PROJECT WORK SYNOPSIS

BUILDING CONVERSATIONAL AI FOR HEALTHCARE INDUSTRY

Submitted by

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Under the guidance of

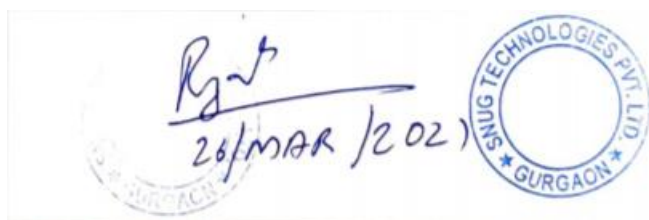|		
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1. Introduction

Conversational AI is the set of technologies behind automated messaging and speech-enabled applications that offer human-like interactions between computers and humans. It is the synthetic brainpower that makes machines capable of understanding, processing, and responding to human language. By bridging the gap between human and computer language, it makes communication between the two easy and natural. The best Conversational AI offers an end result that is indistinguishable from could have been delivered by a human.

Interactive Voice Response (IVR) is an automated telephony system that interacts with callers, gathers information, and routes calls to the appropriate recipients. An IVR system (IVRS) accepts a combination of voice telephone input and touch-tone keypad selection and provides the appropriate responses in the form of voice, fax, call back, email and other contact methods. IVR systems can consist of telephony equipment, software applications, a database, and a supporting infrastructure.

As of today, callers can engage with the Interactive Voice Response (IVR) system using DTMF inputs & must listen to complete announcements before navigating to desired options. This causes users to spend additional time over the IVR system. Conversational AI enabled user to collect their inputs in terms of spoken voice, interpret the intent of caller and navigate to the desired option directly. This can also be extended to various communication channels i.e., chat etc.

The conversational AI expands the quality of IVR, by entitling it with cutting edge technology of Machine Learning and Natural Language Understanding (NLU), thus offering advanced voice recognition technology. This advanced voice recognition would respond suitably, accurately, and efficiently, by comprehending the natural free flow human conversations. The conversational IVR also allows the AI to have intuitive conversations with human beings for having an insight regarding the customer's service demand.

In this project we make use of software like Google Dialogflow to create a Conversational AI which aims to facilitate the daily functioning of hospital-patient communication. Dialogflow is a natural language understanding platform that makes it easy to design and integrate a conversational user interface into your mobile app, web application, device, bot, interactive voice response system, and so on.

For the IVR application we have used the Avaya Aura Experience Portal which is a single platform for automated voice and multimedia, self-service, and Interactive Voice Response (IVR) applications. Experience Portal supports inbound phone, video, SMS, and email applications. Experience Portal also supports outbound phone, SMS, and email applications.

2. Need for Project

The introduction of artificial intelligence (AI) to healthcare through IVR solutions & Intelligent automated BOTs has multifaced functionalities and benefits for both the administrative staff, doctors, nurses as well as the end users/patients. Some of these are listed below:

- **24/ 7 Support for self service**
  Since the AI is a computerized system there will be no need for a huge number of operators for manual intervention. This also allows high-quality patient service to be provided and available 24/7 all 365 days a year.
- **Automate Call Answering and Routing**
  The caller will be greeted by a professionally scripted voice to assist them, asking questions to learn their reason for calling and direct them to the right agent, hence increasing efficiency.
- **Accurate Information Collection**
  As all information is mechanized, there are no chances of human errors and verbal miscommunications. Paper-intensive processes are replaced by faster electronic

methods, and administrative support required for data entry is significantly reduced, as well as measurement errors.

- **Easily Provide Reliable Information to Patients**
  The AI can provide customers information and guidance without ever taking time away from medical or administrative staff. Visiting hours, appointment times, even information about the latest illness going around, all can easily be dispensed to callers automatically. Leading to better efficiency and productivity among staff.

- **Maximize Productivity and Return on Investment**
  As the nursing staff is not routinely required to take calls, answer queries, schedule appointments etc. they can dedicate more time and effort towards patient care. This reduces the workload, staff does not feel overwhelmed hence boosting workspace environment, increasing productivity and efficiency & ultimately return on investment.

