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Smart Mirror with a Personnel AI

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Abstract:** In today's expeditiously paced world, curtailing time is of the utmost concern. Instead of constantly pulling out a device, one could get informed while finishing daily grooming tasks. We designed and built our own prototype and delved into the world of do-it-yourself smart mirrors. Our system uses a raspberry pi with a display to connect to the internet using IOT through the use of a LAN cable/wifi module. This allows us to receive data through the IOT platform. We use forecast.io (Dark Sky) in order to connect our system to the internet and get news feeds. Our proposed project allows building such mirrors that show the viewer different kinds of information in the form of widgets, such as weather, time, date, and news updates. Our framework can annex some AI components. It includes Google speech to text API and text to speech API, Open cv and wit.ai. So it'll have the ability to speak to you and listen to what you say it will also have some facial recognition components so it knows when you're standing in front of the mirror and then the AI will be able to find whether holidays news tell jokes. Our system incorporates all of these on a Raspberry Pi. Therefore, the personalized experience is enhanced with the integration of Artificial Intelligence in the mirror, which over the period of time shall be integrated with other IoT-based home automation devices. We also plan to use the smart mirror in commercial applications such as the railway stations, bus stops, hospitality industries and so on.

***Keywords:** Smart mirror; Internet of things; Raspberry Pi; Artificial Intelligence; Interactive services; Home Automation*

I. INTRODUCTION

In today's world, with prior to facing the day ahead of us, that one mandatory activity that most of us do is to check self in front of a mirror. This is a commonly observed behavior among us before we'd step out of our homes for dinners, meetings, movies, visits, or even for only a walk. In this fast-paced environment, from phones to televisions every single thing around us is getting smarter. [1] But, with respect to traditional mirrors, they remain same from ages. Hence, our ideology is to convert the traditional looking smart mirror into a smart mirror. We propose a smart mirror which is interactive and one can be well informed with the notifications being displayed through widgets and real-time updates. Doesn't it feel good to know more from a mirror rather than just yourself? The date, weather, time and the local news can be accessed just at one shot instead of pulling out some other secondary devices like phones, tablets or even the newspapers. This will save a lot of time and will keep you more informed before you start your day. Intelligent mirrors will take its place in the future technology and will provide both mirror and computer-aided information services to its users. Thanks to the microcontroller cards on board, these systems, which can connect to the internet and take data from the internet, can show this information on the places located on the mirror. In the scope of the study, the developed intelligent mirror system includes the weather information, time and location information, current event information, user information, and camera image taken from web services using Raspberry Pi 3 microcontroller card. [2] This equipment can be controlled by voice commands via the microphone on the smart mirror. The Rest of the paper is organized as follows Section II describes the SYSTEM ARCHITECTURE along with its COMPONENTS, Section III emphasizes on the User interface, Section IV will focus on system training. Finally, we conclude the paper in Section V followed by the references and acknowledgment.

II. SYSTEM ARCHITECTURE AND COMPONENTS

This section explains the methodology adopted in completing this project. Basically, our proposed framework serves for two applications i.e. IOT and A.I. The hardware architecture remains the same for both the architecture except for components like webcam and speakers with respect to the IOT application [3] of the system. Both the applications run on a hardware architecture with a set of components listed below:

1) Raspberry Pi 3(Model B)
2) Led Monitor
3) Sd Cards
4) Hdmi To Vga
5) Two Way Mirror

6) Webcam With Mic (In-Built Microphone)
7) Speakers

Since our proposed architecture provides real-time updates, facial recognition, greetings and various other interactive services, the requirements for stable and quality software are highly essential. Hence,our system is composed of following softwares:

8) Raspbian Stretch with Desktop
9) Python3
10) Pip
11) Forecast.io(dark sky)
12) JSON
13) XML
14) Linuxbrew
15) FFmpeg
16) Google Speech API
17) Opencv3

Few applications of the system's software architecture are shown as follows:

