

# Efficient Chatbot Designing (for Checking Symptoms and providing medicine)

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**Abstract** - In recent years, conversational chatbots have become very popular. Chatbot is a computer programs which simulates human like conversations. It is relatively new and the rise of AI is introducing new developments. Communicating with customers through live chat interfaces has increased day by day to provide real-time customer service. Today manual services are rapidly replaced by chatbots. The early development of AI based chatbots was difficult but now it has become easier because of availability many libraries and tools. The implementation of chatbots have increased but fails to satisfy the user's requests. The frequent questions asked by chatbot makes the user less inclined to use it. AI chatbots imitates human responses, but still far from imitating human emotions. Many users want to connect with chatbot like they are humans but that is not yet possible with AI chatbots. Chatbots have been used in many fields like education, healthcare, e-commerce etc. They are used for specialized tasks like hiring cab, checking weather, purchasing orders. Using chatbots in mobile apps enables the creation of more streamlined user interfaces. It allows users to get support from a single interface. In this survey we have discussed and addressed different techniques used for building a chatbot using state of the art technologies. This will help us in building an efficient chatbot design.

**Index Terms** - Chatbot, Natural Language Processing (NLP), Neural Network, Symptoms, Medicines.

## I. INTRODUCTION

Conversational agent or Chatbot is a program that generates response based on given input to emulate human conversations in text mode. Now-a-days human interaction with digital devices has become common which led to the development of a chatbot. Users want their answers quick and meaningful. A normal human does not have ability of quick guiding. And hence lead the creation of chatbot. One of the main goal of Chatbot is to resemble the intelligent

human and efficient in answer. Our chatbot is based on medical information gathered from different online sources and databases. It's an application that takes queries from the patient related to diseases and gives them answers based on their questions and symptoms, suitable information of particular medicine, offering solution for medical issues. The purpose is to have a smart, accurate, and real-time conversation with the patients.

The reason we selected this topic is to make patients who are suffering from medical illness and not able to consult doctor at a time or who want to know the reason behind their symptoms and causes and also to get immediate answers for user questions posed as input query. The chatbot answers similar questions that medical professionals may have answered.

It can be improved in the future to take care of oral conversations.

## II. LITERATURE REVIEW

The rise of artificial intelligence is introducing many new developments. Chatbots are one of the first examples where AI can be applied in practice. The behavior of bots where AI is applied differs enormously from the behavior of bots where this is not applied. Examples of several organization using chatbots for increasing their business include Lyft, Fandango, Spotify, MasterCard, Staplesx and the Wall of Street Journal.

### 2.1 Evolution of chatbots:

There have been many chatbots developed over the years here are few of them:

A) Eliza: This was the first chatbot developed all the way back in 1966[2]. It was recognized as the first program capable of passing the Turing test. Eliza's model has predefined responses which were matched with keywords got the input text.

B) PARRY: Another well-known chatbot is PARRY [3], introduced by Kenneth Mark Colby, a psychiatrist and computer scientist, at Stanford's Psychiatry Department in 1972. It tries to provoke controversies and thus make the participant give more elaborate answers.

C) A.L.I.C.E: Artificial linguistic internet computer entity[4] is a free chatbot developed in 1995. It was implemented in SETL language and migrated to java. The current version of the bot is called program D. It uses AIML[5], a dialect of XML for creating chatbots.

D) Jabberwacky[6]: Designed by Rollo Carpenter. It is meant to be humorous and entertaining. The creators said it does not have any neural networks or and is purely based on heuristics-based technology.

E) New era: In 2001 there was evolution in chatbot technology with the development of Smarter Child[7] (Molnár & Zoltán, 2018). It was first time that a chatbot could help people with daily tasks as it could retrieve information from databases about movie times, news. The launch of Siri in 2010 as a virtual assistant paved the way for other assistants like Cortana (2015), Alexa (2015).

### 2.2 Types of chatbots:

K Jwala et al.[9] discussed types of chatbots in their paper. Two classes of chatbots based on the information they are:

A) Conversational chatbots: Designed for fun purpose. Chitchat bots don't have any target and are focused on general conversation, task-oriented bots are used for completing specific tasks.

B) Domain based chatbots:

i) Open domain: Designed to answer any question. Eg. Cortana, Alexa, Google assistant.

ii) Closed domain: Designed for a particular area of interest, like track a product that you have ordered.

### 2.3 AI based technologies used for making a chatbot:

Agarwal et al[10] had discussed various neural network technologies used in their paper.

A) Recurrent Neural Network (RNN): RNN allows the data to persist. RNNs have been used extensively for various purposes like language translation, modeling speech recognition, etc However, the unmodified version of RNN is not used much because it suffers from vanishing gradient problems[11].