- **Multilingual Support**
  IVR with AI is an ideal tool for dealing with foreign patients as well. You can provide the service in different languages, instead of hiring exclusive staff who may qualify to deal with people of individual nationalities and languages.

- **Call filtering**
  Many people have a habit of calling doctors repeatedly over trivial matters; IVR helps filter unnecessary calls by providing pre-recorded messages as solutions.

- **Easily Accessible**
  An IVR system is a user-friendly solution and allows patients to enjoy enhanced service anytime from anywhere that too on a medium of their choice.

3. Objective

This project aims to create a Conversational AI incorporating IVR for the health care industry. This reduces the manual intervention of medical staff to assist the caller for required support services.

Caller can connect to the AI via various channels i.e., voice inputs, chat etc. This AI aims to facilitate the industry by providing services for scheduling appointments, medical tests, report status, doctors selection and many more.

Conversational AIs are not limited to medical industry only and can be easily extended to various domains i.e., Hospitality, IT, Airlines, Auto manufacturers etc. This provides a better customer experience and reduces the need of manual assistants to resolve customer queries. Customer will be connected to manual assistants only in fail over cases when AI is not able to resolve customer concern or fulfil customer requirement.

The developed Conversational AI can be extended to multiple platforms such as WhatsApp, Facebook Messenger, Skype etc. thus enabling omnichannel communications providing a customer-centric experience across any channel of their choice.

IVR is a system where a caller can interact with support services by calling via their mobile phones. However, in traditional IVR systems, the caller must listen to the complete announcements to understand the position of various options and must navigate sequentially to each option one by one to reach the desired option. Enhance AI systems enable IVR application to collect the caller's intent directly in the form of spoken voice (instead of telephony DTMF inputs), enabling caller to directly route to their desired option.

4. Methodology:

IVRS can be accessed either by an automated Avaya system-generated call to the patient or by the patient calling a toll-free number.
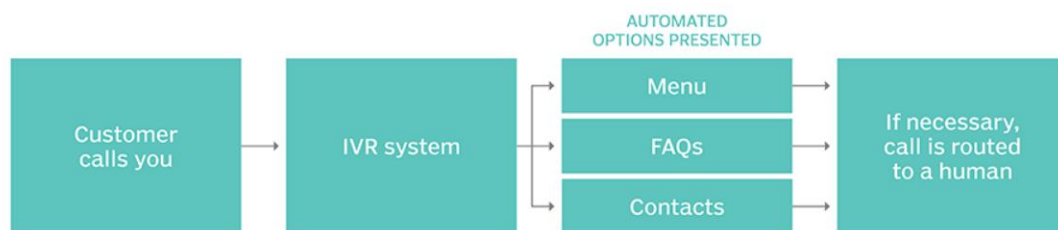

The Conversational AI comprehends and engages in contextual dialogue using natural language processing (NLP) and additional AI algorithms.

First, the AI must understand what the customer is trying to say, or the intent of the customer's question. Natural language understanding (NLU) works to decipher meaning in the user's words, regardless of how it is stated. With sophisticated NLU, the AI will be able to understand the user's intent even among grammatical mistakes, shortcuts, and idiosyncrasies, and remember context from one statement to the next, comprehending what is being said throughout the conversation.

Next, the AI must determine the right response based on its understanding of the user's intent using machine learning. As the AI answers user questions over time, and as human agents help to guide its knowledge, it learns more variations of the same intent and which responses are the most appropriate for each intent.

