



Chat-bot: An Information Retrieving for Myocardial Infarction and Diabetes

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ABSTRACT

Medical information is being very important type for clinicians. We aim to build clinical chat-bot which holds information about diseases namely diabetes and heart diseases. Chat-bots are designed to make people feel they are interacting to a human for their related queries rather to believe for machine feelings. These chat-bots are computer program coded to build textual and conversation which are intelligent and gives us logical replies which are already learned. This research focuses to design such type of bot which act on two said major diseases so the working chat-bot will provide interaction between machine and man where machine will function as a virtual doctor here chat-bot will play a leading role by working as a virtual assistant and skipping the gap between patients and clinicians.

Key words: chat-bot; assistant; treatment; symptoms; diagnose

1. INTRODUCTION

People need health support before or after hospitalization for best cure. Therefore, the simplest way to provide a dialogue system where problems are listened and assisted is chat-bots which lower the real agent's burden and automate our work. The motive to build this system is to provide platform to those patients who have queries for their domain related disease and want to evaluate through open discussion where they can be medicated if needs. The basic architecture for our model to focus on patient area where they can easily communicate and share their related problems freely so that we have worked on closed domain. The system follow pattern when user ask any query, machine will search for matching keywords between the user query and the query answer modules feed in their knowledgebase and it will retrieve corresponding answers, to implement this idea we have made machine learned all possible answers which user can ask, if machine will not recognize any of the question it will show default answer. To work on our idea we have used Dialog-flow to design chat-bot where we have stored data which covers all the related areas of described diseases like disease diagnoses, treatment, medication and diet. To propose this idea we have focused on all possible and accessible environment for users. User will get most suitable advice for their diabetes condition, in order to clarify the diagnosis, virtual doctor will ask several

variant answers which user expects often. Facebook

Messenger is a platform which we integrate to get questions once user in interaction and those questions will be selected answers based given by the patient. This shows chat-bots need to know the conversation flow to predict where patient actually lies and how a virtual doctor can be supportive to patients.

2. METHODOLOGY

The basic architecture is designed under dialog flow as it provides natural language processing (NLP) and natural language understanding (NLU) services, though it is helpful for integration with messaging platforms such as Facebook. The basic idea for our research is defined through figure which clearly explains our domain of research and approach modeling. We aim to build an interactive chat-bot which will have a casual chat to find out patients queries for diabetes and cardiology. This is really very helpful in terms of time consuming, it works effectively and we may not need to wait a long to acquire our problem solutions but we will be answered then and there. The system we proposed are nonlinear dialogues which are history and context aware question answers. Facebook messenger is a platform which helps in interaction that how message is sent to machine functioning as a virtual doctor to read query and fetch answer from learned data. Each question bears own values and parameters as it diagnoses the actual suffered disease as per symptoms defined by user when he/she is asked. This chat-bot not only welcome those who meets their symptoms newly but cherished all types on the behalf of their previous reports come under diabetes and cardiology. Here we not only diagnose but medicate the visited patients too, they may be recommend towards proper diet to avoid revisit of clinics

2.1- Retrieval-based methods

This method retrieves data from existing set of values [11] mostly this type of method supports that data which is already been fixed in repository and the given command has to fetch from its stored data while matching similar keywords as per machine's intelligence.

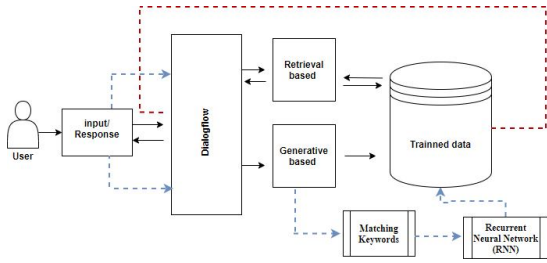


Figure 1 The schema of chat-bot. Red segment enhanced data responding while blue acquires request continuity.

2.2- Generative-based methods

Generative based methods which usually act as encoder-decoder framework [11] this method totally relies between the two recurrent neural networks (RNN) where variables are cheesed to fix length vectors and target length sequence as well.

