

Conversational AI Powered Chatbot Using Lex and AWS

Pradyumna Saini, Mohd Tajammul

School of Computer Science and IT, Jain University, Jayanagar, Bangalore, Karnataka, India

ABSTRACT

Artificial intelligence-based application for their treatment. Thus, telehealth will rapidly and radically transform in-person care to remote consultation of patients. Because of this, it developed a Multilingual Conversational Bot based on Natural Language Processing (NLP) to provide free primary healthcare education, information, advice to chronic patients. The study introduces a novel computer application acting as a personal virtual doctor that has been opportunely designed and extensively trained to interact with patients like human beings. This application is related to a server less architecture and it aggregates the services of a doctor by providing preventive measures, home remedies, interactive counseling sessions, healthcare tips, and symptoms covering the most prevalent diseases in rural India. The paper proposes a conversational bot for delivering telehealth in India to increase the patient's access to healthcare knowledge and leverage of artificial intelligence to bridge the gap of demand and supply of human healthcare providers. This AI application has resulted in reducing the barriers for access to healthcare facilities and intelligent consultations remotely to allow time to time care and quality treatment, thereby effectively assisting the society.

KEYWORDS: chatbot Alexa; conversational technology, digital health Amazon Web Services; Internet of Things

I. INTRODUCTION

The major challenges that India faces is to cater to good quality and affordable healthcare industry to its growing population. The World Health Report issued by World health Organization has ranked India's healthcare system at 112 out of 190 countries.

Same time are not cost-efficient and well-matched to their medical needs. To seek more ways to provide timely medical care, access and quality treatment to the patient, the role comes into play which connects patients with healthcare providers.

In the current growing age of Artificial Intelligence (AI) powered chatbots are playing a leading role by exemplifying the function of a virtual assistant that could manage a conversation via speech. use of voice queries to get answers, perform actions and recommendations according to users needs. They are adaptable to the user's individual language usages, searches , and preferences with continuing use.

applications to access and record the patient's data. At the patient's side, it is a cheaper alternative; AI-enabled virtual assistants that can render 24x7 care to

a wide variety of patients. Many people are suffering from chronic diseases, disabled patients, and patients living in areas would benefit most from such powerful virtual assistants' tools. Advantages of these System: reduced time on the part of physicians, improved security of patient data.

The healthcare domain is facing a range of challenges due to increasing service demand. Shortage of trained professionals and their limited availability while providing treatment to the patients is a major challenge. The main reason for the problem is that healthcare practitioners have to overcome organizational, temporal and geographical barriers to assist the patients. The availability of trained professionals to provide an authentic treatment within the appropriate time is important for disease diagnosis, assisting patients having cholesterol, blood pressure, diabetes or other severe diseases and for the treatment of pregnant women. Mobile Health services resolve these concerns, helping patients with authentic healthcare accessible from remote locations irrespective of time and space. Traditional mHealth

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applications were limited to basic functions such as recording exercise activities or counting calories burnt. However, mobile health applications are becoming more adaptive and complex, providing advanced features like disease diagnosis and assistive patient treatment. Chatbots or conversational agents come under the modern category of mHealth services. They use natural languages and voice-based interaction while communicating with the patients, through a 'question-answer oriented' interface model.

II. BACKGROUND AND RELATED WORK

A. Smart Phone apps

AirStrip offers a mobile, interoperable platform that allows care coordination between multiple devices and multiple care settings. Data from an tech health records, health information exchanges, medical devices, and other monitoring solutions can be accessed by smartphones, tablets, and computers from hospitals, post-acute care centers, and community-based care organization. The AirStrip platform gives providers a tool to all data into one platform that can be accessed via telemedicine, and integrates with other vendor systems.

This patient-faces mobile app allows patients to directly find information on their health conditions and gives them step-by-step guide to treat conditions in the most effective way possible.

B. Chatbot features and implementation standards

The authors also mention the principles to modify healthcare applications. These implementation standards can be used as a reference while structuring and designing chatbot applications. The standards meets four parameters- user experience/ adherence, data safety, data privacy, data integration, and effectiveness. The authors have also described challenges to handle these parameters.

