

Application of Chatbots in Women & Child Safety

Anubhav Ghosh

Machine Learning Engineer, Centre of R&D, G.I Labs India (Ghosh Innovation Labs Private Limited)

Abstract - In developing and crime prone countries, parents are always worried about the safety and location of their daughter. Same is true for husbands who are worried about their wives. IoT^[1] based, face and scene detection enabled devices, embedded in arm wearables or school bags can be used to track their safety. Chatbots can be used to receive information and communicate with the autonomous IoT devices which process the image and location using a cloud-based web service like AWS. In simple terms, a parent can chat with a chatbot agent or Alexa^[2]/Google Assistant^[3] based voice assistant bot and easily know about the child's location, persons and scene nearby and other relevant data. Example: A father is sitting at his office. He is worried and wants to know about his daughter's safety. He can simply ask the chatbot "Hey, I am worried about my daughter. Could you please tell me if she is okay?" The chatbot instantly sends request to the IoT device fixed in the pendant or school bag. The device then activates the 360-degree spherical camera and GPS tracker. The image data is captured and sent to the AWS³ rekognition⁴ which extracts faces from the 360-degree image, matches known and unknown faces and their emotions. This data is augmented with the GPS location and sent to the chatbot. The chatbot then replies to the father "Hi, your daughter is in her school bus currently located at 22/1 Magpie Street. I found her class teacher Miss Marry sitting on her left, her classmate Jerry on the right and bus conductor Mr. Ron in front of her. Would you like to see the image or send an alert beacon to her safety device?" If her father finds anything unusual, he may ask the chatbot agent to report the incident saying, "Something is wrong, report the incident asap". The chatbot agent will accomplish the task and revert "I have reported the incident with 360-degree image and GPS location to nearest police station, bus operator as well as the class teacher via SMS"

Keywords - chatbot, women safety, child safety, A.I against crime

1. INTRODUCTION

I have been working on developing chatbots integrated with IoT devices that can be used for women and child safety for last 3 years. I have a Bachelor of Engineering degree in Computer Science Engineering and have worked as 2x Salesforce certified cloud CRM developer at Accenture for over a year before resigning and starting my own venture G.I Labs India which is now one of the few companies considered as a startup under the Startup India scheme of honorable Prime Minister of India- Mr. Narendra Modi. Prior to that, I, along with my partner Mr. Samidhya Karmakar have filed a patent for women safety IoT^[1] device which has

been published by Indian Patent Office (application number: 201631023441#) in the year 2017.

Currently, I am moving ahead with an aim to utilize Natural Language Processing^[4] to interpret the intention of a worried parent of a girl child in India, where rape and murder are prevalent. The aim of developing a complete solution for safety of working women and school girls cannot be achieved by using any kind of static chatbot. To reach the efficacy, the chatbot agent must get a feed of real time data sent by a Raspberry Pi Zero^[5] based device, fitted with 360-degree spherical camera^[6] and GPS tracker. The raw data consisting of 360-degree image and GPS location is sent to a cloud-based SaaS^[7] like AWS Recognition^[8] or IBM Watson Visual Recognition^[9]. The processed data is then made available to the chatbot agent. Rise of chatbots can play a huge role in mitigating the worries of parents, assisting them in reporting incidents of crime with a chat and eventually securing the women and children from crimes by at least 10%. This can be seen as the fictional Jarvis of Iron Man which was a complete setup to protect and assist Mr. Stark.

2. What is IoT based Chatbot?

Chatbots are artificially intelligent assistants that mimic the human conversation in two simple steps of *Intent Extraction* and *Response Generation*. The first step primarily includes two interfaces - chat (typing the phrase using keyboard/virtual keyboard) or voice (speaking to the assistant). Although the first step remains common throughout, the second step, *Response Generation* determines the variation chatbots.

