

# **Real Time Communication System PoweredBy AI For Specially Abled**

## **A IBM Project Report**

### **Submitted By**

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## **ABSTRACT**

Intelligence is being added to the products and services we use every day. We routinely speak to voice assistants, use vision processing to identify friends and family in photos, and quietly benefit from behind the scenes algorithms that improve quality and reliability. Advances in consumer oriented AI technologies are now finding new applications and use cases as these capabilities become democratized. The communications industry, which was once at the forefront of many of these technologies, is now presented with a plethora of new options for improving existing applications, finding new cost advantages, and redefining existing communications modalities. In the recent years, there has been rapid increase in the number of deaf and dumb victims due to birth defects, accidents and oral diseases. Since deaf and dumb people cannot communicate with normal person so they have to depend on some sort of visual communication. This study examines the role of Artificial Intelligence (AI) and Deep Learning in Real Time Communications. It is designed to help product, strategy, and business development decision makers communications service providers, technology vendors, communications-centric app providers, and enterprise information technology organizations.

## **CHAPTER 1**

### **INTRODUCTION**

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 text cannot be used. Text 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. Artificial Intelligence has been opening up new and simpler ways to manage our daily activities. With the big potential to automate tasks that typically require human intelligence, such as speech and voice recognition, visual perception, predictive text functionality, decision-making and performance of a variety of other tasks, AI can help individuals with disabilities by making a major difference in their ability to get around and take part in the activities of daily living. The project aims to develop a system that converts the sign language into a human hearing text in the desired language to convey a message to normal people, as well as convert text 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.

### **1.1 Project Overview:**

People get to know one another by sharing their ideas, thoughts, and experiences with those around them. There are numerous ways to accomplish this, the best of which is the gift of "Speech." Everyone can very convincingly transfer their thoughts and understand each other through speech. It will be unjust if we overlook those who are denied this priceless gift: the deaf and dumb. In such cases, the human hand has remained the preferred method of communication. The main purpose of this application is to make deaf-mute people feel independent and more confident. They can participate in daily activities rather than being inactive and can get good job opportunities. Adaptive learning platforms also provide personalised learning experiences tailored to the specific needs of students with disabilities. This application aims to help deaf and dumb by providing them with an attractive communication.

### **1.2 Purpose:**

The project's purpose is to create a system that translates sign language into a human understandable language so that ordinary people may understand it. This application aims to help deaf and dumb by providing them with an attractive communication. The system can generate revenue through direct customers and collaborate with health care sector and generate revenue from their customers. 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.

## **CHAPTER 2**

### **LITERATURE SURVEY**

#### **2.1 Existing problem**

Artificial Intelligence enabled virtual sixth sense application for the disabled. The sixth sense is a multiplatform app for aiding the people in need that is people who are handicapped in the form of lack of speech (dumb), lack of hearing (deaf), lack of sight (blind). Tools used are ML OCR kit , Firebase ML toolkit , Google Web toolkit TTS. Technologies used are Android smartphones ,object Detection ,Speech Recognition ,API. Pros and cons are Help dumb people to easily and quickly communicate with normal people. The application still does depend on the camera picture quality for object detection. Design of a Communication System using Sign Language aid for Differently Abled Peoples. Our goal is to design a human computer interface system that can accurately identify the language of the deaf and dumb. Feature Extraction ,Sign to text and Speech conversion. Image preprocessing and segmentation. Blob Detection , Skin color recognition , Template Matching. Hand gestures of deaf peoples by normal peoples this system is proposed and it gives output in the form of sound. A mediator is required to know the sign language. D-Talk: Sign Language Recognition System for People with Disability using Machine Learning and Image Processing. D-talk is a system that allows people who are unable to talk and hear and for them to learn their language easier and also for the people that would interact with them. Image Recognition process Object Detection Gesture Recognition HSV Algorithm. Machine learning ,Deep learning , Decision tree.

#### **Technology**

One of the easiest ways to communicate is through technology such as a smart phone or laptop. A deaf person can type out what they want to say and a person who is blind or has low vision can use a screen reader to read the text out loud. A blind person can also use voice recognition software to convert what they are saying in to text so that a person who is Deaf can then read it.

#### **Interpreter**

If a sign language interpreter is available, this facilitates easy communication if the person who is deaf is fluent in sign language. The deaf person and person who is blind can communicate with each other via the interpreter. The deaf person can use sign

language and the interpreter can speak what has been said to the person who is blind and then translate anything spoken by the blind person into sign language for the deaf person.

### **Just Speaking**

Depending on the deaf person's level of hearing loss, they may be able to communicate with a blind person who is using speech. For example, a deaf person may have enough residual hearing (with or without the use of an assistive hearing device such as a hearing aid) to be able to decipher the speech of the person who is blind or has low vision. However, this is often not the most effective form of communication, as it is very dependent on the individual circumstances of both people and their environment (for example, some places may have too much background noise).

## **2.2 References.**

*Kusumika Krori Dutta, Sunny Arokia Swamy Bellary [Year 2017, Machine Learning Techniques for Indian Sign Language Recognition ]*. Over the years, communication has played a vital role in exchange of information and feelings in one's life. Sign language is the only medium through which specially abled people can connect to rest of the world through different hand gestures. With the advances in machine learning techniques, Hand gesture recognition (HGR) became a very important research topic.

*Bhumika Gupta, Pushkar Shukla, Ankush Mittal [Year 2016 , K-Nearest Correlated Neighbour Classification for Indian Sign Language Gesture Recognition using Feature Fusion ]*. INDIA proposed that recognition of gesture of Indian Sign Languages using static images where a test image is first categorized into a single or double handed gesture followed by its classification using a fusion of SIFT and HOG descriptors via K-Nearest Correlated Neighbours

*Kusurnika Krori Dutta , Satheesh Kumar Raju , Anil Kumar G , Sunny Arokia Swamy [ Year 2015 , Double Handed Indian Sign Language to Speech and Text ]*. The system is trained with double handed sign language by using a minimum eigenvalue algorithm. Here Logitech web camera is used for image acquisition and processing is performed in MATLAB.

## **2.3 Problem Statement Definition .**

### **Statement :**

In the recent years, there has been rapid increase in the number of deaf and dumb victims due to birth defects, accidents and oral diseases. Since deaf and dumb people cannot communicate with normal person so they have to depend on some sort of visual

communication. A World Health Organization report says around 63 million people in India suffer from either complete or partial deafness, and of these, at least 50 lakh are children. Communication between deaf-mute and a normal person has always been a challenging task.

### **Description :**

The Deaf/Dumb people need a way to communicate easily and quickly with the normal people, so that the Deaf/Dumb people feel confident enough to express their thoughts, ideas, and can make conversation with the normal people.

### **Who does the problem affect?**

1) Communication plays a significant role in making the world a better place. Most people communicate efficiently without any issues, but many cannot due to disability.

2) They cannot hear or speak, which makes Earth a problematic place to live for them. Even simple basic tasks become difficult for them.

3) Disability is an emotive human condition, Being deaf and dumb pushes the subject to oblivion, highly introverted.

### **What are the boundaries of the problem?**

1) People sometimes stereotype those with disabilities, assuming their quality of life is poor or that they are unhealthy because of their impairments.

2) People may see disability as a personal tragedy, as something that needs to be cured or prevented, as a punishment for wrongdoing, or as an indication of the lack of ability to behave as expected in society.

### **What are the resources?**

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.

### **What are the objectives?**

1) Designing

and implementing a system using artificial intelligence, Deep Learning algorithms and image processing concepts to take input as hand gestures (or) sign language and It generates recognizable outputs in the form of text and voice.

