REAL TIME COMMUNICATION SYSTEM POWERED BY AI FOR SPECIALLY ABLED

NALAIYA THIRAN PROJECT REPORT

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1. INTRODUCTION

1.1 PROJECT OVERVIEW

In our society, we have people with disabilities. The technology is developing day by day but no significant developments are undertaken for the betterment of these people. Communications between deaf-mute and a normal person has always been a challenging task. It is very difficult for mute people to convey their message to normal people. Since normal people are not trained on hand sign language. In emergency times conveying their message is very difficult. The human hand has remained a popular choice to convey information in situations where other forms like speech cannot be used. Voice Conversion System with Hand Gesture Recognition and translation will be very useful to have a proper conversation between a normal person and an impaired person in any language.

The project aims 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 and dumb. 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 and speech is given as output.

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

2.1 EXISTING PROBLEM

Vision based gesture recognition technique overcomes the drawbacks of the sensors or wires. Howevglove based system. This approach does not require the user to wear gloves, er, video camera(s) is used to capture the images of hands while they perform certain gestures, which are further processed and analyzed using computer vision techniques. This type of hand gesture recognition reduces the complexity, makes the process look natural and is very convenient for users. At present, it is the most popular approach to gesture recognition. However, there are still several challenges which are not yet addressed, for example, partial or full occlusion background clutter, illumination change, etc. Hence the study of vision based system is the most essential and is needed for further use.

2.2 REFERENCES

1.Abhishek, K. S., Qubeley, L. C. F., & Ho, D. (2016, August).Glove-based hand 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

In this paper an attempt has been made to design a sign language recognition system. An intelligent glove has been designed to automate the communication between a deaf-mute with others by converting sign language into speech or understandable language. The sensory gloves provide data of the human hand shape or movement and translate it to text and speech. It comprises hardware and software for translating sensor data. It is wearable devices that can be put on

human hands and convert hand’s gestures into signs letter byletter and send the data into the firebase for further processing. The glove is equipped with flex sensors and an inertial measurement unit to recognize the movement by monitoring the finger orientation and hand motion in three-dimensional spaces that senses a person’s gestures in the form of finger bend and hand fist tilt. The Hall sensor has been used to process and collect data for training and model development. The three different machine learning algorithms, i.e., support vector machine, Naïve Bayes, decision tree, have been used for analysis. It has been observed that the support vector machine has the highestaccuracy, i.e., 90%. After Analyzing, the data has been sent to the speech converting function, and then audible resultshave been produced.

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

Sign Language Recognition is a breakthrough for helping deaf mute people and has been researched for many years. Unfortunately, every research has its own limitations and are still unable to be used commercially. Some of the researches have known to be successful for recognizing sign language, but require an expensive cost to be commercialized. Nowadays, researchers have gotten more attention for developing Sign Language Recognition that can be used commercially. Researchers do their researches in various ways. It starts from the data acquisition methods. The data acquisition method varies because of the cost needed for a good device, but cheap method is needed for the Sign Language Recognition System to be commercialized. The methodsused in developing Sign LanguageRecognition are also varied betweenresearchers. Each method has its own strength compare to other methods and researchers are still using different methods in developing their own Sign Language Recognition. Each method also has its own limitations compared to other methods. The aim of this paper is to review the sign languagerecognition approaches and find the best method that has

been used by researchers. Hence other researchers can get more information about the methods used and could develop better Sign Language Application Systemsin the future.

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

This study could be a cnn-based human hand signal recognitionmethodology. Cnn could be an investigate section of neural networks. Application of cnn to memo rize human signals, there's no need to create complicated calculations to extricate picture features and determine them. With the help of the convolution and sub sampling level of a cnn, invariant highlights are permitted with little disruption. To decline the colli sion of different hand postures of a hand signal sort on the acknowledgment preciseness, the principal axis of the hand is found to calibrate the picture in this work . Calibrated pictures are profitable to a cnn to memorize and recognise precisely. In a genuine circumstance, when ordinary individuals encounter with deaf people, communication deterioration arises due to different manners of communication. In order to convey with the hearing disabled individual, the information about sign dialectis indispensable, merelyit fetch to be an obstruction for those who don't learn the dialect. The most common limitation confronted by hard of hearing individuals in communication is the nonattendance of a flag mediator. Individuals are not keen to memorizesign dialect on account of the miserable stipulate of sign dialect coursefor ordinary individuals.

