

DEVELOPMENT OF CONVERSATIONAL ASSISTANT IN EDUCATIONAL SUPPORT SYSTEM USING IBM WATSON

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ABSTRACT

The term "chat bot" refers to computer software that replicates human interaction using voice instructions, text, or both. It is an artificial intelligence (AI) characteristic that can be integrated and utilized in a wide variety of applications. The development of different approaches for developing chat bots and different techniques for creating chat bots. Because a chat bot must accurately mimic a natural answer, it must first analyze the client's question and then develop a suitable response. The analytics and effectiveness of the assistant can be measured in IBM Watson service and is used to improve the quality of interactions by improving the data set and using Watson Assistant recommendations have also integrated the IBM Watson Assistant with the IBM Watson so that the chat bot gets the extra ability to answer the questions asked by the user in a more efficient manner mainly with respect to the accurate answers.

Keywords: Chat bot, IBM Watson, Server less Computing, Open whisk.

1. INTRODUCTION

Chat bot could be a program that can get connected with clients in customary usual dialect. In numerous business cases like eatery booking framework, book suggestion framework, ticket booking framework etc. the people can be supplanted by these virtual conversational assistants for tedious, boring and repetitive tasks of responding to queries and giving proficient acknowledgements, e.g.: E-help work areas, Client cares. Chat bots are moreover utilized in operating systems as virtual conversational assistants such as Cortana in windows and Siri in mac. Today, the demand of the chat bots in the business world and in trade division is expanding day by day as they have overwhelming capability in robotizing the customer service and additionally in decreasing the efforts of the people. Chat bots are the taxons of conversational agents that are planned in such a way that they communicate with the customers using natural dialect or natural language. The finest source of answers to the user's questions in any area is eventually a chat bot. For the most part, these virtual assistants are utilized for obtaining the knowledge. Chat bots can be also executed on our mobiles and local personal systems and can be accessed via the web. Chat bots are the software units which behave like a human entity. When the client begins inquiring questions on some specific theme or domain, the conversation

starts and the chat bot begin replying to their questions. An answer to the client's inquiry is built based on a knowledge database which is predefined.

Currently, with the advancement of natural language processing-based machine-learning methods, chat bots are able to create way better decisions. In this respect of building a virtual conversational assistant in the field of education, and specifically for the student's purpose, we had chosen the IBM Watson Assistant as our AI service for creating the chat bot. IBM Watson makes us to develop and construct AI driven chat bots. The term AI driven implies that, the chat bot is built using the natural language understanding and natural language processing etc. instead of programming the whole discussion of the human and the responses of the bot through different programming languages. This implies that we would not program, then collect/retrieve the answers that we would anticipate as the responses from the chat bot, instead those answers or the responses are intelligently gathered, make sense out of and are given to the clients.

We made up our mind to build a virtual conversational assistant with the help of the IBM Watson framework; because of its reliability, unwavering quality and ease of usage. There are several popular cloud service providers like IBM, Amazon and Google which give APIs for the building and improvement of the chat bots. IBM Watson is a chat bot API which is provided by the IBM, comes already trained with the industry pertinent information for replying to the client questions. With IBM Watson as the service for building a chat bot; we can build dialogues or messages up to the primary 10,000 messages per month [2]. Watson service is presently one of the foremost powerful and capable Artificial Intelligence services available; and are being used in several different applications across the world. The set of several various services that could be exploited to construct an effective virtual conversational assistant incorporates Watson Assistant; which gives the access to the necessary fundamental tools to construct a chat bot. Apart from Watson Assistant, IBM's Watson Discovery is used additionally, which is valuable in retrieving useful information from expansive sum of unstructured data and from farther databases. These primary services are complemented by a number of other computer program modules, such as Speech-To-Text, which is utilized to consider human voice as input, Text-To-Speech, and Natural Language Understanding, which permits to extricate key components from texts, e.g. concepts, entities, keywords [3]. Virtual assistants built with the help of Watson Assistant are focused on for the business environments, which implies that its primary aspiration is not to be available directly to the common people. With IBM Watson Assistant, clients can deploy their chat bots on other platforms such as Slack or indeed Facebook.

