REAL TIME COMMUNICATION SYSTEM POWERED

BY AI FOR SPECIALLY ABLED

NALAIYA THIRAN PROJECT REPORT

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1. INTRODUCTION

1.1 PROJECT OVERVIEW

This report provides an introduction into how Artificial Intelligence (AI) has the potential to support and enhance the accessibility of Information and

Communication Technologies (ICTs).In an increasingly multimedia-heavy world where authors and developers fail to appreciate the importance of alternative formats that may suit users preferences, such as working with audio content rather than written or images rather than video, we need to develop more tools to automate accessibility tasks. Lack of accessibility means that ICTs are unable to provide ease of use and support for persons with disabilities (PwD).'AI for Good' has the potential to remove this barrier, if it is provided with the right data and algorithms while ensuring Universal Design(UD)for all. when someone call, that words will be recognize and words will converted into text ,whatever language it be converting for deaf and dumb people.

1.2 PURPOSE

Communication should be universal without any barriers or limitations. This project establishes a method for providing equality, turning the disabilities of the hearing and or speech impaired individuals to abilities, creating a base where both the disabled and the able can communicate without any barrier. Our objective is to blend deaf and dumb within society and make them able to use their personal computers more effectively and efficiently. The bigger picture is creating an interactive model of communication for deaf and dumb people. We are making use of a convolution neural network to create a model that is trained on different hand gestures. An app is built which uses this model. This app enables deaf and dumb people to convey their information using signs which get converted to human understandable language.

2. LITERATURE SURVEY

	Paper name	Author name	Algorithm used	Application	limitation
1	Motionlets matching with adaptive kernels for 3D Indian Sign Language recognition.	Kishore. D.A,Sastry.A.C. S, & E. K. P.V. Kumar,	They create a two-phase algorithm for device translations that maintain many regions of three- dimensional sign language motion information.	An application that recognizes Indian sign language indications. It is generated 3D motion captured data, which is then used to recognize sign language.	The model translates sign languages does not convert text to sign languages.
2	A wearable system for recognizing American Sign Language using IMU and surface EMG sensors.	Wu, Jian,Lu, Sun and Roozbeh Jafari	The best subset of highlights from countless different highlights is selected, and 4 common different algorithms are researched for device designs.	Hand gestures are used to detect signals performed by both speech-impaired and hearing impaired people into speech	Using hand-held sensors and talking would not have the same level of

					precision.
3	Avatar- based sign language interpretation for weather forecast and other TV programs	oh J, Kim B, Kim M, Kang S, Kwon H, Kim I, Song Y	They studied the previous 3 years' worth of weather forecasting documents from the variety of Sources to determine the frequency of each word.	For both speech- impaired and hearing- impaired people to see the weather forecast with a sign language	This system works only with a weather forecasting system.
4	Glove-based continuous Arabic Sign Language recognition in user-dependent mode	Tubaiz N, Shanableh T, Assaleh K	Modified K- Nearest Neighbours classifier.	Continuous Arabic sign language recognition (ArSL)	Sensor readings cannot be visually checked for manual labelling.
5	Intelligent mobile assistant for hearing impairers to interact with the society in Sinhala language",	Yasintha Perera, Nelunika Jayalath, Shenali Tissera, oshani Bandara, Samantha Thelijjagoda	Instant Messaging, Mobile Application, Voice recognition, Natural Language processing, Graphic Interchange Format Introduction	The significance is that it allows hearing- impaired individuals to communicate when they are long distance apart. This app will close the divide between hearing impaired people	The file Format is not compatible
6	Sign Language Recognition System Using Deep Neural Network", Advanced Computing & Communication Systems (ICACCS)	Surejya Suresh, Haridas T.P. Mithun, M.H. Supriya.	CNN structure and a summary of the planned construction. The planned construction was studied using 2 plans, the 1st of which use the Stochastic Gradient optimizer and the second of which used the Adam	The convolutional neural network was used to create a basic version of the sign recognition plan, which was successfully tested.	It is not user friendly

2.1 EXISTING PROBLEM

2.2 REFERENCES

1. **Abhishek, K. S., Qubeley, L. C. F., & Ho, D. (2016, August).Glove-basedhand gesture recognition sign language translator using capacitive touch sensor. In 2016 IEEE International Conference on Electron Devices and Solid State**

