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An Improved Rapid Response Model for University Admission Enquiry System Using Chatbot

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Abstract

A model for real-time response on admission related enquiries was developed in this research with the aim of bridging the lag usually experienced through the conventional approach of phone call and email. The model was implemented using IBM Watson to design a Chatbot for rapid response to admission enquiries. Botium was used to evaluate the performance of the Chatbot which gave an accuracy of 95.9% with instance of 212successful test cases and 9failed test cases. The approach introduces users to new and emerging technological solutions for optimal and rapid response in the educational sector.

Keywords: Enquiry System; Chatbot; Artificial Intelligence; University; IBM Watson; Botium.

1. Introduction

Universities all over the world are experiencing deep changes in the way they work and interrelate with their students and their relatives, because these constituents are demanding more attention through different channels as well as immediate response and service [1,2]. Research revealed that the younger generation is more likely to use chat applications like WhatsApp, SMS, and Facebook Messenger, to communicate rather than phone calls or other person-to-person direct contact methods [3]. We live in the era of constant high- volume, high-intensity communication using different applications, different approaches, and different platforms [4]. However, the increasing rise in technology has made it possible to build a system that acts like a human, a user-friendly one that holds conversations with various number of users in the manner a human would.

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A chatbot is a computer- generated application that is capable of having a virtual conversation with a human in such a way that they don't really feel like they are talking to a computer. In a University, an avenue where enquiries can be made at an easy, comfortable and fast pace should be considered rather than the traditional way such as making phone calls, browsing the school website or sending emails. This project considers the need and relevance of a platform which can streamline interactions between people and services, enhance user experience and at the same time, offer the school with new opportunities to improve the user's engagement process and operational efficiency by reducing the typical cost of customer service.

2. Related Works

Artificial intelligence (AI) is intelligence exhibited by machines. In computer science, according to [5], the field of AI research defines itself as the study of "intelligent agents" i.e. any device that perceives its environment and takes actions that maximize its chance of success at some goal. The term "artificial intelligence" is applied when a machine mimics "cognitive" functions that humans associate with other human minds, such as "learning" and "problem solving" [5]. AI research is divided into subfields that focus on specific problems, approaches, the use of a particular tool, or towards satisfying particular applications. The central problems (or goals) of AI include the following: reasoning, knowledge, planning, learning, natural language processing, perception, and ability to move and manipulate objects. Many tools are used in AI, including versions of search and mathematical optimization, logic, methods based on probability and economics. The AI field draws upon computer science, mathematics, psychology, linguistics, philosophy, neuroscience, artificial psychology and many others. In recent years [6] asserted that chatbots, or technology- fueled virtual assistants, have taken the world by storm. Chatbots' power stems from either set scripts (a technology known as "rules"), or artificial intelligence. A chatbot is defined as a "software program that simulate conversation with human users, using text, voice or images or a combination of spoken and visual heuristics" [7]. A chatbot could be thought of as someone who is awake 24/7 (24 hours, 7 days a week) and answers users to the best of their knowledge, except that they are not humans. The use of chatbots as described by [8], have had a tremendous growth over the decade. It is predicted that by 2019, virtual personal assistants "will have changed the way users interact with devices and become universally accepted as part of everyday life" [9], in the work "Chatbot for admissions" aimed at reducing the burden on the head of admissions, and potentially other users, by developing a convincing chatbot. A keyword and string similarity algorithm was devised to search through the set of data and finds a potential answer, the program then replies the user and provides a relevant web link if the user is not satisfied by the answer. Furthermore, a web interface was provided for both users and an administrator. The following were achieved in this project; a literature review was undertaken to prepare the background of the project, together with an investigation of existing tools, and consultation with the head of admissions.

