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RON – (A Friendly Chatbot)

Yash Agarwal[1], Karan Grover[2], Harishiv Gupta[3], Mr. Saurabh Kumar[4]
[1,2,3] Student, School of Computing, DIT University,
[4] Assistant Professor, School of Computing, DIT University,
Dehradun, India

Abstract:
A chatbot (at most basic level) is a computer program that simulates and processes human conversation (either written or spoken), allowing humans to interact with digital devices as if they were communicating with a real person.
Our Project is "RON", a personal chatbot inspired by sci-fi. We envisioned this project to use both face recognition and speech recognition to perform meaningful and friendly conversations. And it is not just a chatbot we are also adding some features like checking browsing history, playing something on YouTube, Google search etc. so you can also call it as a mini or personal virtual assistant.

Keywords:
Artificial Intelligence (AI), Machine Learning (ML), Chatbot, Virtual Assistant, Natural Language Processing (NLP), Facial Recognition, Application Programming Interface (API), Training Models.

Introduction:
Chatbots are software applications that are used to conduct automatic conversations via text or text-to-speech formats. One of the very initial one was *ELIZA*, created in 1966, used pattern matching and substitution methodology to simulate a textual conversation (to be noted that it couldn't either listen or speak). Currently, one of the most advanced in the market is *Amazon ALEXA*, an intelligent personal assistant that understands the user's voice and talks back. These can be like simple programs that answer a simple query with a simple response, or like complicated digital assistants which learn and evolve with time to perform increasing levels of personalization as they collect and process that information.
There are two main types of chatbots:

1. **Task-oriented (declarative) chatbots**

These are simple and single-purpose programs focused on performing single task.

2. **Data-driven and predictive (conversational) chatbots**

These are often referred to as virtual assistants and offer much more sophisticated, interactive, and personalized experience than task-oriented chatbots.
Face recognition is a way of identifying and confirming an individual user's identity using their facial features. These systems can be used to identify people in photos, videos, or in real-time. These systems are part of a category of Biometric Security Software. Similar forms of such systems include voice recognition, fingerprint recognition, and eye retina or iris recognition.
Speech recognition is the process of converting audio into text for the purpose of conversational AI and voice applications. Speech processing system has mainly three tasks, first task is speech recognition which allows the machine in recognising the words, phrases and sentences a user speak. Then comes natural language processing which allows the machine to understand everything user said, and third and last is speech synthesis to allow the machine to speak.
Our Project is "RON", a personal chatbot inspired by sci-fi. We envisioned this project to use both face recognition and speech recognition to perform meaningful and friendly conversations.

Literature Review

1. Google Assistant

It is an artificial intelligence–powered virtual assistant developed by Google that is primarily available on smartphones and smart home devices. Unlike the company's previous virtual assistant, Google Now, the Google Assistant can engage in two-way conversations.

2. Amazon Alexa

Also known simply as Alexa, Amazon Alexa is a virtual assistant technology largely based on a speech synthesiser called 'Ivona'. Bought by Amazon in 2013, it was first used in the Amazon Echo smart speakers and the Echo Dot, Echo Studio and Amazon Tap speakers developed by Amazon.

3. Chatbot in Python

Authors: Akshay Kumar, Pankaj Kumar Meena, Debiprasanna Panda and Ms. Sangeetha
In their work, Kumar and his team provided the design of a chatbot, which provides a genuine and accurate answer for any query using Artificial Intelligence Markup Language (AIML) and Latent Semantic Analysis (LSA) with python platform.[7]

4. Chatbots: Are They Really Useful?

Authors: Bayan Abu Shawar and Eric Atwell
Shawar and Atwell basically focused on an academic paper highlighting some case studies and including a brief history of chatbots that extends back to the earliest experiments such as ELIZA (c. 1966). Their work is based on making a chatbot using AIML patterns with ALICE.[1]

5. The Anatomy of ALICE

Author: Wallace, Richard S.
In this work, Dr Wallace proposed the technical presentation of Artificial Linguistic Internet Computer Entity (A.L.I.C.E.) as well as Artificial Intelligence Markup Language (A.I.M.L.), which are set in the background by philosophical and historical ruminations occurring on human consciousness.[2]

