

Virtual Agent for Students to Understand Placement Process of Multiple Companies Using Alexa Voice Service

Suhas P. Salunkhe

*Department of Computer Science and Engineering
Savitribai Phule Pune University,
Pune, Maharashtra, India
classical.suhas@gmail.com*

Dr. Sachin V Todkari

*Professor, Department of CSE
Jaywantrao Sawant College of
Engineering, Pune, Maharashtra, India
sachintodkari@gmail.com*

Abstract—The aim of a chatBOT is to conduct conversation which allows people access to information via a lightweight messaging application. Basically there are two types of chatBOT. One is Rule-based chatBOT and second one is AI ChatBOT. We are using AI ChatBOT for our application. Mainly our virtual agent is to make conversation much interactive and well communicating to person. The conversations in most chatbot are still using a keyboard as the input. Keyboard input is considered ineffective as the conversation is not natural without any saying and a conversation is not just about words. The paper propose a design of a chatbot with voice interaction to make a conversation more alive. We use Alexa Voice Service to make voice communication and more effective. We will use Amazon alexa to make voice interface. We are going to design virtual agent which will provide placement process details to students. It helps students to understand the placement process of multiple companies. It is an automated solution that we propose to help student to get the details of placements. This proposed system will make good impact on student and student can always touch with placement process of companies. As we are developing voice based communication agent, so it is much interactive and effective. Further we can explored with additional tool such as creating visualization to make the agent can analyze the user's emotion and reaction.

Keywords—*Alexa voice service, Artificial Intelligence, Chatbot, Conversational Models, Help student, Neural Networks, Placement details, Virtual agents, Voice response*

I. INTRODUCTION

Basically we are going to design virtual agent(ChatBOT) which will provide placement process details to students. It is a voice communication with students. Basically Virtual Agent is a program that communicates with people.

Chatbot that have been deployed on the internet uses text as input and output. Text I/O relatively effective as the user can review the input so that the input from the user can be rechecked if there are any mistakes. However, text inputting is not efficient because of the keyboard as the device required at the time when users want to talk to the chatbot. Therefore, chatbot is not fully efficient and unattractive.

One solution to improve chatbot efficiency is to use interface other than text, as example voice interface. Voice interface is developed with a technology using Alexa Voice Service. With voice interface, chatbot would be able to make conversations not only in the form of text, but also through sound. The ability to speak with chatbot would make the conversation more interesting.

Mainly our virtual agent is for freshers who can get the details placements procedure for multiple companies. Virtual agent also provides details about each and every stage in interview process. So that with refereeing this information student can know which company is suitable for me or what is the process of interviews. We are going to develop system to connect with Amazon Alexa Voice Service and using it to connect with our virtual agent. We will going to design algorithm to connect with Amazon Alexa Voice Service Skills which includes intents and utterances. Another algorithm to do processing of alexa inputs and send output to. Challenging part to connect with Alexa is that we need to take care of there service and use it in our application. Further we can provide more intelligence to our voice agent to communicate with student. We are using ServiceNOW tool, it's a development IDE to developed algorithms which we are introducing in a paper. In a future we can develop the Text-Based virtual agent.

Basically we proposed this system to helps students to make them life easy. Most important factor we overcome that time. Using this system we are completely minimizing the time which we required to reach out to persons for information.

Let's say I am a student of BE Final Year. I want to know about placement procedure of TCS. So how our system helps to student to know that.

- Student needs to open that Voice Agent ChatBOT(Proposed System).
- Voice Agent ask for what can I do for you?
- Conversation comes in a picture.

- Communication with VA will give you a detail information about placement procedure for TCS.
- Student can ask any question about TCS placement.
- After the communication he/she will get information about placement details.
- This is the basic scenario we will introduce in our system.

Example -

Prerequisites -

- Need a Amazon Echo Device or Supported application in your mobile example - Reverb
- Any student or fresher

Placement Help - PH

Student - ST

ST - Alexa Open Placement Help

PH - Welcome to Placement Help. What can I do for you?

ST - I want to know about the placement process of Infosys?

PH - Yes, sure. What you want to know?

ST - What is the eligibility criteria?

PH - You should have an aggregate of 68% in your graduation with no active backlogs. May be percentage criteria will be change.

II. MOTIVATION

Our motivation for this project is that our students which are going for their future. Basically any user can use our system to know placement about the companies. Main motivation is that to provide automated solution to students to know the placement details.

