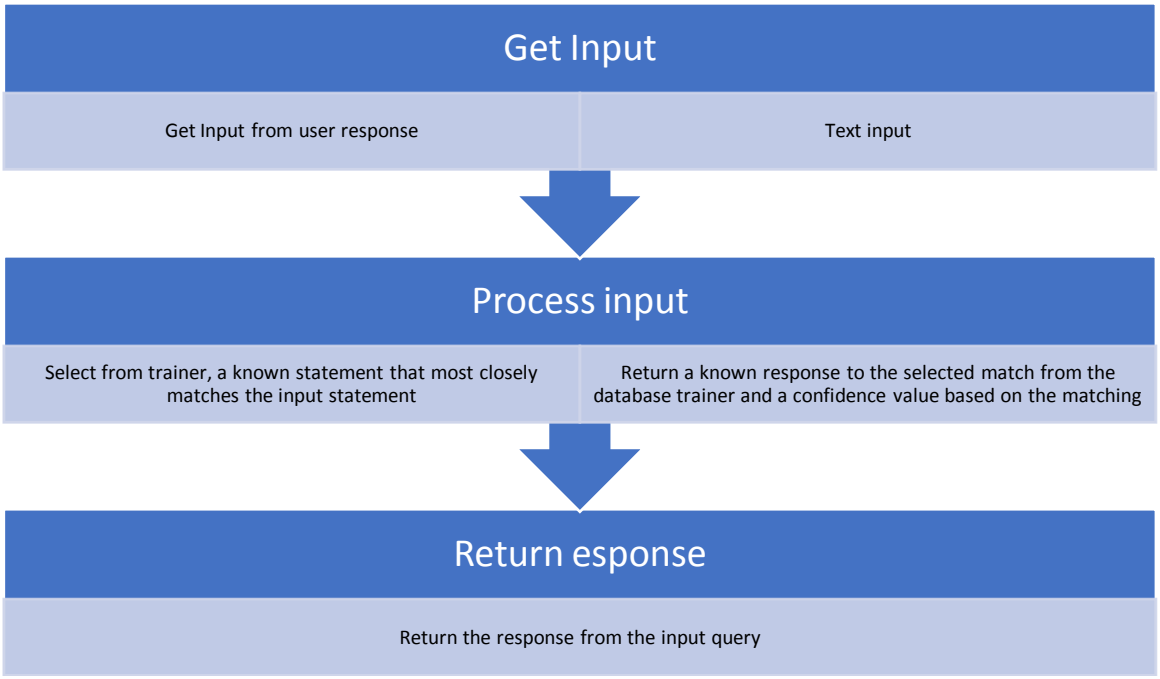

Figure 5: Process flow diagram of the result assisted chatbot management system

IV. Results and Discussion

This section reports the various interfaces designed and developed as a result of research work.