B) Long Short Term Memory (LSTM): LSTM[12] uses identity as its activation function whose

derivative is 1 which prevents the back propagated gradient to vanish with the help of 'gates' (0,1). A value of 0 means not to let anything pass through and 1 means let everything pass. LSTM does the task of remembering the gender of the subject, so that the chatbot can use 'his/ her' depending on the previously remembered input.

C) Seq2Seq: In Seq2Seq[13] two RNN are used for input and output sequences. Second RNN sets its initial state according to this vector. In the case of chatbots, this technique can easily be used with slight modification by considering input sentence as the source language string and its response as the element for target language string.

### 2.4 Neural network based methods for chatbots:

Vyas Ajay Bhagwat[8] investigated two types of Neural Network chatbot development methods by generating the response from scratch or by retrieving responses from large datasets or combination of both.

A) Retrieval-based Neural Network: These types of models have existed traditionally as rule-based answering systems. Previously many sophisticated models stored the context of conversation, generating multiple responses based on the context, evaluating each response and outputting the response with the highest score. Retrieval-based systems are now coupled with Deep Learning techniques to provide more accurate responses.

B) Generation based neural network: Generation-based Neural Networks, do not rely on fixed responses. Responses are based purely on machine learning and training data. In this method a predefined template is used like ("What about", "I'm not sure about"). The sentences are then completed using the user input and context. These models are currently being researched to work reasonably well

### 2.5 Metrics used to evaluate chatbot performance:

A metric is a quantifiable measure that is used to assess the business process. Some metrics help in designing an effective chatbot are:

A) BiLingual Evaluation Understudy Score: BiLingual Evaluation Understudy (BLEU)[14] score is a method that is used to compare a generated sequence of words with reference sequence. BLEU score was proposed by Kishore Papineni in 2002 and was initially developed for translation task only.

The advantages of BLEU score are:

- It is easy to calculate and inexpensive
- It is language independent
- It correlates highly with human evaluation

The higher the BLEU score, the more intelligent the chatbot.

B) Turing Test: Turing test[15] was developed by Alan Turing in 1950, which is used to test the ability of machine that exhibits intelligent behavior equivalent to human. If the tester is unable to distinguish the answers provided by human and machine, then we say that the machine has passed the turing test.

C) Scalability: A chatbot is more scalable if it accepts huge number of users.

D) Interoperability: Interoperability is the ability of a system to exchange and make use of information. An interoperable chatbot support multiple channels.

E) Speed: Regarding speed, the response rate measurement of a chatbot plays an important role. Quality chatbots delivers responses quickly.

### III. PROPOSED SYSTEM

#### 3.1 Working of the system:

The user will select one of 4 options available to him. Then the input will be sent to the flask server. The respective module will be invoked according to the options selected. The deep learning model find relevant response. If no match is found, user will receive response accordingly.

The functionality of the system is as follows:

1. Medicine from symptoms or disease:
  - a. User inputs symptoms or a disease
  - b. Symptoms or the disease is matched from the knowledge base.
  - c. Medicines for those inputs is suggested.
2. Disease from symptom:
  - a. User inputs their symptoms.
  - b. Symptoms are checked against diseases in the knowledge base.
  - c. List of diseases are selected.
3. Symptom for disease:
  - a. User inputs their disease.
  - b. Disease is matched from the knowledge base.
  - c. Symptoms for a particular disease is shown.
4. To gain insight on any medicines:
  - a. User inputs the medicine name.

b. The name is matched against the knowledge base.

c. All the details of the medicine can be viewed

#### 3.2 Flowchart

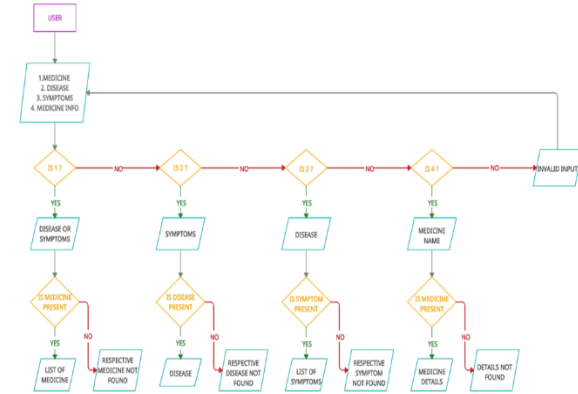


Figure 1: Flowchart of Chatbot

The figure 1 above represent the Flowchart of the chatbot. A 'Flowchart' is a visual depiction of an algorithm. The steps of the algorithm are represented in a flowchart as various forms of boxes, with interconnecting arrows indicating the logical flow. Different operations are represented by boxes, and the sequence of these operations is shown by arrows. Because this is a visual depiction of an algorithm, it aids the programmer/tester in comprehending the logic of the program.