Some motivational points -

- Main thing to proposed this system is that helps student for understanding the process of placement.
- Students should know all things and most important from how to start and prepare for placement.
- Student can save our time and get the information about placement.
- There is no need to go to third person for getting information about the placement details.
- Considering web search, we all know there are no information which is combine together and student can easily understand.
- Now a days placement is the most important for all students.
- Communication should be interactive and more user friendly.

Now a days it is a need that student do not waste time on searching things on internet because about placement. There are lot of sites which are not provides the correct details. So we come up with this solution to provide all details about companies' placement procedure. So that students' aware of the procedure.

III. PROBLEM DEFINITION

A. Objectives

The objective of this project is to build a robust, interactive and flexible Voice ChatBOT which will provides useful and important information about placement details of multiple companies. It is a Voice Based ChatBOT so that it is more interactive.

Following points we are considering for our propose system :

Good Accuracy : Virtual Agent guides student about placement details with correct details and it is helpful for student to get place in a company.

Time Saving : Virtual Agent is a machine which will communicate with students, so that time is save were students need to go to person, searching on internet, goto websites and all.

Effective Response - As it is a voice communication so it is most effective and interactive.

Availability - ChatBOT is always available to communicate with user. It is 24/7 service.

Cost Savings - Implementing a full functioning chatBOT, is much cheaper and faster than creating a cross platform app or hiring employees for each task.

From our research we realized that we should make a system which will give a correct and direct information to our students. Without going to anywhere they should know the things.

B. Scopes

Mainly it is for to understanding and getting information about the placement procedure of the various companies. Proposed system is mainly for fresher who is searching for job or a student. System will provide the information about only placement process. Scope of our system is defined by answers of the following questions.

Let's say student wants to know about placement process of InfoSys.

Actually I want to know more about Infosys?

How can a fresher apply in Infosys?

Where to apply for the same?

What is the eligibility criteria to appear Infosys campus drive?

What is the criteria to apply?

How many round I need to crack?
 What is the Duration?
 What is the Quantitative Ability?
 What is the Analytical Ability?
 What is the Verbal Ability?
 What is Online Test?
 What is Technical Round?
 What is the criteria of this round?
 What is HR Round?

C. Goals

The most important goal to proposed this system to helps student to understand process of placement of various companies. So because of this system student get the correct details about placement process.

- To minimize the time of student which was wasted in a searching information on website.
- To provide straightforward details of the placement process.
- To provide information about each and every stages of placement.
- Overall students should aware of the process of placement. Student can be any user.
- To make communication better, effective and interactive.
- Conversation make alive, with this voice communication.

IV. PROPOSED SYSTEM ARCHITECTURE

A. System Overview

We introduce this system to help students to understand the placement process of various companies. User who uses the system can be student or any other person who is fresher. We can say that any user can use this system to understand the placement process.

Actually our proposed system is a ChatBOT. As we know ChatBOT is a virtual agent who can communicate with user.

Simple flow of how user can use ChatBOT -

1. Student opens the ChatBOT(Placement Process)
2. Virtual Agent ask for any help about process.
3. Student make response with company name.
4. After that user can ask information about anything about company.
5. Student can get the information from the Virtual Agent.



Figure 1. Basic Flow of System

Already have an answers of an number of question that student can ask. We configure answers of that questions in ServiceNOW database. Student communicate with virtual agent by using Alexa enabled device(Amazon Echo). Student say something to alexa and as per the user input our system will process it and give answer to student.

B. System Design

As we know what is the main motivation of our system. Also we know that what is the use of this system. The major function of the proposed system to give a correct and useful information about placement process to student. System has the responsibility that, it should give a appropriate information about student's questions and communication should be interactive.

Concepts we need to consider while implementing this system -

Alexa Voice Service

The Alexa Voice Service (AVS) is Amazon's intelligent voice recognition and natural language understanding service that allows you to voice-enable any connected device that has a microphone and speaker.

ServiceNOW Tool

ServiceNOW is a company that provides service management software as a service.

REST API

REST (Representational State Transfer) is designed to take advantage of existing protocols. While REST can be used over nearly any protocol, it usually takes advantage of HTTP when used for Web APIs.

JSON Representation

JSON (JavaScript Object Notation) is a lightweight data-interchange format. It is easy for humans to read and write. It is easy for machines to parse and generate.