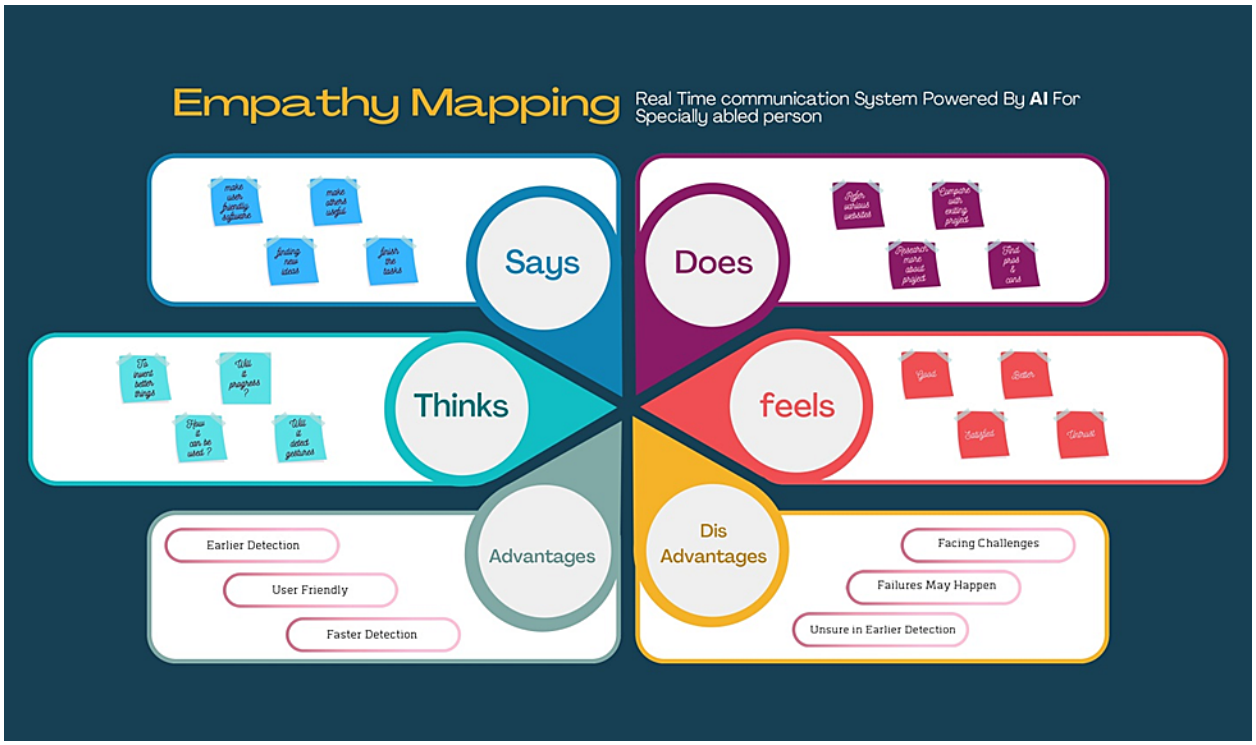
Circuits(EDSSC)(pp. 334-337).IEEE

2.Anderson, R., Wiryana, F., Ariesta, M. C., & Kusuma, G. P. (2017). Sign language recognition application systems for deaf-mute people: A review based on input-process output. Procedia computer science, 116,441, 448

3.Badhe, P. C., & Kulkarni, V. (2015, November). Indian sign languagetranslator using gesture recognition algorithm. In 2015 IEEE International Conference on Computer Graphics, Vision and Information Security (CGVIS)(pp.195-200).IEEE

3. IDEATION & PROPOSED SOLUTION

3.1 EMPATHY MAP CANVAS



3.2 IDEATION & BRAINSTORMING

3.3 PROPOSED SOLUTION

1. Problem Statement (Problem to be Solved):

To model a system for aiding deaf and dumb people and help them to communicate in real[1]

Time.

2. Idea / Solution description:

The model uses a technique called Background-subtraction which is considered as a major pre[1]

processing step. There are two methods available in the literature for removing the background to extract the foreground object. We have planned to employ these methods in the design of the proposed Sign Language Converter for identifying the hand region in the input image captured by the camera.

3.Novelty / Uniqueness:

We will be using the latest and trending wearable technology which makes it possible to carry the device (Mobile Application) easily anywhere and everywhere by the disabled person which makes the communication possible by both specially abled and normal people.

We will be using the most recent convolution neural network architecture to improvethe effiffifficiency of the trained model.

1. Social Impact / Customer Satisfaction:

Helps to bridge the gaps in communication with hearing and speaking impaired people.

5.Business Model (Revenue Model)

The implemented end product will be marketed as a Retailer model, in which the product will be assigned an initial base price and will be updated once we bring new features to it

6.Scalability of the Solution:

Bootstrapping the company at fifirst through the founder’s funds, but eventually through reinvesting the profifit from servicing customers.

3.1 PROBLEM SOLUTION FIT

4. REQUIREMENT ANALYSIS

4.1FUNCTIONAL REQUIREMENT

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail Registration through LinkedIN
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Uploading image	Upload image through camera Upload image through gallery
FR-4	Text to speech	Select speech icon to convert the respective text for sign language
FR-5	Whiteboard	Use whiteboard to share the message by drawing
FR-6	Emergency templates	Select emergency templates icon to pass the message quickly

4.2NON-FUNCTIONAL REQUIREMENT

Following are the non-functional requirements of the proposed solution.

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	User can easily upload the image and this app is designed in a way where user can easily find some predefined templates
NFR-2	**Security**	User should signin into an app only then proceed for further process. So unautrhorized access will be avoided at max.
NFR-3	**Reliability**	This app have robust fault tolerance and even if a glitch occurs also it recovers fastly.
NFR-4	**Performance**	This app will quickly upload and process the images because it predict the sign language using CNN model and it gives high accuracy
NFR-5	**Availability**	The predefined templates will be available to all users and also have whiteboard option. This app is designed in a way that it is transparent and

