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Automatized Medical Chatbot (Medibot)

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***Abstract*—Automatized medical chatbots are conversationally built with technology in mind with having the potential to reduce efforts to healthcare costs and improve access to medical services and knowledge. We built a diagnosis bot that engages patients in the conversation for their medical query and problems to provides an individualized diagnosis based on their diagnosed manifestation and profile. Our chatbot system is qualified to identify symptoms from user inputs with a standard precision of 65%. Using these extracted diagnosed symptoms correct symptoms were identified with a recall of 65% and a precision of 71%. Finally, the chatbot returned the expected diagnosis for further more operations. This determines that a medical chatbot can provide a somewhat accurate diagnosis to patients with simple symptom analysis and a conversational approach, this suggests that an effective spoken language medical bot could be viable. Moreover, the relative effectiveness of this bot indicates that more proceeds automated medical products may flourish to serve a bigger role in healthcare.**

Keywords—Human-machine interaction, Chatbot, Medical Chatbot, Natural Language Processing, Machine Learning, Bot

I. INTRODUCTION

An automatized medical chatbot is a system with human interaction using natural language diagnosis to provide medical aid. The vast amount of information that is available on the internet allows chatbots to provide accurate and systematic statistics based on the user's demand and requisite. Chatbots are used in domains like Customer Support and Services, Virtual Assistance, Online Trainers, and Online Reservations and also for general conversations.

We built a diagnosis bot that engages patients and explains their state using natural language. The bot inquires for relevant particulars, e.g., name, age, etc. and appeal for symptoms. Our bot can withdraw patterns from messages using AIML (Artificial Intelligence Mark-up Language) based on XML (Extensible Mark-up Language) to strengthen AI (Artificial Intelligence) applications [1]. The structure asks progressively more specific questions in order to obtain a good diagnosis. The three primary components of our system are:

- recognition and drawing out of symptoms from the discussion with the user.
- accurate detection of extracted symptoms to documented symptoms in the database.
- developing recognition as well as referring the patient to the most appropriate specialist if necessary.

The system was also compared to popular chatbot available.

Our motive is to show that the proposed medical Chatbot could be a better alternative to many already existing bots in the domain of medical science.

II. EASE OF USE

The system bases on the conversational data that the user provides during the conversation. The idea behind this is to focus on the preliminary symptoms and the problems that the user may be experiencing. After the automated medical chatbot has collected enough data from the initial conversation, it now forwards the conversation by asking questions to the user and trying to review diseases by converting the input data into queries and execute it to gather the solution of illness that the user might be suffering from [2]. After the bot has shortlisted the possible diseases that the user may have according to rank to the possible diseases that the user may be suffering from [11]. The Chatbot starts questioning the user about how the user is feeling. Once it gets a desired amount of data it finds the most likely disease that the user may be suffering through according to the input data [5]. After the bot has found the disease that the user is suffering through, it measures the seriousness of the illness and acts accordingly either by suggesting remedies and medication to the user [3] or by connecting or suggesting the user to the doctor if the measure hits the predetermined threshold value [11].

The creation, validation, and maintenance of the detailed medical knowledge base follow rigorous and well-established procedures [11]. The content development process is divided into segments, as outlined in the diagram below "Fig.1".

Stages include:

- defining the scope of the desired changes,
- obtaining specialist knowledge based on the reports and other available sources,
- specifying test criteria,
- performing manual and automated acceptance tests,
- installing the certified model to the API.

The system not only diagnosis the patients but can also detect the disease or illness of an individual by the symptoms provided by the individual [6]. The process can be systematically recurrent with automated regression tests to shield the stability of the procedure [11].

III. UNDERSTANDING PATTERN DETECTION USING SNIPPETS

<pattern>I am not feeling well</pattern>

<pattern>I am sick</pattern>

<pattern>I am feeling sick</pattern>

Fig. 1. The content development process of bot

If we consider the above three patterns, our Chatbot would look for these pattern utterances in the messages provided by the user and if the pattern matches the messages, the Chatbot would proceed further [12].

<pattern>Tell me remedies for *</pattern>

<pattern>what medication I should take for *</pattern>

<pattern>Tell me cure for *</pattern>

In the above snippets, the pattern suggests that the user already knows the problem he is suffering from and he just wants to know the medication and cure for the problem [10]. Star "*" here refers to the illness/disease the user is talking about. Our bot will check if the initial part of the message is "Tell me remedies for" followed by the disease name (star). Then the name of the disease (star) would be submitted to the bot engine.

Example-

<pattern>Tell me remedies for *</pattern> Suppose the user types-

User: Tell me remedies for Migraine Pain

Here Migraine Pain takes the place of the star "*" in the pattern – Tell me remedies for "*".

The illness "migraine pain" will be submitted to the Chatbot engine to get remedies for

Migraine Pain.

<pattern>I am feeling like *</pattern>

<pattern>I am having *</pattern>

<pattern>I am suffering from *</pattern>

In the above snippets, the pattern suggests that the user has no idea about the illness he is suffering from and all he can tell the Chatbot is how he feels [10]. Here star "*" refers to the desired symptom, the user is talking about. Our Chatbot will check if the initial part of the message is "I am feeling like" followed by the symptom (star). Then the disease symptom (star) would be submitted to the bot engine, this can be seen through the "Fig.2".