Following are the objects we are going to use to achieve our goal.

End User



Mainly it is a student/fresher. He/She communicate with Voice ChatBOT to get the information of the placement process of various companies.

Alexa Enabled Device (Amazon Echo)



To communicate with our system we need a Amazon Echo device. **Amazon Echo** (shortened and referred to as **Echo**) is a brand of smart speakers developed by Amazon.

C. Architecture of Proposed System

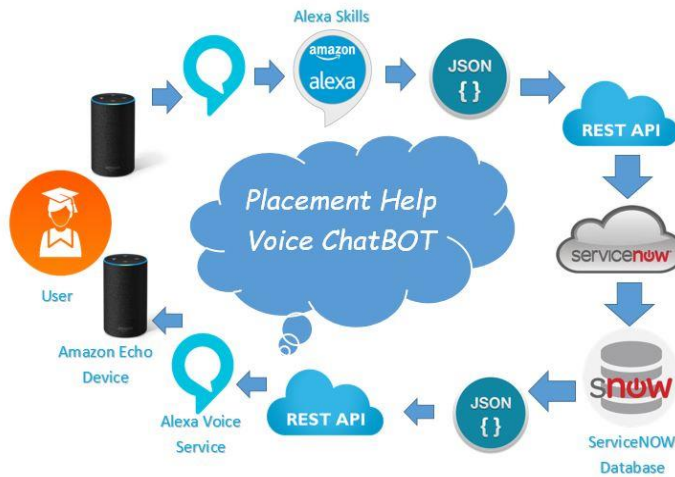


Figure 2. Architecture of Proposed System

Architecture is consist of following parts -

- User** - User is one who starting the conversation with Alexa or placement help. So when he/she wants to ask anything to placement help virtual agent then he/she can say “Alexa open placement help” or “Alexa ask placement help to how many interview rounds for TCS” etc.
- Amazon Echo Device** - User ask his/her questions to echo device. Echo device take the speech from user like “Alexa open placement help”
- Alexa Voice Service** - Alexa voice service is most important part for further processing. It will take speech/voice from Alexa and convert it into text.
- Alexa Skills** - Alexa voice service check the skill is exist or not. AVS found the skill name from user’s questions. If skill is found in AVS then it will go further otherwise it will stops the execution and echo device gives response like “skill not found”. In our system skills we have generated as “Placement Help”.
- JSON Formatted Data** - Whatever data received and send from and to serviceNOW / AVS service is in the form of JSON. Suppose skill is found then AVS generate the response message for received inputs from user. It will generate the JSON formatted

response and send further to REST API. Whatever answers of user’s input are generated at ServiceNOW and it will generate the JSON and sent to AVS for further processing and finally user receives the voice response of his/her request. JSON response is the JSON formatted data which is understandable by AVS.

- REST API** - Communication between AVS and ServiceNOW tool is from REST API. Whatever the JSON is send/receive to/from ServiceNOW/AVS is through REST API. We can say that REST API is the connection point between our development and AVS.
- ServiceNOW** - ServiceNOW is a Developer tool which will take response from AVS and perform processing on that. It will generate the output from whichever input get from user. It will generate JSON formatted output and send to AVS.
- ServiceNOW Database** - Most important part of our system. It is needed to store information of multiple companies. Without the database we are not able to do anything. We retrieves the information from database as per the user’s input and generate the output which we need to send to AVS.

This is the architecture we are following to design our system.

D. Process Flow of Proposed System

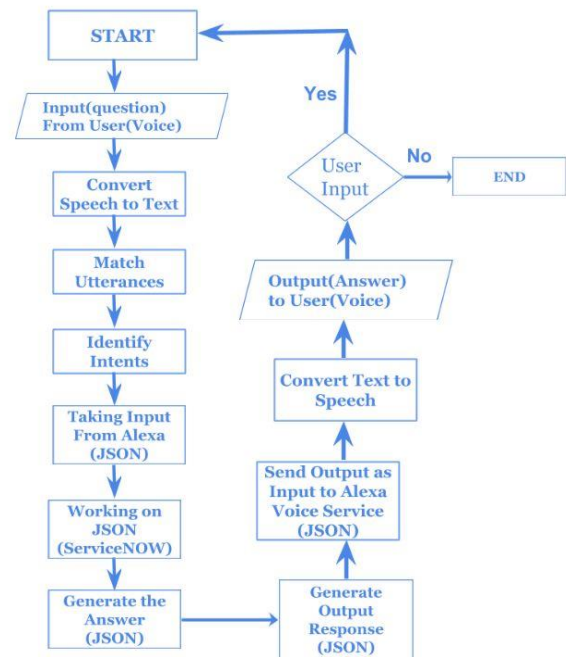


Figure 3. Process Flow of Proposed System

We need Amazon Echo device with login with your credentials and configured. Let's start with process flow