6. Integration of IOT and Chatbot for aquaculture with NLP

Authors: M. Udin Harun Al Rasyid, Sritrusta Sukaridhoto, Muhammad Iskandar Dzulqornain and Ahmad Rifa'i
This research proposed an integrated IoT and chatbot to monitor aquaculture conditions integrated with smart aerator.[3]

7. A new Chatbot for Customer Service on social media

Authors: Anbang Xu, Zhe Liu, Yufan Guo, Vibha Sinha and Rama Akkiraju
In their work, Anbang Xu and his team created a new conversational system which is integrated with state-of-the-art deep learning techniques and is trained by nearly 1M Twitter conversations between users and agents from over 60 brands.
Their evaluation revealed that over 40% of the requests are emotional, and the system is about as good as human agents in showing empathy to help users cope with emotional situations.[4]

8. Pregnancy Companion Chatbot Using Alexa and Amazon Web Services

Authors: Sanket Sanjay Sadavarte and Eliane Bodanese
In this work, questionnaires were designed for the expectant mothers and healthcare professionals who treat them, to design the chatbot. The inputs were then captured to verify the feasibility, relevance, and technology acceptance for the use cases. Chatbot designs were slowly changed from text-based interaction to voice-based interaction. It was then tested on Amazon Echo dot, a smart speaker device supported by Amazon voice assistant Alexa. They argued that designing such a chatbot on top of a custom Alexa skill allows developers to use multiple Amazon Web Services.[5]

9. An intelligent Chatbot using deep learning with Bidirectional RNN and attention model

Authors: Manyu Dhyani and Rajiv Kumar
Purpose of this work was to increase the perplexity and learning rate of the model and find Bleu Score for translation in same language.[6]

Objective:

A chatbot (at most basic level) is a computer program that simulates and processes human conversation (either written or spoken), allowing humans to interact with digital devices as if they were communicating with a real person.

Our objective was to design a chatbot which uses both Face Recognition and Speech Recognition to perform a meaningful conversation. Titled "RON", our project is a personal chatbot inspired by sci-fi. We envisioned this project to use both face recognition and speech recognition to perform meaningful and friendly conversations. And it is not just a chatbot we are also adding some features like checking browsing history, playing something on YouTube, Google search etc. so you can also call it as a mini or personal virtual assistant.

Tools Used:

These are some tools we used in our project. These include ides, packages, modules etc we used.

1. **Hardware:**

Intel i3-8th gen processor, inbuilt webcam and microphone.

2. **IDEs used:**

Visual Studio & Visual Studio Code with pip installer installed to build and check code.

3. **Packages and modules used:**

cv2, numpy, face_recognition (for face recognition functions), os & re, datetime (for date and time), speech_recognition, pyttsx3 (for speech recognition), wikipedia (to search something on wikipedia), pywhatkit (to play something on youtube), browser_history (fetching browser history), nlp & nltk (for nlp functions i.e., input statements processing), transformers & tensorflow (for training models), pytorch.

Description:

Our Project is "RON", a personal chatbot inspired by sci-fi. We envisioned this project to use both face recognition and speech recognition to perform meaningful and friendly conversations. And it is not just a chatbot we are also adding some features like checking browsing history, playing something on YouTube, Google search etc. so you can also call it as a mini or personal virtual assistant.

In *phase 1*, we selected our project topic, *literature review* necessary for this project and gathered materials we had to use in next phase. In this phase we finalised our topic to be a combination of *'Face recognition'* and *'Speech recognition'*. We also studied how many types of chatbots are there and what differences they have and what common features they share.

Since then, we also decided to add some virtual assistant function we also selected some virtual assistants like *'Google Assistant', 'Amazon Alexa', 'Siri'* etc for our study like how they make a conversation with normal users and how they perform various tasks according to users need.

Next, we had *phase 2*. After figuring out how should we approach next parts we started our implementation part. We first split our work into two major parts, first one, Facial Recognition part and, second one, Speech Recognition part.