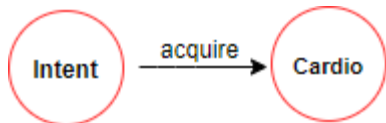


Figure 2 (a) functional property

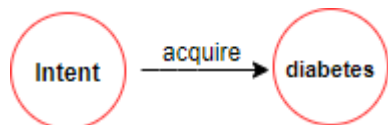


Figure 2(b) functional property

Dialog flow

To prosecute our idea we have used Dialogflow past api.ai, where developer experienced different questions with different ways to transform training phrases so the more modification to the intent can assimilate better to the user. The data we learned to the bot to determine how it retorts on user’s questioning. For this we have construe various entities concerning diabetes and cardiology to know important detail of the question. Context controls parameter values which plays substitution role for conversation.

2.3.1- Dialog flow Intent

Intent is basically our intentions that we inquire about our domain, here we have submitted different intents related to diabetes separately cardiology, these intents are already been learned to the machine in multiple ways to get better result. Here we can manage different intents which may deal in different chunks of communication between user and machine for better result, our fixed intents may give a needed exposure to the user for which they actually needed

to meet chat-bot.

Agent

To access it we can create an Agent on Dialogflow for clinicians. To reach on domain which we are working on.

Dialogflow Entities

Entities are essentially keywords to assure the call by user as per their query for identification and extraction useful data from the given input. It only picks particular

Training Phrases

This step in Dialogflow provides how we can add our data or trained our system in various ways. Training phrases helps to fix sentences in multiple ways from user perspective that how a user can access for any related query. This segment is basic where we need to work and trained our system to work more efficiently.

Response

Dialogflow provides responsive environment where we can check our queries response either it sends accurate answers or not. Here we can be assure with the build system’s intelligence and working status.

Facebook Messenger

Facebook messenger is a platform where we have integrate our Facebook messenger with Dialogflow technology to act on asked questions. Initially we need to add a test button whichwill display a chat-bot where we can inquire our questions which we have already learned to machine, for better result we have seek multiple questions with variant ways to audit either it supports all queries or not.

3.LITERATURE REVIEW

In the literature, the most relevant work in this domain is carried by[4] Designing a Chat-bot for diabetic patients where they proposed an idea of virtual diabetic doctor which will search results feed in data set against relevant questions ask by patients. They used a technique which makes chat-bot learn for past history as per their routine activities [4]. Chat-bots work as a virtual human to whom you are in contact to get knowledge of your domain. Diabetes and cardiology covers past decade build bots which somehow works at limited areas. To hustle patients basic requirement called symptoms machine will judge accordingly and will suggest corresponding answers. Moreover we have spotlight on Diabetic patients with high risk of readmission to focuses on patients timely discharged specially hospitals who should facilitate proper treatment it will reduce the rate or readmission of patients [6] Moreover diabetes

is more associated for risk factor to various body organs. Diabetes cardiomyopathy attacks heart muscles in diabetic patients, the paper proposed to get basic treatments and results. [9] The past research on these areas have highlighted most of the areas individually. Our surveyed for currently working chat-bots in different countries like a London based application named Your.MD is a symptom checker which is interacting with patients through text and voice, they need to produce because it reduces burden of medical staff. Same as Sensely which works as a virtual nurse, it diagnosis specific chronic disease like diabetes and heart failure. It supports five minute call to directly connect with nurse and may confer on ongoing style behavior to promote health. Florence agent also work as a virtual nurse which only detect nearby clinics to the patients and set the appointments for them. Another application Molly which assist as an advisory nurse assistant which relate patients with clinics. Buoy Health applications also supports nearest clinicians to the patients Eva supports women tracks like menstrual cycles and pregnancies.

3- Evaluation

In our system we have designed two distinct approaches which modify question/answer and conversational flow for both major diseases. These both approaches have equal distribution in domain with all good send knowledge.