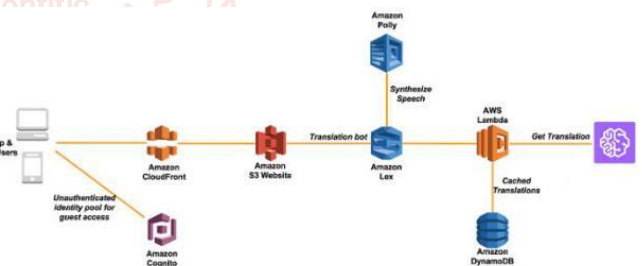
C. Existing solutions

Instant messaging platforms have been widely adopted as one of the main technologies to communicate and exchange information. Nowadays, most of them provide built-in support for integrating chatbot applications, which are automated conversational agents capable of interacting with users of the platform. Chatbots have proven useful in many other contexts to automate tasks and improve the user experience, such as automated customer services, education, and e-commerce. Moreover, existing reports emphasize that chatbot design will become a key ability in IT hires in the near future. The global chatbot market is projected to reach 2 billion dollars by 2024, growing at a CAGR (compound annual growth rate) of 29.7%.

This interest and demand for chatbot applications has emphasized the need to be able to quickly build complex chatbot applications supporting AI-based natural language processing in order to be able to fluently chat with the user. Furthermore, any non-trivial chatbot requires accessing an orchestration of internal and external services in order to perform the requested user actions.

As such, chatbots are becoming complex software artifacts that require a high-level of expertise in a variety of technical domains, ranging from NLP to a deep understanding of the APIs of the targeted instant messaging platforms and third-party services to be integrated.

The research use primary data, which was collected using structured questionnaire. The sample size for the study that consists of 100 respondents. The questionnaire has prepared in such a way so as to gather data from the respondents, which will be helpful in attaining the objectives of the study. The collected data has been carefully scrutinized, tabulated and analyzed using simple statistical techniques like percentages. and support to translate more than 30 languages. The cognitive service 'Language Understanding Intelligent Service' (LUIS) has been used in



the design; for creating HTTP endpoints to return JavaScript Object Notation (JSON) responses, developing new models and while training the language model with sample utterances. The design uses the Telegram messaging app. It performs message encryption and offers a free, open-source and secure platform. The chatbot tracks user location through Google Maps Application Programming Interface.

Many articles and research papers have underlined the increasing popularity and acceptance of pregnancy companion mobile apps. The chatbot is effective than a smartphone app as it provides a voice interface through a personalized platform. Current chatbot designs provide suggestions and tips on many topics like lifestyle, personal wellbeing, healthy diet, and others. However, some additional aspects are necessary to make these chatbots more relevant for users. In [14-27], authors have given a number of solutions for security mechanism in cloud computing.

III. DESIGN AND METHODOLOGY

A. Technology Acceptance Survey

The authors explain the 'Unified Theory of Acceptance and Use of Technology' (U-TAUT) system to analyze the user acceptance of technology and the application use context. The advanced ver. deals with the technology application in private contexts. can be considered as a reference while analyzing the impact of a chatbot in many applications. Researchers have already used the model in the context of mHealth applications. It focuses on aspects such as Effort expectations, Performance expectations, Facilitating conditions, Social influences, Price values Hedonic motivations and Habits. A set of questions were framed to verify the primary familiarity of the user with the smartphone or chatbots and to predict how frequently they are using them. Multiple questions were asked to record user opinions while accepting the chatbot as a assistant and as a replacement tool for the traditional smartphone interaction.

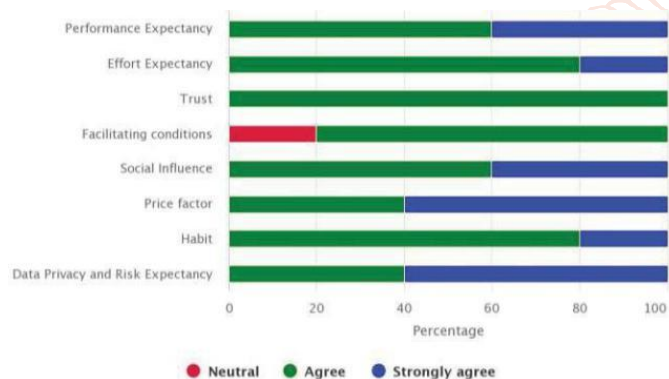


Fig 1 Survey summary-

Almost all users were having a primary exposure for technology, but some of them accepted that they don't use chatbots more frequently. As most of the interviewees often feel the need for a doctor's advice in a day, they admitted that sometimes they can't raise their queries or questions with someone. Although they prefer using a search engine like Google to get the answers; they were in favor of a chatbot to replace it. Users were asked to provide their consent for the parameters on the scale of 1-5 (strongly disagree, disagree, neutral, agree, strongly agree) while looking at the feasibility of a chatbot. Figure 1 shows a statistical summary of the survey, which highlights the positive user inclination towards a Health chatbot.