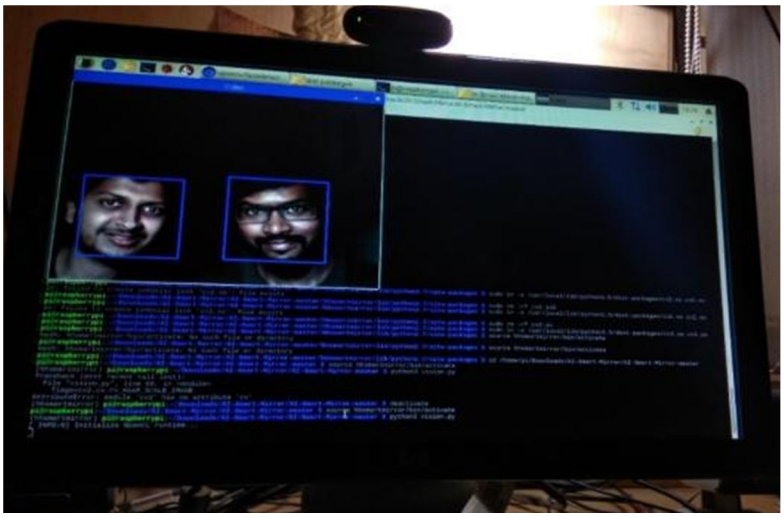

Fig. 1 Facial Recognition using OpenCV3[4]

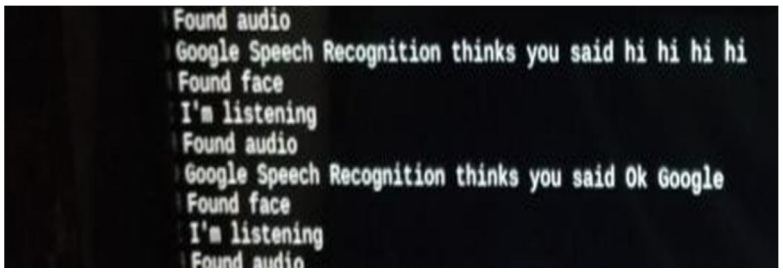

Fig. 2 Operations using Google Speech API[5]

A. IOT

The technology involved with IOT uses the concept of REST (Representational State Transfer API). It works more of it like a website in which you(client) make a call to the server and you get required data through https protocol. In our framework, we make use of JSON[6] and XML to get the forecast and local news respectively. JSON (JavaScript Object Notation) can be called as a resource to facilitate the forecast request across the network. Whereas the XML[7] here is a markup language with the inclusion of RSS for obtaining the feed of the local news. The RSS gives the updated information to the client which prevents the client to fetch the data individually. This saves a lot of time and RSS are created using XML codes which is a mark applied for coding documents in terms of machine and human code.

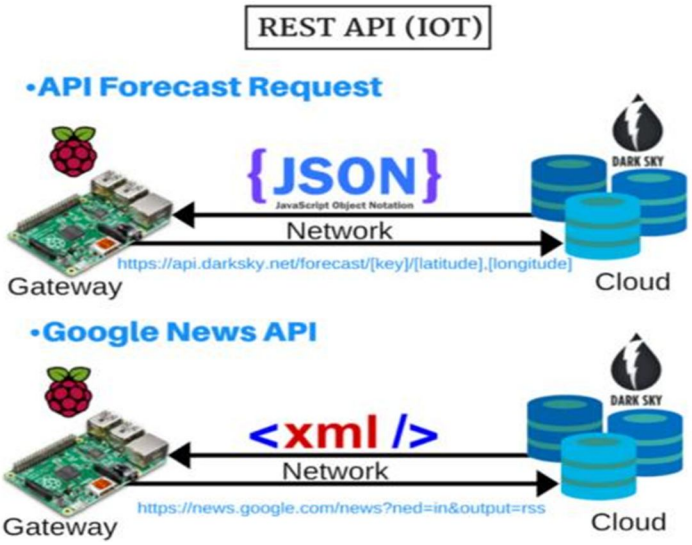

Fig. 3 Rest API Call

The weather API token is taken from a site called forecast.io(dark sky)[8]. So you'll need to make an account on forecast.io. It's free and it will give you an API token and then you would just replace it in the main file. In the forecast.io site and forecast API under developers, you can register and create an account, it will, uh, display an API token which is just a string value. JSON is used to obtain the information about the weather forecast ranging from 7-day forecasts to 3 or current day forecasts. While the XML is used to obtain the results of the local news which will serve as a real-time data with timely updates. Both forecast and time machine requests return the same weather conditions, in the same convenient JSON format. You can parse the response directly, or use one several community-contributed libraries to interact with our API in the programming language of your choice.