2.3 PROBLEM STATEMENT DEFINITION

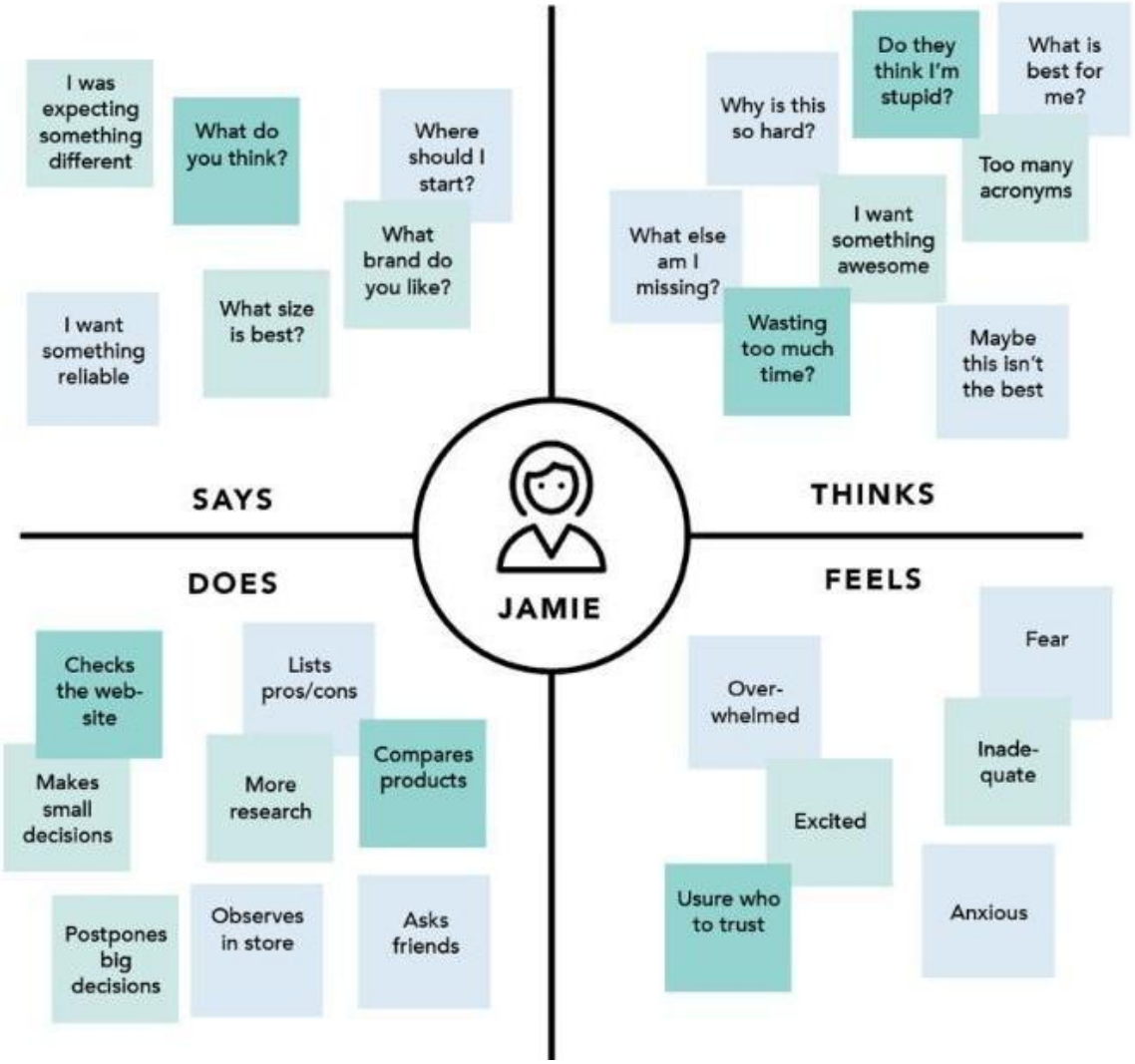
According to the times now survey, the Indian population consists of about 30 percent disabled people, and of that 20 percent are deaf and mute. I'm a normal

user I’m trying to interact with deaf –muted person via speech to sign converter but couldnot find matching signs for this regional phrases because lackof input resources which make me feel frustrated. The only chance of communication is the sign language but it is practically not feasible that everyone studies the sign language. Technology has risen to unprecedented rates which also comes with a leeway for the disabled people. With the help of technology, Voice Conversion System with Hand Gesture Recognition and translation will be very useful to have a proper conversation between a normal person and an impaired person in any language.

3. IDEATION AND PROPOSED SOLUTION

3.1 EMPATHY MAP CANVAS

Differently Abled is often described in terms of lack of normal functioning of physical, mental or psychological processes. It is also defined as learning difficulties or difficulties in adjusting socially, which interfaces with a person’s normal growth and development.By understanding their problems, we can create a better solution for their lives. For our project,we are getting surveys from specially abled persons to understand what they truly needed tohave a normal life.