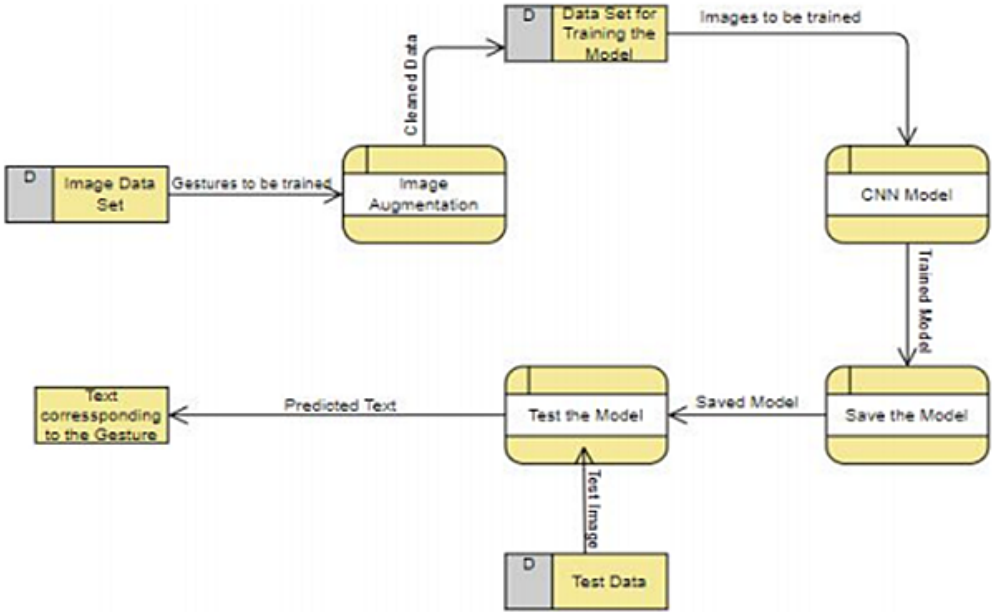
5.PROJECT DESIGN

5.1 DATA FLOW DIAGRAM

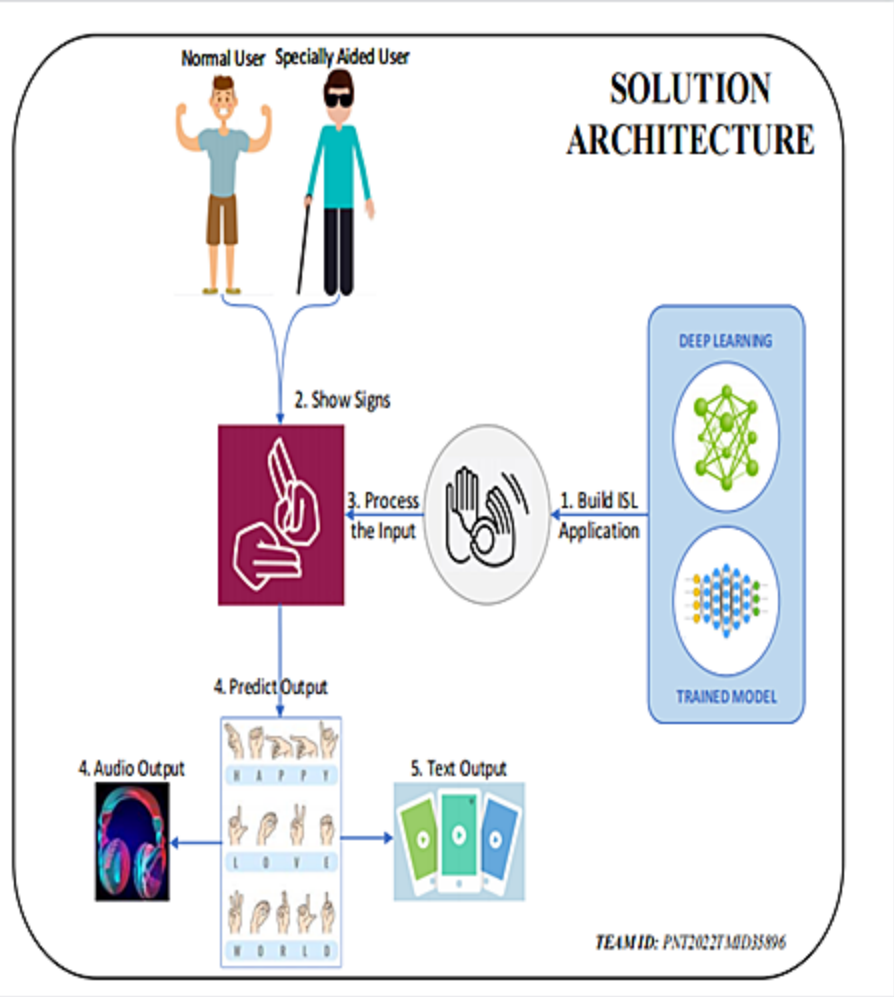
Data Flow Diagrams:

Level - 0 DFD:

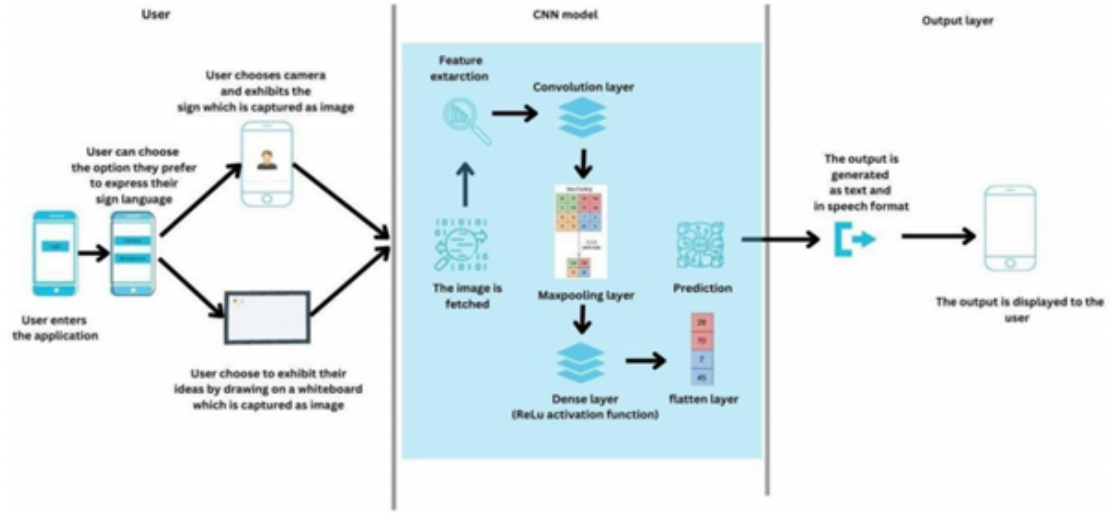
Level - 1 DFD:



5.2 SOLUTION & TECHNICAL ARCHITECTURE



Technical Architecture:



5.3USER STORIES

1.Problem:

Vedha has difficulty in hearing. He uses sign language to communicate with others. But he can't able to communicate with normal people who don't understand sign language.

