Fourth International Conference on Electronics, Communication and Aerospace Technology (ICECA-2020)
IEEE Xplore Part Number: CFP20J88-ART; ISBN: 978-1-7281-6387-1

Dynamic Information Retrieval With Chatbots: A Review of Artificial Intelligence Methodology

Vishal Dutt
Department of Computer Science,
Aryabhatta College,
Ajmer, India
vishaldutt53@gmail.com

Satya Murthy Sasubilli
Workday Integration Architect,
Huntington, Columbus,
OHIO
satya.Murthy@huntington.com

Anand Eswararao Yerrapati
Solution Architect
Oracle,
Bangalore, India
anand.yerrapati@gmail.com

***Abstract*— A chatbot is a computer program designed to simulate a conversation with human users, especially over the Internet. Ultimately, the chatbot acts like a virtual assistant or interactive agent in a conversations interface to respond to user queries or messages via communication channel like mobile apps, messenger apps or browser-based applications. Chatbots have become more popular nowadays and most of the companies are implementing them wherever they can to reduce the operation cost. In many cases, human resources are utilized to respond to user queries, where the chatbot can do the same job by searching the data in the system so that the human talent can be used for other advanced tasks. As the advancement in the technology, chatbots are also evaluated in a better way such that they can do some other tasks beyond just answering the textual questions. This paper provides a chatbot based solution for users or candidates, who are searching for a job to apply in a company. This solution makes the job searching and applying process easy, where the user can apply for a job in a few taps without visiting the company website or their mobile app.**

Keywords*— *Chatbots, Artificial Intelligence, Recruitment, Job Search, Job Application, Mobility

I. INTRODUCTION

It is very rare to find people, who are not using mobile and a messenger. With the availability of internet and increase in the usage of mobiles, almost everything is available at the doorsteps. Then why can't be jobs? Even today if it is required to find and apply for a job in a company, either the candidate should visit the company website or install their mobile app. Sometimes, applying job in website might be tedious. The process always require a laptop or desktop to fill all the required input fields. Why can't the mobile messenger apps are used to apply for the same jobs in a company?

Chatbots provide a solution by connecting to any of the messenger apps like Facebook, Twitter, WeChat, Line, Slack etc. So that there is no need to install any mobile app of the company just to search and apply jobs. As the advancements in the chatbots, they also support multiple languages, which is very much helpful for localization. And the effort would be less. Many chatbot platforms support multiple channel [1] integrations. Hence, the same chatbot can be exposed to different channels and messenger apps. Because of this, there is no need to develop multiple chatbots for various channels. So, any improvements to the chatbot can be done to one version, where it would apply to all the channel users.

In this paper usage of chatbots in HR domain is highlighted and designed to provide a solution for job search and job apply in different formats.

Natural Language Processing (NLP) is the great tool to work on understanding the human inputs. The sentimental analysis of the human emotions is the key to design a model which can work on chat bots which can help the human resource department. The recruitment with the technology increases the production of the great team. Artificial intelligence is the superior basement for development of the great things related to the real-time problems. The natural language process will work on stemming and lemmatization which can further enhance the performance to model which was tried to build[2].

The process of stemming in natural language processing is to understand the concepts related to the grammatical things related to the language the user has chosen. In chat bot creation we can't restrict the user to follow some specific language to operate and comminate with the machine. The communication with device will be based on the type of language and phrases, while designing the concept. The concept behind using the natural language processing [NLP] model is to understand the query generated by the user or the person, who is attending interview. The interviews, which have been done by the person in physical can be replaced by the machines in the secured channel, where it can extract the knowledge on different people, who is having different domain knowledge. The different domain knowledge is important to hire a person for different roles in the organization[3-4].

Stemming and lemmatization are the common strategies to handle the multiple queries. For an instance we can consider the questionaries' posed by the user to the learning platform support team and they requested for some answers for their questions using the bot and that bot was programmed statically because it can't take the inputs from the user in dynamic

format. If the user gave the input in the format prescribed in the form of syntax, then the machine can understand the phrase mentioned and process the query.

Rest of the paper is organized as follows. Section II discuss the use case and requirements. Section III describes the design and proposed solution for this paper. Section IV shows some screen shots of the interaction with the designed chatbot solution and finally Section V concludes the paper.