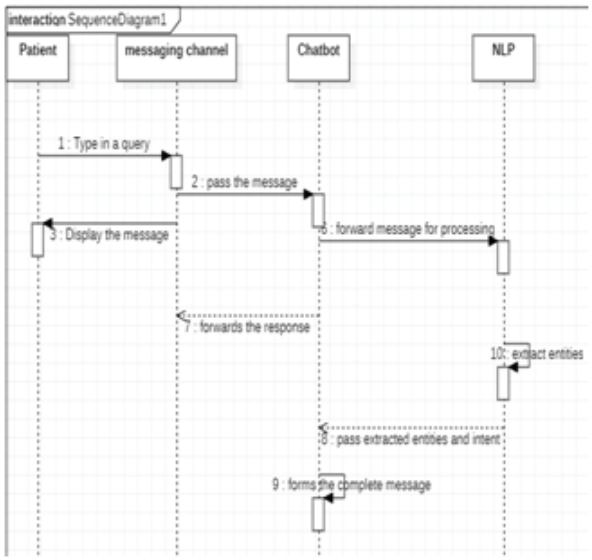

Fig. 2. Sequence Diagram

Example-

<pattern>I am suffering from *</pattern>

Suppose the user types-

User: I am suffering from headache

Here headache replaces star "*" in the pattern – I am suffering from "*".

The initial symptom "headache" will be submitted to our Chatbot engine to help the bot proceed further to know the exact illness [10].

Assuming that the bot engine is hosted on a web server and interacting with the REST APIs using the GET method. Systematic designs allow the engine to generate desired responses [7].

IV. RESULT

Analysis of work performed on data of different domains and sizes for inquiring about the disease of a patient. The different algorithm requires time for training and testing and accuracy may also vary in the different algorithm [12]. By training the dataset of different count we get the class-wise distribution of the record. Algorithm K-nearest neighbor (KNN) and naïve handles only fast and simple classification while SVM holds good command over complex classification tasks [12].

SVM if faster to train with respect to the best feature space size so that the performance is also increased for mid ranges that can be seen in "Table I" and plotted graph comparing different algorithms can be found in "Fig. 3".

TABLE I. ALGORITHMIC COMPARISON

Table Head	Comparison of Algorithm			
	Algorithm	Disease Count	Answer Accuracy	%Accuracy
1.	SVM	150	142	0.9466667
2.	KNN	150	133	0.8866667
3.	Naive	150	120	0.8

Development results of application software can be seen in "Fig. 4.". After the diseases are spotted according to the symptoms by the engine, then in the desired format the result will be reflected in the application [8]. The gisted diseases are provided by the engine according to the symptoms provided by the user, and the engine fetches the disease out by asking questions to the user in a linear fashion [9].

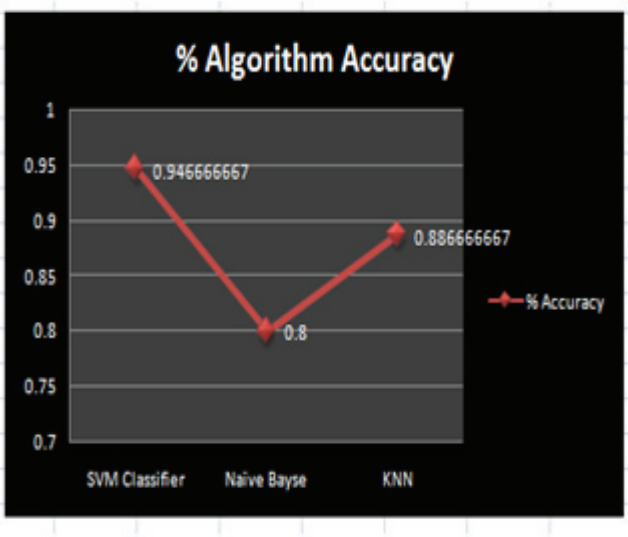

Fig. 3. The plot of Algorithm Accuracy after comparison of the different methods

Fig. 4. Development result of application software

V. FUTURE WORK

Looking forward to the future developments and updates include the accuracy of the result with adding some new features that enhance the task and performance of the bot. It also includes the removal of the rank-based algorithm with some alternative algorithm so that the performance of the can be improved and taken up to the next level.

The system will also be designed for image recognition and sentimental analysis. This feature will boost up the chat-bot quality and will also grab the minute details from the image, which may later be proven as important during diagnostics and can help in making a better decision. Image analysis will put down the burden on the radiologist present everywhere and no need to scrutinize images again and again for fetching details, as the details could be fetched altogether at once by the AI system. This also proposes to have better results as it focuses on every small detail and this results in taking a better decision in critical situations.

Fig. 5. Analyzed image of human hand

As shown in "Fig. 5" that the x-ray image of the human hand could be analyzed and every minute detail could be taken out of the image so a better decision could be taken at critical situations.

VI. FEEDBACK

For the effective appraisal of our work, our center of attention was on the unique questions. Our testers establish that it was clear what variety of input they needed to give, and the carry-out questions were well-governed. They also felt like it was apparent what the bot understood and processed their inputs appropriately. No latency in the system working was noticed during testing. Given additional polished symptom detection, a user mentioned that it would be very effortless and productive to continue using the bot.

VII. CONCLUSION

We advanced in developing an automatized medical chatbot that layout personalized recognition based on symptoms. This bot utilizes an external, closed-source recognition engine, so in order to upgrade the functionality of the diagnosis, it may be obligatory to develop an engine from scrape or find discover another asset that holdup expansion that can be useful in the long run.

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