3.2 IDEATION AND BRAINSTORMING

Brainstorming provides a free and open environment that encourages everyone within a team to participate in the creative thinking process that leads to problem solving. Prioritizing volume over value, out-of-the-box ideas are welcome and built upon, and all participants are encouraged to collaborate, helping each other develop a rich amount of creative solutions.

A brainstorming session by the team produced these solutions and greater clarity was induced.

3.3 PROPOSED SOLUTION

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	An application for deaf and dumb people to convey their information using signs which get converted to human-understandable language and speech in Artificial Intelligence.

2.	Idea / Solution description	By using Voice Conversion System with Hand Gesture Recognition and translation will be very useful to have a proper conversation.
3.	Novelty / Uniqueness	We are using a convolution neural network to create a model that is trained on different hand gestures and an app is built for the use this mode.
4.	Social Impact / Customer Satisfaction	Communicating with others and being connected in the society and remove accessibility barriers.
5.	Business Model (Revenue Model)	By Using: Better communication with the disabled and Financial By Without Using: Can't Communicate and leads to loneliness.
6.	Scalability of the Solution	Enhance people with disabilities to step into a world where their are facing difficulties in communication.

3.4 PROBLEM SOLUTION FIT

Define CS, fit into CC

1. CUSTOMER SEGMENT(S) CS

Who is your customer?
i.e. working parents of 0-5 y.o. kids

Deaf-mute and a normal person are the customers of this project.

6. CUSTOMER CONSTRAINTS CC

What constraints prevent your customers from taking action or limit their choices of solutions? i.e. spending power, budget, no cash, network connection, available devices.

The network connection of the device should be stable to capture the voice or sign languages

5. AVAILABLE SOLUTIONS AS

Which solutions are available to the customers when they face the problem
or need to get the job done? What have they tried in the past? What pros & cons do these solutions have? i.e. pen and paper is an alternative to digital notetaking

Nowadays Deaf Mute Communication Interpreter,Under Wearable communication method, there are Glove based system, Keypad method and Handycom Touch screen.

Explore AS, differentiate

Focus on J&P, tap into BE, understand RC

2. JOBS-TO-BE-DONE / PROBLEMS J&P

Which jobs-to-be done (or problems do you address for your customers? There could be more than one; explore different sides.

Communication between the deaf and non-deaf has always been a very cumbersome task. This paper aims to cover the various prevailing methods of deaf-mute communication interpreter system.The two broad classification of the communication methodologies used by the deaf –mute people are Wearable Communication Device and Online Learning System.

9. PROBLEM ROOT CAUSE RC

Whatis the real reason that this problem exists? back story behind the need to do this job?

i.e. customers have to do it because of the change

Communications between deaf-mute and a normal person has always been a challenging task. It is very difficult for mute people to convey their message to normal people. Since normal people are not trained on hand sign language. In emergency times conveying their message is very difficult. The human hand has remained a popular choice to convey information in situations where other forms like speech cannot be used.Voice Conversion System with Hand Gesture Recognition and translation will be very useful to have a proper conversation between a normal person and an impaired person in any language.

7. BEHAVIOUR BE

What does your customer do to address the problem and get the job done?

i.e. directly related: find the right solar panel installer, calculate usage and benefits; indirectly associated: customers spend free time on volunteering work (i.e. Greenpeace)

Easy to use can be able to respond quickly.Able to produce absolute translation. Should consume less data. Requirement of internet speed.

Focus on J&P, tap into BE, understand RC

Identify strong TR & EM

3. TRIGGERS TR

What triggers customers to act? i.e. seeing their neighbour installing solar panels, reading about a more efficient solution in the news.

If any specially abled people use this device for communication make the others to use this device.

4. EMOTIONS: BEFORE / AFTER EM

How do customers feel when they face a problem or a job and afterwards?
i.e. lost, insecure > confident, in control - use it in your communication strategy & design.

It enables Specially abled people to convey their information using signs which get converted to human-understandable language and speech.

10. YOUR SOLUTION SL

If you are working on an existing business, write down your current solution first, fill in the canvas, and check how much it fits reality.
If you are working on a new business proposition, then keep it blank until you fill in the canvas and come up with a solution that fits within customer limitations, solves a problem and matches customer behaviour.

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 and speech is given as output.

8. CHANNELS of BEHAVIOUR CH

ONLINE

What kind of actions do customers take online? Extract online channels from #7

The specially abled people need to access the device.

OFFLINE

Extract offline channels from #7 and use them for customer development.their neighbour installing solar panels, reading about a more efficient solution in the news.
Store the data and information are being transferred.