II. USECASE DISCUSSION

Here, in the use case, user should have an easiness to find and apply to a job in the company. A chatbot is required to interact with the user like a human to ask and understand the user requirements and suggest the user with best available job. The bot should be flexible to take the resume in multiple formats (pdf or doc or any file) or a form with input fields. And also, the bot should give more information about the company.

The main purpose of the bot was divided into different parts and those are mentioned as follows:

- First the bot needs to understand the language the user communication with it
- The bot needs to understand the key things in the question it has to ask.
- Need to get the company related answers
- Need to understand the different reviews given on that specific role in the company
- Need to understand the specific review on the company before asking them to answer questions
- The bot needs to be dynamic in understanding the answers even though there are spelling mistakes

The main purpose of the chat bot is to understand the person in a dynamic format and the user needs to understand the exact requirement that a bot post to the user.

III. LITERATURE REVIEW

The chat bots are most prominent technologies which can take the review regarding the user input and then they process it using the machine learning models, which can considerthe process model to predict some information from that data. The process of managing the job requirements using the chat-bots is a challenging issue, where it is required to focus on the latest technologies, which can implement the human nature identification. There are so many ongoing researches on the concept of artificial intelligence and made a way beyond thinking for the real time problems. The main real time problem which the work mentioned in the proposed system is regarding the method of implementing AI into chat bot, where it can track the accurate job for the user[5-6].

The recent times we can find different applications which are working on the same thing like chat bot which can take the user inputs and make them to work on understanding the human requirements. The requirement is to understand the sentimental analysis of the human inputs which can carry the all the aspects of the requirements mentioned by the user. The user will give the sample inputs and make the application to understand the requirement. The requirement may be based on the experience as well the domain of the work. There is a simulation which can make us to understand the requirement.

If some of the online job portals are observed, when the profile is updated as a fresher, they will show the jobs with one year experience, if it is updated with one year, the job results will show with the experience of the 2+. In this way the people who seeking the job change are not getting the right offers.

The real time applications with chat bot can solve the problem as many researchers thought the same. Well that's not that easy to understand the machine which can track the information related to the actual user inputs. The inputs given to the machine will be tracked for the further reference. This kind of reference will make you to understand the requirement of the users and chat bot will give the best out of the condition.

IV. EXISTING APPROACHES

There are different existing approaches, which are speaking about the bot, where it is performing job-based analysis and service. The performance of the bot will be based on the user criteria. The purpose of the bot needs to be specific and dynamic.

Several existing methodologies are working on the chat bot. In early stage of artificial intelligence, a medical chat bot can be used to perform the task like understanding the human symptoms by different questions. The questioning process will be based on the symptoms input we gave to the machine it will identify the disease[9].

There is another methodology in job identification mechanism by using the chat bot in recent times, which is asking about the experience in a specific field and trying to get the related postings on the platform to the user. But it fails to understand what is there in the resume and whether it is matching with the inputs given by the user or not. The comparison between the resume and the contents mentioned in the profiles must be performed for the better understanding of the requirements of the user.

Some of the applications of chat bot are trying to force the user to choose the contents only mentioned by the owner of the application, but the search results and the operations will not be based on the requirement of the application. The requirements must match with the concepts mentioned in the resume. The same thing will apply in all aspects of analyzing the content.

Different applications are there and real-time applications on internet is having this kind of chat bots. For example, the COVID – 19 application is considered, where it asks the symptoms of the user and identifying whether the

patient is having the virus or not. In the same way some applications are already available but the major difference is when there will be difference in the title of the job or the query and the required answer. There will be rapid difference in all these things. It is required to process the information based on the accurate requirements and in this position, it requires machine learning methodologies [8].

V. PROPOSED SOLUTION

In this work, we developed an interactive chatbot for a company SonuAppz (This name is taken only to understand the work more clearly) and the workflow of the proposed solution is shown in Fig 1 and in section V. The flow starts with the user interaction. The user can type any message, let's say "Hi". If the text is not a formal question, then the bot responds with the available options like menu it handles as shown in Fig 2. The user can tap on the option "Explore with me" before searching for a job to know more about the company as shown in Fig 3. This option helps the user to understand the work culture and company benefits like leaves, policies, growth options in the company etc. Now the user can select the "Search Job" option and the bot responds as shown in Fig 4.