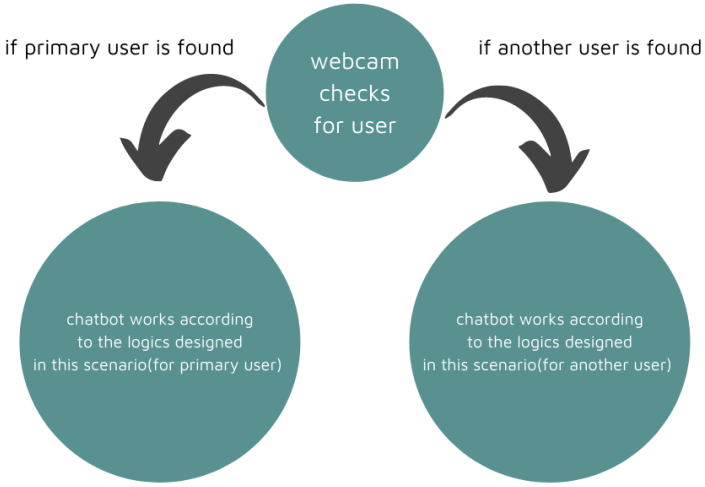

Figure 1: working based on user type

Face recognition is a way of identifying or confirming an individual's identity using their face. Our approach is that chatbot will work according to who the user is using it, using a *'webcam'* attached it will search for the face, if the face it finds matches with the one present in its image folder it will label it as *'Primary User'* and to that user it will offer full functionalities, if the face doesn't
match, it will label it as a non-primary user and for that user some functionalities will be restricted. Modules and packages used here are *'cv2', 'numpy', 'os'* and *'face_recognition'*.[8] After figuring out who the user is, it will move on to *'speech recognition'* part. Speech recognition technology is the process of converting audio into text for the purpose of conversational AI and voice applications. For speech recognition we used *'speech-recognition', 'tensorflow', 'transformers', 'pyttsx3'*.[14][15] In this part, it will search for user voice after which it will convert the user speech to text query and process it using *'NLP'* functionalities. Natural language is a very important subfield of computer science, more specifically of AI, which enables computers/machines to understand, process and manipulate human language. 'NLP' functionalities will help in understanding what user might want to say. Based on those results training model will come to play its role.[9][10]

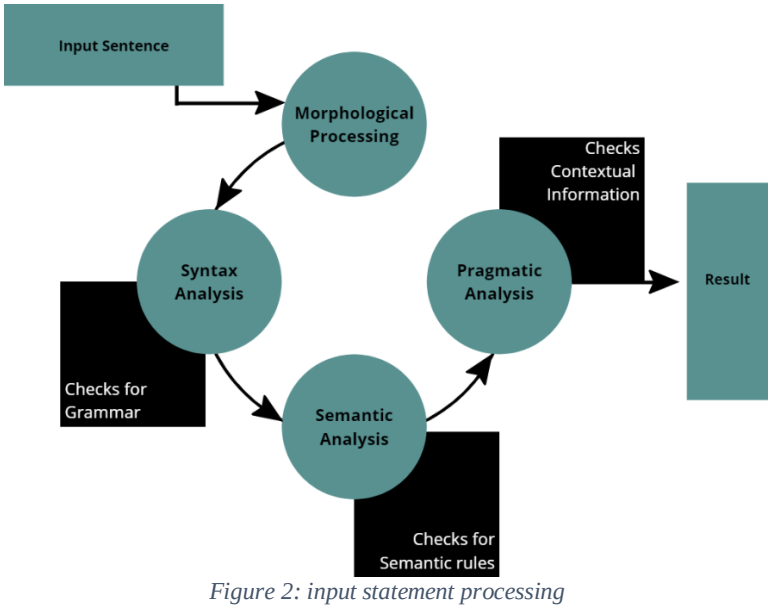

Figure 2: input statement processing

In case the user query doesn't matches with pre-defined cases, the *training model* will check the pre-existing data present in the
corpus and generates results accordingly and also update the corpus to reflect those conversations for the future conversations. After the *'training model'* has generated the results, those results are processed to the user (it can be in the form of speech or any output device) after *text to speech* conversion.[18] We used torch library for 'nlp' and made a neural network module and gone through the concept of Relocation.