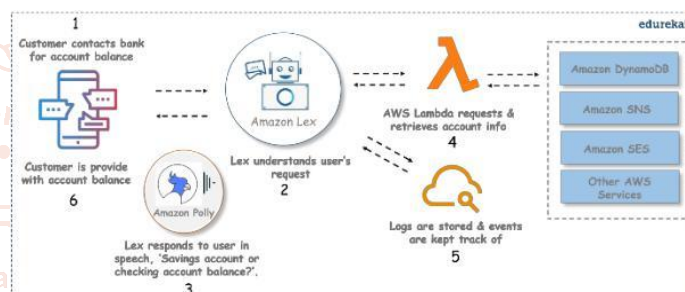
The survey analysis interpreted from factors resulted in a fairer analysis of the technology acceptance. The responses from the users were helpful in structuring the chatbot design features, making it a relevant and engaging tool for the users.

B. Design and Block diagram

Alexa is a popular virtual voice assistant application developed by Amazon. Devices like Amazon Echo

Plus, Echo Studio or Echo dot are enabled with Alexa. Amazon Alexa provides multiple function like real-time data extraction, voice interaction, weather forecast, broadcasting, smart audio-video streaming, tasks list management, home-automation control and other. Third-party users can also configure these functionalities by designing and installing a custom 'skill' on Alexa enabled smart speaker. The skill, just like a mobile phone application allows the user to perform certain defined tasks that involve features such as service assistance or voice interaction. Alexa has become a popular tool in realizing the concept of intelligent and interactive chatbots.

Designing a chatbot on top of a custom Alexa skill allows developers to utilize a range of Amazon Web Services like AWS Lambda, Simple Email Service (SES), Simple Notification Service (SNS) and DynamoDB.



AWS Lambda is a cloud computing platform that allows users running code without managing or provisioning the cloud servers. The developer is charged only for the compute time consumed- no charge when the code doesn't run. The Lambda function codes are run on a computing infrastructure having high-availability. It also manages the administration of cloud computing resources, capacity provisioning and automatic scaling, maintenance of the server and operating system, code logging and monitoring. The developer just supplies the Lambda function code in one of the supported languages, and the other services are handled by AWS Lambda.

AWS DynamoDB is a NoSQL database service providing higher scalability and quick performance. Developers don't have to worry about the management of hardware provision, replication, software patching, setup, and configuration, or cluster scaling as this is handled by DynamoDB. It also secures the sensitive data by encrypting it at rest, reducing the burden on the developer. It allows the creation and maintenance of any amount of data. More on, DynamoDB serves incoming requests are any traffic level.

AWS SNS is a cloud-based notification service that can be used for generating message notifications from serverless and distributed applications. It is a durable

and secure platform that offers higher throughput with higher availability.

AWS SES is a cloud-based service that can be configured for generating email notifications, transactional or marketing emails. SES is a reliable, cost-effective, flexible and highly-scalable service useful for multiple use cases serving different requirements.

- AWS Lex enables you to build applications using a speech or text interface powered by the same technology that powers Amazon Alexa.
- Lex bot interactions with AWS Lambda In Lex you now create a single Lambda function per language per bot, which must be able to support both types of Lex interaction: Initialization/Validation - Lambda is called at every turn of the conversation. This allows you to initialise, validate or override slot data values.
- Amazon Connect - An easy-to-use omnichannel cloud contact center that helps you provide superior customer service at a lower cost. Over ten years ago, Amazon's retail business needed a contact center that would give our customers personal, dynamic, and natural experiences.

Figure 2 displays the integrated system block diagram. Voice communication can be observed between the pregnant woman and the Alexa enabled Echo dot device. Alexa Skills Kit (ASK) handles user requests captured in as an audio signal. It converts the audio input into the equivalent text to detect the 'intent' or context of the request. Corresponding to the detected intent, the associated Lambda function event gets evoked. Request response interaction between the Lambda function and ASK takes place in the JSON format. Suitable actions are performed by Lambda for the raised request, such as extraction of the data or generation of a response. The Lambda function interacts with AWS DynamoDB for data storage or data retrieval. ASK translates the responses sent by the Lambda function to audio output for the user. SNS and SES are triggered through the Lambda function to generate short text notifications or emails in case of certain events.