Extract online & offline CH of BE

4.REQUIREMENT ANALYSIS

4.1 FUNCTIONAL REQUIREMENT

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement	Sub Requirements
FR-1	**User Registration**	Registration through Form Registration through Gmail.
FR-2	**User confirmation**	Confirmation via Email Confirmation via OTP
FR-3	**System**	Desktop with high resolution camera
FR-4	**Authorization Levels**	There are two levels of authorization namely standard access level and advanced access level.
FR-5	**External interface**	Ethernet, Wi-Fi, USB to provide internet facility to access the resources with real time communication.
FR-6	**Reporting**	If any issues found in the application, automatically it will be notified to the developer.

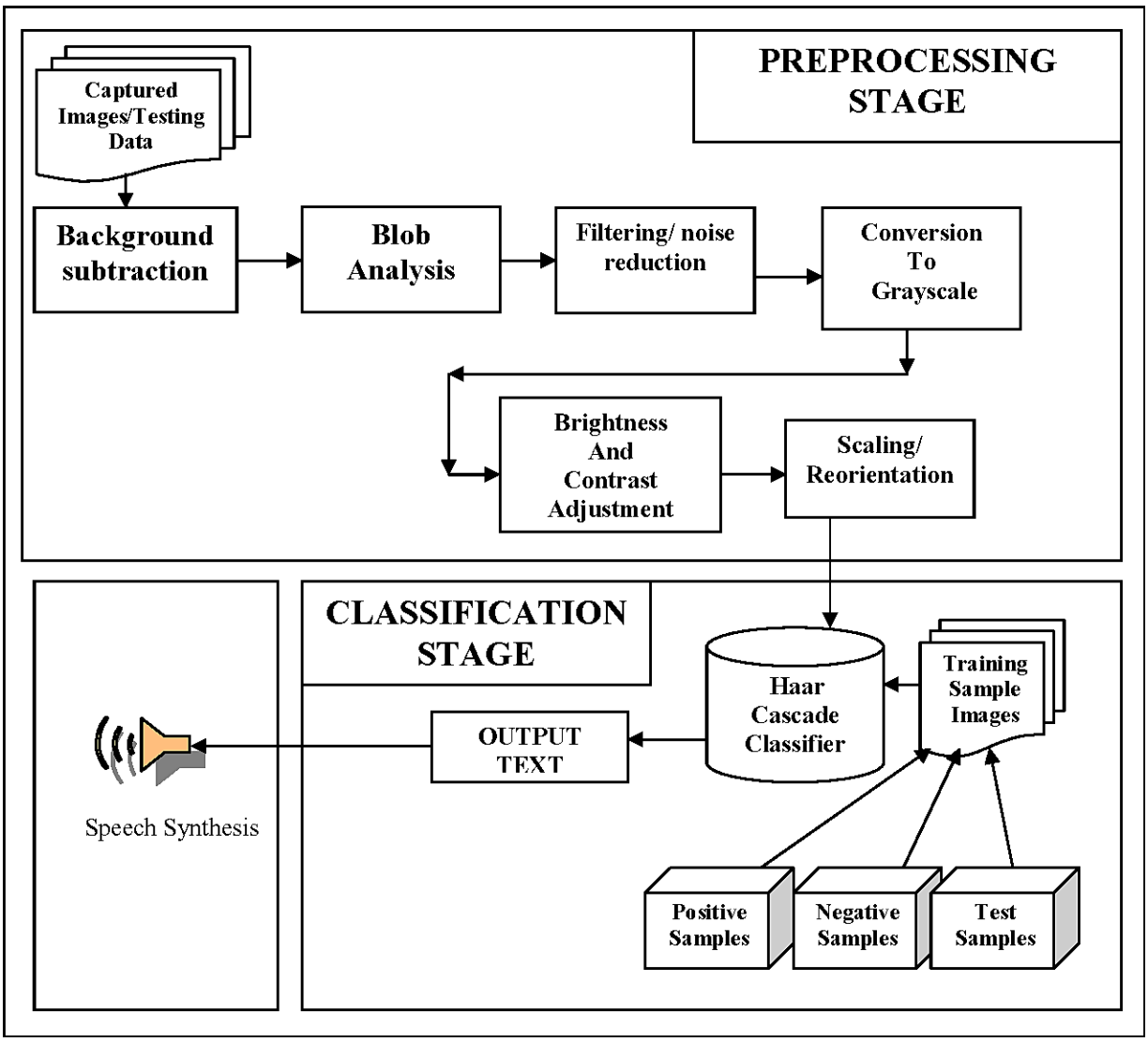
4.2 NON FUNCTIONAL REQUIREMENT

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

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	To convey a message to normal people, as well as convert speech into understandable sign language for the deaf and dumb people.
NFR-2	**Security**	Converted information using signs into speech is accessed only by the user.
NFR-3	**Reliability**	Provides insight into potential issues for desktop applications on managed devices.
NFR-4	**Performance**	The time for converting signs into speech should be faster for the real time communication.
NFR-5	**Availability**	Provides automatic recovery as much as possible.
NFR-6	**Scalability**	This app enables deaf and dumb people to convey their information using signs which get converted to human-understandable language and speech is given as output.