Solution:

To develop a system that converts the sign language into a human hearing voice in the desired language to convey a message to normal people, as well as convert speech into understandable sign language for the deaf ,the system enhances the user friendly experience.

2.Problem:

Ram is a dumb by birth. He uses sign language to communicate with others. But he can't able to communicate with normal people who don't understand sign language.

Solution:

To create a app for understanding sign language and convert into Speech signal as output for normal people.

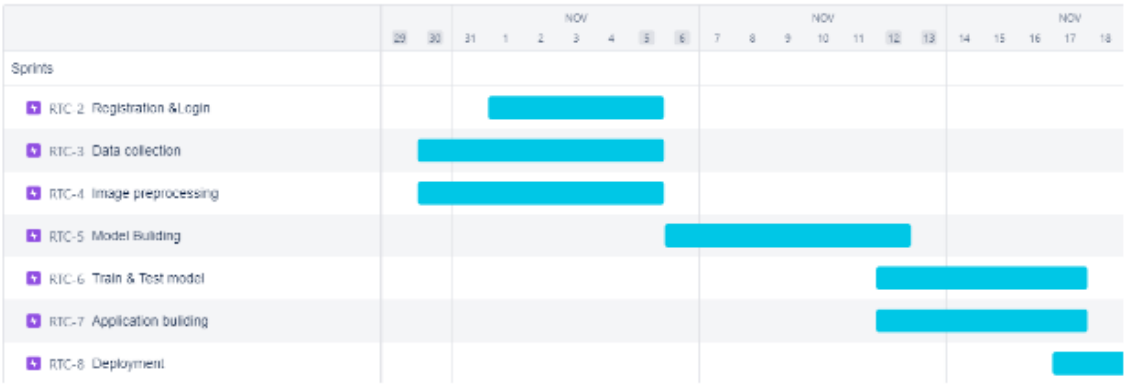
6.PROJECT PLANNING & SCHEDULING

6.1SPRINT PLANNING & ESTIMATION

6.2 SPRINT DELIVERY SCHEDULE

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)
Sprint-1	20	6 Days	01 Nov 2022	06 Nov 2022	10
Sprint-2	20	6 Days	01 Nov 2022	06 Nov 2022	22
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	16

6.3 REPORTS FROM JIRA



7.CODING AND SOLUTIONING

7.1 FEATURE 1

LOGIN AND REGISTRATION

index.html

<!DOCTYPE html>

<html lang="en" >

<head>

<meta charset="UTF-8">

<title>Sign Up Signin Form Template Example</title>

<link rel="stylesheet"
href="./style.css">
</head>
<body>
<!-- partial:index.partial.html -->
<html lang="en">
<head>
<!-- Latest compiled and minified CSS -->
<link rel="stylesheet"
href="https://maxcdn.bootstrapcdn.com/bootstrap/3.3.5/css/bootstrap.min.css">

</head>
<body>
<div id="form">
<div class="container">
<div class="col-lg-6 col-lg-offset-3 col-md-6 col-md-offset-3 col-md-8 col-md-offset-2">
<div id="userform">
<ul class="nav nav-tabs nav-justified" role="tablist">
<li class="active">Sign up
<a href="#login" role="tab"

data-toggle="tab">Log in

<div class="tab-content">
<div class="tab-pane fade active in"
id="signup">
<h2 class="text-uppercase text-center"> Sign Up
for Free</h2>
<form id="signup">
<div class="row">
<div class="col-xs-12 col-sm-6">
<div class="form-group">
<label>First Name* </label>
<input type="text" class="form-control"
id="first_name"
required data-validation-required-message="Please enter your
name."
autocomplete="off">
<p class="help-block text-danger"></p>
</div>
</div>

<div class="col-xs-12 col-sm-6">
<div class="form-group">
<label> Last Name* </label>
<input type="text" class="form-control"

id="last_name"
required data-validation-required-message="Please enter your name."
autocomplete="off">
<p class="help-block text-danger"></p>
</div>
</div>
</div>
<div class="form-group">
<label> Your Email* </label>
<input type="email" class="form-control" id="email" required
data-validation-required-message="Please enter your email address."
autocomplete="off">
<p class="help-block text-danger"></p>
</div>
<div class="form-group">
<label> Your Phone* </label>
<input type="tel" class="form-control" id="phone" required data-validation-required-message="Please enter your phone number."
autocomplete="off">
<p class="help-block text-danger"></p>