2) We can convert the sign languages into voice or text. So that the specially abled

people will convey the message to normal people.

### **What are the purposes?**

The project aims to develop a system that converts the sign language into a human hearing voice or text in the desired language to convey a message to normal people, as well as convert speech or text into understandable sign language for the deaf and dumb.

### **Why is it important that we fix the problem?**

1) They can participate in daily activities rather than being inactive and can get good job opportunities.

2) Adaptive learning platforms also provide personalised learning experiences tailored to the specific needs of students with disabilities.

3) This application aims to help deaf and dumb by providing them with an attractive communication.

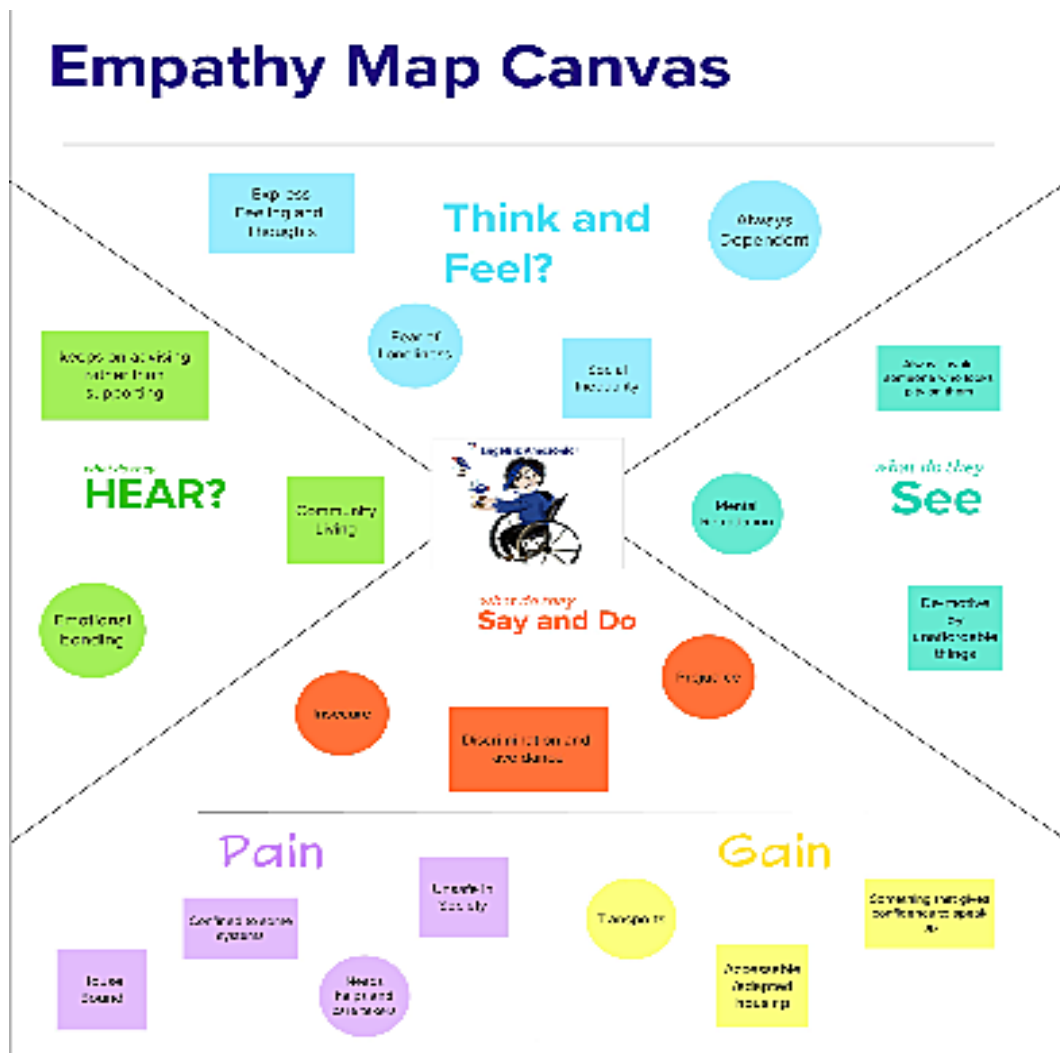
## **CHAPTER 3**

### **IDEATION & PROPOSED SOLUTION**

#### **3.1 Empathy Map Canvas :**

An empathy map canvas helps brands provide a better experience for users by helping teams understand the perspectives and mindset of their customers. Using a template to create an empathy map canvas reduces the preparation time and standardizes the process so you create empathy map canvases of similar quality. Ideation is often closely related to the practice of brainstorming, a specific technique that is utilized to generate new ideas. A principal difference between ideation and brainstorming is that ideation is commonly more thought of as being an individual pursuit, while brainstorming is almost always a group activity. Your goal This is where you engage in unfiltered, Unrestrained brainstorming.

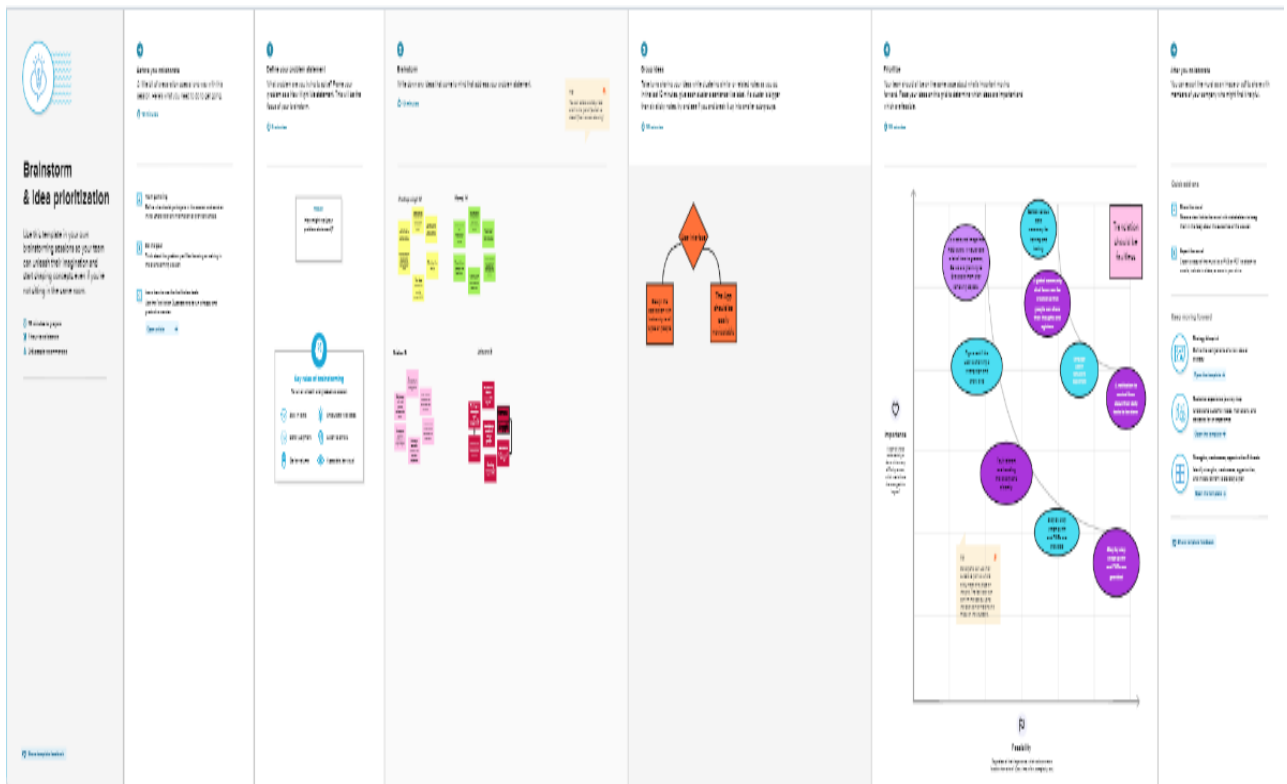




## 3.2 Ideation & Brainstorming

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.