B. AI

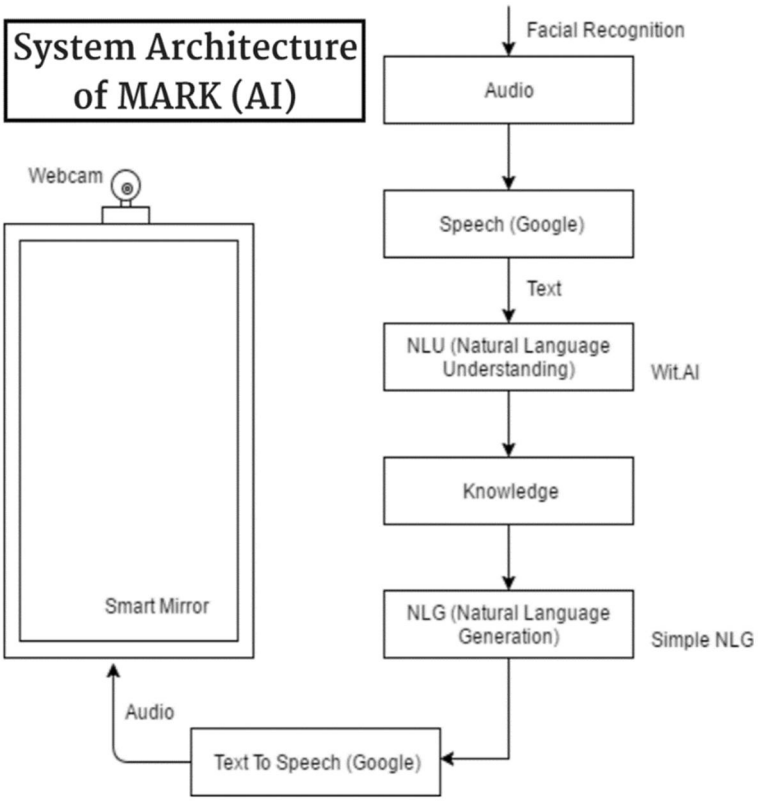

Fig. 4

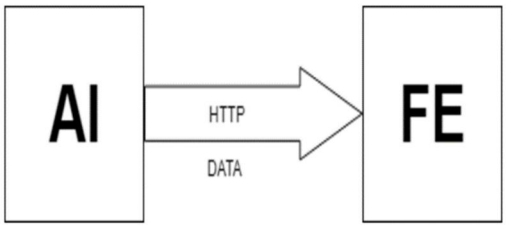

Fig. 5

The above diagram Fig. 4 depicts the flow of control involved with the application of Artificial Intelligence in our proposed architecture. Our AI is similar to that scenario where let's just say that this is our smart mirror and when the smart mirror sees a user we have a webcam up top so there will be some sort of facial recognition and once we know that the users in front of the smart mirror[9], it will start listening for audio so let's take that example where somebody says what's the weather this is just audio and it's not very useful to us because you can't really process audio as fast as you can process text so we're going to use a module to convert that audio to text so we'll just call this speech and this is using Google speech and Google is really good about translating audio to text so it's very accurate and usually for most accents it'll able to quickly translate that audio to text. Once we have text we want to figure out you know what does the user actually mean by this sentence and in order to do that we're using a knowledge module and wit.AI[10]. This extracts the intent from our text so suppose in this case the intent is weather and the user wants to know about the weather, weather would be an entity because it modifies what you return for the weather. So when we have this we need to reach out to the internet and find information about what the user wants. So we'll call that module knowledge once we have knowledge saying the weather is 50 or 75 degrees and sunny, we want to convert that to a sentence that actually flows and makes sense like somebody else is saying it to them. Once we have the text we actually need to say to the user so we have one final module here and this is text-to-speech and so we're also using Google text-to-speech here and it basically creates audio that we can play back to the user through portable speakers. Fig. 5 elaborates on the JavaScript display system to run your application so what we did was we created a client on the front end that our AI will communicate with send data to this front end and then the front end will display information that we generated with our AI so this AI system is something we wrote and then front end is driven by magic mirror but it uses a module that we created as well first thing I'm going to do is go back to magic mirror[11] and then clone this repository this needs to be running before we can start up our AI client because it is dependent on this front-end running because it sends HTTP calls to this front-end.