</div>
<div class="form-group">
<label> Password* </label>

<input type="password" class="form-
control" id="password"
required data-validation-required-message="Please enter your
password"
autocomplete="off">
<p class="help-block text-danger"></p>
</div>
<div class="mrgn-30-top">
<button type="submit" class="btn btn-larger btn-
block"/>
Sign up
</button>
</div>
</form>
</div>
<div class="tab-pane fade in"
id="login">
<h2 class="text-uppercase text-center"> Log
in</h2>
<form id="login">
<div class="form-group">
<label> Your Email<span

class="req">* </label>
<input type="email" class="form-control"
id="email" required
data-validation-required-message="Please enter your email
address."
autocomplete="off">
<p class="help-block text-danger"></p>
</div>
<div class="form-group">
<label> Password* </label>
<input type="password" class="form-
control" id="password"
required data-validation-required-message="Please enter your
password"
autocomplete="off">

<p class="help-block text-danger"></p>
</div>
<div class="mrgn-30-top">
<button type="submit" class="btn btn-larger btn-
block"/>
Log in
</button>
</div>
</form>
</div>

</div>
</div>
</div>
</div>
<!-- /.container -->
</div>
<script src="//code.jquery.com/jquery-
1.11.3.min.js"></script>
<!-- Latest compiled and minified JavaScript -->
<script
src="https://maxcdn.bootstrapcdn.com/bootstrap/3.3.5/js/bootstr
ap.min.js">
</script>
</body>
<!-- partial -->
<script src="./script.js"></script>
</body>
</html>
script.js
$('#form').find('input,
textarea').on('keyup blur focus', function (e) {

var $this = $(this),
label = $this.prev('label');
if (e.type === 'keyup') {

```
if ($this.val() === &#39;&#39;) {
label.removeClass(&#39;active highlight&#39;);
} else {
label.addClass(&#39;active highlight&#39;);
}
} else if (e.type === &#39;blur&#39;) {
if( $this.val() === &#39;&#39; ) {
label.removeClass(&#39;active highlight&#39;);
} else {
label.removeClass(&#39;highlight&#39;);
}


} else if (e.type === &#39;focus&#39;) {
if( $this.val() === &#39;&#39; ) {


label.removeClass(&#39;highlight&#39;);
}


else if( $this.val() !== &#39;&#39; ) {


label.addClass(&#39;highlight&#39;);
}


}
});
```

$('.tab a').on('click', function (e) {
e.preventDefault();
$(this).parent().addClass('active');
$(this).parent().siblings().removeClass('active');

target = $(this).attr('href');
$('.tab-content > div').not(target).hide();
$(target).fadeIn(800);
});