### 3.3 Proposed Solution :

#### **Problem Statement (Problem to be solved)**

1. The project aims to develop a system that detects the object in indoor and outdoor mode with high accuracy and processing speed. The input image to the CNN, the object is detected in indoor environment like person, chair, bench and outdoor environments like car, bus, animal, and motorcycle etc.,.

2. The detected image information is provided as a voice output using a speech synthesizer to the visually challenged persons to assist them in their mobility

#### **Idea / Solution description**

The ideas consisted of designing and implement a system using **artificial intelligence and machine learning** concepts to take input as hand gestures.

### **Novelty / Uniqueness**

1. *The objective of the proposed work is to develop an application for blind persons based on the machine learning. It will eliminate the need for dedicated devices and other wearable devices to assist them to recognize objects as they move around.*

2. *To give blind users the ability to move around in unfamiliar indoor and outdoor environment, using friendly device by object identification system.*

### **Social Impact / Customer Satisfaction**

1. *About two thirds of People with a mobility and dexterity disability are most likely to **experience a great deal of difficulty with everyday activities.***

2. *The main purpose of this application is to make visually-impaired people feel independent and more confident.*

### **3.4 Problem Solution fit :**

The Problem-Solution Fit simply means that **you have found a problem with your customer and that the solution you have realized for it actually solves the customer's problem.**

### **Problem Solution fit :**

<b>1. CUSTOMER SEGMENT(S)</b>  People with disability who have problems such as blindness, deaf, dumb, or physical disabilities can use mobility proves to be one of the most challenging issues to overcome.	<b>2. PROBLEMS</b>  -To communicate between specially abled person to normal person -Not even and every person understand the sign language	<b>3.TRIGGER TO ACT</b>  -Disabled person wants to interact with normal people and they have to feel like having <u>_____</u>
<b>4.EMOTIONS</b>  Visually impaired users can set it up to work with VoiceOver. Allows people with disabilities to fully control their environments	<b>5.AVAILABLE SOLUTION</b>  -Provide personalized learning experiences. It makes use of text editors and social media to -People with disability can perform multiple tasks. Easy to learn and visualize access with all keywords.	<b>6.CUSTOMER STATE LIMITATION</b>  -Not able to afford -From doing a search or dictating a audio message to send to a friend.
<b>7.BEHAVIOUR</b>  -People with reduced mobility can control everything at home just by using their voice	<b>10.MY SOLUTION</b>  -Sign language can also be translated to audio messages in our application using CNN -AI allows users to share their saving goals and have communication with people	<b>9.ROOT/CAUSE</b>  -Specially abled persons can't talk to normal persons -User can enlish their ideas using a visual representation of sign indicating actions.
<b>8.CHANNELS OF BEHAVIOUR</b>  -AI technologies can play an important role in breaking down the communication barriers of deaf. -Advertising in online with the help of influencers to promote the product		

## CHAPTER 4

### REQUIREMENT ANALYSIS

#### 4.1Functional requirement

1. System is presented as black box.
2. Hearing impaired is the person that performs the signs.
3. Normal hearing is the passive user of the system.

A. **The System requirements that are required are specified below,**

#### Camera module:

4. In this module the input video streaming can be captured by using camera. The capture video frame can be converted as image by extracting the image from video.
5. Image pre-processing and segmentation module:
6. In image pre-processing module, the input extracted images can be sub-segmented so

that multiple regions can be formed from a single image.

#### **Database module:**

7. The model of trained images can be stored in data base management system for detection of objects in indoor and outdoor environments.

#### **Recognition module:**

8. The conventional neural network algorithm is used for recognition of objects in indoor and outdoor environments by comparing with data base system.

#### **Audio module:**

9. The recognized object images format can be converted as audio format based on speech synthesizer and the audio output is easy for understanding blind and self navigate without any persons help.

### **4.2 Non-Functional requirements**

Nonfunctional Requirements (NFRs) define system attributes such as security, reliability, performance, maintainability, scalability, and usability. They serve as constraints or restrictions on the design of the system across the different backlogs. In systems engineering and requirements engineering, a non-functional requirement is a requirement that specifies criteria that can be used to judge the operation of a system, rather than specific behaviours. Non-Functional requirements, not related to the system functionality, rather define how the system should perform. Here, we will just briefly describe the most typical non functional requirements.

#### **Usability**

The Most Usability dimensions appears learnability ,accessibility ,Sign languages and satisfication the usefulness of Mobile Application meant to specially abled

#### **Security**

ADT-Best Security System for the specially abled Overall Simplisafe- Best Security System for the specially abled With an App

### **Reliability**

The Sign method is the most accepted method as a means of communication to specially abled people

### **Performance**

Languages,behaviour norms significant role in each of the pepole

### **Availability**

Loop system ,accessible it helps to people who are specially abled

### **Scalability**

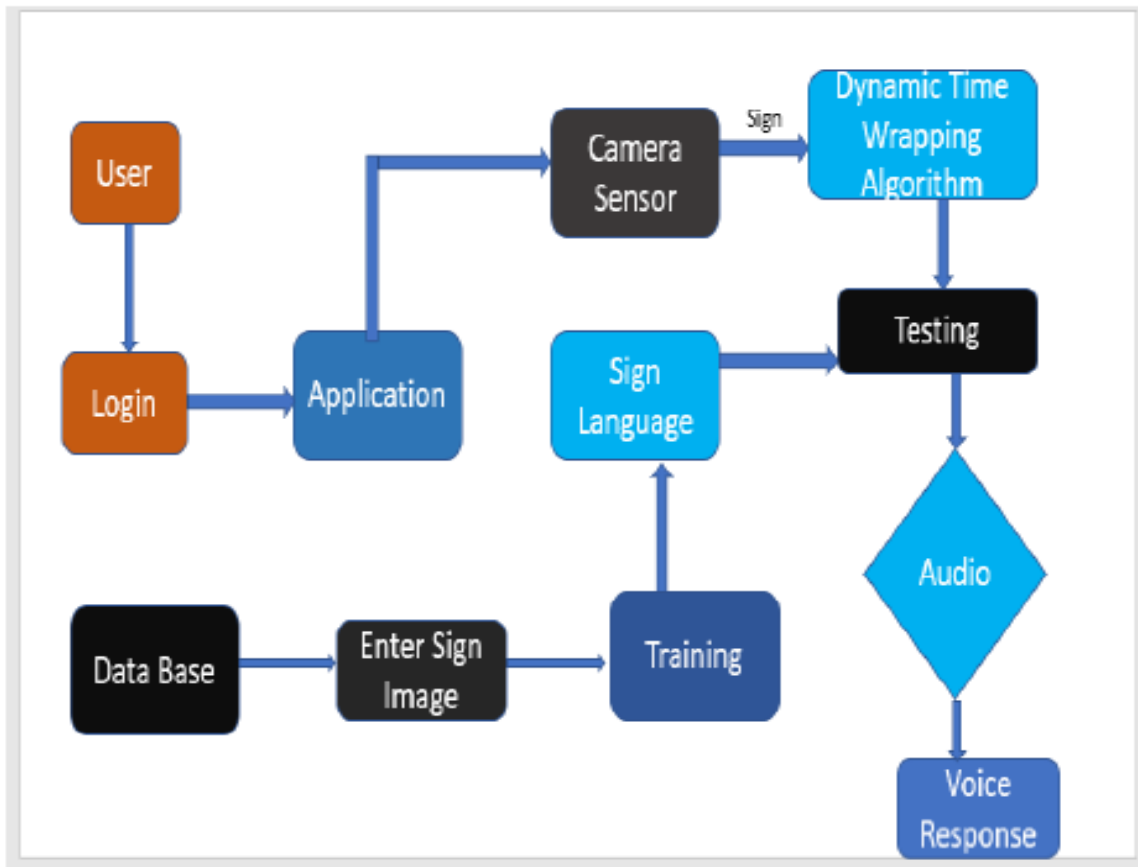
Sign language which will deal with development of an automatic sign language recognition/verification and sign product