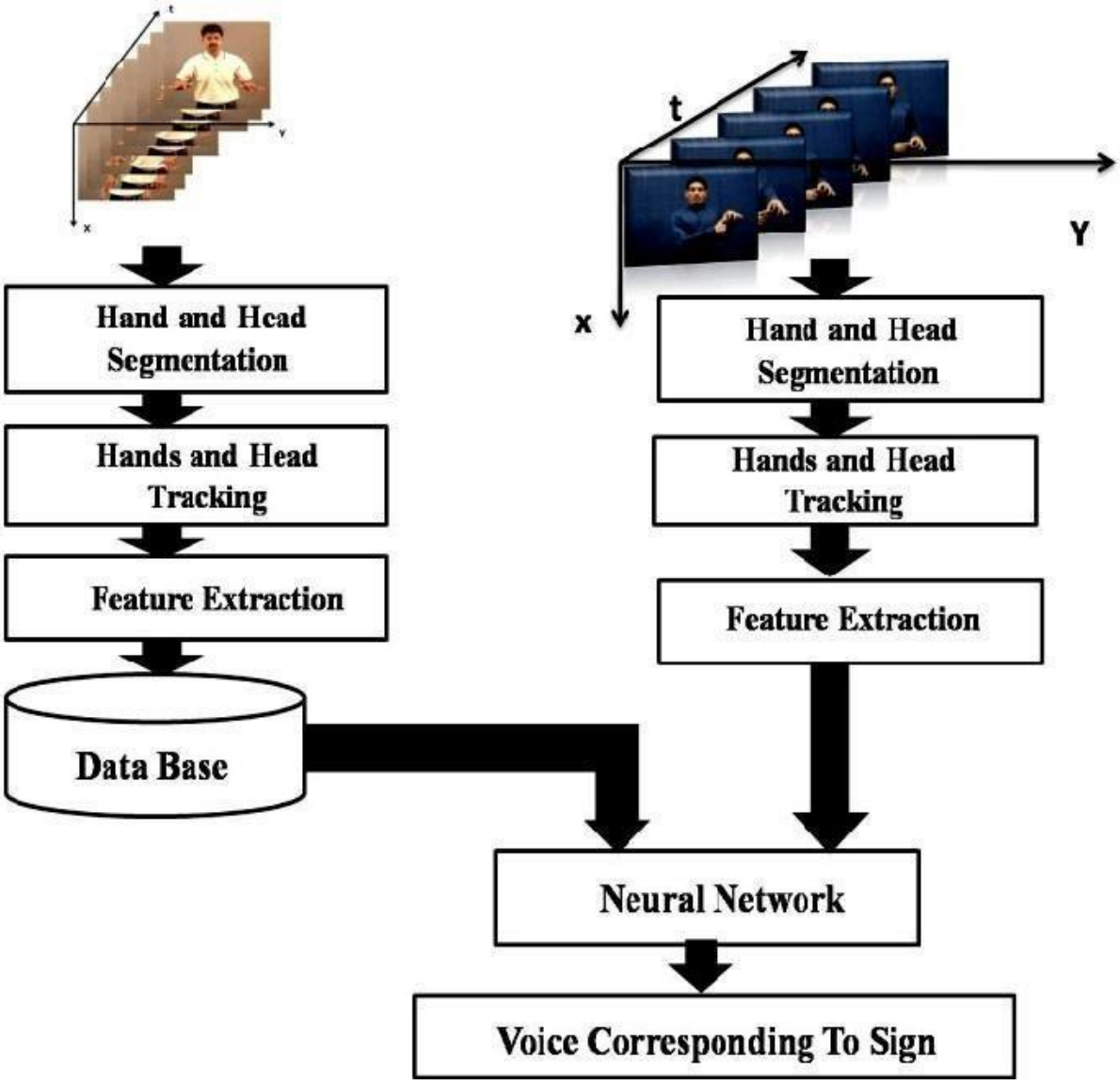
5.PROJECT DESIGN

5.1 DATA FLOW DIAGRAM

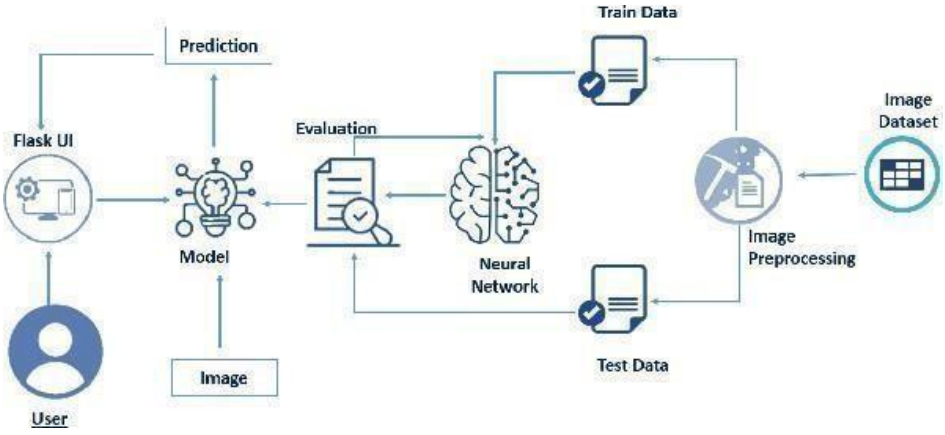


5.2 SOLUTION AND TECHNICAL ARCHITECTURE

SOLUTION ARCHITECTURE



TECHNICAL ARCHITECTURE



5.3 USER 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 AND SCHEDULING

6.1 SPRINT PLANNING AND ESTIMATION

Sprint	Functional Requirement (Epic)	User Story / Task
Sprint-1	Data Collection	Dataset is collected on the basis of various hand signs and curated according to the problem statement.
Sprint-1	Data Preprocessing	The dataset is preprocessed in order to check noisy data and other inconsistencies before executing it to the algorithm.
Sprint-2	Model Building	Model is built according to the image features in such a way that the model identifies the features of the sign image and learns in order to give correct output.
Sprint-2	Model Training	Data is fed into the model and the model is trained in order to find the optimal weights that give help in predicting the correct output.