1. **Start** - In this step user needs to connect with skills which will provide details about placement process of various companies. After that alexa give response to user as per the request by user.
2. **Input From User** - After connect with respected skill. Student can ask any information about he/she wants. If student ask about how many rounds for specific company.
3. Example - "How many interview rounds?"
4. **Convert Speech to text** - As we are using Alexa Voice Service, it will take care of converting speech to text. It will first take speech and convert it to text and perform processing on text.
5. **Match Utterances** - Alexa then takes this input and match at her end and find out the same match of that sentence from list of utterances. Alexa finds matching percentage of sentence with respect to list of sentence. If appropriate match is found then alexa gives a reply otherwise stop the process. This step is done by Alexa Voice Service.
6. **Identify Intents** - This step is done by Alexa Voice Service. Each and every intent is consist of multiple utterances. If utterance is found then alexa will pick th related intent.
7. **Taking Inputs from Alexa** - We have created REST API to connect with Alexa Voice Service. We are taking input from Alexa as JSON response with the help of this REST API which we created at our side. We have to write algorithm to taking input from alexa and process them as per our need.
8. **Working on JSON(get the Response from Alexa)** - Lets say student wants the "number of interview rounds?".Whatever the JSON got from Alexa, we process at our end. We need to perform some database related information to take out the related answer. Once we find out the appropriate the answer then go for next step.
9. **Generate the Answers** - Generate the answer as per the JSON received from Alexa Voice Service.
10. **Generate Output Response** - Now we have to generate output which is understable by Alexa. So here we need to write algorithm which will generate output. This output is in JSON format.
11. **Send output as input to Alexa** - Then we need to send this output to input by using REST API message. Output is in a JSON containing answers as a text format.
12. **Convert text to speech** - Alexa will convert text to speech.

13. **Get the output to user** - Finally gives the answer to the student for his/her question.

This is the process flow which our system will follow.

V. ALEXA VOICE SERVICE

Alexa Voice Service (AVS) is Amazon's suite of services built around its voice-controlled AI assistant for the home and other environments. AVS and Alexa were first introduced with Echo, the company's intelligent speaker, which enables voice interaction with various systems in the environment and online. Alexa is available for an ever-increasing number of other devices, including smartphones, tablets and remote controls.

AVS is tightly integrated with Amazon's e-commerce environment, which means that it makes purchases fast and simple. Alexa also connects to streaming media services online, and supports If This Then That (IFTTT), an online service that automates Web-based tasks so that when user-specified events occur, follow-up tasks are triggered and handled.

In the AVS environment, services are known as skills. Hurricane Center, for example, is an Alexa skill that provides constantly updated information on storm systems, based on data from government agencies. A skill called Virtual Librarian is essentially a recommendation engine that suggests books, based on awards nominations, bestseller lists and user reviews. Alexa Skills Kit, a software development kit (SDK), is made freely available to developers and skills are available for instant download from Amazon.com.

Here are a few of the many things that a user can do through AVS:

- Get sports scores.
- Make reservations.
- Add items to a shopping list.
- Have a recipe read to you as you cook.
- Perform mathematical calculations.
- Play music.

Alexa's main competitor is Google Assistant. Alexa, Google Assistant and similar technologies may be ushering in the preliminary stages of pervasive computing: a scenario in which people interact naturally with unobtrusive computing devices located throughout our environment.

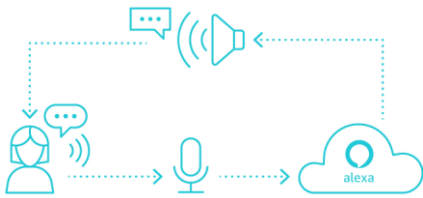


Figure 3. Alexa Voice Service

VI. AMAZON ECHO DEVICE

Amazon's Alexa is the voice-activated, interactive AI bot, or personal assistant, that lets people speak with their Amazon Echo, Echo Dot and other Amazon smart home devices. Like Siri and Cortana, Alexa is designed to respond to a number of different commands and even converse with users. Alexa comes with more than a few capabilities: playing music, pulling up the weather or even reading news. But Alexa Skills are apps that give Alexa even more abilities, letting her speak to more devices even websites.