Table 1 Training and Testing

Intent	Training	Test	Σ
GETCURRENT STATUS	14	28	42
GETCHECK-UP RESULTS	18	22	40
GET DIET MORE	22	10	32
GET DIET STATUS	17	29	46
GET DISEASE	19	16	35
Σ	90	105	195

Evaluation Criteria

Detailed results of Evaluation on each intent and entity are shown in tables which have different aspect for each intent and entity designed for chat-bot. Where for each intent and entity row is based on true positive true negative false positive and false negative from where precision recall and F-Score have been calculated. High level perspectives LUIS with remarkable score of 0.916, RASA 0.821, Watson Conversation 0.752 and Api.ai 0.687[17]

Table 2 Accuracy Table

APPROACHES	ANSWER ACCURACY	SIMILARITIES	EFFECTIVENESS	SENTENCE STRUCTURE	FOLLOWUP QUESTION
QUESTION ANSWER SYSTEM	3	2.2	2.5	2.7	2
CONVERSATIONAL FLOW	3	2.5	2.9	3	1

Evaluation Measurements

To predict high-risk patients we have built a system that will identify correct patients fraction (Recall) without large number of false patients (high precision), here ROC curves are used for result declaration of problems.[1] ROC gives more information when working on huge dataset as we have gathered. Precision P is positive friction for all positive evaluated values in example Precision= (TP/TP+FP) Where TP stands for True Positive and TN stands for True Negative respectively. Recall= TP/(TP+FN) here FN stands for False Negative.

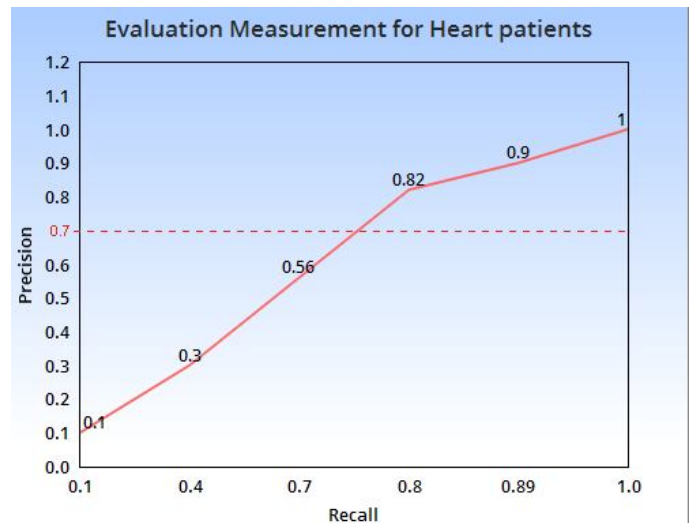


Figure 3 Evaluation measurements for Heart patients

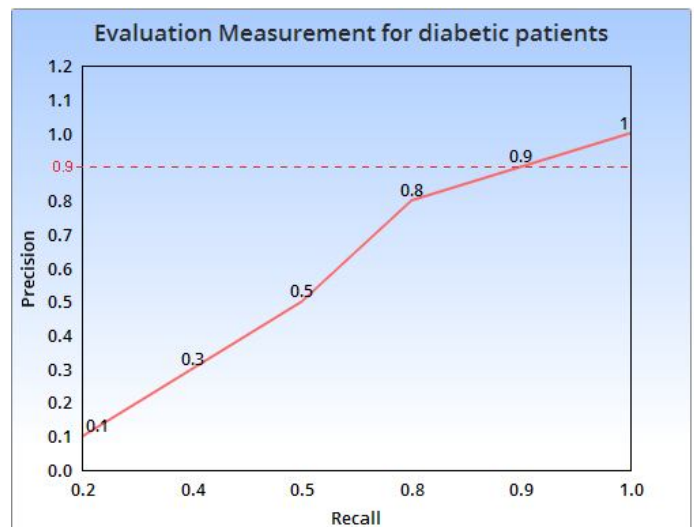


Figure 4 Evaluation measurements for Diabetic patients

F1 Score

The function for precision and recall needed to find comparison between precision and recall as it is more useful than accuracy. If we have different values of false positive and false negative it is good to run precision and recall, here F1 score for diabetic patients is 0.9 and 0.7 for heart patients. $F1 = \frac{2 * Precision * Recall}{Precision + Recall}$ Here, our first labeled model show all the possible values at response against questions that has near perfect accuracy, same we have labeled results with slight modification for Heart patients.

4.CONCLUSION AND FUTURE WORK

Here chat-bot is a clinical assistant for diabetic and heart patients which is used to assist there disease symptoms (DS), disease diagnose (DD), disease treatment (DT), and disease related diet (DRD). This states the accomplishment of research loop in recent times, furthermore we can extend the same approach for more diseases hence the chat-bot can be more efficient to work on image detection base for reports.

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