## **CHAPTER 5**

### **PROJECT DESIGN**

#### **5.1 Data Flow Diagram :**

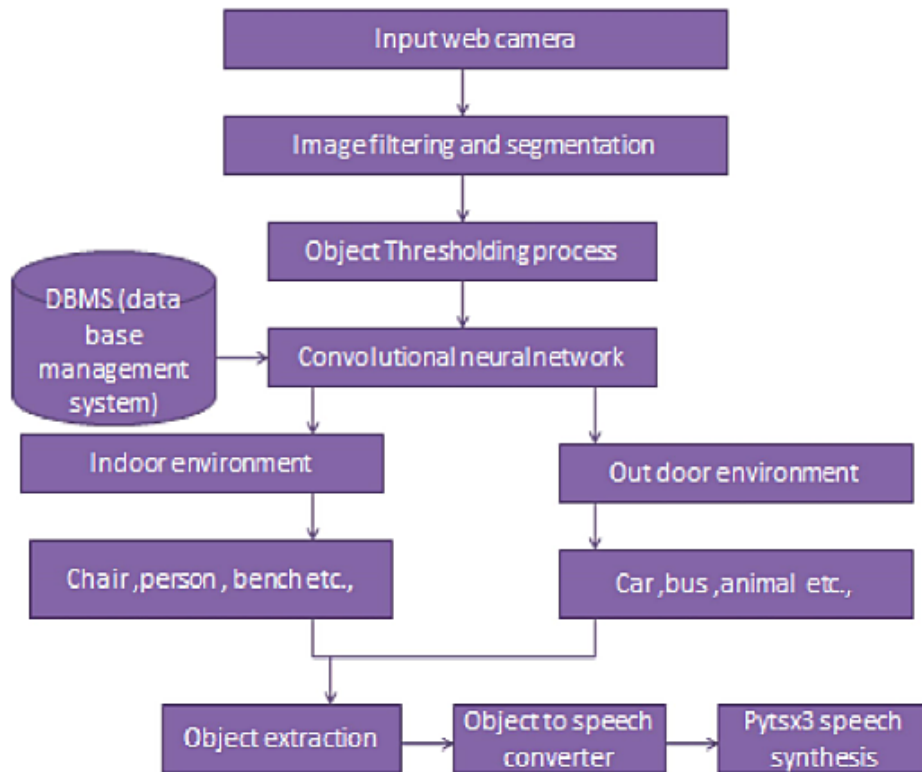
A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. The data-flow diagram is a tool that is part of structured analysis and data modelling. When using UML, the activity diagram typically takes over the role of the data-flow diagram. A special form of data-flow plan is a site-oriented data-flow plan. Data flow (flow, dataflow) shows the transfer of information (sometimes also material) from one part of the system to another. The symbol of the flow is the arrow. The flow should have a name that determines what information (or what material) is being moved.



## 5.2 Solution & Technical Architecture :

Technical Architecture (TA) is **a form of IT architecture that is used to design computer systems**. It involves the development of a technical blueprint with regard to the arrangement, interaction, and interdependence of all elements so that system-relevant requirements are met.

### Technical Architecture :



## CHAPTER 6

### PROJECT PLANNING & SCHEDULING



## Project Planning Phase

### Project Planning Template (Product Backlog, Sprint Planning, Stories, Story points)

Date	2 November 2022
Team ID	PNT2022TMID30001
Project Name	Real Time Communication System Powered by AI for Specially Abled
Maximum Marks	8 Marks

### Product Backlog, Sprint Schedule, and Estimation (4 Marks)

Use the below template to create product backlog and sprint schedule

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password	2	High	4
Sprint-1		USN-2	As a user, I will receive confirmation email once I have registered for the application	1	High	4
Sprint-2		USN-3	As a user, I can register for the application through Facebook	2	Low	4
Sprint-1		USN-4	As a user, I can register for the application through Gmail	2	Medium	4
Sprint-1	Login	USN-5	As a user, I can log into the application by entering email & password	1	High	4
	Dashboard					4

Sprint-3	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	2	High	4
<b>Sprint</b>	<b>Functional Requirement (Epic)</b>	<b>User Story Number</b>	<b>User Story / Task</b>	<b>Story Points</b>	<b>Priority</b>	<b>Team Members</b>
Sprint-3	Upload Image	USN-3	As a User, I can upload the sign language image for translating into audio format	2	High	4
Sprint-3	Solution	USN-4	As a User , If user get any query ,Then they get suggestion through help desk	2	Medium	4
Sprint-4	Manage	USN-5	Do-it-Yourself Service for delivery everything	1	High	4

#### Project Tracker, Velocity & Burn down Chart: (4 Marks)

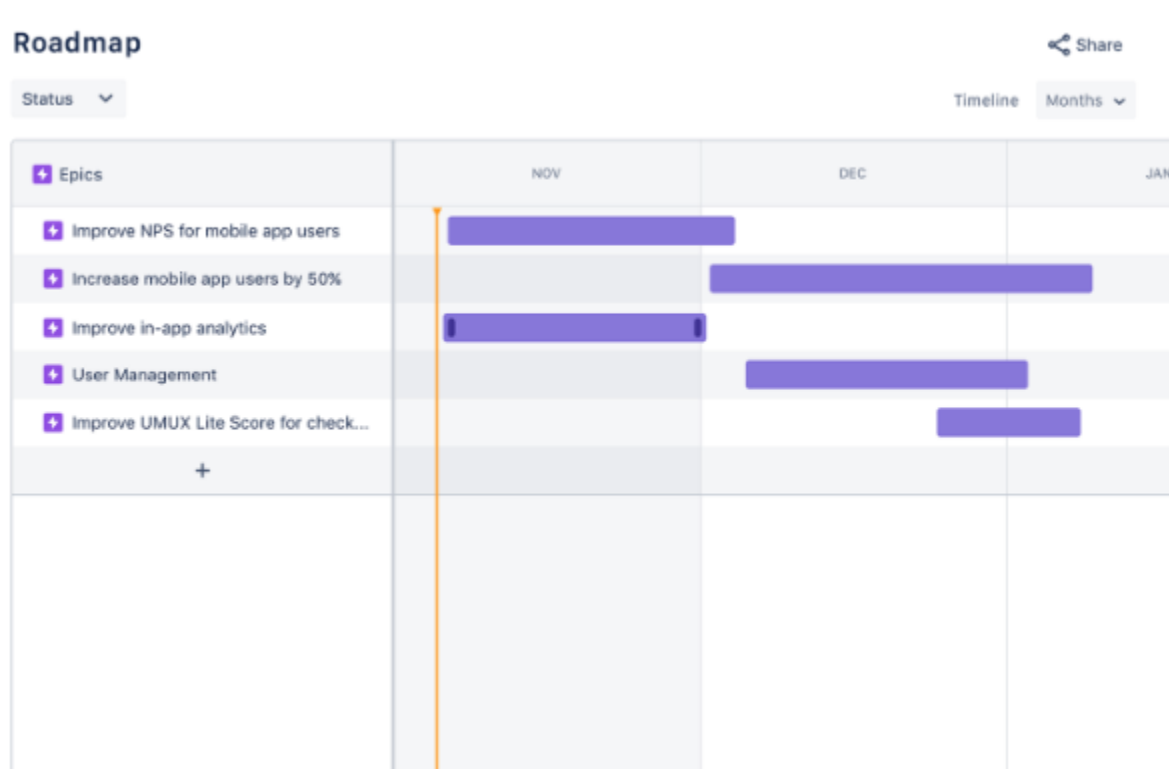
Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