However, in any case, when constructing a virtual conversational application for a venture, it needs to be verified and tested before entering into the generation stage and, that testing ought to be brought by the real-life clients who talk with it and find out the failures and pitfalls on recognition and misunderstandings of the client thoughts and desires. Watson is additionally an assistant which is based on an intent structure and design, where intents represent the user's intention or desire in his or her utterance, that is, what he or she desires and can ordinarily be distinguished by a verb like "to go" or "to

do". Watson Assistant puts forward that its clients will be capable to, in a less time, build a chat-bot, with which they can start establishing a dialogue. That creation is done in three steps, corpus creation, plan, and integration [4]. Open Whisk, on the other hand is one of the primary open-source servers less ventures originally created by the IBM [1]. Since Open Whisk could be a Faas, i.e., it runs functions in response to events from web or mobile applications; or anything that can make a HTTP call can invoke or conjure the Open Whisk functions; for instance, sensors that are utilized within the Web of Things etc.

2. RELATED WORK

The paper named "Building a Chat bot with Server less Computing", describes a nonexclusive architectural design for a chat bot framework which is built on top of server less computing platform. Open Whisk is a server less platform powered by IBM that is uninhibitedly accessible and publicly available. The Open Whisk model depends on three important natives in particular, namely, Action, Trigger and Rule. The work that is carried out by the author in this paper examines the utilization of the server less programming model as a mashup framework to modularize domain-specific processing for the chat bot, as well as a way to create a mechanism for extending the chat bot's capabilities. The authors are explicitly keen in designing server less chat bots that interact with a set of assorted commodity services publicly accessible on the web like a weather service and stateful reminders. They present an architecture as well as a model execution of their chat bot that uses WDC services as our AI building blocks and the IBM Open Whisk server less computing service. Their design supports incremental extension of a chat bot's fundamental set of capabilities – conceivably composed using diverse programming languages by other organizations within the company -- and is generic enough to support distinctive client interaction medium (e.g., audio, text) [1]. Investigation and comparison of three popular existing chat bots API offerings specifically IBM, Amazon and google based on three fundamental highlights like Language Interpretation, Identity examination and Tone analysis.

After that propose and build a voice interactive and multilingual chat bot that can viably respond to users' disposition, tone, and dialect using IBM Watson Assistant, Tone Analyzer, and Dialect Interpreter. The chat bot was assessed employing a use case that was focused at responding to client's needs with respect to exam stress based on university students survey data generated using Google Forms. The results of measuring the chat bot effectiveness and adequacy at analyzing responses with respect to the exam stress indicate that the chat bot responding appropriately to the client's questions with respect to how they are feeling about exams is 76.5%. The chat bot could moreover be adjusted for use in other application areas such as student info-centers, government stands, and mental well-being support frameworks [2].

The paper titled "Smart Assistance for Students and People Living in a Campus" is a virtual assistant built with two subsystems, conversational assistant and content discovery. Clients interact with the system through an integration point, which advances

the request to the dialogue skill so that it recognizes the intents and entities. Content discovery module is called to extract necessary information from the unstructured documents present in the remote database. The IBM services have particular price for each and every API call, so an optimization plan is made to reduce the number of interactions between the assistant and the cloud. Presentation of a virtual assistant that uses the Watson technology to support students and staff of a smart campus at the University of Palermo. In spite of the fact that few are in progress, the outcomes reveal the effectiveness of the approach the authors proposed [3]. This paper provides a brief history of the events and ideas that positioned the author's team to take on the Jeopardy! Challenge, build Watson, IBM Watson, and eventually triumph. It depicts both the nature of the QA challenge represented by Jeopardy! And their overarching specialized technical approach. The primary body of this paper provides a narrative of the DeepQA processing pipeline to introduce the articles in this uncommon issue and put them in the context of the overall system. Finally, this paper summarizes their primary outcomes, depicting how the framework, as a holistic combination of numerous differing algorithmic procedures, performed at champion levels, and it briefly talks about the team's future investigation plans [5].