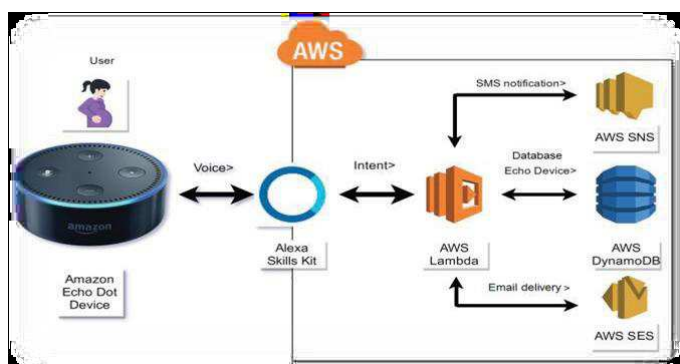


Fig 2 system block diagram

C. Data source selection

An authentic and reliable data source is needed to extract the backend data which is used for the chatbot design. Considering these features a platform recommended by healthcare practitioners, the National Health Service (NHS) website was selected as a dataset source. NHS is the national healthcare system in the United Kingdom. The website has information content about pregnancy such as weekly guide, recommendation, and also suggestions about relevant miscellaneous topics.

IV. IMPLEMENTATION AND VERIFICATION

A. Implementation aspects

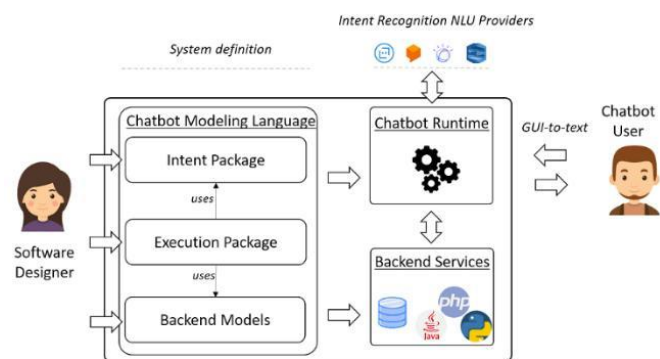
AWS Developer account and AWS Management console account are needed to configure an Alexa skill with Amazon Web Services. ASK Developer Console enables the programmer to configure and publish a custom Alexa skill. On the other side, the AWS Management console enables the programmer to utilize multiple AWS services, monitor cloud services, user and roles management, handle costing and billing and execution requirement.

In this growing world of AI, consumers are getting technological help in all facets of their lives. The data provides various ways to get information and has radically changed the way of communication.

Innovation has enhanced our lives with more opportunities, and everything is quite simple for us. Everybody likes to collaborate and expect quick answers without much delay. You can use online networking platforms or websites regularly for various reasons to connect with others.

A chatbot is a program or service that easily connects with us to help solve our queries/problems. The services that a chatbot can deliver are quite diverse, from providing important life-saving health messages to checking the weather. While interacting with chatbots, you should feel as if you are talking with a real person only.

From my perspective, chatbots or smart assistants with artificial intelligence are dramatically changing businesses. There is a wide range of chatbot building platforms that are available for various enterprises, such as e-commerce, retail, banking, leisure, travel, healthcare, and so on.



CONCLUSION AND FUTURE SCOPE

The chatbot solution offers suggestions and recommendations Health care ; such as patient care medical check experienced emotional feelings, observed symptoms, suggestions, and recommendations about other relevant topics. The design also addresses one more limitation of the existing solutions, providing mobile message and email notification service in the case of an emergency. The chatbot records daily sleep duration and regular exercise activities, by maintaining a diary log which is useful while consulting the doctor. It also provides tips and information about multiple topics that are relevant to medicine.

The paper presents a proof of concept model to analyze the multiple possible services, which a health care chatbot system can provide. The primary objective was the implementation of the probable use cases by applying a suitable technology. The proposed solution is not a full-proof solution; however, it is possible to further extend its features and the technology application demonstrations to structure a

The proposed approach of recording sleep time and exercise activities from the user conversation can be replaced with the help of smart fitness devices or body wearable's to record them automatically. Smart healthcare devices that monitor personal health parameters such as blood oxygen level, Electrocardiogram readings, heart rate, and body temperature; can be used along with the chatbot system to identify the emergency.

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