2.1 Intent Extraction

Data classifiers like Bernoulli Naïve Bayes Classifier^[10] or Gaussian Naïve Bayes Classifier^{[10],[11]} are used to extract the intention request from the data set of keywords mentioned in the user's request phrase or statement. Once the statement has been categorized as one of the intents for which the chatbot has been trained, a JSON response is sent to the backend to trigger a function and generate a response

2.2 B. Response Generation

The response that is to be generated can be static, dynamic from a database like Amazon DynamoDB or cloud computing function or can be Real-Time where a set of sensors send a set of raw data which are processed by some cloud based SaaS like IBM Watson Visual Recognition or Amazon Rekognition which process the data, extract relevant information like faces, emotions, age, appearance, similarity

to the known faces etc. and then send the processed data in form of JSON to the chatbot. IoT-Chatbots are those chatbots which use this third way of generating response by fetching real-time data from various sensors by leveraging their connectivity and interconnectivity over the internet.

3. USING IoT BASED CHATBOT TO ENSURE SAFETY

Women working till late night and school children below 9 years of age who cannot use smartphones to inform their parents are always at a risk of abduction, sexual assault or murder. The solution can be properly elaborated after explaining the medium of communication that is used today.

3.1 Present Day Scenario

In today's world, worried parents wait for a phone call from their daughter, rely on SMS or ping using a messaging app and then wait for the reply. They may also make a phone call to their daughter if they do not get a timely response. However, none of these methods are efficient in mitigating the tension, reporting incident at the right time or instantly reply with location and situation pertaining to their daughter's safety. Lack of evidence at the right time also hinders the investigation process.

3.2 Proposed Solution Using IoT Based Chatbot



Figure 1. Figure describing the basic architecture of the model

Instead of the contemporary methods mentioned in section 3.1, autonomous systems like Chatbots can be used by parents to get instant replies with real-time processed data from the IoT device. An example of the same has been given in the Abstract section. An elaborative step by step description of the system's working methods has been given below.

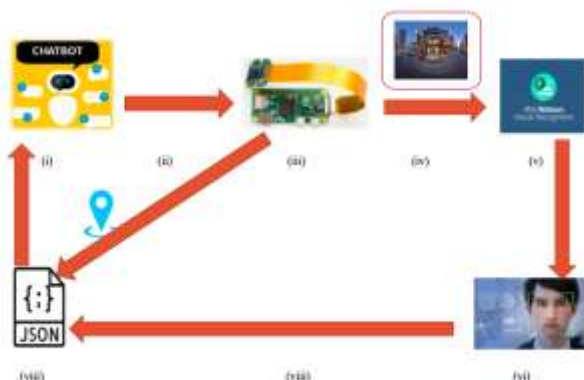


Figure 2. Figure describing the workflow of the model

- STEP I: A parent starts a chat and asks the chatbot about the whereabouts of his/her child.

- STEP II: The chatbot uses Natural Language Processing^[4] to extract the intent from the statements and phrases used while chatting
- STEP III: After intent extraction, chatbot sends a request to the IoT device to call a function which will capture a 360-degree image and the location using GPS. While the GPS data is directly sent to the response file (VIII), the 360-degree image is sent to a Software as a service (SaaS)^[7] like IBM Watson Visual Recognition or Amazon Rekognition
- STEP IV: The image that has been captured by the 360-degree spherical camera on IoT device contains a lot of information like human faces, emotions, age and appearance of people in the picture. These details can be fetched when this image is processed by a machine learning based image recognition software as mentioned in step (III).
- STEP V: Machine Learning based image recognition software like AWS Rekognition or IBM Watson Visual Recognition^[9] process the image to retrieve relevant information as mentioned in step (iv). The system also uses face recognition to detect if the faces in the picture are known or not.
- STEP VI: The image recognition software returns a response which contains all the information that has been fetched from the 360-degree image using machine learning.
- STEP VII: All the data from the image are then sent to a response JSON file.
- STEP VIII: The response JSON file now has processed real-time data from the image and also the GPS location. The chatbot parses all the relevant information from the JSON response and provides a meaningful and conclusive answer to the parent.