III. USER INTERFACE

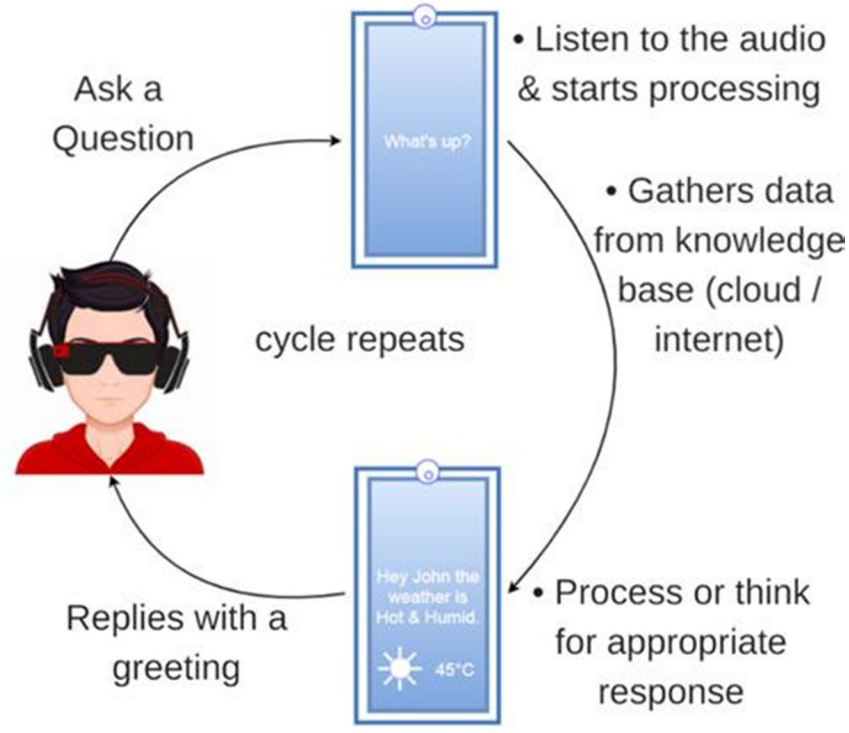

Fig. 6 Interaction Mechanism

In our smart_mirror[12] system, the launch phrase function is recursive so you can keep asking it questions and it will keep responding to it and then when you say either thank you or it doesn't recognize your intent it will stop responding to you and you'll have to say the launch phrase again so let me just give a demo of a bunch of different phrases not all of them will there, will be a few Easter eggs but you can find those if you want to test it,

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User: Hello(Launch Phrase)
Mirror:(Displays)

User: News
Mirror: Sure, I have got some headlines For you

User: Weather
Mirror: The temperature is 28^0C And Sunny

User: Find me a map of Kadubeesenahalli
Mirror: sure here's a map of Kadubeesenahalli

User: Joke
Mirror: A clean house is a sign of a broken computer

User: Show me your face
Mirror:(Displays)