Finally, the AI generates a response in a format that is easily understood by the user.
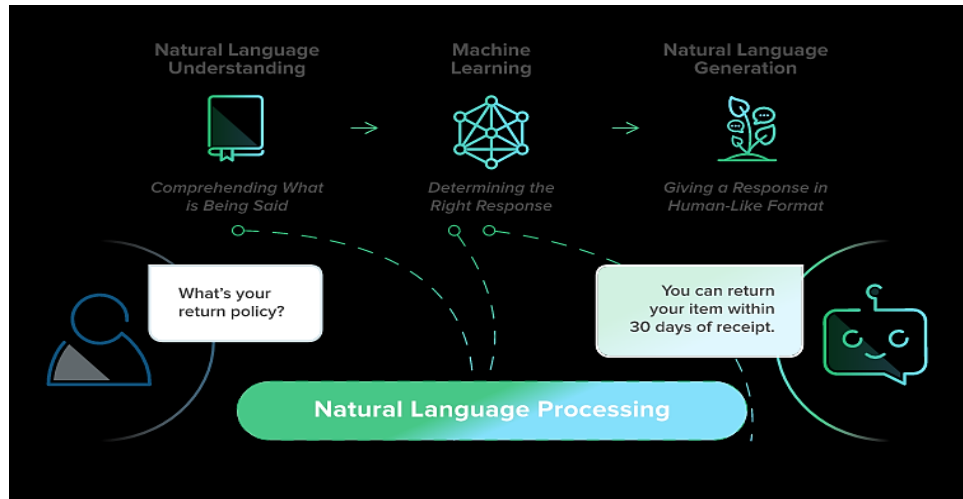
For the intelligent automation of our AI, we use the Google Dialogflow software which is extended in its functioning by calls to several API's. Integration with apps like Google Calendar facilitate in scheduling tasks and appointments. Integrations with Goggle Assistant and in other cases specifically curated text-to-speech and speech-to-text applications enable voice related flow of conversation.

The patient's spoken answer or keypad response is automatically recognized by Dialogflow, and a response to any question will result in either branching to another intent or skipping to further evaluation.

Dialogflow records and documents all the answers provided by the patient for every question triggered by the intent thus invoked. These answers, either text/chat or spoken are entered into a database automatically and the digitized data allows rapid evaluation, real-time feedback and interpretation, and report generation.

Dialogflow itself can handle static responses. Fulfilments are used in cases where a dynamic response to the patient is necessary. Fulfilments comprise Webhooks and API calls that send the information collected to external clients and databases, using them to query and extract the exact information required. Dialogflow uses the response provided by these clients to respond to the user.
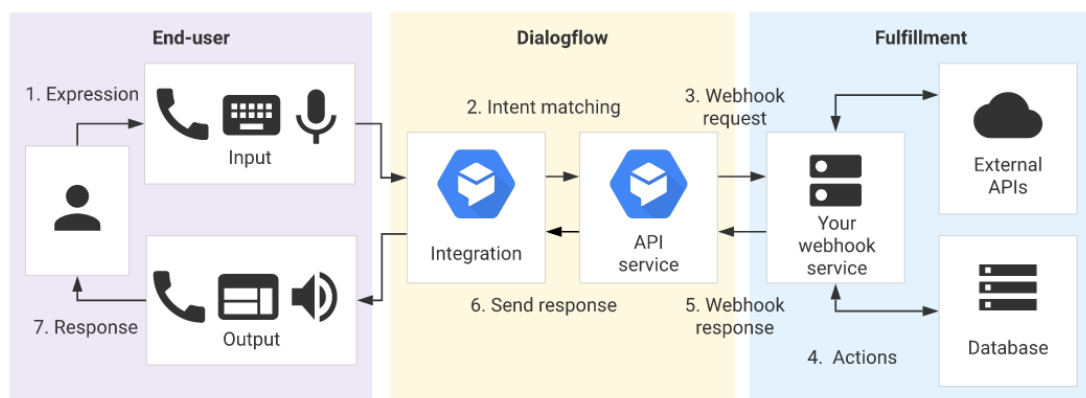
5. Project Schedule

6-month project:

February 2021	Learning Java Understanding Google Dialogflow
March 2021	Learning Spring and Hibernate Creating and testing sample chatbots on Google Dialogflow
April 2021	Learning about REST API's, Node.js Enhancing Chatbot to integrate with different backend system to provide automation
May 2021	Extending Chat bot to various communication Channels
June 2021	Extending Chat Bot to different Domains i.e., Hospitality, IT support etc.
July 2021	
August 2021	

6. References

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   - https://cloud.google.com/dialogflow/es/docs/quick
   - https://cloud.google.com/dialogflow/es/docs/concepts