If you observe Fig 4, the user can find jobs by entering a job type like Sales, Marketing or he/she can find by location by providing his/her location. To get the location, click on the button "Based on location" which will open the map and allows the user to select a location. If the user doesn't find any jobs with these two options or he/she is not clear which job fits him/her, then he/she can select the option "Assist me". When the user selects this option, the bot will ask a few questions like his current organization, job category etc. and suggest the relevant jobs if any[10-11].

The application developed working on different approaches on the single entry. When the user enters into the chat section it will ask for the different things being provided by the application provider or the service provider. Then it must activate the segment that query belongs to. For an instance consider that the user requires some answer to the important question, which is not related to the job. For an instance if the user requires some information related to the acceptable notice period of some organization, need to check with FAQ section. After selecting that section, it will show the pre-defined questions for the user to answer those. Then it will check the information requested by the user and process it as the important query and make it valid after validating the user inputs. The architecture following here is in three ways. But it will connect to the specific DB according to the selection. As mentioned earlier, if you choose FAQ, then it will connect to the FAQ DB then process the requests further. In each case we have individual DB's for the processing and the requests are processed according to each step we have chosen[13].

The NLP will work on the different methodologies. If the request is regarding the job assistance, then it need to understand the concept behind question posed by the bot to the user and it has to understand the insights of the resume. The chat bots must work on the sentimental analysis. Because, a chat bot's job is not only giving the result for the searched query but also to understand the important things related to an organization and also related to the company. The main agenda here is to understand the user inputs in the form of reviews. If the review of a certain thing is not given properly, then the application developer need to look over the concept of language processing and need to compare the real quality of the product and the review given by the user on the same product. Some of the competitors will make a fake review on the genuine product or the application, then we need to make the model to understand such kind of issues. In the same way, if any employee was hired from the organization and gave some bad report intentionally on the open platform, then it may create the problem monitor the exact meaning of the application. The next section will deal with the result analysis of the application developed [14].

Different applications are available on the same kind of concepts, like application development using chat bot and managing the organization activities with chat bot. but there is a situation where chat bots are failed to develop the user-friendly environment for the users. Even the search engine fails to give the accurate result some times. The proposed systemwill separate the positive and negative cases in the user input and check the compatibility with the query available in the repository and compute the operation [15].

Searching for the job is not a simple task. We need to understand the user requirement in and out. The process of implementing the proposed approach satisfies all the requirements based on the users input justification with both positive and negative instances.

NLP is the common approach of machine learning to design the chatbot process. The NLP will work based on the corpus and the reality will be based on the user inputs. Corpus is having the positive and negative words. But NLP the proposed method working on is to analyze and reduce the negativity in user search.

The query the user posed will be compared to the existing openings in the repository and there will be comparison portion using NLP which will identify the accurate keywords of the search should the user need to ask and search process will be refined internally.

VI. RESULTS

Chatbot is implemented to meet the user requirements to find relevant jobs and information of an Organization. This section shows some screenshots of the developed chatbot, which help to understand this paper better.

Rather than the content mentioned in the previous section, we also need to look over the following results of the application SONU APPZ. This application can be worked with different approaches and priorities. This application was developed to make the user to get the better job chances and the application will give the accurate responses to the users to get the accurate result.

This kind of applications are not developed by using the filters. This is an artificial intelligence application which can hold the values.