## Reports from JIRA

Jira is a proprietary issue tracking product developed by Atlassian that allows bug tracking and agile project management. Jira helps teams plan, assign, track, report, and manage work

and brings teams together for everything from agile software development and customer support to start-ups and enterprises. Software teams build better with Jira Software, the #1 tool for agile teams.

Jira is a commercial software product that can be licensed for running on-premises or available as a hosted application. Atlassian provides Jira for free to open source projects meeting certain criteria, and to organizations that are non-academic, non-commercial, non-governmental, non-political, non-profit, and secular. For academic and commercial customers, the full source code is available under a developer source license.



## CHAPTER 7

### CODING & SOLUTIONING

#### 1. PRE-REQUISITIES

##### Anaconda

Anaconda is a distribution (a bundle) of Python, R, and other languages, as well as tools tailored for data science (i.e., Jupyter Notebook and RStudio). It also provides an alternative package manager called conda. Anaconda is an open-source distribution of the Python and R programming languages for data science that aims to simplify package management and

deployment.

### **Computer Vision**

Computer vision is a field of artificial intelligence (AI) that enables computers and systems to derive meaningful information from digital images, videos and other visual inputs – and take actions or make recommendations based on that information. Computer vision is a field of AI that trains computers to capture and interpret information from image and video data.

### **Flask Framework**

Flask is a micro web framework written in Python. It is classified as a microframework because it does not require particular tools or libraries. It has no database abstraction layer, form validation, or any other components where preexisting third-party libraries provide common functions.

## **2. PYTHON PACKAGES**

### **Tensorflow**

TensorFlow is a free and open-source software library for machine learning and artificial intelligence. It can be used across a range of tasks but has a particular focus on training and inference of deep neural networks.

### **Keras**

Keras is an open-source software library that provides a Python interface for artificial neural networks. Keras acts as an interface for the TensorFlow library. Up until version 2.3, Keras supported multiple backends, including TensorFlow, Microsoft Cognitive Toolkit, Theano, and PlaidML.

### **OpenCV**

OpenCV is a library of programming functions mainly aimed at real-time computer vision. Originally developed by Intel, it was later supported by Willow Garage then Itseez. The library is cross-platform and free for use under the opensource Apache 2 License.

### **Flask Framework**

Flask is a micro web framework written in Python. It is classified as a microframework because it does not require particular tools or libraries. It has no database abstraction layer, form validation, or any other components where preexisting third-party libraries provide common functions.

## **3. LANGUAGES USED IN THE PROJECT**

### **PYTHON**

Python is a high-level, general-purpose programming language. Its design philosophy emphasizes code readability with the use of significant indentation. Python is dynamically-typed and garbage-collected. It supports multiple programming paradigms, including structured, object-oriented and functional programming.

## **HTML**

The HyperText Markup Language or HTML is the standard markup language for documents designed to be displayed in a web browser. It can be assisted by technologies such as Cascading Style Sheets and scripting languages such as JavaScript.

## **CSS**

Cascading Style Sheets is a style sheet language used for describing the presentation of a document written in a markup language such as HTML or XML. CSS is a cornerstone technology of the World Wide Web, alongside HTML and JavaScript.

## **JS**

JavaScript, often abbreviated as JS, is a programming language that is one of the core technologies of the World Wide Web, alongside HTML and CSS. As of 2022, 98% of websites use JavaScript on the client side for webpage behavior, often incorporating third-party libraries.

# **4. SERVICES USED ON IBM CLOUD**

## **IBM WATSON STUDIO**

Watson Studio, formerly Data Science Experience or DSX, is IBM's software platform for data science. The platform consists of a workspace that includes multiple collaboration and open-source tools for use in data science. In Watson Studio, a data scientist can create a project with a group of collaborators, all having access to various analytics models and using various languages (R/Python/Scala). Watson Studio brings together staple open source tools including RStudio, Spark and Python in an integrated environment, along with additional tools such as a managed Spark service and data shaping facilities, in a secure and governed environment.

## **WATSON MACHINE LEARNING**

Watson Machine Learning provides a full range of tools and services so that you can build, train, and deploy Machine Learning models. Choose the tool with the level of automation or autonomy that matches your needs, from a fully automated process to writing your own code.

## **IBM CLOUD OBJECT STORAGE IBM**

Cloud Object Storage is a service offered by IBM for storing and accessing unstructured data. The object storage service can be deployed onpremise, as part of IBM Cloud Platform offerings, or in hybrid form.

## 7.1 Feature 1

```
<!DOCTYPE html>
<html lang="en">

<head>
  <meta charset="utf-8">
  <meta name="viewport" content="width=device-width, initial-scale=1.0, shrink-to-fit=no">
  <title>SmartBridge_WebApp_VideoTemplate</title>
  <link rel="stylesheet"
href="https://cdn.jsdelivr.net/npm/bootstrap@5.1.3/dist/css/bootstrap.min.css">
  <link rel="stylesheet" href="https://use.fontawesome.com/releases/v5.12.0/css/all.css">
  <link rel="stylesheet" href="assets/css/Banner-Heading-Image.css">
  <link rel="stylesheet" href="assets/css/Navbar-Centered-Brand.css">
  <link rel="stylesheet" href="assets/css/styles.css">
</head>

<body style="background: rgb(39,43,48);">
  <nav class="navbar navbar-light navbar-expand-md py-3" style="background:
#212529;">
    <div class="container">
      <div></div><a class="navbar-brand d-flex align-items-center" href="#"><span
      class="bs-icon-sm bs-icon-rounded bs-icon-primary d-flex justify-content-
center align-items-center me-2 bs-icon"><i
      class="fas fa-flask"></i></span><span style="color:
rgb(255,255,255);">Real-Time Communication
      System Powered By AI&nbsp;For Specially Abled</span></a>
    <div></div>
  </div>
</nav>
<section>
  <div class="d-flex flex-column justify-content-center align-items-center">
    <div class="d-flex flex-column justify-content-center align-items-center" id="div-
video-feed"
    style="width: 640px;height: 480px;margin: 10px;min-height: 480px;min-width:
```

```

640px;border-radius: 10px;border: 4px dashed rgb(255,255,255) ;">
    
</div>
</div>
<div class="d-flex flex-column justify-content-center align-items-center"
style="margin-bottom: 10px;"><button
    class="btn btn-info" type="button" data-bs-target="#modal-1" data-bs-
toggle="modal">Quick Reference
    -<strong> ASL Alphabets</strong></button></div>
</section>
<section>
    <div class="container">
        <div class="accordion text-white" role="tablist" id="accordion-1">
            <div class="accordion-item" style="background: rgb(33,37,41);">
                <h2 class="accordion-header" role="tab"><button class="accordion-button"
data-bs-toggle="collapse"
                data-bs-target="#accordion-1 .item-1" aria-expanded="true"
                aria-controls="accordion-1 .item-1"
                style="background: rgb(39,43,48);color: rgb(255,255,255);">About The
Project</button></h2>
                <div class="accordion-collapse collapse show item-1" role="tabpanel" data-bs-
parent="#accordion-1">
                    <div class="accordion-body">
                        <p class="mb-0">Artificial Intelligence has made it possible to handle our
daily activities
                            in new and simpler ways. With the ability to automate tasks that
normally require human
                            intelligence, such as speech and voice recognition, visual perception,
predictive text
                            functionality, decision-making, and a variety of other tasks, AI can assist
people with
                            disabilities by significantly improving their ability to get around and
participate in
                            daily activities.<br><br></p>
                    </div>