7.2 FEATURE 2

style.css

```
body, html {
height:100%;
background: #1c1e21;
overflow-x: hidden;
font-family: &amp;#39;Dosis&amp;#39;, sans-serif;
}
btn {
border-radius: 0
}
.btn:focus, .btn:active, .btn.active, .btn:active:focus {
outline: 0;
border-radius: 0
}
.btn-larger {
padding: 15px 40px !important;
border:2px solid #F7CA18 !important;;
```

```
border-radius: 0px !important;;
text-transform: uppercase;
font-family: &#39;Dosis&#39;, sans-serif;
font-size: 18px;


font-weight: 300;
color: #F7CA18;
background-color: transparent;
-webkit-transition: all .6s;
-moz-transition: all .6s;
transition: all .6s;
}
.btn-larger:hover, .btn-larger:focus, .btn-larger:active, .btn-
 larger.active,
.open .dropdown-toggle.btn-larger {
border-color: #F7CA18;
color: #fff;
background-color: #F7CA18;
border-radius: 0
}
.btn-larger:active, .btn-larger.active, .open .dropdown-toggle.btn-
 larger {
background-image: none;
}
.btn-larger.disabled, .btn-larger[disabled], fieldset[disabled] .btn-
 larger, .btn-
larger.disabled:hover, .btn-larger[disabled]:hover, fieldset[disabled]
```

```
 .btn-
larger:hover, .btn-larger.disabled:focus, .btn-larger[disabled]:focus,
fieldset[disabled] .btn-larger:focus, .btn-larger.disabled:active, .btn-
larger[disabled]:active, fieldset[disabled] .btn-larger:active, .btn-
larger.disabled.active, .btn-larger[disabled].active, fieldset[disabled]
 .btn-
larger.active {
border-color: #AEA8D3;
background-color: #AEA8D3;
}

.btn-larger .badge {
color: #AEA8D3;
background-color: #fff;
}
div#form {
color: #fff;
background-attachment: scroll;
background: #1c1e21
url(https://static.pexels.com/photos/8819/warsaw.jpg);
background-position: center center;
background-repeat: none;
-webkit-background-size: cover;
-moz-background-size: cover;
background-size: cover;
-o-background-size: cover;
min-height:100%;
```

```
}
#userform p {
font-size: 14px;
margin-bottom: 5px;
}
#userform ul {
list-style-type: none;
padding: 0;
margin-bottom: 0px;
}
#userform {


background: rgba(0,0,0,0.8);
margin: 20px 0 20px 0
}
@media (min-width: 768px) {
#userform {
background: rgba(0,0,0,0.8);
margin: 50px 0 20px 0
}
}
#userform .nav-tabs.nav-justified &gt; li &gt; a {
text-transform: uppercase;
font-size: 20px;
color: #F7CA18;
background-color: rgba(90,90,90,0.5);
}
```

```
#userform .nav-tabs.nav-justified &gt; .active &gt; a, #userform .nav-
 tabs.nav-
justified &gt; .active &gt; a:hover, #userform .nav-tabs.nav-justified
 &gt; .active &gt;
a:focus {
border: 0;
background: #F7CA18;
color: white;
border-radius: 0;
}
#userform .nav-justified &gt; li &gt; a {
margin-bottom: 0;
-webkit-transition: all .6s;
-moz-transition: all .6s;


transition: all .6s;
}
#userform .nav-justified &gt; li &gt; a:hover {
background: #AEA8D3;
color: #FFF;
}
#userform .nav-tabs &gt; li &gt; a {
border: 0px solid transparent;
border-radius: 0
}
#userform .nav-tabs.nav-justified &gt; li &gt; a:hover {
background: #F7CA18;
```

```
color: #FFF;
border-radius: 0;
border: 0;
-webkit-transition: all .6s;
-moz-transition: all .6s;
transition: all .6s;
}
#userform .nav-tabs &gt; li.active &gt; a, #userform .nav-tabs &gt;
 li.active &gt;
a:hover, #userform .nav-tabs &gt; li.active &gt; a:focus {
color: #F7CA18;
cursor: default;
background-color: transparent;
border: 0;
-webkit-transition: all .6s;
-moz-transition: all .6s;


transition: all .6s;
}
@media (min-width: 768px) {
#userform .nav-tabs.nav-justified &gt; li &gt; a {
border: 0;
-webkit-transition: all .6s;
-moz-transition: all .6s;
transition: all .6s;
}
#userform .nav-tabs.nav-justified &gt; li &gt; a:hover {
```

```
background-color: #F7CA18;
border-color: transparent;
border: 0;
-webkit-transition: all .6s;
-moz-transition: all .6s;
transition: all .6s;
}
}
@media (max-width: 768px) {
.nav-justified &gt; li {
display: table-cell !important;
width: 1% !important;
}
}
#userform .nav-tabs {
border-bottom: 0px solid #ddd;
}


#userform .tab-pane h2 {
margin: 10px 0;
color: #FFF;
}
#userform .tab-pane p.lead {
margin-top: 20px;
}
#userform .tab-content {
padding: 20px
```

```
}
#userform .form-group {
margin-bottom: 0px;
color: #FFF;
}
#userform .form-group input, #userform .form-group textarea {
padding: 10px;
}
#userform .form-group input.form-control {
height: auto;
background-color: rgba(237, 235, 250, 0.1);
color: #FFF;
}
#userform .form-control {
border-radius: 0;
border: 1px solid #fff;
}
#userform .form-control:focus {


border-color: #F7CA18;
box-shadow: none;
}
#userform::-webkit-input-placeholder {
text-transform: uppercase;
font-family: &#39;Dosis&#39;, sans-serif;
font-weight: 700;
color: #bbb;
```

```
}
#userform #signup .form-group label {
position: relative;
-webkit-transform: translateY(35px);
-ms-transform: translateY(35px);
transform: translateY(35px);
left: 10px;
top: 0px;
color: rgba(255, 255, 255, 0.5);
-webkit-transition: all 0.25s ease;
transition: all 0.25s ease;
-webkit-backface-visibility: hidden;
pointer-events: none;
font-size: 12px;
font-weight: 300
}
#userform #signup .form-group label .req {
margin: 2px;
color: #F7CA18;


}
#userform #signup .form-group label.active {
-webkit-transform: translateY(0px);
-ms-transform: translateY(0px);
transform: translateY(0px);
left: 2px;
font-size: 12px;
```

```
}
#userform #signup .form-group label.active .req {
opacity: 0;
}
#userform label.highlight {
color: #ffffff;
}
#userform #login .form-group label {
position: relative;
-webkit-transform: translateY(35px);
-ms-transform: translateY(35px);
transform: translateY(35px);
left: 10px;
top: 0px;
color: rgba(255, 255, 255, 0.5);
-webkit-transition: all 0.25s ease;
transition: all 0.25s ease;
-webkit-backface-visibility: hidden;
pointer-events: none;
font-size: 12px;


font-weight: 300
}
#userform #login .form-group label .req {
margin: 2px;
color: #F7CA18;
}
```

```
#userform #login .form-group label.active {
-webkit-transform: translateY(0px);
-ms-transform: translateY(0px);
transform: translateY(0px);
left: 2px;
font-size: 12px;
}
#userform #login .form-group label.active .req {
opacity: 0;
}
.mrgn-30-top {
margin-top: 30px
}
```

8.TESTING

8.1 TEST CASES

ACTION/DESCRIPTION

Open your real time communication for system by AI for Specially abled application.

STEP NO	INPUT	EXCEPTED RESULT
1	**Voice Over**	AI should read the message, mails, attend calls.
2	**Tall Back**	AI should response to the user and to use the application efficiently.
3	**Cortona**	AI should visually handicapped or blind individuals to navigate their computers using just their voice.
4	**Ava**	AI should transcription tool that utilises AI to immediately transcribe a group of people's discussion.
5	**Siri**	AI should Voice control allows users to simply pronounce their request, such as conducting a Google search or dictating a text message to send to a friend. People who are blind or visually impaired can utilize Siri to communicate with others.
6	**IFTTT**	AI should other applications so that a user with limited dexterity may utilize all of his smartphone's functions without difficulty.
7	**Voice itt**	Readily comprehend persons with brain traumas or Parkinson's disease whose speech may appear difficult to interpret at first.

8.2 USER ACCEPTANCE TESTING

User Acceptance Testing (UAT) is a type of testing performed by the end user or the client to verify/accept the software system before moving the software application to the production environment. UAT is done in the final phase of testing after functional, integration and system testing is done.