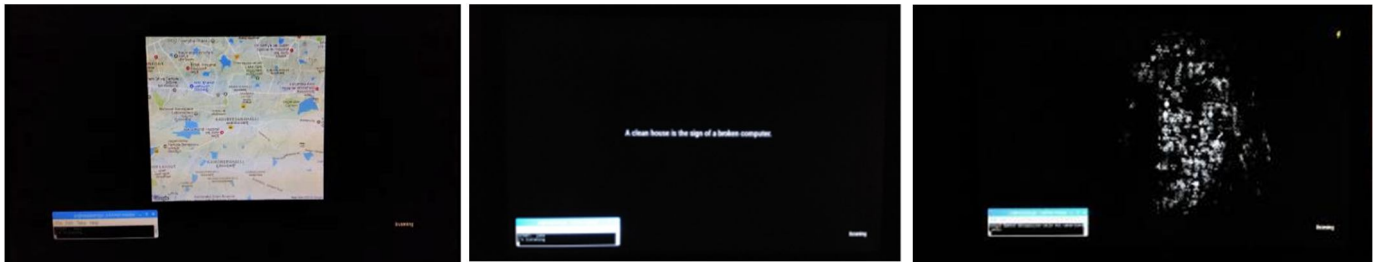

Fig.7. Experimental Results of A.I application

Run python smartmirror.py and depending on how slow your network connection is, it might take a few seconds to start up. So, when it's loaded and if I click on the window and press enter, it goes full screen and we have our very own real-time smart mirror set up!

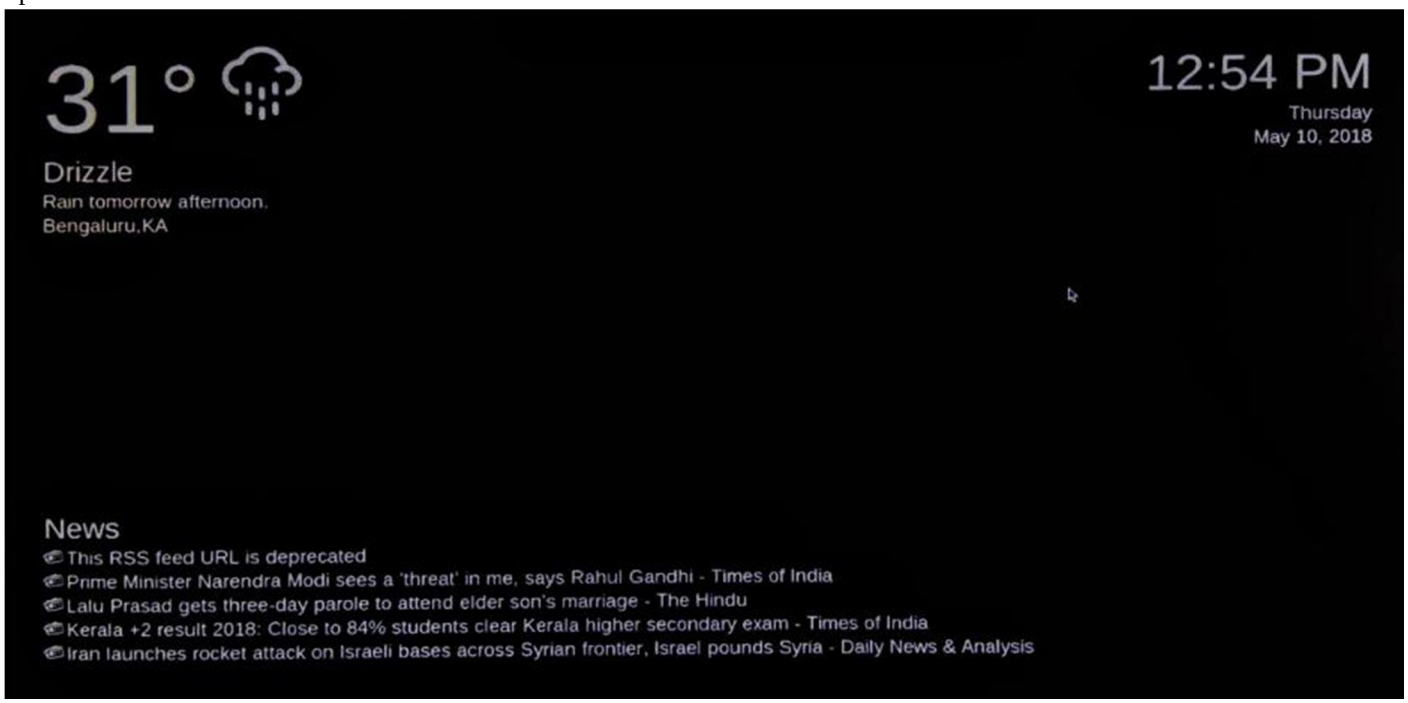

Fig. 8 Experimental result of IOT application.