How does Alexa work?

Once you buy an Amazon Alexa device Amazon Tap or an Echo Dot—the device connects through WiFi or Bluetooth to the internet and then to other devices. With the most common devices, the Amazon Echo and Echo Dot, people merely say "Alexa," which wakes up the device, and then ask for what they want. Alexa Skills radically expands the bots repertoire, allowing users to perform more actions with voice-activated control through Alexa.

VII. ALEXA SKILLS AND DETAILS

A. Alexa Skill

- Alexa provides capabilities, or skills, that enable customers to create a more personalized experience.

B. Alexa Skill Kit

- The Alexa Skills Kit (ASK) is a collection of self-service APIs, tools, documentation, and code samples that makes it fast and easy for you to add skills to Alexa.

C. Invocation Name

An 'invocation name' is the word or phrase used to trigger your skill.

Example - invocation name is "placement help"
"Alexa, open placement help"

D. Intents

- An intent is what a user is trying to accomplish. Within the code, this is how you define your function.

Examples -

Let say student say "I want to know about InfoSys".

Then we need to create an intents for that statement.

Intent is "KnowMoreInfo" or you can give any name.

There are some rules while defining the intents space is not allowed. you can read it from alexa developer site.

E. Utterances

- Utterances are the specific phrases that people will use when making a request to Alexa.
- Just think of the number of ways that people can ask for the time.

Example -

Lets say student wants to know company name

InfoSys.

So student can say by different sentences which wants the information about company.

"Can you please tell me about Infosys"

"How Infosys is?"

F. Slot

- A slot is a variable that relates to an intent allowing Alexa to understand information about the request.

Example

Lets say student ask system to "How much rounds of interview in Infosys?"

Then our system will give reply as follows -

"It is {numberofrounds}"

"Number of rounds are {numberofrounds}"

- Amazon provides a number of built in slot types, such as dates, numbers, durations, time, etc. But developers can create custom slots for variables which are specific to their skill.

G. End point

- In our system, endpoint is a REST Message that we created in ServiceNOW which Communicate between serviceNOW and Amazon Alexa.

- Alexa provides 2 ways to communicate with external Application.

- AWS Lambda ARN

- HTTPS

- We used HTTPS.

Example -

https://servicenowinstanceid.servicenow.com/api/x_snc_amazon_echo/alexa

H. Using Intents, Utterances and Slots

- Intents, utterances, and slots all work together to tell Alexa what you want to happen when someone is using your Alexa skill.
- You'll provide the Amazon Developer Platform with a list of your intents and utterances in the following way:



Figure 4. Sentence with intent, utterances and slots

Referring the above figure we know -

Alexa - Wake up word.

Means that when student wants to know about placement procedure of InfoSys.

He/she need to invoke the skill that we created for specific model like placement model.

So he/she needs to say , "Alexa open placement help". After that skill is invoke and student ask for anything about company.

VIII. ALGORITHMS

Following algorithms we will introduce -

- Connect with Alexa Voice Service
- Process input and generate the output

Mainly we are going to use ServiceNOW tool for developing our system.

Prerequisites -

In ServiceNOW we are going to implement -

- Need to create table which consist of all the intents which are specified in Alexa Skill Kit.
- Need to create tables which stores the information about multiple companies.
- Need to create REST API to connect with Alexa.
- Need to Create 2 source files or classes. One(**PlacementRequest**) is for processing inputs from Alexa and another(**PlacementResponse**) is for generating output to Alexa.
- Need to create one source file which will generate the answers of the questions.

A. Connect with Alexa Voice Service

In REST API -

We need to provide API path, which we need to specify in alexa skill endpoint.

We need to add POST method to get the input from Alexa and send output to the Alexa.

REST API is the connection point between ServiceNOW and Alexa Voice Service.

B. Processing Inputs and Generate Output

Let's say student wants to know about "How many rounds of interview?"

We received input from Alexa which is in JSON format. Which is consist of number of objects like session, intents, attributes etc. Alexa input consist of name of intent.

Remember intent consist of utterances and we know utterance is "How many rounds of interview?". Suppose intent name is "**numberofrounds**"(received from Alexa voice service response).