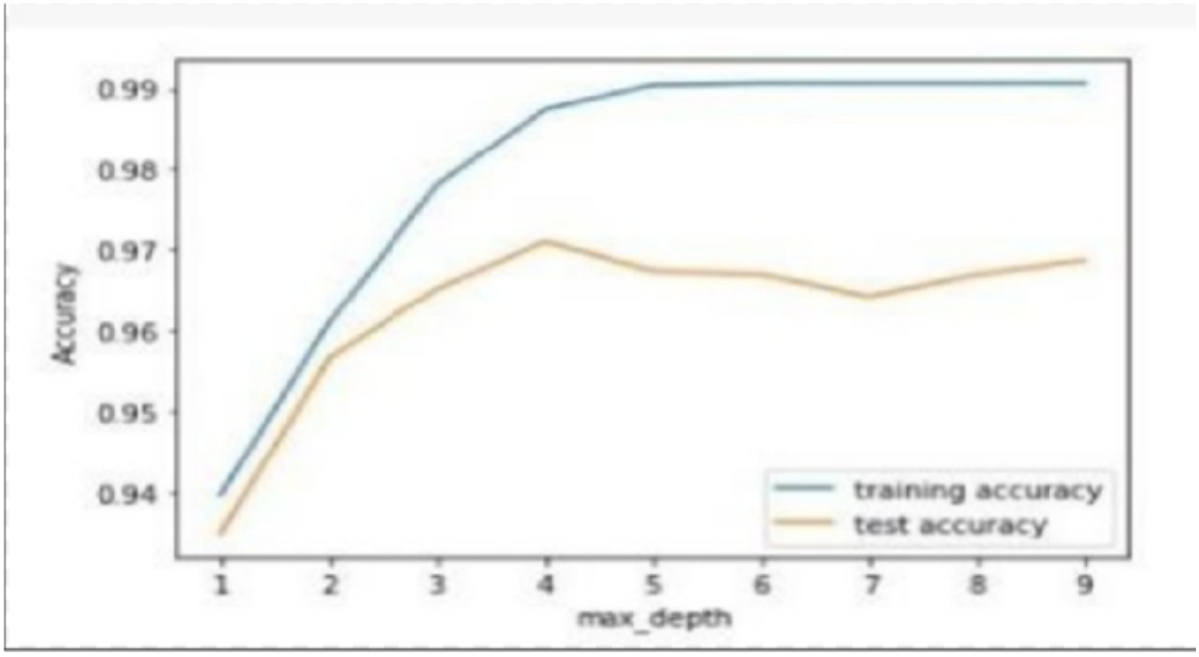
NEED OF USER ACCEPTANCE TESTING

Need of User Acceptance Testing arises once software has undergone Unit, Integration and System testing because developers might have built software based on requirements document by their own understanding and further required changes during development may not

be effectively communicated to them, so for testing whether the final product is accepted by client/end-user, user acceptance testing is needed.

9.RESULT

9.1 PERFORMANCE METRICS



10.ADVANTAGES & DISADVANTAGES

10.1ADVANTAGES

Improves accessibility and ensure that students with disabilities have access to rich learning opportunities.

10.1.1 For the blind or visually impaired.

1. Voice Over: It is a screen reader that is built into iPhones. Although its primary function is to pronounce any email or text message, Voice Over also uses AI to describe app icons, battery levels, and even partial photos.

2. Talk Back: It is the Android equivalent of Voice Over. It allows users to make maximum use of their cell phones.

3. Siri: It is the iPhone's virtual assistant. Voice control allows users to simply pronounce their request, such as conducting a Google search or

dictating a text message to send to a friend. People who are blind or visually impaired can utilize Siri to communicate with others.

4. Cortana: It is a virtual assistant developed by Microsoft and available on Windows. It enables visually handicapped or blind individuals to navigate their computers using just their voice. It's comparable to Siri in several ways.

10.1.2 For the deaf or hard of hearing

1.Virtual assistants such as Siri and Google Assistant allow consumers to fully utilise their cell phones while remaining connected to others.

2.Ava is an instant transcription tool that utilises AI to immediately transcribe a group of people's discussion. Its algorithm inserts punctuation, the speaker's name, and the appropriate words from the user's dictionary.

3.A simple technique for those with hearing impairments to participate in and follow a conversation with many people without using lip-reading. Roger Voice, a French group discussion transcription software accessible in 90 languages. It functions in the same manner as Ava does.

10.1.3 People with physical limitations

Virtual assistants such as Siri, Google Assistant, and Google Voice Access allow persons with limited mobility to utilise their smartphones using voice commands. Google Voice Access was designed specifically for persons with limited dexterity.

IFTTT is an app that integrates other applications so that a user with limited dexterity may utilize all of his smartphone's functions without difficulty. It develops combos with the applications to conduct activities like reading an email aloud and posting a tweet automatically.

With the app Voiceitt, even persons with speech difficulties may benefit from AI technology. Voiceitt, thanks to machine learning, can readily comprehend persons with brain traumas or Parkinson's disease whose speech may appear difficult to interpret at first. This programme normalises their speech to provide an audio or text output, allowing persons with speech

difficulties to speak with others and be recognized.

10.2 DISADVANTAGES

1. AI-based design and development is often driven by the needs and behaviors of the "average user," and from a user experience design perspective, people with disabilities typically fall outside of the usual experience.
2. Automatic speech recognition (ASR) systems, for example, typically are optimized around common speech patterns, not around the speech patterns of people with speech disabilities.
3. The cost of implementation, both at the time and the economic level, is a very important factor in choosing to execute this type of project. Companies that lack internal skills or are not familiar with AI systems, must value the outsourcing of both implementation and maintenance in order to obtain successful results in their project.

11.CONCLUSION

This paper, we present an efficient application foruneducated Deaf-Dumb application. This application aims to help deaf and dumb by providing them with an attractive communication

and learning tool. This work introduce a Mobile application that enable communication between educated Deaf-Dumb and normal people in our society .It also develop an aid tool for deaf and dumb in many fields like restaurants, Hospitals and transportation. Moreover, this application introduces an easy converting words into text to any languages for deaf and dump people.