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IV. SYSTEM TRAINING

The implementation of IoT involves training through making an account on forecast.io and the forecast API under developers and if you register Create an account, it will display an API token which is just a string value and so once you get that, you can come back to your smartmirror.py and then replace this token here with your API token. Once you've done that, you can just hit, uh, escape and then capital ZZ to save. Okay, now you can go back to my console and we'll need to do one more thing before we start this , we need to install one more thing and is python-imaging tk So you can install that with sudo apt-get install python-imaging.tk and after I run this, I can run python smartmirror.py And depending on how slow your network connection is it might take a few seconds to start up Okay, so now it's loaded and if I click on the window and press enter, it goes full screen and we have our very own smart mirror set up!

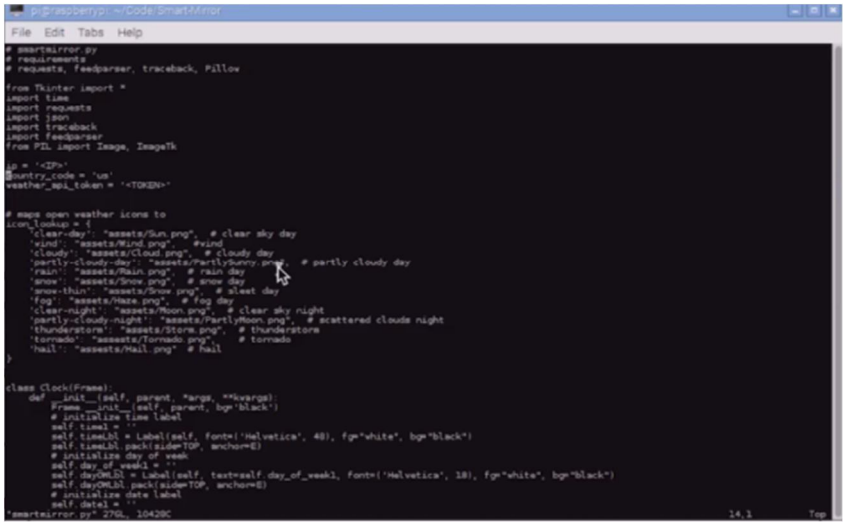

Fig. 9 Token Initialization

The implementation of A.I technology involves facial-recognition model which is used for detecting faces so when we have our webcam hooked up this is basically just a bunch of data points that help the computer vision code which determines if there's a face in the image. We'll use that for our facial recognition module where there's also a wit training data zip. Wit AI is what we're using for natural language understanding and we use it for our smart mirror because it's very useful and easy to work with. So what we are going to want to do is use this training data to set up a new app. So we've already had a few apps up here but you will need to create an account with wit AI and then setup your own app so that you can get an API key and then use that with your application. Hence when you come to wit and after making an account you'll see the plus button up here for a new app.