The requirements of the system were established and a range of algorithms and tools were investigated, including keyword and template matching. An algorithm that combines keyword matching with string similarity has been developed. A usable system using the proposed algorithm has been implemented. The system was evaluated by keeping logs of questions and answers and by feedback received by potential students that used it [10], worked on "Implementation of a Chatbot System using AI and NLP" aimed at solving the problem of difficulty in searching for information on a college's website. The solution to these was a college

inquiry chatbot, which is a fast, standard and informative widget that enhances college website's user experience and provide effective information to the user. The chatbot system was developed using Artificial Intelligence (AI) and Natural Language Processing (NLP) algorithms. It has an effective user interface and answers questions related to examination cell, admission, academics, user's attendance and grade point average, placement cell and other miscellaneous activities. An Interactive Advisory with Bots was developed by [11] with the aim of improving academic excellence in educational establishments. The work focused on creating a balance in the foregoing situations by presenting a design of a faceless automated "AdvisorBot" based on the bot framework. The design reflects a virtual support system model which could be adopted to enhance student support and course advising efficiency. The design follows a mix of the agent and object-oriented approaches and produces an implementation-ready specification whose full implementation would effectively support students during their studies. The system facilitates the process of advising by providing quick and easy access to valuable information, and giving important feedback on several issues involved in student advisement, which otherwise would take considerable time. Chatbot for University Related FAQs was presented by [12] with the aim of addressing the problem of accomplishing many tasks. The chatbot provides an efficient and accurate answer for any query based on the dataset of FAQs using Artificial Intelligence Markup Language (AIML) and Latent Semantic Analysis (LSA). Template based welcome/ greetings and general questions will be responded using AIML and other service based questions uses LSA to provide responses at any time that will serve user satisfaction. This chatbot can be used by any University to answer FAQs to curious students in an interactive fashion. [13], in their work "Artificially Intelligent Chatbot" implements a system (a virtual assistant) based on AI that can solve any college related query. This will work as a College Oriented Intelligence Machine. This system is an Interaction with virtual human and this is strictly for college oriented. This virtual machine will respond to the queries of students on college related issues, and if in the process of responding and the answer is found invalid, the system will declare that the answer is invalid and further this invalid answer can be deleted or modified by the admin on the system. This will help students in fetching the information without visiting the college or to stand in queue. Students can use this chat bot to get the answers to their queries in a very easy and fast way A Cognitive Virtual Admissions Counselor system was carried out by [14]. The virtual admissions counselor is a system capable of providing potential students accurate information at the time that they want to know it. After the evaluation of multiple technologies, Amazon's LEX was selected to serve as the core technology for the virtual counselor chatbot. Student surveys were leveraged to collect and generate training data to deploy the natural language capability. The cognitive virtual admissions counselor platform is currently capable of providing an end-to-end conversational dialog to resolve three categories of questions, referred to as intents. These intents allow the chatbot to determine if the user is asking questions about class sizes, tuition amount, and semester start dates. The virtual admissions counselor is able to support three intents, each with accuracy metrics greater than 90%. The virtual admissions counselor is also capable of providing a conversational dialog allowing the successful resolution of potential student inquiries using LEX as the core service [15], worked on "College Chat-bot" using artificial intelligence algorithms that analyses user's queries and understand user's message. This System is a web application which provides answer to the query of the student. Students just have to query through the bot which is used for chatting. Students can chat using any format, there is no specific format the user has to follow. The System uses a developed bot in artificial intelligence to answer the query, the system provides appropriate answers as per user queries, the user can query

any college related activities through the system. The user does not have to personally go to the college for enquiry, the System analyses the question and then provide answers to the user. With the help of artificial intelligence, the system answers the query asked by the students. The system replies using an effective Graphical User Interface, as if a real person is talking to the user. The user can query college related activities such as date and timing of annual day, sports day, and other cultural activities. This system helps the student to be updated about the college activities.

3. Methodology

The chatbot is a conversational agent developed using an artificial intelligence platform called Watson provided by IBM to respond to admission related enquiries in the university. Fig. 1 shows the architecture of the system which explains how the chatbot works. The user is granted access through any of the devices that is connected to a network and then access a messaging platform which is the interface through which the user can converse with the chatbot. The user sends a message to the chatbot, which transcribes the message in plain text to the NLU (Natural Language Understanding) component that extracts the intents and entities of the text before sending such message to the NLP (Natural Language Processing) components. The information sources which can be either the API, Knowledge base, data storage, or human intervention is searched for the required information, this information is then sent to the message generator to generate the appropriate response and the response is sent to the chatbot which is then sent back to the user.