The neural network will take inputs in some format, for that we used *'nltk'* and *'PorterStemmer'* for clarifying the data, tokenizing it and indexing the data. Now we used *'.json'* file for adding feelings and chat in out AI by creating dictionary using intents forming a pattern then formed a *'.pth'* file(deep learning module- py torch) which will get trained using intents.json. which will understand the chat dataset, adding more commands. We also used some functions of *nlp* like *'CrossEntropyLoss()'* an algorithm of deep learning.[11][12][13]

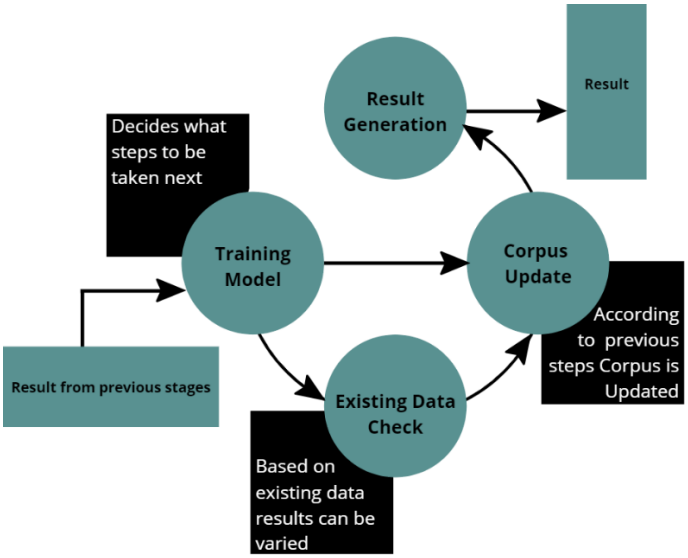

Figure 3: data training & corpus update

In *Phase 3*, we reviewed our work again to find out what else can be improved right then and what else can be in future work, like we found that we can also make a GUI for it, we can also make it work according to users' native language and not just in any one language.

We also found in our last phase that we can similarly add many other works done by many other peoples to make our project better and useful, like using CNN or RCNN, to improve image processing quality etc.[16][17]

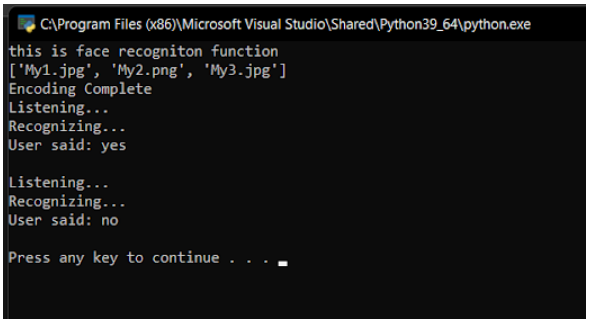

Figure 4: Sample1

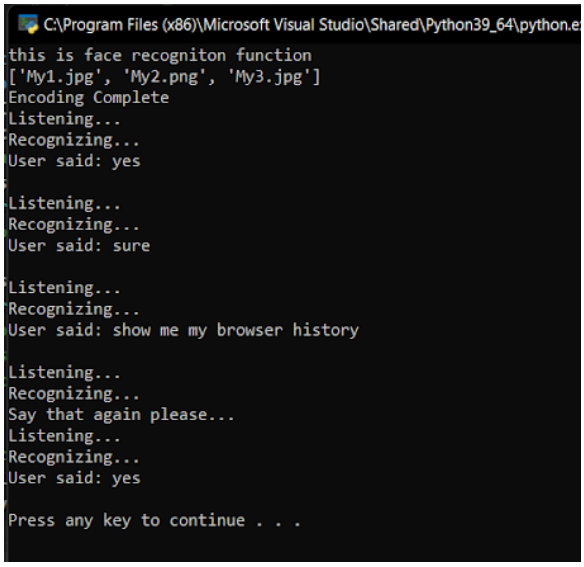

Figure 5: Sample 2

```
#   speak function   #
def speak(audio):
    engine.say(audio)
    print('RON: ',audio)
    engine.runAndWait()

#   function to take commands   #
def takeCommand():
    #   It takes microphone input from the user and returns string output   #
    r = sr.Recognizer()
    with sr.Microphone() as source:
        print("Listening...")
        r.energy_threshold = 1000
        r.pause_threshold = 1
        audio = r.listen(source, timeout = 5, phrase_time_limit = 5)

    try:
        print("Recognizing...")
        query = r.recognize_google(audio, language='en-in')
        print(f"User said: {query}\n")
    except Exception as e:
        print("Say that again please...")
        query = takeCommand().lower()
    return query

#   function to search something on wikipedia   #
def wikiSearch(query):
```