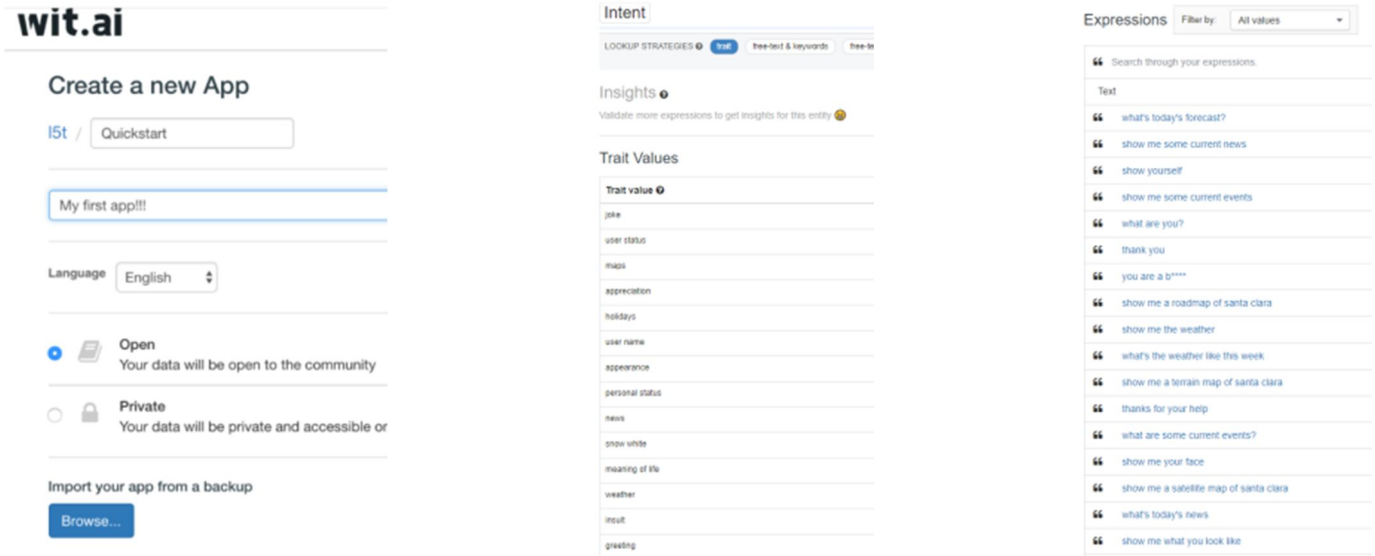

Fig. 10 Wit.ai (Natural Language Understanding Engine) Training data

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V. CONCLUSION & FUTURE SCOPE

This documentation is about the smart mirror project. This stemmed from the need for better time management and productively along with the inspiration of new, developing technologies now available. The smart mirror idea was created to give instant access to information in a convenient and time-saving environment, the living room. All other aspects of the mirror's design developed from these ideas and inspirations. The goals of the smart mirror[13] were to aim to reduce the time needed in a user's daily routine and provide a merger of user and technology that becomes an enhancement, not a new burden. The functionality must meet these descriptions in the design. The smart mirror[14] did the thinking for the user with intelligent, commonly used applications. Apps like their calendar, music, news, Twitter, to-do lists, and weather will be available. The apps were unobtrusively displayed on the screen, hidden by the two-way mirror, as to look like a seamless experience. A good project can't be produced without proper research first. Similar projects and products were analyzed for similarities, improvements, and flaws. Once enough information was collected about specifications and prices, strategic components were selected to be part of the project from both a hardware and software perspective. The hardware components included the central PC components, the webcam with mic, speakers, and Raspberry Pi. After research, the design phase was started. This included multiple subsystems which ranged in various difficulties and depth of design. One of the easier subsystems to design was the gesture control subsystem. The final stages of the project, and document covered how the mirror was approached in terms of prototyping and testing. Overall, the group was optimistic and confident that the individual designs of the components would come together to deliver the promised smart mirror experience. The prototype that was delivered was well tested, contained minimal bugs, and was something that has that consumer product potential. The group continued to follow the milestones as well as the direction set up by this document to finally deliver the smart mirror as the best it can be. We have designed the future of the mirror known as the smart mirror that provides a user interaction between the mirror and the user. The mirror consists of LED display monitor which displays all information which is useful for the user.

VI. ACKNOWLEDGMENT

The project team of "Smart Mirror with a personal AI" would like to express our honest sense of gratitude to our institution – New Horizon College of Engineering (NHCE). We wish to express our sincere thanks to Mr. Aravinda , Head of the Department of Electronics & Communication Engineering, NHCE for permitting us to pursue our project in college and encouraging us throughout the project. Our gratitude goes to all who have stood behind us and motivated and helped us accomplish the goal by sharing their knowledge and views on the topic. Among them is our guide Mrs. Aparna who has guided us throughout the task with her expertise and experience.