If the parent now feels that the information that the chatbot has provided is unusual and needs to be reported, he or she may simply ask the chatbot to report the incident (with relevant data) to the nearest police station or concerned authority. I have also automated the chatbot agent to automatically fetch relevant information from the IoT device and send notifications to the parents.

4. ENSURING PRIVACY OF THE DATA

During experimentation, I have ensured that the chatbot is private and only accessible to certain people like the parents, husband or other requested members of the family. I have also configured a dating mode for working women who may wish to temporarily prevent the IoT device from transmitting any data.

5. CONCLUSION & FUTURE WORK

The proposed solution can be used to counter the crime against women. It does not provide protection, but it does provide a medium to report incidents quickly, to help in

investigation by providing proof and most importantly it provides a medium to know the whereabouts and alert the authorities accordingly. Even a security factor of 10% to counter the crime and aid in the efficient and timely investigation and prosecution will create a sense of fear in the minds of criminal. Over the next 10 years, IoT based chatbots can be enhanced to increase the security factor two-fold by introducing data analytics which the chatbot can use to predict the threat to security.

Apart from being intelligent to extract the intent and understand human's need using machine Natural Language Processing, the efficiency of chatbots also plays a huge role in the success and widespread of chatbots. Response consisting of Real-time data from various sensors and processed files can make a chatbot more efficient. A lot of research has been done to make chatbots smart and intelligent to interpret human conversation. However, there is also a need of extensive research in enhancing the response side of a chatbot. If the chatbots do not provide relevant, accurate, updated and conclusive information to the user, the advent of chatbots may be futile.

REFERENCES

- [1] A Survey on Internet of Things: Architecture, Enabling Technologies, Security and Privacy, and Applications – Jie Lin, Wei Yu, Nan Zhang, Xinyu Yang, Hanlin Zhang, Wei Zhao
- [2] The What and How of Smart Personal Assistants: Principles and Application Domains for IS Research – Robin Knote, Andreas Janson, Laura Eigenbrod and Matthias Sollner.
- [3] Analysis and Comparison of Intelligent Personal Assistants – Oktay Bahceci.
- [4] Natural Language Processing (Almost) from Scratch – Ronan Collobert, Jason Weston, Leon Bottou, Michel Karlen, Koray Kavukcuoglu, Pavel Kuksa.
- [5] <https://www.arrow.com/en/research-and-events/articles/raspberry-pi-zero-w>
- [6] A Wireless 360-degree Wearable Streaming Camera for Remote Situational Awareness – Brian Peck, Stephen Gilbert, Eliot Winer and Rober C. Ray
- [7] A survey on Software as a service (SaaS) using quality model in cloud computing – Sarbojit Banerjee, Shivam Jain
- [8] https://aws.amazon.com/rekognition/?nc2=h_m1
- [9] <https://www.ibm.com/watson/services/visual-recognition/>
- [10] BANK CHAT BOT – An Intelligent Assistant System Using NLP and Machine Learning – Chaitrali S. Kulkarni, Amruta U. Bhavsar, Savita R. Pingale, Prof. Satish S. Kumbhar.
- [11] Performance Analysis of Naive Bayes and J48 Classification Algorithm for Data Classification - Tina R. Patil, Mrs.S.S Sherekar.

- [12] Topic Aware Neural Response Generation -Chen Xing, Wei Wu, Yu Wu, Jie Liu, Yalou Huang, Ming Zhou, Wei-Ying Ma.

[#]

<http://ipindiaservices.gov.in/PatentSearch/PatentSearch/ViewApplicationStatus?AppNumber=+EJUjwjE6B+Dxf/q6DxvCQ==>

BIOGRAPHY



Anubhav Ghosh is the co-founder of G.I Labs India (Ghosh Innovation Labs Private Limited) and leads the NLP R&D Centre of the company. Under his leadership, the company has been certified as one of India's top 3000 startups by IIM Calcutta Innovation Park. Also, he is a former employee of Accenture.