#### 3.3 Sequence Diagram:

The figure 2.1 and 2.2 above illustrates the Sequence Diagram of the chatbot. A sequence diagram simply displays the order in which things interact, or the order in which these interactions occur. Sequence diagrams show how and in what sequence the components of a system work together. Businesspeople and software engineers frequently use these diagrams to describe and understand requirements for new and current systems.

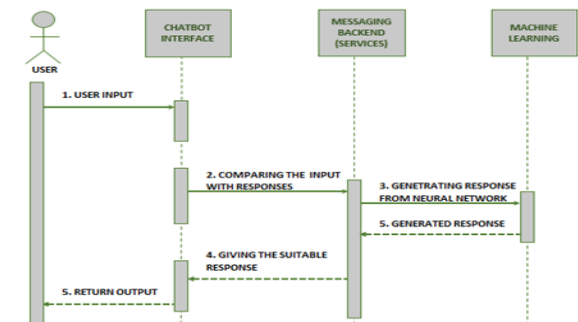


Figure 2.1: Sequence Diagram of User

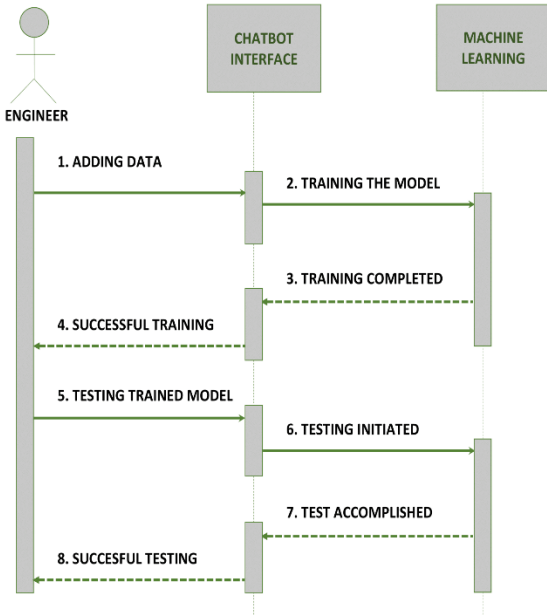


Figure 2.2: Sequence Diagram of Engineer

**3.4 Architecture:** The figure illustrates architecture of the chatbot. The interface is where the user will be interacting with chatbot. The server layer will contain the template responses and the deep learning models. If input message doesn't correspond with any responses, template responses will be given. The message is first tokenized and then feed into Neural Network

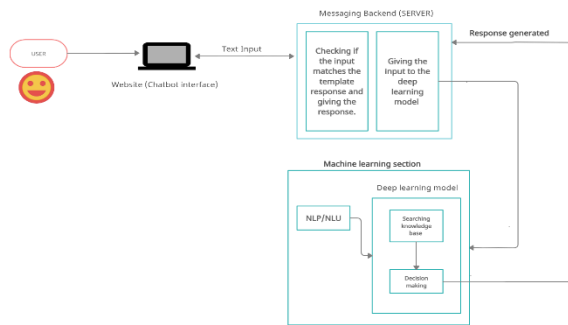


Figure 3: Architecture of the Chatbot

**3.5 Use Case:**

The figure 3 below portrays the Use Case of the chatbot. Use-case diagrams are used in UML to represent a system's behavior and to record the system's needs. Use-case diagrams depict a system's high-level functionality and scope. In use-case diagrams, the use cases and actors define what the system does and how the actors interact with it, but not how the system works inside.

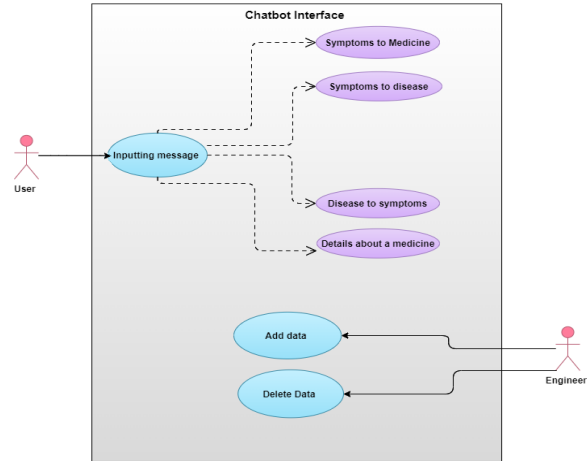


Figure 4: Use Case Diagram of Chatbot

**IV. CONCLUSION**

In this research we have studied about the state-of-the-art technologies for making AI and NLP based chatbot. It has been said that chatbots are supposed to be very user friendly, this is so because the user can type in their own language and the chatbot can guess what he/she wants. The emerging Artificial Intelligence field has increased the service experience of the customer as it satisfies the need of the modern generation, especially in the medical field. Although a machine can never be right 100 percent of the time. The responses are heavily based on the training of data. We are going to take efforts in the future to increase the training data so that the chances of getting irrelevant answers is less.

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