The paper titled "Implementation of an inquisitive chat bot for database supported knowledge bases". This paper represents the implementation of an inquisitive chat bot which finds the lost information of a query and probes the questions to clients to gather the data that are required to reply to the inquiry. Through this execution with modified ALICE engine and a knowledge base engine the level of interactivity between user and chat bot is improved. [6].

3. METHODOLOGY

The work done for building this conversational assistant can be summarized into two important phases, where the first phase describes about the developing of the chat bot using the IBM Watson assistant and the second phase describes about the integration of the Watson Assistant to the Watson Discovery with which we, the users can access the most accurate and up-to-date information which is available in the large databases.

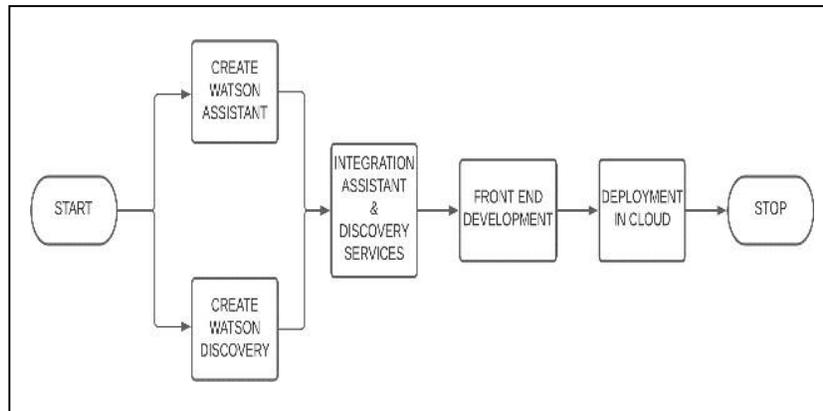


Fig. 3.1. Flow Chart

3.1 Building the chat bot-IBM Watson:

In this work, we used the IBM Watson Assistant service hosted on the IBM Cloud platform. The first step for building the bot is to create an account on the IBM Cloud and then creating the instance of the Watson Assistant. There are three main components in the IBM Watson Assistant, with which we can build the conversational assistant. Each of them are explained below:

- Intents
- Entities
- Dialog

Intents: To be precise and clear, intents are called as the intentions which a user have while he/she is exercising with the chat bot. There are several various intents like greetings, regrets etc. which we create according to our requirements.

Entities: Entities in IBM Watson are basically used for recognizing the important and interesting parts of the user's utterance. An entity modifies an intent more specifically.

Dialog: A dialog forms when the created intents and entities are combined together in order to build the conversation dialogues between the user and the chat bot. The flow of the dialogues are represented graphically in a tree format within the tool.

3.2 Creating Watson Discovery and integrating it with IBM Watson

Watson Discovery is a famous and widely used tool, developed for the purpose of searching a particular information from large databases. It is also one of the search tools based on the Artificial Intelligence. Watson Discovery consists of a cognitive search and content analytics engine and is integrated with various applications in order to identify new patterns, latest trends and actionable insights to drive better for getting efficient results back to the user. Setting up the collection according to our requirements is the first

step we need to do while creating the Watson discovery. Since we are creating a collection for our documents, you can give your collection a name, and set the language of your documents to English. When we are ready to upload all the necessary documents and files to the database using the discovery tooling, we should make sure that there are no files and documents with same name, because when a new version is uploaded, the original is over-written. Analyzing and processing of all the files and documents which are either structured or un-structured is another step done by the discovery tool.