Steps -

- Read the request JSON file(Input from Alexa) through REST API
- Read the Intent name from JSON
 - Need to call methods from class **PlacementRequest**
- Intent Name = "numberofrounds"
- If (intentname == "numberofrounds")
 - If not found quite the process and waiting for student input.
 - If found then goto step 5
- Connect to that database record.
- Run Script related to that record.
- Retrieves the information from database.
- Generate answers
- Generate the response as per the answers or data retrieve from database
 - Call the methods from class **PlacementResponse** It is generating the response.
 - Class **PlacementResponse** containing methods to generate appropriate objects which we requires to generate output.
- Send the response to Alexa through REST API

IX. EXAMPLE : COMMUNICATION

Prerequisites -

- Need a Amazon Echo Device or Supported application in your mobile example - Reverb
- Student is a Fresher

Placement Help - PH
Student - ST

ST - Alexa Open Placement Help
PH - Welcome to Placement Help. What can I do for you?

ST - I want to know about the placement process of Infosys?
PH - Yes, sure. What you want to know?

ST - What is the eligibility criteria?
PH - You should have an aggregate of 68% in your graduation with no active backlogs. May be percentage criteria will be change.

ST - How can I fresher apply?
PH - You can apply from referral, on campus, off campus.

ST - How many rounds of interview?
PH - There are 3 or 4 rounds.

ST - Which are those rounds?
PH - Aptitude Test, GD, Technical, HR.

ST - We need to crack all rounds?
PH - You need to crack all rounds to make selection in.

ST - How the aptitude test is?
PH - There are 3 section are in that.

ST - Which are those sections?
PH - Quantitative Ability, Verbal Ability, Analytical Ability.

ST - Can you please tell me about Quantitative Ability?
PH - Yes Sure. Basically it is for to test problem solving and analytical skills. They check your mathematical critical thinking.

ST - Is there any time limit or?
PH - Yes there are 10 question for 35 minutes.

ST - There any expected cut-off.
PH - Yes. minimum 6 to 7 answers are correct.

So this is the simple conversation between the Placement Help and Student.
Whatever the communication is a voice communication, so that it is more effective and interactive.

X. LIMITATIONS

- Our system is based on voice so may be problem of understanding the output which is in voice.
- We need to always train the data for new input received by user.

XI. FUTURE WORK

- We can implement Text-Based Virtual Agent for communicating to students.
- We can deploy our system on a dedicated server and it becomes good system for students.
- We can also integrate with tone analyser so we can get the emotions of the students. With the help of that emotions we can provide them answers.
- We can also provide voice security if one can wants to use it for privately.
- We can provide visualization so that communication will be more effective and it is useful for analyzation of emotions.

XII. CONCLUSION

Mainly we are focusing on student placement. Student get the information about the placement process of various companies so that student knows how we can prepare for respected company. Without going to web search, third person student get the details of placement. Here time is saved by the automated system. It's a voice based chatBOT so it is more interactive communication between student and voice ChatBOT. Mainly it is helpful for student to make their life easy about placement.

XIII. REFERENCES

- [1] Shih-Hung Wu, Liang-Pu Chen, Ping-Che Yang, Tsun Ku, "Automatic Dialogue Template Synthesis for Chatbot by Story Information Extraction", 2018 IEEE International Conference on Information Reuse and Integration (IRI), pp. 485-490, 2018
- [2] N T Thomas, "An e-business chatbot using AIML and LSA", International Conference on Advances in Computing, Communications and Informatics (ICACCI)", pp. 2740 - 2742, 2016