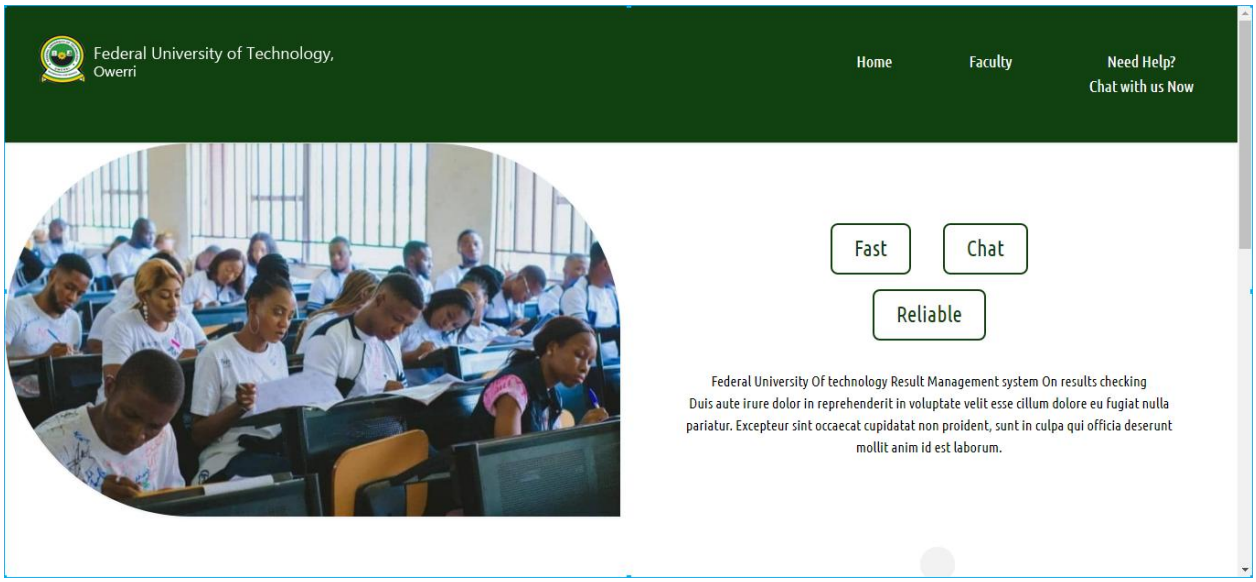

Figure 6: Web view landing page

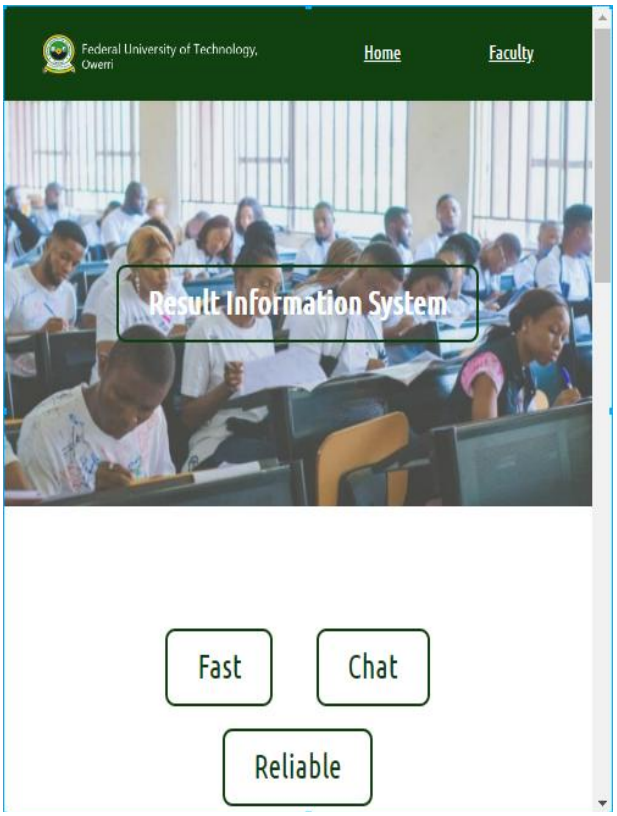

Figure 7: Mobile view landing page

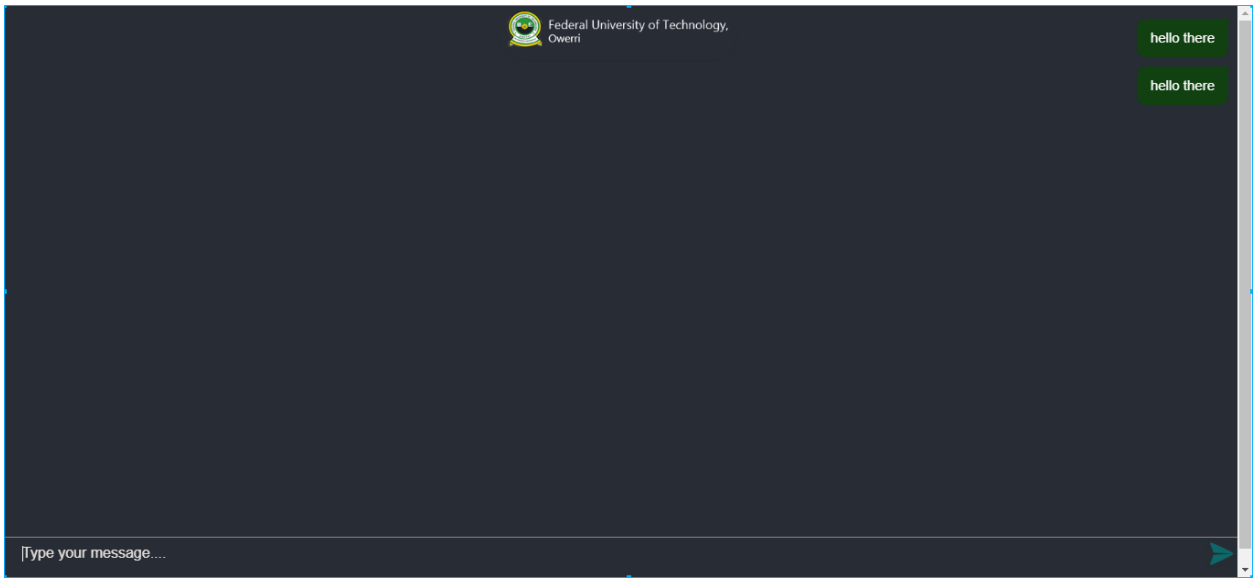

Figure 8: Chatting Interface

4.1 System Performance Evaluation

This section details the system's performance as determined by the evaluation.