12.FUTURE SCOPE

In the future, ASR systems may provide error-free closed captioning rather than approximations. AI may also allow people with disabilities to fully control their environments not only at home but also in the classroom and the workplace.Full-scale automation may not yet be practical, but progress is being made.Some organizations are already using AI to assess conformance to accessibility guidelines. As this use becomes more widespread, conformance assessment will become more scalable. And as this use continues, we will find many other ways in which AI can be used to improve accessibility and ensure that students with disabilities have access to rich learning opportunities.

13.APPENDIX

SOURCE CODE

Import datagenerator to train and test

```
from tensorflow.keras.preprocessing.image import ImageDataGenerator
train_datagen = ImageDataGenerator(rescale =
1./255,shear_range=0.2,zoom_range=
0.2,horizontal_flip=True,vertical_flip=False)
test_datagen = ImageDataGenerator(rescale = 1./255)
import tensorflow as tf
import os
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense, Conv2D, Flatten, Dropout,
MaxPooling2D
from tensorflow.keras.preprocessing.image import ImageDataGenerator
import numpy as np
import matplotlib.pyplot as plt
import IPython.display as display
from PIL import Image
import pathlib
```

```
from keras.preprocessing import image
# and use
# image.ImageDataGenerator()
# image.load_img()
Apply ImageDataGenerator Functionality To Train And Test set
from google.colab import drive
from tensorflow.keras.preprocessing.image import ImageDataGenerator
print(&quot;This dataset has been created and uploaded by IBM-TeamID-IBM-
Project-PNT2022TMID31975&quot;)
x_train= train_datagen.flow_from_directory(r&quot;/content/drive/MyDrive/IBM
PROJECT/DATA
COLLECTION/training_set&quot;,target_size=(64,64),class_mode=&quot;categorical&quot;,
batch_size=48)
x_test = test_datagen.flow_from_directory(r&quot;/content/drive/MyDrive/IBM
PROJECT/DATA COLLECTION/test_set&quot;,target_size=
(64,64),class_mode= &quot;categorical&quot;,batch_size=48)
x_train.class_indices
x_test.class_indices
```

MODEL BUILDING

```
from keras.models import Sequential
from keras.layers import Dense
from keras.layers import Convolution2D
from tensorflow.keras.layers import Conv2D, MaxPooling2D
from keras.layers import Dropout
from keras.layers import Flatten
model=Sequential()
model.add(Convolution2D(32,(3,3), input_shape=(64,64,1), activation =
&#39;relu&#39;))
model.add(MaxPooling2D(pool_size=(2,2)))
model.add(Flatten())
model.add(Dense( units=512, activation=&#39;relu&#39;))
model.add(Dense(units=9, activation=&#39;softmax&#39;))
model.compile(loss=&#39;categorical_crossentropy&#39;, optimizer=&#39;adam&#39;,
metrics=[&#39;accuracy&#39;])
model.save(&#39;Realtime.h5&#39;)
a=len(x_train)
b=len(x_test)
Length of training and testing data
print(a)
print(b)
```

TEST THE MODEL

```
from tensorflow.keras.models import load_model
from tensorflow.keras.preprocessing import image
import numpy as np
import cv2
img = image.load_img(&#39;/content/drive/MyDrive/IBM PROJECT/DATA
COLLECTION/test_set/D/101.png&#39;,target_size = (500,500))
img
from skimage.transform import resize
arr=image.img_to_array(frame)
arr = resize(arr,(64,64,1))
arr = np.expand_dims(arr,axis=0)
pred=np.argmax(model.predict(arr))
op=[&#39;A&#39;,&#39;B&#39;,&#39;C&#39;,&#39;D&#39;,&#39;E&#39;,&#39;F&#39;,&#39;G&#
39;,&#39;H&#39;,&#39;I&#39;]
print(&quot;THE PREDICTED LETTER IS &quot;,op[pred])
from skimage.transform import resize

def detect(frame):
img=resize(frame,(64,64,1))
img=np.expand_dims(img,axis=0)
if(np.max(img)&gt;1):
prediction=model.predict(img)
print(prediction)
prediction=model.predict_classes(img)
print(prediction)
arr= image.img_to_array(img)
frame=cv2.imread(&#39;/content/drive/MyDrive/IBM PROJECT/DATA
COLLECTION/test_set/F/107.png&#39;)
data=detect(frame)
from google.colab.patches import cv2_imshow
cv2_imshow(frame)
cv2.waitKey(0)
cv2.destroyAllWindows()
frame=cv2.imread(&#39;/content/drive/MyDrive/IBM PROJECT/DATA
COLLECTION/test_set/A/102.png&#39;)
data=detect(frame)
from google.colab.patches import cv2_imshow
cv2_imshow(frame)
cv2.waitKey(0)
cv2.destroyAllWindows()
```

```
frame=cv2.imread(&#39;/content/drive/MyDrive/IBM PROJECT/DATA
COLLECTION/test_set/D/108.png&#39;)
data=detect(frame)
from google.colab.patches import cv2_imshow
cv2_imshow(frame)
cv2.waitKey(0)
cv2.destroyAllWindows()
print(&quot;THE PREDICTED LETTER IS &quot;,op[pred])
```

GITHUB & PROJECT DEMO LINK

IBM-Project-10276-1662555320

https://youtube.com/@039_19_nishanthr

PROJECT DEMO LINK

https://www.youtube.com/embed/SE7QPzc0ysI