- [3] Ankil Shah, Bhargav Jain, Bhavin Agrawal, Saurabh Jain, Simon Shim, "Problem Solving Chatbot for Data Structures", in IEEE 8th Annual Computing and Communication Workshop and Conference (CCWC), pp. 184-189, 2018
- [4] Bayu Setiaji ; Ferry Wahyu Wibowo, "Chatbot Using a Knowledge in Database: Human-to-Machine Conversation Modeling", 2016 7th International Conference on Intelligent Systems, Modelling and Simulation (ISMS), pp. 72 - 77, 2016
- [5] B. R. Ranoliya, N. Raghuvanshi and S. Singh, "Chatbot for university related FAQs," in Advances in Computing, Communications and Informatics (ICACCI), 2017.
- [6] J. Quintero ; R. Asprilla, "Towards an efficient voice-based chatbot", 2015 IEEE Thirty Fifth Central American and Panama Convention (CONCAPAN XXXV), pp. 1 - 6, 2015
- [7] Massimiliano Dibitonto, Katarzyna Leszczynska, Federica Tazzi, and Carlo M. Medaglia, "Chatbot in a Campus Environment: Design of LiSA, a Virtual Assistant to Help Students in Their University Life", Springer International Publishing AG, part of Springer Nature 2018, M. Kurosu (Ed.): HCI 2018, LNCS 10903, pp. 103–116, 2018.
- [8] Divya Madhu, C. J. Neeraj Jain, Elmy Sebastain, Shinoy Shaji, Anandhu Ajayakumar, "A Novel Approach for Medical Assistance Using Trained Chatbot", 2017 International Conference on Inventive Communication and Computational Technologies (ICICCT), pp. 243 - 246, 2017
- [9] Divya Madhu, C. J. Neeraj Jain, Elmy Sebastain, Shinoy Shaji, Anandhu Ajayakumar, "A Novel Approach for Medical Assistance Using Trained Chatbot", 2017 International Conference on Inventive Communication and Computational Technologies (ICICCT), pp. 243 - 246, 2017
- [10] M Naveen Kumar ; P C Linga Chandar ; A Venkatesh Prasad ; K Sumangali, "Android Based Educational Chatbot for Visually Impaired People", 2016 IEEE International Conference on Computational Intelligence and Computing Research (ICCIC), pp. 1 - 4, 2016
- [11] Hanjong Choi, Takeshi Hamanaka, Kanae Matsui, "Design and Implementation of Interactive Product Manual System using Chatbot and Sensed Data", 2017 IEEE 6th Global Conference on Consumer Electronics (GCCE), pp. 1-5, 2017
- [12] Rafael E. Banchs, "On the construction of more human-like chatbots: Affect and emotion analysis of movie dialogue data", 2017 Asia-Pacific Signal and Information Processing Association Annual Summit and Conference (APSIPA ASC), pp. 1364-1367, 2017
- [13] Cyril Joe Baby, Faizan Ayyub Khan, J. N. Swathi, "Home Automation using IoT and a Chatbot using Natural Language Processing", 2017 Innovations in Power and Advanced Computing Technologies (i-PACT), pp. 1 - 6, 2017
- [14] Ashay Argal, Siddharth Gupta, Ajay Modi, Pratik Pandey, Simon Shim, Chang Choo, "Intelligent Travel Chatbot for Predictive Recommendation in Echo Platform" 2018 IEEE 8th Annual Computing and Communication Workshop and Conference (CCWC), pp. 176-183, 2018
- [15] Sameera A. Abdul-Kader, John Woods, "Question Answer System for Online Feedable New Born Chatbot", 2017 Intelligent Systems Conference (IntelliSys), pp. 863 - 869, 2017
- [16] Elahe Paikari, André van der Hoek, "A Framework for Understanding Chatbots and their Future" 2018 IEEE/ACM 11th International Workshop on Cooperative and Human Aspects of Software Engineering (CHASE), pp. 13 - 16, 2018
- [17] Rupesh Singh, Manmath Paste, Nirmala Shinde, Harshkumar Patel, Nitin Mishra, "Chatbot using TensorFlow for small Businesses", 2018 Second International Conference on Inventive Communication and Computational Technologies (ICICCT), pp. 1614 - 1619, 2018
- [18] M. A. E. L. Mowad, A. Fathy, and A. Hafez, " Smart home automated control system using android application and microcontroller", International Journal of Scientific & Engineering Research, vol. 5, no. 5, pp. 935-939.



Dr. Sachin V. Todkari, is completed PHD in CSE from Kalinga University, Raipur. He is completed ME in Information Technology from MIT COE Kothrud, Pune. He is completed BE in Computer Science and Engineering from College of Engineering, Ambajogai. Area of Research is Wireless Sensor Network. He is working as a Associate professor. Contact him at sachintodkari@gmail.com



Suhas Pandurang Salunkhe, is a Master of Engineering student in the Department of Computer Science and Engineering, Savitribai Phule University of Pune. He has completed Bachelor of Engineering in the Department of Computer Science and Engineering. He is working as Software Developer in IT industry. Contact him at classical.suhas@gmail.com