Figure 6: Sample 3

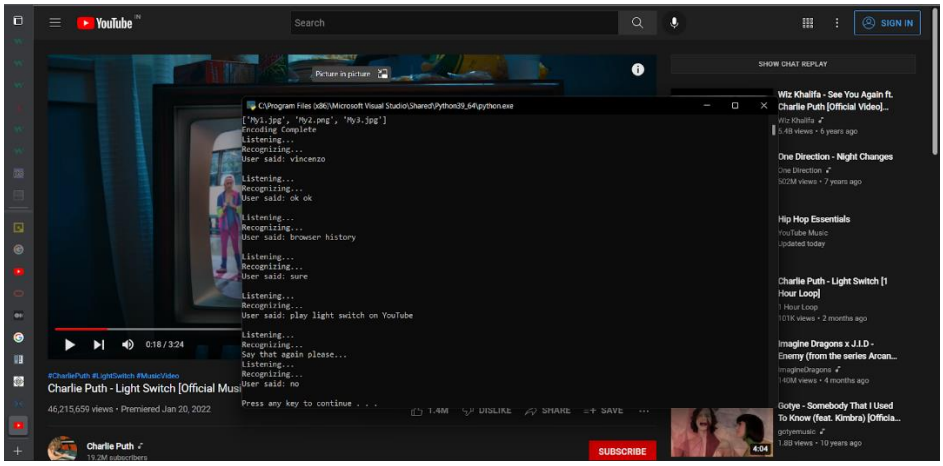

Figure 7: Playing video on Youtube

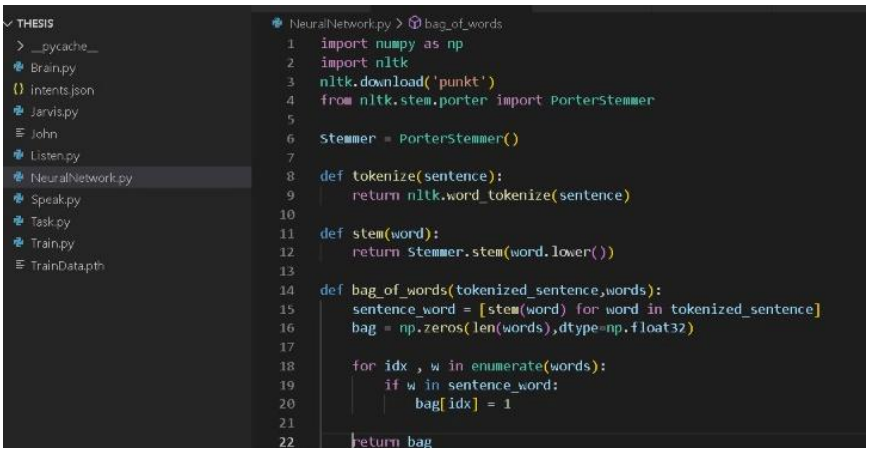

Figure 8: Sample 4

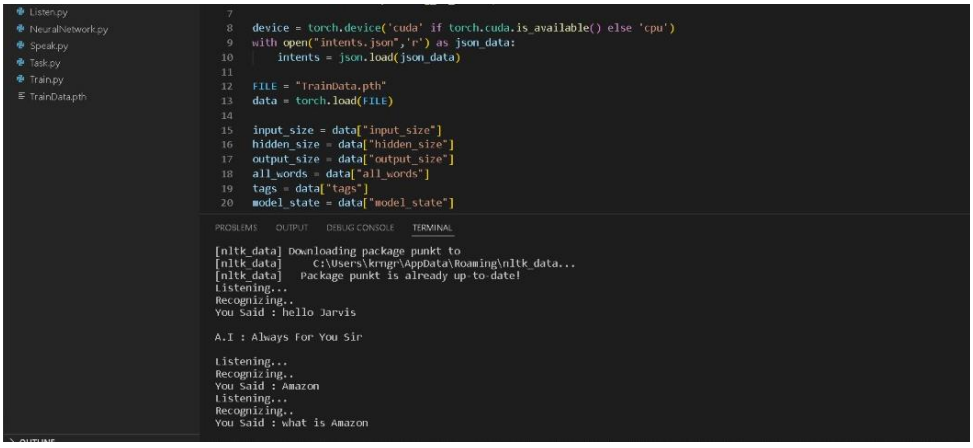

Figure 9: Sample

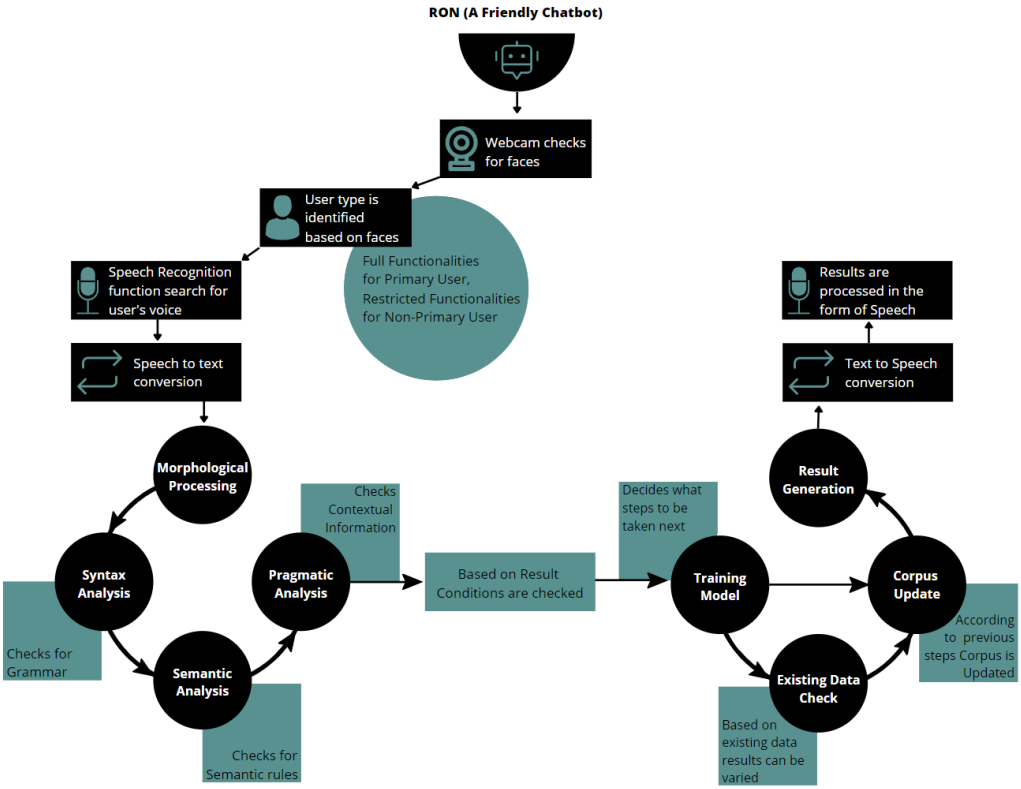

Figure 10: project working

Conclusion & Future Scope:

A chatbot (at most basic level) is a computer program that simulates and processes human conversation (either written or spoken), allowing humans to interact with digital devices as if they were communicating with a real person.

In this project we learned about facial recognition, speech recognition, NLP, training models, corpus etc. All these concepts are very useful and can be used to build many useful technologies. In conclusion, we will say that after using both face recognition and speech recognition with NLP and training models we have a basic (or, dummy) chatbot.

For Future scope, a lot can be done in future in this project like, recording the whole conversation in text file, adding more virtual assistant functions, recognising different user languages and processing results accordingly using google translate API, etc.

A lot more models and works can be combined together with this work to build a better version of it.

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