```

```
</div>
</div>
<div class="accordion-item" style="background: rgb(33,37,41);">
    <h2 class="accordion-header" role="tab"><button class="accordion-button
collapsed"
        data-bs-toggle="collapse" data-bs-target="#accordion-1 .item-2" aria-
expanded="false"
        aria-controls="accordion-1 .item-2"
        style="background: rgb(39,43,48);color: rgb(231,241,255);">Developed
By</button></h2>
    <div class="accordion-collapse collapse item-2" role="tabpanel" data-bs-
parent="#accordion-1">
        <div class="accordion-body">
            <p class="mb-0">Students at Er.Perumal Manimekalai College of
Engineering,Hosur<br><br>1. <strong>M.Prathap Singh</strong> 610819104303<br>2.
                <strong>G.Sridhar</strong> 610819104046<br>3.
<strong>S.Jaisurya</strong> 610819104017<br>4. <strong>M.Manoj</strong>
610819104025<br>
            </p>
        </div>
    </div>
</div>
</div>
</div>
</div>
</section>
<div class="modal fade" role="dialog" tabindex="-1" id="modal-1">
    <div class="modal-dialog" role="document">
        <div class="modal-content">
            <div class="modal-header">
                <h4 class="modal-title">American Sign Language - Alphabets</h4><button
type="button"
                    class="btn-close" data-bs-dismiss="modal" aria-label="Close"></button>
            </div>
            <div class="modal-body"></div>
            <div class="modal-footer"><button class="btn btn-secondary" type="button"
data-bs-dismiss="modal">Close</button></div>
```



```

        </div>
    </div>
</div>
<script
src="https://cdn.jsdelivr.net/npm/bootstrap@5.1.3/dist/js/bootstrap.bundle.min.js"></scrip
t>
</body>

</html>

```

## 7.2 FEATURE 2

```

.img-preview {
    width: 256px;
    height: 256px;
    position: relative;
    border: 5px solid #F8F8F8;
    box-shadow: 0px 2px 4px 0px rgba(0, 0, 0, 0.1);
    margin-top: 1em;
    margin-bottom: 1em;
}

```

```

.img-preview>div {
    width: 100%;
    height: 100%;
    background-size: 256px 256px;
    background-repeat: no-repeat;
    background-position: center;
}

```

```

input[type="file"] {
    display: none;
}

```

```

.upload-label{
    display: inline-block;
    padding: 12px 30px;
}

```

```
background: #39D2B4;
color: #fff;
font-size: 1em;
transition: all .4s;
cursor: pointer;
}
```

```
.upload-label:hover{
background: #34495E;
color: #39D2B4;
}
```

```
.loader {
border: 8px solid #f3f3f3; /* Light grey */
border-top: 8px solid #3498db; /* Blue */
border-radius: 50%;
width: 50px;
height: 50px;
animation: spin 1s linear infinite;
}
```

```
@keyframes spin {
0% { transform: rotate(0deg); }
100% { transform: rotate(360deg); }
}
```

```
$(document).ready(function () {
// Init
$('.image-section').hide();
$('.loader').hide();
$('#result').hide();

// Upload Preview
function readURL(input) {
if (input.files && input.files[0]) {
var reader = new FileReader();
reader.onload = function (e) {
```

```

        $('#imagePreview').css('background-image', 'url(' + e.target.result + ')');
        $('#imagePreview').hide();
        $('#imagePreview').fadeOut(650);
    }
    reader.readAsDataURL(input.files[0]);
}
}
$('#imageUpload').change(function () {
    $('.image-section').show();
    $('#btn-predict').show();
    $('#result').text("");
    $('#result').hide();
    readURL(this);
});

```

**// Predict**

```

$('#btn-predict').click(function () {
    var form_data = new FormData($('#upload-file')[0]);

```

**// Show loading animation**

```

$(this).hide();
$('.loader').show();

```

**// Make prediction by calling api /predict**

```

$.ajax({
    type: 'POST',
    url: '/predict',
    data: form_data,
    contentType: false,
    cache: false,
    processData: false,
    async: true,
    success: function (data) {
        // Get and display the result
        $('.loader').hide();
        $('#result').fadeOut(600);
        $('#result').text(' Result: ' + data);
    }
});

```

```

        console.log("Success!");
    },
    });
});

});