In order to create a better user experience, we have also used the “Smart Document Understanding” feature of the Watson Discovery, which will enhance the discovery model further so that the queries will be greatly focused to search only for the most relevant information found in a typical user’s manual. SDU has the ability to train the Watson Discovery for extracting the custom fields from the files and documents which the user uploads. Improvement in the responses for the queries depends on the customization of how well our documents are indexed into the discovery. In order to train the custom conversion modules, we can also annotate the fields within your document using SDU. As we annotate, Watson learns and will start predicting the annotations. SDU models can be used on other collections also as they can be exported. Document type or the file extension of the document support of the SDU depends on the plan we use, i.e., either a lite plan or an advanced plan. Querying of the document helps in extracting important information from the documents using keywords.

For doing this, we need to train the Watson with the example queries which represents the queries which the user enters and the ratings that indicate which results for each query are relevant and not relevant.

Integrating the Watson Discovery as a search skill with the previously built Watson Assistant is the final step.

Web crawler is another significant feature of the Watson Discovery service which is used for fetching the data from various websites. Using the web crawlers, we can crawl the public websites, as they don’t require passwords. We can select how often we’d like the Discovery to sync with the websites, the language, and the number of hops.

3.3 Frontend Development

As the main objective of our work is to develop a conversational assistant for our college i.e. GMRIT, we have chosen the website of our college during the frontend development and this would be the web page where we deploy the chat bot which we had developed.

3.4 Deployment into cloud

At last, we had deployed the chat bot into cloud using heroku tool belt.

4. RESULTS

Below are the previews/outputs which we obtained after the successful execution of our work.



Fig. 4.1: Initial view of Virtual assistant.



Fig. 4.2: Assistant answers about GMRIT.

Fig 4.3: Answering about hostels.

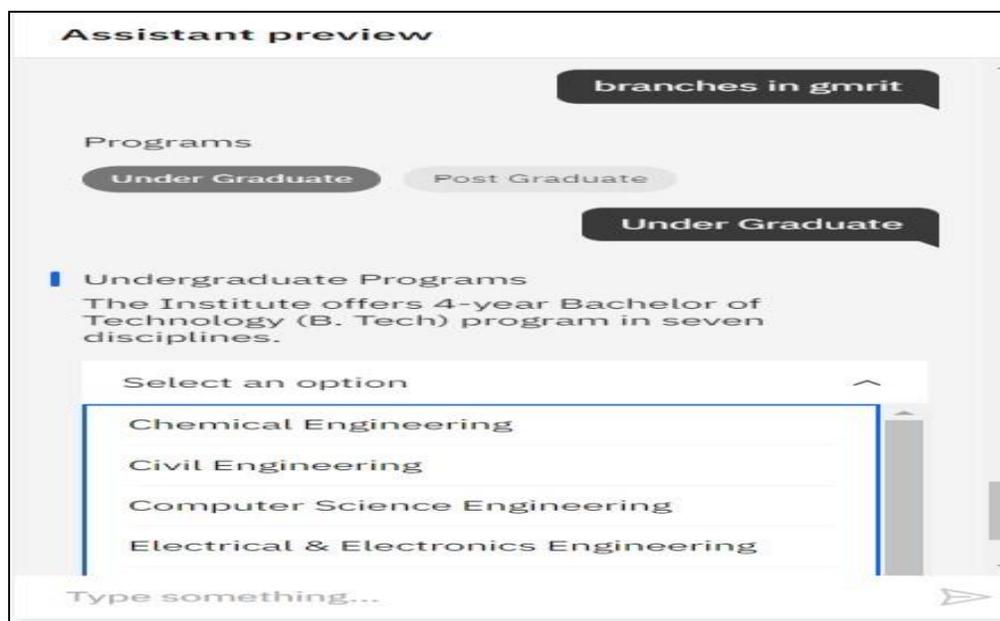
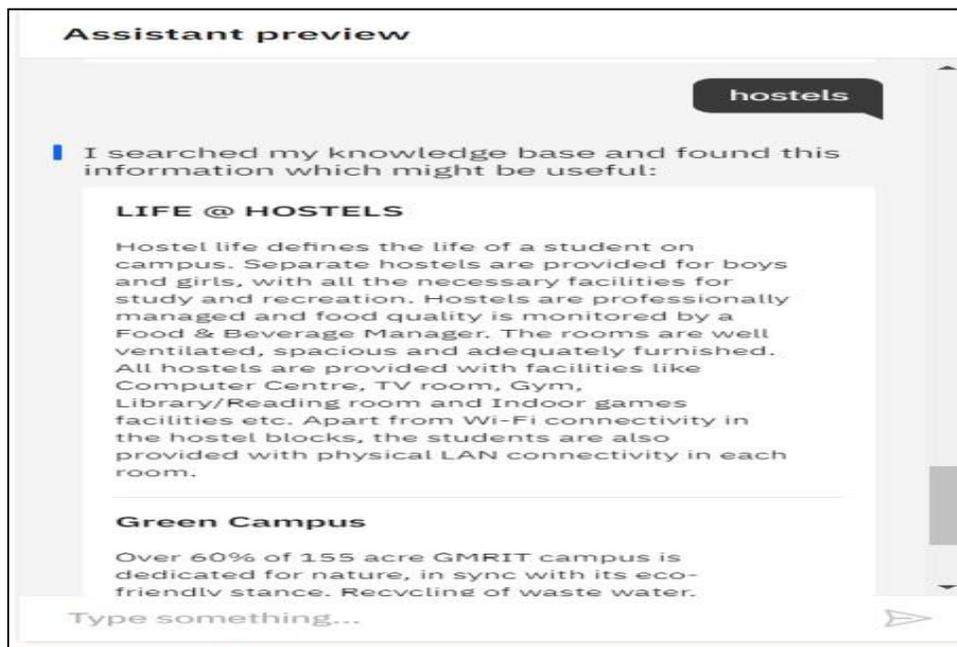