Table II: Performance Metric

Metrics	Accuracy
Comprehension	87.35%
Functionality	91.00%
Speed	76.63%
Interoperability	80.00%
Engagement	88.05%
Scalability	87.23%

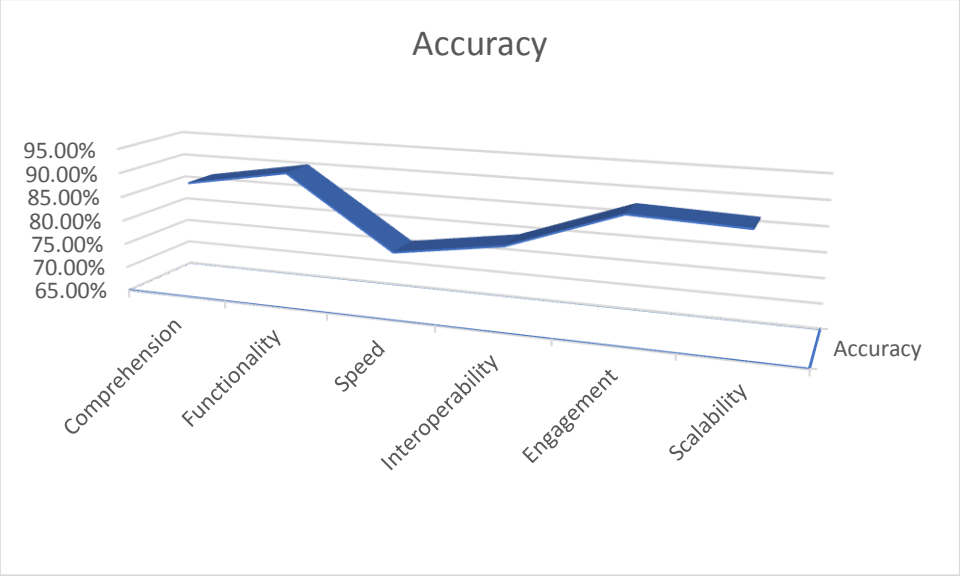

Figure 9: diagram showing the performance metric

Chat Analytics

Figure 10: Line graph of sentiment analysis

Figure 8 depicts a line graph of sentiment request session and interaction counts based on sentiment result data from the developed model

V. Conclusion

This research work centers its focal point on the usage of web based chatbot assisted services for result information system; thus, it eliminates and replaces the traditional methods of accessing information with the use of chatbot to provide electronic and digital services to students. Therefore, students are no longer faced with the backlogs that that is associated with manually checking or enquiring about results information. The development of the web based chatbot information system experienced some level of constraints which affected the speed by which such system was built. Despite the anticipated obstacles, the web-based chatbot for information system was designed to solve a variety of challenges for pupils. The chatbot is designed to provide the most benefits in terms of responding to student questions and making life on campus easier in terms of information retrieval. Deep Learning models will be used in the future to improve the design of intelligent chatbot assisted services.

References

[1]. Ardiana, D. P. Y., Joni, I. D. M. A. B., and Udayana, I. P. A. E. D. (2020). Mobile based chatbot application for HIV / AIDS counseling using artificial intelligence markup language approach Mobile based chatbot application for HIV / AIDS counseling using artificial intelligence markup language approach. *International Journal of Physics*, *1469*, 2–8. https:// doi.org/10.1088/1742-6596/1469/1/012041

[2]. Arora, S., Batra, K., and Singh, S. (2012). *Dialogue Systemn: A Brief Review*. *3*(2), 2–5.

[3]. Bushra, K., and Nadesh, R. (2020). Design and Development of Diagnostic Chabot for supporting Primary Health Care Systems. *Nternational Conference on Computational Intelligence and Da- ta Science*, *167*, 75–84. https://doi.org/10.1016/j.procs.2020.03.184

[4]. Candela, E. (2018). *Consumers' perception and attitude to wards chatbots' adoption: A focus on the Italian* (Master's Thesis, Aalbor University; Vol. 1). Retrieved from https:// projekter.aau.dk/projekter/files/281244069/IMthesis

[5]. Comendador, B. E. V, Francisco, B. M. B., Medenilla, J. S., Sharleen, M. T., and Serac, T. B. E. (2015). *Pharmabot : A Pediatric Generic Medicine Consultant Chatbot*. *3*(2), 137–140. https:// doi.org/10.12720/joace.3.2.137-140

[6]. Dahiya, M. (2017). A Tool of Conversation : Chatbot. *International Journal Of Computer Sciences and Engineering*, *5*(5), 2–5. https://doi.org/2347-2693

[7]. Fadhil, A., and Schiavo, G. (2017). *Designing for Health Chatbots*. Retrieved from https:// www.researchgate.net/publication/331343433 designing for health chatbots&ved+2ahukewivibXhAC&usg=16209980178 67

[8]. Gregori, E. (2017). *Evaluation of Modern Tools for an OMSCS Advisor Chatbot*. Retrieved from https://www.researchgate.net/

[9]. publication/338868364 Evaluation of Modern Tools for an OMSCS Advisor Chatbot

[10]. Hussain, S. A., Folu, O., and Shrish, B. (2019). *Chatbot for Family Planning Counseling*. https:// doi.org/10.1007/978-3-030-22219-2 26

[11]. Jayashree, K., Monika, K. A., Preetha, R., and Piraisoodan, S. P. (2020). The Smart Health Care Prediction using Chatbot. *International Journal of Recent Technology and Engineering*, *9*(2), 75–78. https://doi.org/10.35940/ijrte.A3007.079220