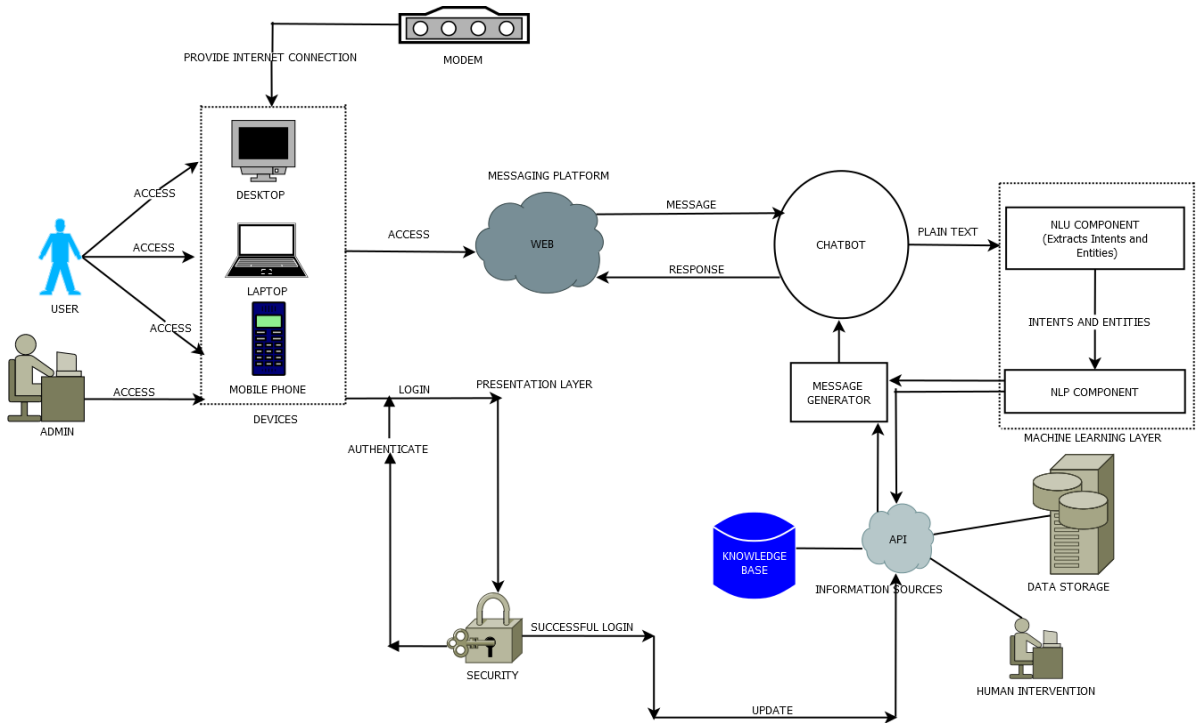

Figure 1: Architecture of the chatbot system

The administrator has access to any of the devices and can perform the same activities as the user and also has administrative rights which allow logging in to the system. If the login is successful, the admin can access the

information sources and make necessary updates to the system, but if the login is unsuccessful, access is declined. In implementing the system, Watson was used to provide intents, entities, dialogs and Watson Assistants. Dia was used to draw the structured diagrams while Botium was used to test the chatbot and to ensure quality assurance.

4. Results and Discussion

The model was developed with the purpose of having a chatbot respond to university admission related enquiries using an artificially intelligent platform by IBM Watson. The platform consists of components for the effective development of the chatbot such as intents, entities, dialog analytics, etc. Intents were used as prerequisites for constructing dialogue structures. An intent is always preceded with the '#' symbol, for example, #Screening_Date_Time contain questions users can ask regarding the admission screening date, time, centers, requirements, etc. Fig. 2 shows the intents page of the chatbot system. Entities are words or group of words that may be present in the user's intents that aid better response to questions. They provide a specific context for an intent; entities are preceded with '@' symbol and are used with intents to develop a robust dialog structure. Fig. 3 shows the entities of the chatbot. Dialog consists of various nodes and child nodes that cater for responses pertaining to different intents and entities. It is responsible for generating response to user's questions as shown in Fig. 4. A demonstration of the Chabot proffering answers to questions asked by users is as shown in Fig. 5.