Fig 4.4: Bot displaying the UG options.

5. CHALLENGES

Presence of complexity lies for the most part amidst the testing of chat bots which could be a major issue for different ventures etc., because of the non-stop evolving of the natural language models due to their frequent upgradation and consequently, it gets to be strenuous to test and run the chat bots regularly for checking their precision and accuracy. Clients anticipate fast replies from the bot even though they have limited time span for their inquiries and so gets to be quite challenging for the firms to construct chat bots, which hold the user's attention till the end. In spite of the fact that, conversational UI, plays a crucial role in exhibiting, recreating human like conversations and way better client experiences, a machine, in any case, wouldn't always render the same empathy that a human seems do.

5.1 Performance

Utilization of the Server less computing can make the development and advancements of the services simple, but providing the Quality of Service (QoS) is difficult and troublesome most of the times.

5.2 Security

Several large number of servers less platforms depend on a storage or container service like Docker etc. in order to create application siloes; hence it is very important to ensure that those small code snippets, called as functions cannot break out of this silo and try to gain access to the unauthorized resources. Also, we should make sure that there are no data manipulations, data theft etc. to the data which is present in the database. Installing of antivirus and other several premeasures can turn our work better and secure.

6. CONCLUSION AND FUTURE ENHANCEMENT

In this work, we presented a virtual conversational assistant which is built under the AI services of the IBM Cloud under Watson Assistant service and Watson Discovery service. This chat bot is able to answer most of the user queries regarding our college, for example, answers about the details of college, hostels, various programs available in our college, new notifications and time tables for the examinations and exam results etc. Our work can be extended further in such a way that, it supports different user interaction mediums with respect to various other languages other than English. We will still include a better user interface and make sure that the virtual assistant looks elegant with respect to the frontend design etc. and we will moreover incorporate a voice-based inquiry recognition, where the clients deliver their voice as input, and chat bot responds back to the client with text as the output. We'll moreover permit the chat bot to access the web, which can offer assistance to solve all the inquiries of a particular client and make strides and improve the likelihood of victory within the bots. After fruitful execution of chat bot in our college, we are going to implement it in other fields like restorative, medical, sports,

scientific areas, etc. It will be exceptionally useful in all the zones as without investing much time we are able to access all the relevant information and that too without any sorting. On success, we are going to make this chat bot available and accessible to all the clients as an android app.

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