```

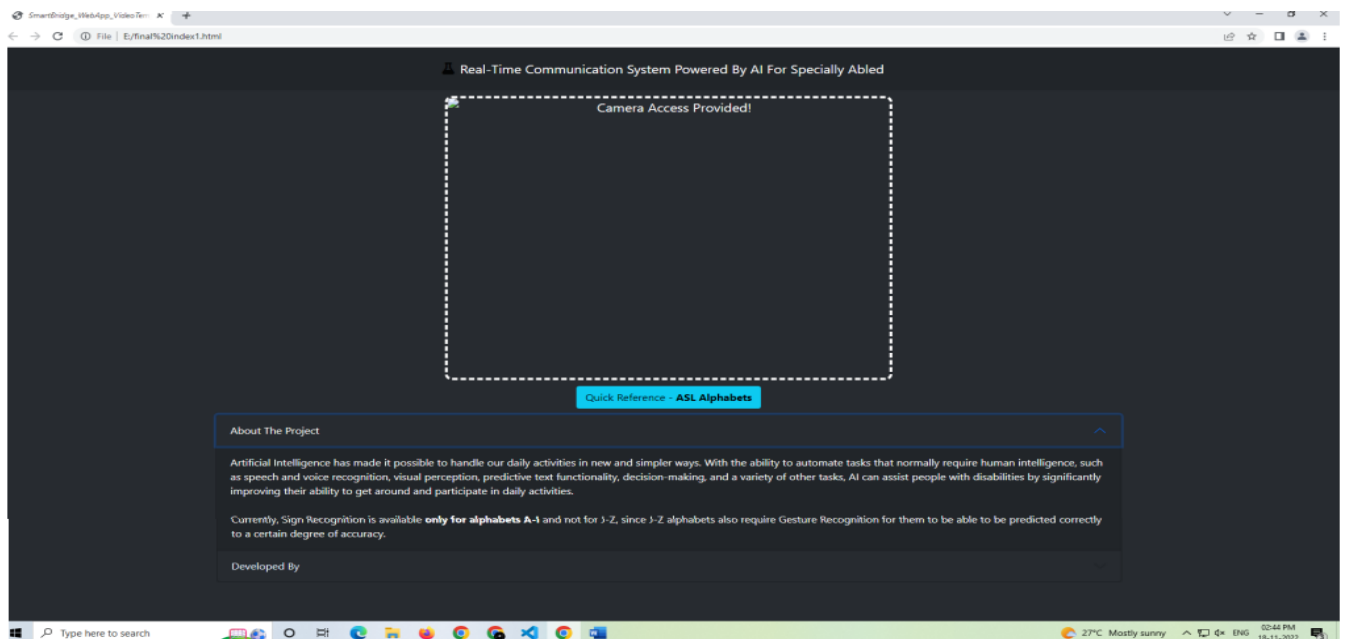
## 7.3 Database Schema

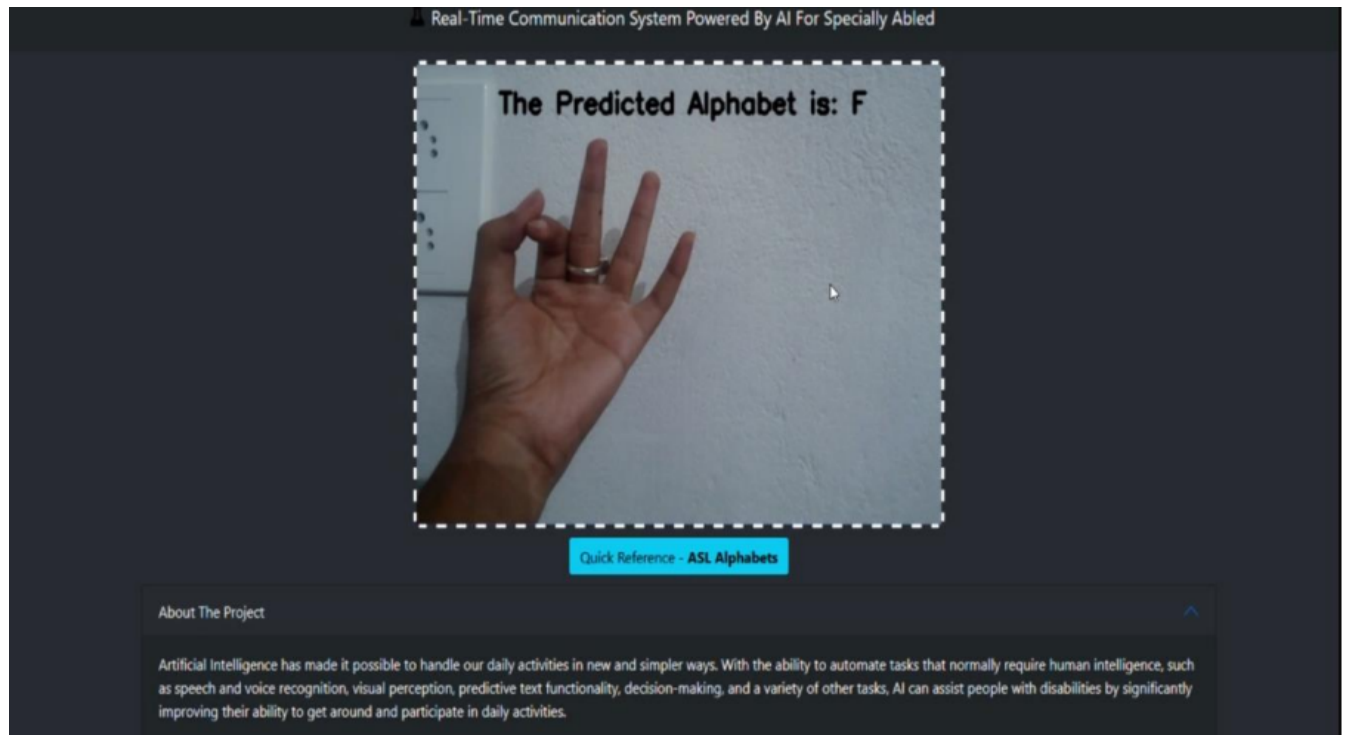
### NOSQL

NoSQL, also referred to as “not only SQL”, “non-SQL”, is an approach to database design that enables the storage and querying of data outside the traditional structures found in relational databases. Examples of column-based NoSQL databases include Cassandra, HBase, and Hypertable. NoSQL databases are non-tabular databases and store data differently than relational tables.

## CHAPTER 9

## RESULTS





## 9.1 Performance Metrics

Project metrics are key indicators that help to track a project's performance. To be a successful project manager, one must monitor the team's progress and lead the efforts to the project's goals. Metrics also help to implement corrective measures in case the numbers don't align with the expectations. Accuracy describes the closeness of values to a true value – in other words, how correct they are compared to your target or goal.

When you measure your results and find them very close to your target value, they are accurate. Accurate project estimates help identify cost and schedule requirements with relative precision, and reduce the risk of running out of time, resources, and budget during a project.

Training Accuracy - 0.9956 %

Validation Accuracy – 0.9756 %

```

Epoch 1/15
168/168 [=====] - 33s 183ms/step - loss: 0.1781 - accuracy: 0.9417 - val_loss: 0.0413 - val_accuracy: 0.9856
Epoch 2/15
168/168 [=====] - 32s 189ms/step - loss: 0.0452 - accuracy: 0.9862 - val_loss: 0.0387 - val_accuracy: 0.9892
Epoch 3/15
168/168 [=====] - 30s 180ms/step - loss: 0.0267 - accuracy: 0.9922 - val_loss: 0.0623 - val_accuracy: 0.9761
Epoch 4/15
168/168 [=====] - 30s 178ms/step - loss: 0.0134 - accuracy: 0.9967 - val_loss: 0.0368 - val_accuracy: 0.9892
Epoch 5/15
168/168 [=====] - 30s 178ms/step - loss: 0.0107 - accuracy: 0.9964 - val_loss: 0.0406 - val_accuracy: 0.9892
Epoch 6/15
168/168 [=====] - 30s 178ms/step - loss: 0.0080 - accuracy: 0.9973 - val_loss: 0.0563 - val_accuracy: 0.9868
Epoch 7/15
168/168 [=====] - 30s 181ms/step - loss: 0.0055 - accuracy: 0.9985 - val_loss: 0.0411 - val_accuracy: 0.9880
Epoch 8/15
168/168 [=====] - 30s 181ms/step - loss: 0.0041 - accuracy: 0.9994 - val_loss: 0.0804 - val_accuracy: 0.9880
Epoch 9/15
168/168 [=====] - 32s 193ms/step - loss: 0.0063 - accuracy: 0.9985 - val_loss: 0.0532 - val_accuracy: 0.9916
Epoch 10/15
168/168 [=====] - 30s 180ms/step - loss: 0.0095 - accuracy: 0.9964 - val_loss: 0.0894 - val_accuracy: 0.9892
Epoch 11/15
168/168 [=====] - 30s 181ms/step - loss: 0.0037 - accuracy: 0.9991 - val_loss: 0.0969 - val_accuracy: 0.9856
Epoch 12/15
168/168 [=====] - 31s 184ms/step - loss: 0.0029 - accuracy: 0.9994 - val_loss: 0.0715 - val_accuracy: 0.9868
Epoch 13/15
168/168 [=====] - 31s 187ms/step - loss: 0.0021 - accuracy: 0.9991 - val_loss: 0.0665 - val_accuracy: 0.9904
Epoch 14/15
168/168 [=====] - 30s 181ms/step - loss: 0.0023 - accuracy: 0.9997 - val_loss: 0.0627 - val_accuracy: 0.9904
Epoch 15/15
168/168 [=====] - 33s 196ms/step - loss: 0.0018 - accuracy: 0.9997 - val_loss: 0.0682 - val_accuracy: 0.9904

```

## CHAPTER 10

### ADVANTAGES & DISADVANTAGES

#### ADVANTAGES

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 text is given as output. They can participate in daily activities rather than being inactive and can get good job opportunities. Adaptive learning platforms also provide personalized learning experiences tailored to the specific needs of students with disabilities. This application aims to help deaf and dumb by providing them with an attractive communication.