Sprint-2	Model Testing	Model is tested in such a way that the collection data or images are trained frame by frame according to the user requirements.

Sprint-3	Sign Capture / Text input	I can see an option to start capturing the video using my camera, so that the signs are converted into text or audio. As a user, there's an option to convert the text or audio that i provide into signs
Sprint-4	Converted Message/Sign	The signs I capture using my camera are converted to english text or audio
Sprint-4	Application Testing	The application is then tested under various circumstances.

6.2 SPRINT DELIVERY SCHEDULE

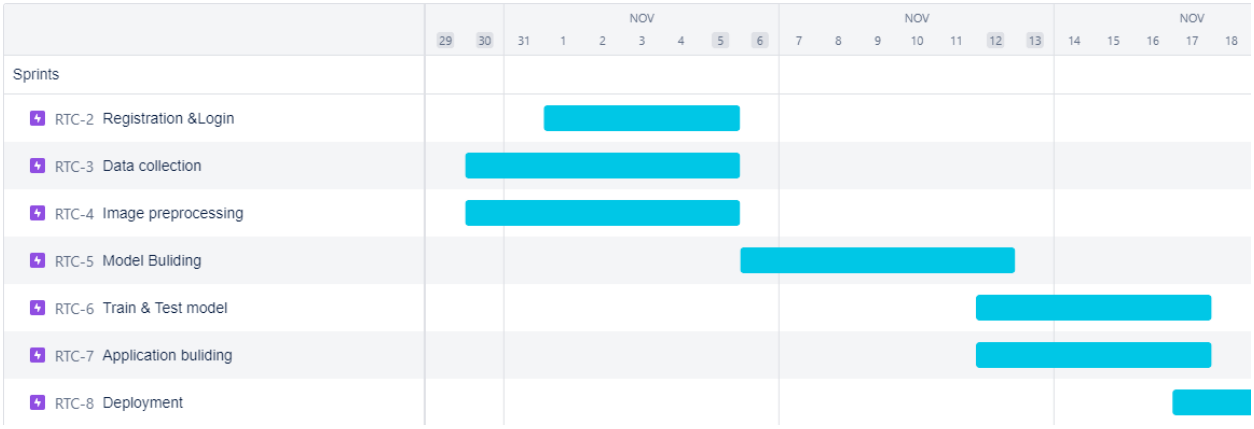
Sprint	**Total Story Points**	**Duration**	**Sprint Start Date**	**Sprint End Date (Planned)**	**Story Points Completed (as on Planned End Date)**
Sprint-1	20	6 Days	01 Nov 2022	06 Nov 2022	10
Sprint-2	20	6 Days	01 Nov 2022	06 Nov 2022	22
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20
Sprint-4	20	6 Days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