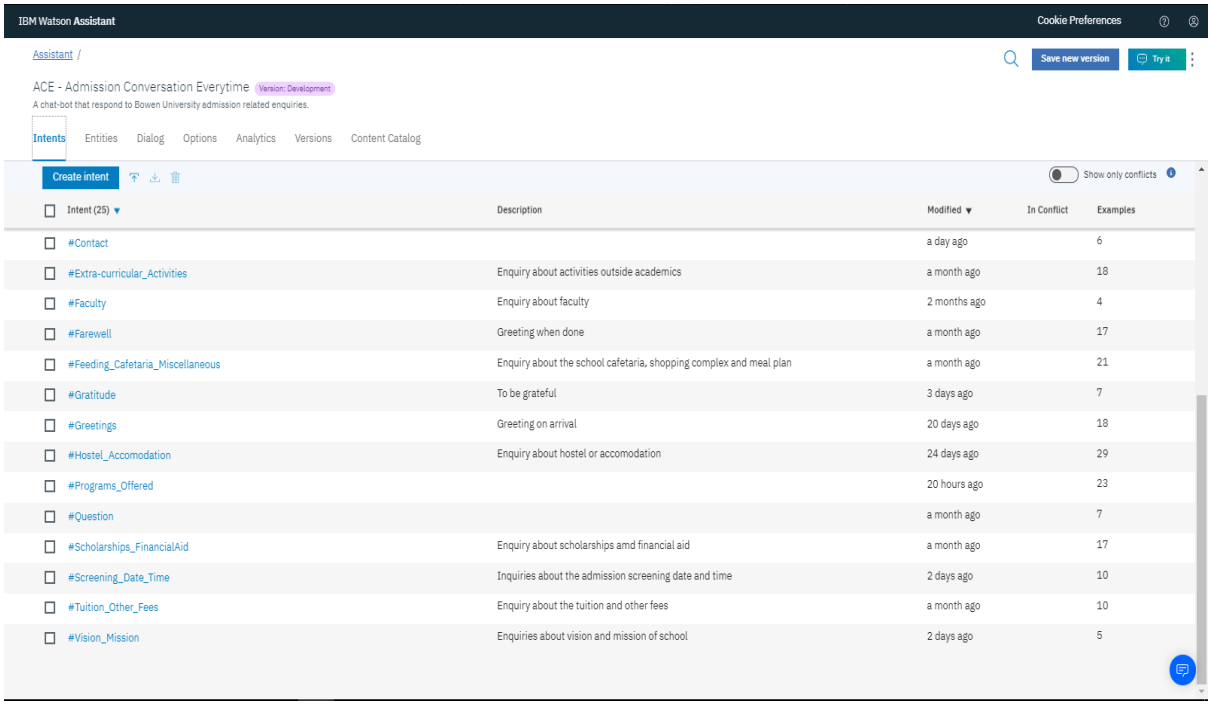

Figure 2: Intents of the Chatbot

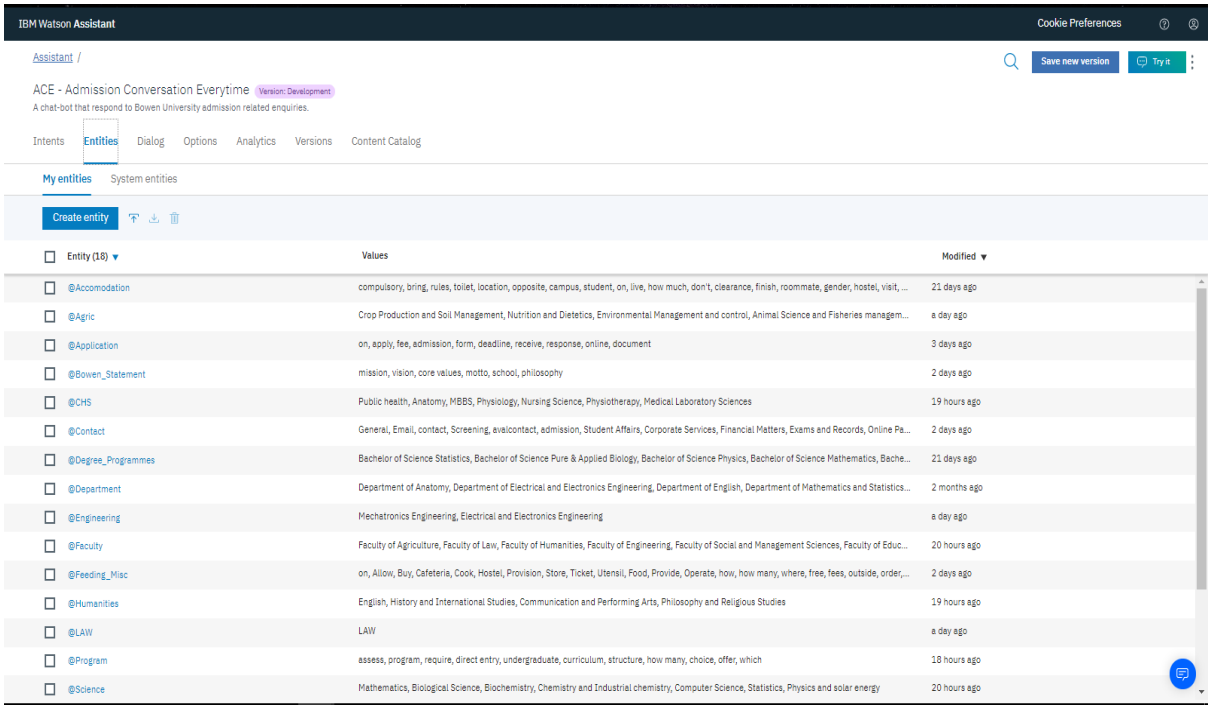

Figure 3: Entities of the Chatbot

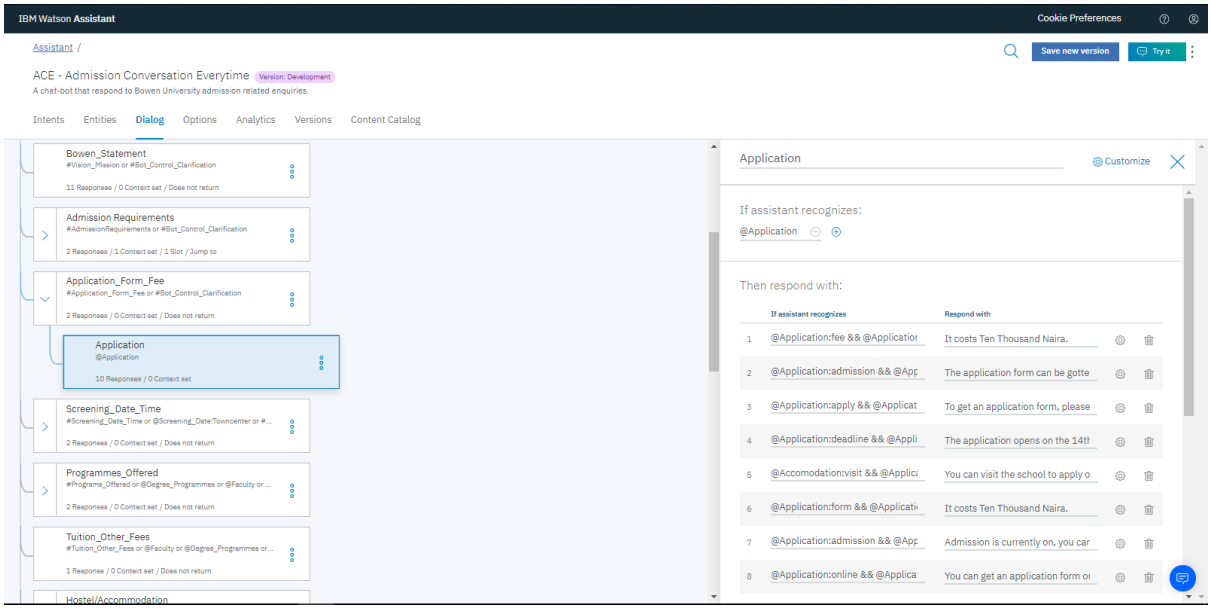

Figure 4: Dialog Structure of the Chatbot

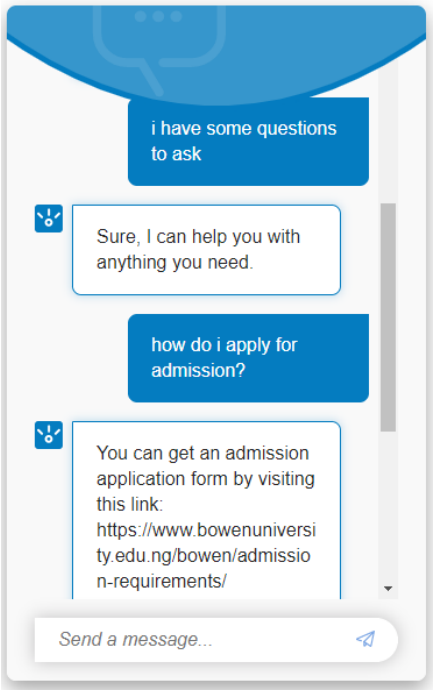

Figure 5: Chatbot answering Questions

5. System Testing and Evaluation

The developed system was tested and evaluated using Botium which uses test set that consists of test cases known as BotiumScript. These test cases consist of 'convo file' and 'utterances file' where convo file holds the structure of the conversation that the chatbot is expected to follow and utterances file holds several phrases/questions that the chatbot is expected to recognize from the user. The convo file test cases and the utterances file test cases are as shown in Fig. 6 and 7 while the test result as shown in Fig. 8 gave an accuracy of 95.9% with instance of 212successful test cases and 9failed test cases.