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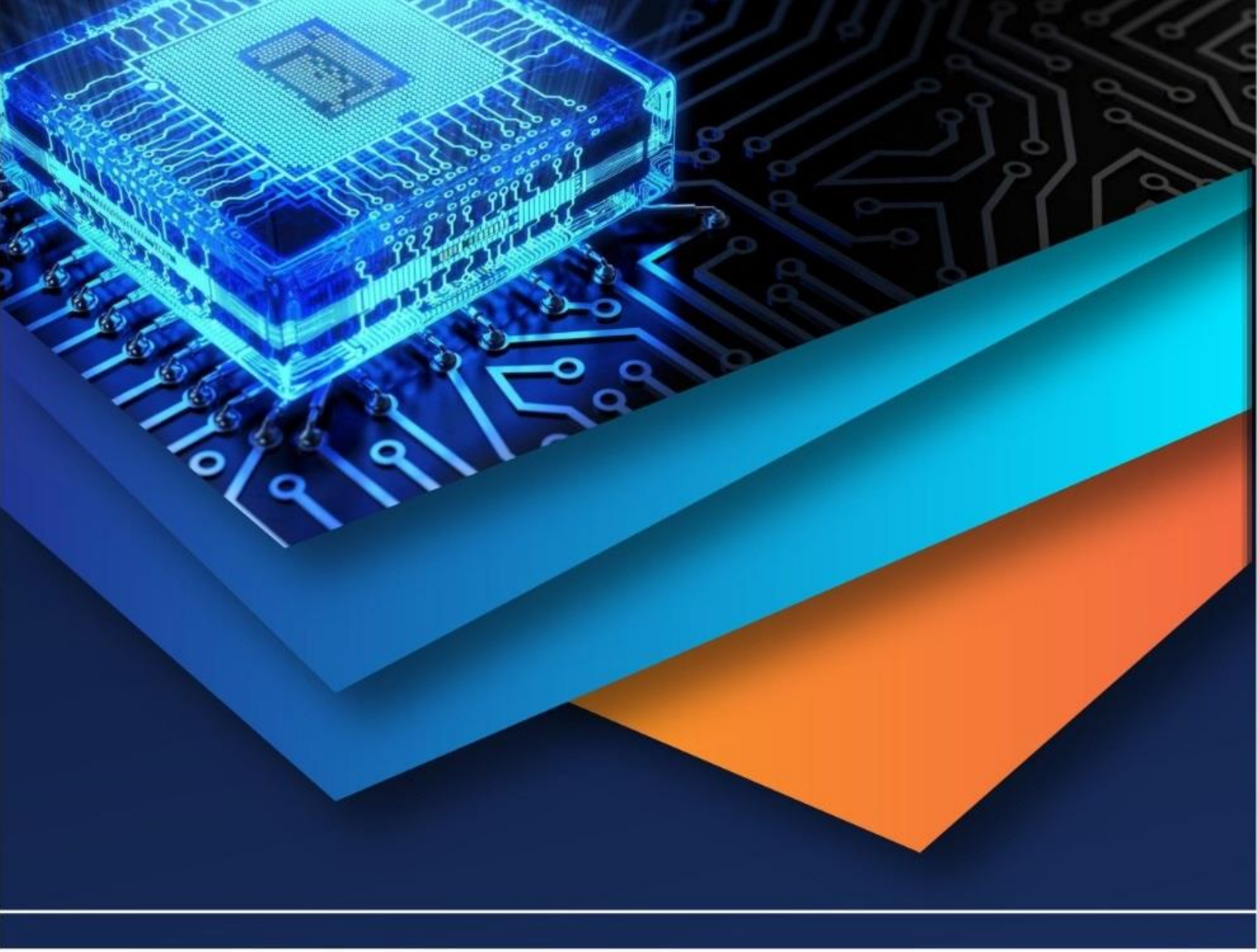

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