Velocity:

Imagine we have a 10-day sprint duration, and the velocity of the team is 20(points per sprint). Let's calculate the team's average velocity (AV) per iteration unit (story points per day)

$$AV = \frac{sprint\ duration}{velocity} = \frac{20}{10} = 2$$

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"><a href="#signup"  role="tab" data-toggle="tab">Sign up</a></li>
         <li><a href="#login"  role="tab" data-toggle="tab">Log in</a></li>
       </ul>
       <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<span class="req">*</span> </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<span class="req">*</span> </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<span class="req">*</span> </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<span class="req">*</span> </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<span class="req">*</span> </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">*</span> </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<span class="req">*</span> </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>
```

```
  <!-- /.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/bootstrap.min.js"></scrip
t>
</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() === '') {
          label.removeClass('active highlight');
        } else {
          label.addClass('active highlight');
        }
    } else if (e.type === 'blur') {
          if( $this.val() === '' ) {
                    label.removeClass('active highlight');
```

```
                    } else {
                label.removeClass('highlight');
                    }
    } else if (e.type === 'focus') {
      if( $this.val() === '' ) {
                label.removeClass('highlight');
                    }
     else if( $this.val() !== '' ) {
                label.addClass('highlight');
                    }
    }
});
$('.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: 'Dosis', 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: 'Dosis', 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 > li > a {
        text-transform: uppercase;
        font-size: 20px;
        color: #F7CA18;
        background-color: rgba(90,90,90,0.5);
}
#userform .nav-tabs.nav-justified > .active > a, #userform .nav-tabs.nav-justified >
.active > a:hover, #userform .nav-tabs.nav-justified > .active > a:focus {
        border: 0;
        background: #F7CA18;
        color: white;
        border-radius: 0;
}
#userform .nav-justified > li > a {
        margin-bottom: 0;
        -webkit-transition: all .6s;
        -moz-transition: all .6s;
        transition: all .6s;
}
#userform .nav-justified > li > a:hover {
        background: #AEA8D3;
```

```
        color: #FFF;
}
#userform .nav-tabs > li > a {
        border: 0px solid transparent;
        border-radius: 0
}
#userform .nav-tabs.nav-justified > li > 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 > li.active > a, #userform .nav-tabs > li.active > a:hover,
#userform .nav-tabs > li.active > 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 > li > a {
        border: 0;
        -webkit-transition: all .6s;
        -moz-transition: all .6s;
        transition: all .6s;
}
#userform .nav-tabs.nav-justified > li > 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 > 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: 'Dosis', 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

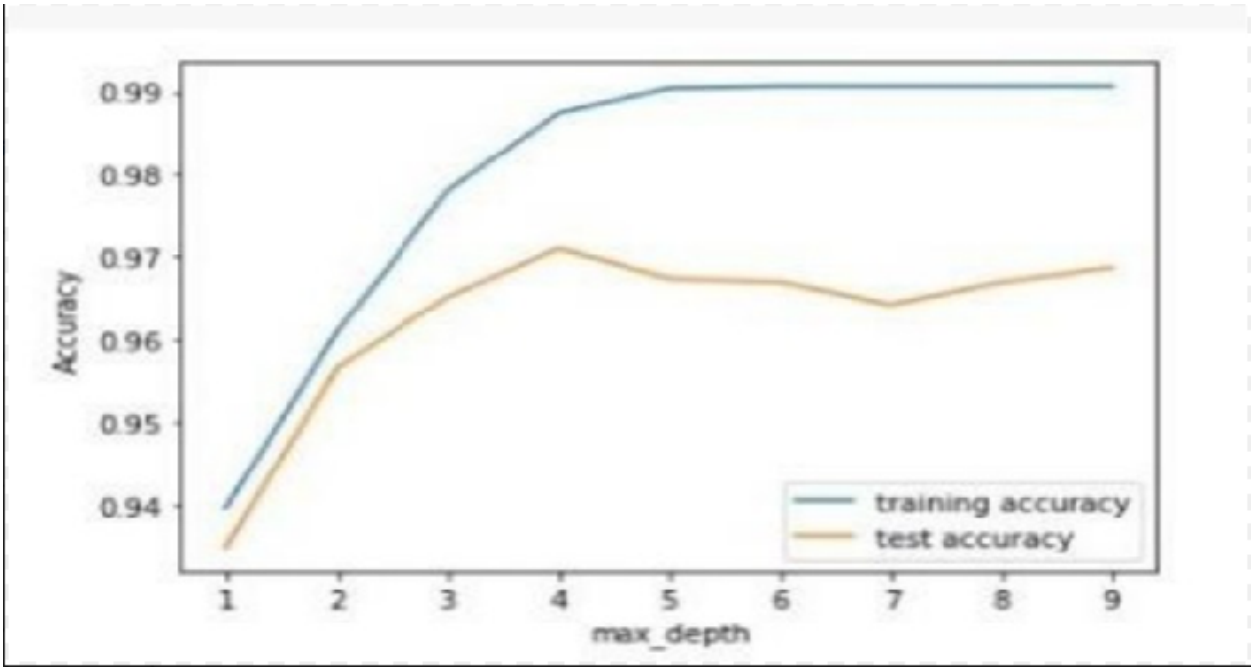
User Acceptance Testing (UAT) is a type of testing performed by the end user or the client to verify/accept the software system before moving the software application to the production environment. UAT is done in the final phase of testing after functional, integration and system testing is done.