#### DISADVANTAGES

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. AI-based tools can also be used to help with interactions by people who are unable to see content. Tools like Apple Siri and Amazon Echo and Alexa provide ways of interacting with content through a spoken dialogue model.

## **CHAPTER 12**

### **FUTURE SCOPE**

Applying augmentations to the dataset can make the model training more accurate but also stabilize it at higher accuracies. Thereby depicting its caliber to make highly accurate predictions with an accuracy rate of 99%. we examined and assessed the deep learning techniques used to classify a sign language. The project aims to develop a system that converts the sign language into a human hearing voice or text in the desired language to convey a message to normal people, as well as convert speech or text into understandable sign language for the deaf and dumb. The Deaf/Dumb people needs a way to communicate easily and quickly with the normal people, so that the Deaf/Dumb people feel confident enough to express there thought, ideas, and can make conversation with the normal people.

Designing and implementing a system using artificial intelligence, Deep Learning algorithms and image processing concepts to take input as hand gestures (or) sign language and It generates recognizable outputs in the form of speech. The system uses neural networks and Computer vision to recognizes the video or image of sign language then smart deep learning algorithms translate it into text. As the specially abled people feel very difficult to convey their message to normal people in emergency times as well as in normal times. The main purpose of this application is to make deaf-mute people feel independent and more confident. They can participate in daily activities rather than being inactive and can get good job opportunities. Adaptive learning platforms also provide personalised learning experiences tailored to the specific needs of students with disabilities. This application aims to help deaf and dumb by providing them with an attractive communication.

## **CHAPTER 13**

### **APPENDIX**

#### **13.1 Source Code**

Real-Time Communication System Powered by AI for Specially Abled Project

Image Preprocessing

Import ImageDataGenerator Library And Configure It

```

from tensorflow.keras.preprocessing.image import ImageDataGenerator
train_datagen=ImageDataGenerator(rescale=1./255,horizontal_flip=True,vertical_flip=True, zoom_range=0.2)
test_datagen=ImageDataGenerator(rescale=1./255)

```

Apply ImageDataGenerator Functionality To Train And Test Set

```

x_train=train_datagen.flow_from_directory(r"C:\Users\Acer\Downloads\conversation engine for deaf
and dumb\Dataset\training_set",target_size=(64,64),
    class_mode="categorical",batch_size=30)
Found 15750 images belonging to 9 classes.
I
x_test=test_datagen.flow_from_directory(r"C:\Users\Acer\Downloads\conversation engine for deaf
and dumb\Dataset\test_set",target_size=(64,64),
    class_mode="categorical",batch_size=30)
Found 2250 images belonging to 9 classes.

```

Model Building

Import The Required Model Building Libraries

```

from keras.models import Sequential
from keras.layers import Dense
from keras.layers import Convolution2D
from keras.layers import MaxPooling2D
from keras.layers import Dropout
from keras.layers import Flatten

```

Initialize The Model

```

model=Sequential()

```

Add The Convolution Layer

```

model.add(Convolution2D(32, (3,3), activation="relu", input_shape=(64,64,3)))
#No of feature detectors, size of feature detector, image size, activation function

```



Add The Pooling Layer

```
model.add(MaxPooling2D(pool_size=(2, 2)))
```

Add The Flatten Layer

```
model.add(Flatten())
```

Adding The Dense Layers

```
model.add(Dense(200, activation='relu'))
model.add(Dense(200, activation='relu'))
model.add(Dense(9, activation="softmax"))
```

Compile The Model

```
model.compile(loss="categorical_crossentropy", metrics=["accuracy"], optimizer='adam')
len(x_train)
525
len(x_test)
75
```

Fit And Save The Model

Fit the neural network model with the train and test set, number of epochs, and validation steps. The weights are to be saved for future use. The weights are saved in signlanguage.h5 file using save().

```
model.fit(x_train, epochs=9, validation_data=x_test, steps_per_epoch=len(x_train), validation_steps=len(x_test))
```

Epoch 1/9

```
525/525 [=====] - 329s 616ms/step - loss: 0.3160
- accuracy: 0.8886
- val_loss: 0.1389 - val_accuracy: 0.9644
```

Epoch 2/9

```
525/525 [=====] - 251s 478ms/step - loss: 0.0592
- accuracy: 0.9810
- val_loss: 0.2418 - val_accuracy: 0.9662
```

Epoch 3/9

```

525/525 [=====] - 271s 515ms/step - loss: 0.0345
- accuracy: 0.9886
- val_loss: 0.2308 - val_accuracy: 0.9680
Epoch 4/9
525/525 [=====] - 240s 457ms/step - loss: 0.0244
- accuracy: 0.9923
- val_loss: 0.1640 - val_accuracy: 0.9711
Epoch 5/9
525/525 [=====] - 217s 412ms/step - loss: 0.0258
- accuracy: 0.9914
- val_loss: 0.0888 - val_accuracy: 0.9769
Epoch 6/9
525/525 [=====] - 267s 509ms/step - loss: 0.0171
- accuracy: 0.9942
- val_loss: 0.2250 - val_accuracy: 0.9782
Epoch 7/9
525/525 [=====] - 344s 655ms/step - loss: 0.0139
- accuracy: 0.9955
- val_loss: 0.1629 - val_accuracy: 0.9773
Epoch 8/9
525/525 [=====] - 356s 678ms/step - loss: 0.0107
- accuracy: 0.9964
- val_loss: 0.1430 - val_accuracy: 0.9631
Epoch 9/9
525/525 [=====] - 363s 692ms/step - loss: 0.0136
- accuracy: 0.9956
- val_loss: 0.2175 - val_accuracy: 0.9756

```

```
model.save("signlanguage-new.h5")
```

Test The Model

```

Import The Packages And Load The Saved Model
from keras.models import load_model
import numpy as np
import cv2
from tensorflow.keras.models import load_model
from tensorflow.keras.preprocessing import image
import numpy as np
model=load_model("signlanguage.h5")
Load The Test Image, Pre-Process It And Predict
img=image.load_img("16.png",target_size=(64,64))
img

```

[illegible]

```

[0., 0., 0.],
[0., 0., 0.]], dtype=float32)
x.shape
(64, 64, 3)
x = np.expand_dims(x, axis=0)
x.shape
(1, 64, 64, 3)
pred_prob = model.predict(x)
1/1 [=====] - 1s 1s/step
pred_prob
array([[1., 0., 0., 0., 0., 0., 0., 0., 0.]], dtype=float32)
class_name=["A", "B", "C", "D", "E", "F", "G", "H", "I"]
pred_id = pred_prob.argmax(axis=1)[0]
pred_id
0
print("the alphabet is ",str(class_name[pred_id]))
the alphabet is A

```

## 13.2 GitHub & Project Demo Link

### GitHub Link

<https://github.com/IBM-EPBL/IBM-Project-19493-1659698728>

### Demo link

[https://drive.google.com/file/d/1Cawg5pSGOxkA4pDgoiucnLm26ZsMa\\_cu/view?usp=sharing](https://drive.google.com/file/d/1Cawg5pSGOxkA4pDgoiucnLm26ZsMa_cu/view?usp=sharing)

**Kindly download to watch**