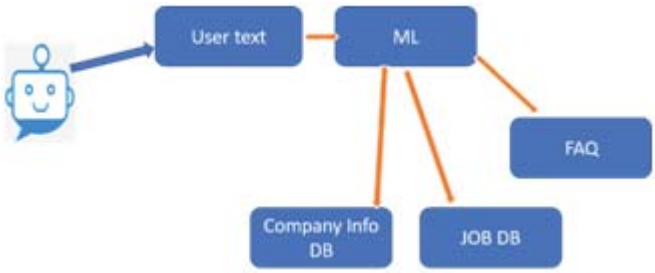

Fig. 1. Chatbot Workflow

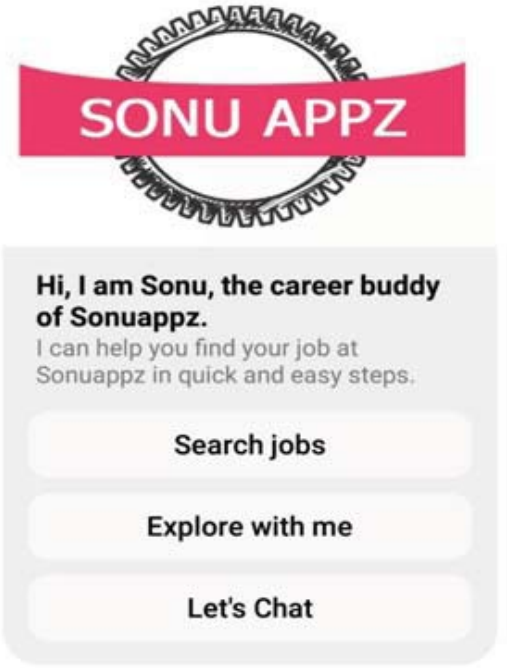

Fig. 2. Features the bot offers to user

Fig. 3. Options to know about the company

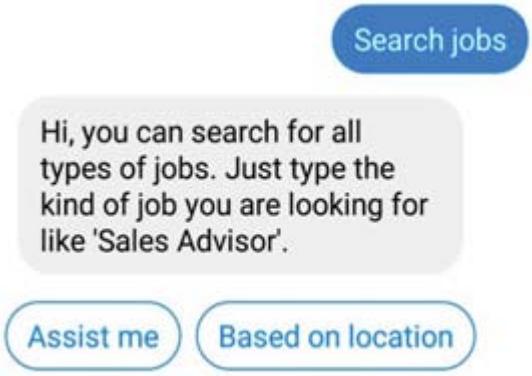

Fig 4: Chatbot response for Search jobs

VII. CONCLUSION

The chat bot applications are most required thing in the development of an organization. In the current application, there is an interaction of the user and a model to understand the insights of the user inputs in the form of question and answer. Natural language processing is the major mechanism adopted in this application. Lemmatization and stemming are the key concepts to discuss about the process of having a perfect chat bot. In this application, the user needs to select the type of communication from the service provider, then it performs the operations like data manipulation, and data addition in the application. Everything is based on the user inputs based on the selection. This application is mostly used for the better implementation of the job-oriented platform by using chat bots instead of struggling for the job search.

References

[1] G. Eason, B. Noble, and I. N. Sneddon, "On certain integrals of Lipschitz-Hankel type involving products of Bessel functions," Phil. Trans. Roy. Soc. London, vol. A247, pp. 529–551, April 1955. (references)

[2] J. Clerk Maxwell, A Treatise on Electricity and Magnetism, 3rd ed., vol. 2. Oxford: Clarendon, 1892, pp.68–73.

[3] I. S. Jacobs and C. P. Bean, "Fine particles, thin films and exchange anisotropy," in Magnetism, vol. III, G. T. Rado and H. Suhl, Eds. New York: Academic, 1963, pp. 271–350.

[4] K. Elissa, "Title of paper if known," unpublished.

[5] R. Nicole, "Title of paper with only first word capitalized," J. Name Stand. Abbrev., in press.

[6] Y. Yorozu, M. Hirano, K. Oka, and Y. Tagawa, "Electron spectroscopy studies on magneto-optical media and plastic substrate interface," IEEE Transl. J. Magn. Japan, vol. 2, pp. 740–741, August 1987 [Digests 9th Annual Conf. Magnetics Japan, p. 301, 1982].

[7] M. Young, The Technical Writer's Handbook. Mill Valley, CA: University Science, 1989.

[8] "Anatomay and utility of an artificial intelligence conversational entity", Anirudh Khanna et al, 2015, IEEE conference

[9] Evaluation of authorship attribution software on a chat bot corpus, Nawaf Ali et al, 2011, IEEE

[10] "Absolute Answerability In The Era Of Artificial Intelligence And Machine Learning: A Talent Management Perspective", Preethi Keerthi Dsouza, 2019, IEEE.

[11] "Intelligent Chatting Service Using AIML", G. Saqib et al, 2018, IEEE

[12] "AI Based Chat-Bot Using Azure Cognitive Services", Kapil Tajane et al, 2019, IEEE international conference

[13] "Artificial Intelligence Based Solarbot", Sayali Patil et al, 2018, IEEE

[14] "HR Based Interactive Chat bot (PowerBot)", Shabana tadvi et al., 2020, IEEE

[15] "DocChat: An Information Retrieval Approach for Chatbot Engines Using Unstructured Documents", Z. Yan et.al, 2016, Proceedings of the 54th Annual Meeting of the Association for Computational Linguistics Volume 1, DOI: 10.18653/v1/P16-1049.