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.RESULTS

9.1 PERFOMANCE METRICS



10. ADVANTAGES AND DISADVANTAGES

10.1 ADVANTAGES

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

For the blind or visually impaired.

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

2.**TalkBack**: It is the Android equivalent of VoiceOver. 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.

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.

People with physical limitations.

1.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.

2.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.

3.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 behaviorsof 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

The main objective of this research has been achieved successfully.Gesture interpretation works best in case users who understand sign language may interact with people who are unfamiliar with sign language. Speech interpretation is helpful for sign language non-speakers who want the accompanying hand sign to be understood. Room conditions such as lighting can play a role in predicting the outcome of poor lighting. The light that is either too bright or too dim will result in inaccurate hand segmentation, resulting in accurate gesture prediction. The type of inaccuracy can merge from the user's peripherals, such as poor web camera performance or poor microphone quality. In a nutshell, the development of technology is essential, and its deployment insign language is highly critical. It will serve to bring efficiency in communication, not only to the deaf and dumb but those with the ability to hear and speak as well. In addition to creating opportunities for their career growth, it will enhance their social life through effective communication.Making an impact and changing the lives of the deaf and dumb through technology will be an innovation of the yearworth the time and resources.At the beginning of the D-Talk idea, the developers think to have more than one task for this application, but in the end,

they narrow the task to have only one. They thought to have an open calendar, launch Microsoft office word, and browse the website. The final task was to launch three websites Facebook,Twitter, and YouTube.

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("This dataset has been created and uploaded by IBM-TeamID-IBM-Project-PNT2022TMID31975")
x_train= train_datagen.flow_from_directory(r"/content/drive/MyDrive/IBM PROJECT/DATA COLLECTION/training_set",target_size=(64,64),class_mode="categorical",batch_size=48)
x_test = test_datagen.flow_from_directory(r"/content/drive/MyDrive/IBM PROJECT/DATA COLLECTION/test_set",target_size= (64,64),class_mode= "categorical",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 = 'relu'))
model.add(MaxPooling2D(pool_size=(2,2)))
model.add(Flatten())
model.add(Dense( units=512, activation='relu'))
model.add(Dense(units=9, activation='softmax'))
model.compile(loss='categorical_crossentropy', optimizer='adam',
metrics=['accuracy'])
model.save('Realtime.h5')
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('/content/drive/MyDrive/IBM PROJECT/DATA
COLLECTION/test_set/D/101.png',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=['A','B','C','D','E','F','G','H','I']
print("THE PREDICTED LETTER IS ",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)>1):
 prediction=model.predict(img)
 print(prediction)
 prediction=model.predict_classes(img)
 print(prediction)
arr= image.img_to_array(img)
frame=cv2.imread('/content/drive/MyDrive/IBM PROJECT/DATA
COLLECTION/test_set/F/107.png')
data=detect(frame)
from google.colab.patches import cv2_imshow
cv2_imshow(frame)
cv2.waitKey(0)
cv2.destroyAllWindows()
frame=cv2.imread('/content/drive/MyDrive/IBM PROJECT/DATA
COLLECTION/test_set/A/102.png')
data=detect(frame)
from google.colab.patches import cv2_imshow
cv2_imshow(frame)
cv2.waitKey(0)
cv2.destroyAllWindows()
frame=cv2.imread('/content/drive/MyDrive/IBM PROJECT/DATA
COLLECTION/test_set/D/108.png')
data=detect(frame)
from google.colab.patches import cv2_imshow
```

```
cv2_imshow(frame)
cv2.waitKey(0)
cv2.destroyAllWindows()
print("THE PREDICTED LETTER IS ",op[pred])
```

Github ID AND LINK

IBM-Project-10079-1659090686

https://github.com/IBM-EPBL/IBM-Project-10079-1659090686

DEMO LINK

https://youtu.be/W4zZj

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