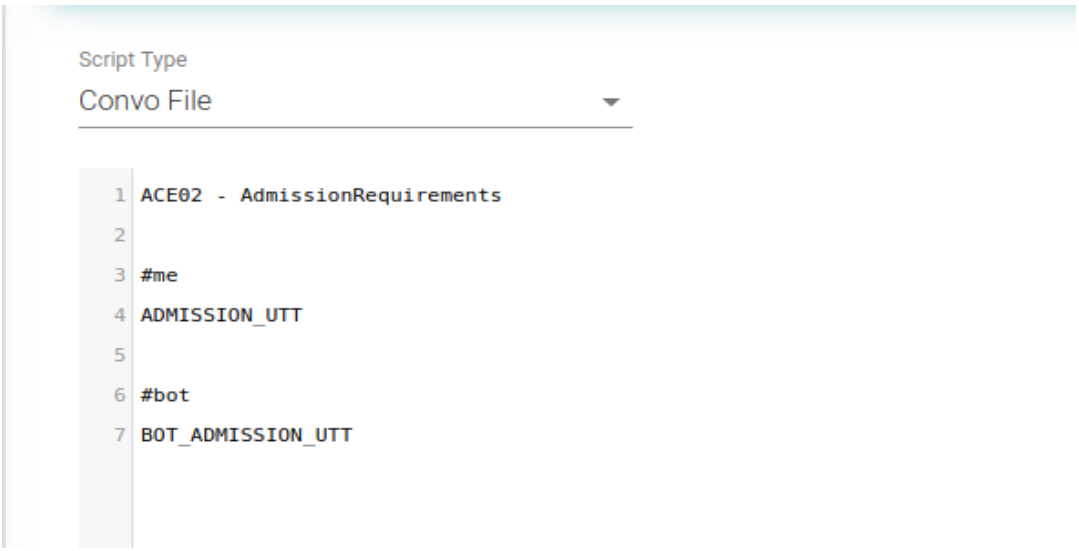

Figure 6: Convo File Test Cases

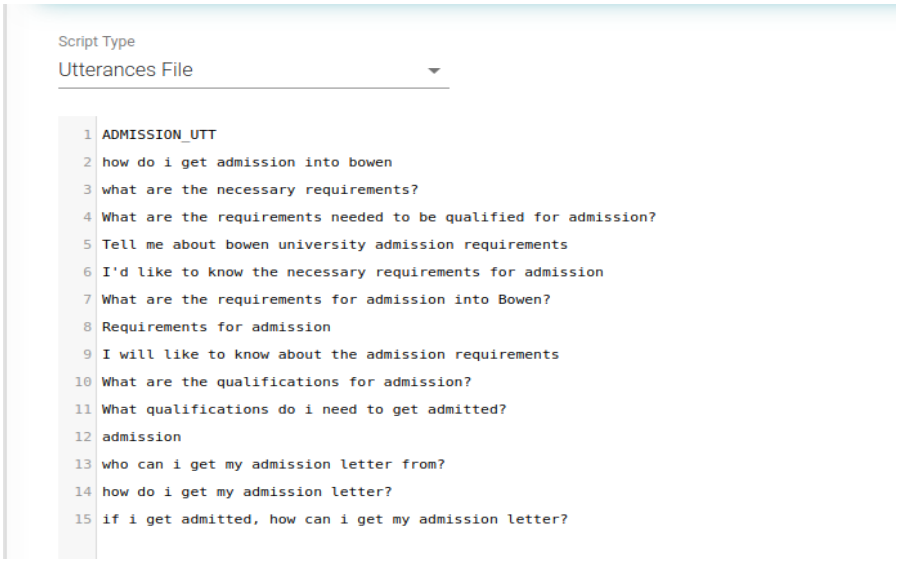

Figure 7: Utterance File Test Cases

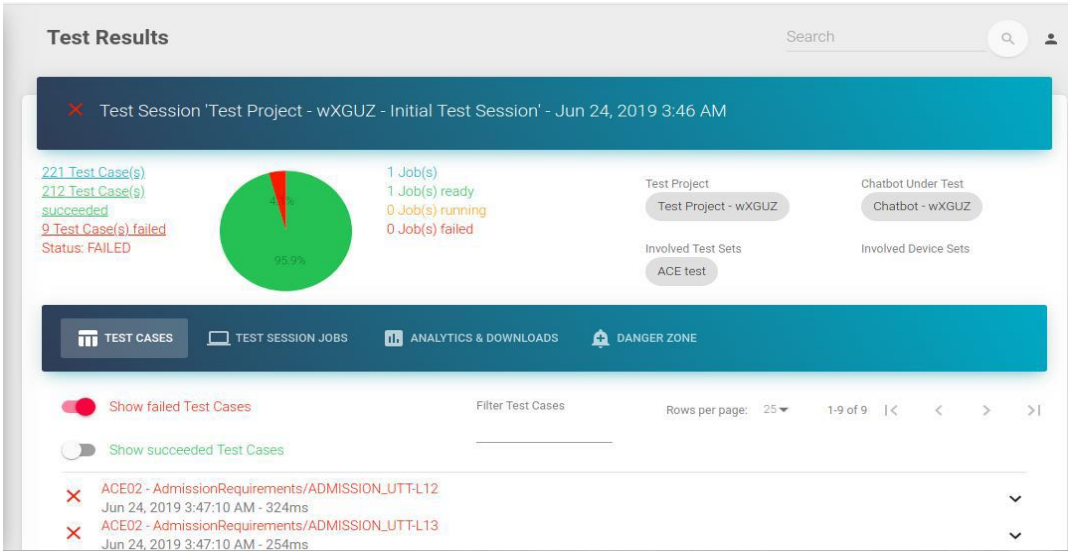

Figure 8: Chatbot Test Result

6. Conclusion

The Chatbot developed with the aim of assisting prospective students and parents on admission enquiries in a university is in a timely, reliable and efficient manner thereby, improving the existing system. The approach introduces users to new and emerging technological solutions for optimal and real-time feedback in the educational sector. With this solution, the cost of making enquiries is drastically reduced as information can be gotten instantly and anywhere; search engine on the university website is optimized as the chatbot narrows down one's search of information on the school's website through provision of direct link to the information. With the provision, admission officer's workload is reduced as the chatbot can respond to basic information thereby reducing the amount of calls and mails to be responded. Adopting this solution will improve quality and efficient service delivery and in a real-time manner in the educational sector.

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