THANTHAI PERIYAR GOVERNMENT INSTITUTE OF TECHNOLOGY

ELECTRONICS AND COMMUNICATION ENGINEERING

PROJECT REPORT

Real-Time Communication System Powered by AI for Specially Abled

Submitted by

TEAM ID : PNT2022TMID29700

TEAM LEADER : PRIYANGA V (513119106067)

TEAM MEMBER 1 : SWETHA B (513119106088)

TEAM MEMBER 2 : SARUMATHI R (513119106073)

TEAM MEMBER 3 : SRINATH P (513119106082)

TEAM MEMBER 4: YAMIN SEHWAG (5131191060101)

PROJECT REPORT FORMAT

- INTRODUCTION
- LITERATURE SURVEY
- IDEATION & PROPOSED SOLUTION
- REQUIREMENT ANALYSIS
- PROJECT DESIGN
- PROJECT PLANNING & SCHEDULING
- CODING & SOLUTIONING
- TESTING
- RESULTS
- ADVANTAGES
- DISADVANTAGES
- CONCLUSION
- FUTURE SCOPE
- APPENDIX

INTRODUCTION

1.1 Project Overview

AI technologies can play an important role in breaking down the communication barriers of deaf or hearing-impaired people with other communities, contributing significantly to their social inclusion. Recent advances in both sensing technologies and AI algorithms have paved the way for the development of various applications aiming at fulfilling the needs of deaf and hearing-impaired communities. To this end, this survey aims to provide a comprehensive review of state-of-the-art methods in sign language capturing, recognition, translation and representation, pinpointing their advantages and limitations. In addition, the survey presents many applications, while it discusses the main challenges in sign language technologies. Future research direction are also proposed in order to assist prospective researchers towards further advancing the field.Sign languages are the primary language of many people worldwide. To overcome communication barriers between the Deaf and the hearing community, artificial intelligence technologies have been employed, aiming to develop systems for automated sign language recognition and generation have to be considered - though sharing some characteristics of spoken languages -since they differ in others.

1.2 Purpose

The main purpose is communication between hearing-impaired people and other communities and also the Sign language recognition, sign language representation, sign language capturing. We are using 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. The main purpose is communication between hearing-impaired people and other communities and also the Sign language recognition, sign language representation, sign language capturing. We are using a convolution neural network to create a model that is trained on different hand gestures. A basic understanding of the particularities and notation of sign language serves to understand the importance better and challenges of automated sign language translation. 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.

LITERATURE SURVEY

2.1 Existing Problem

The aforementioned search condition describes the existence of the above words (i.e., recognition, translation, etc.) in the title, abstract or keywords of the literature works. In this context, allows for variations in the search terms i.e., capture allows the existence of words, such as capture, capturing, etc. In addition, the search is performed for papers published after 2018 since the field is evolving with fast pace and older methods are rendered quickly obsolete. To this end, this review aims to present only the latest and best works related to sign language technologies.Communication is the only medium by which we can share our thoughts or convey the message but for a person with disability (deaf and dumb) faces difficulty in communication with normal person. Because of this, a person who lacks in hearing and speaking ability is not able to stand in race with normal person.

Deafness is either congenital or acquired. Congenital deafness arises from some natural cause which deprives the child of hearing from its birth. Acquired deafness arises from disease, accident, or other causes. Older people who can't hear well may become depressed, or they may withdraw from others because they feel frustrated or embarrassed about not

understanding what is being said. Sometimes, older people are mistakenly thought to be confused, unresponsive, or uncooperative because they don't hear well.Hearing people and their constant, pervasive audism. Hearing people and their incessant creation of barriers to Deaf people's equality, employment, language, culture, and freedom to be themselves in the way they want to be.Deaf individuals face oral and printed language barriers. Deaf individuals have limited access to health-care services due to communication barriers and interpersonal factors.You can imagine the emotional and psychological toll of not being able to communicate with those closest to you, let alone others at school or work. For many deaf individuals living in rural areas, they might be the only deaf person in their community or school, making it extremely challenging to build relationships.

2.2 Reference

The papers included in this review have been published as journal articles, conference proceedings and book chapters (i.e., DOCTYPE) in the fields of computing and engineering (i.e., SUBJAREA). A systematic literature search was performed by adopting the PRISMA guidelines. The articles were extracted in June 2021 from three academic databases, namely Scopus.

2.3 Problem Statement Definition

Communication is the only medium by which we can share our thoughts or convey the message but for a person with disability (deaf and dumb) faces difficulty in communication with normal person. Because of this, a person who lacks in hearing and speaking ability is not able to stand in race with normal person. The number of the records retrieved from the three databases is 2368. From this number, 331 duplicate records are removed, leading to 2037 unique records. After screening title, abstract and finally the full text with various criteria to discard irrelevant records, 106 records remain and are included in this review. Sign languages are natural languages that use different means of expression for communication in everyday life. More particularly, it is the only means of communication for the hearing impaired. Thus, it provides replacement for speech among deaf and mute people. Several research works are going on sign language in order to make the communication between a deaf person and a normal person easy. Japanese Sign Language etc. Generally, the semantic meanings of the language components in all these sign languages differ, but there are signs with a universal syntax. For example, a simple gesture with one hand expressing 'hi' or 'goodbye' has the same meaning all over the world and in all forms of sign languages. Sign languages are natural languages that use different means of expression for communication in everyday life.

IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas

- An empathy map is a simple, easy-to-digest visual that captures knowledge about a user's behaviors and attitudes.
- It is a useful tool to helps teams better understand their users.Creating an effective solution requires understanding the true problem and the person who is experiencing it.
- The exercise of creating the map helps participants consider things from the user's perspective along with his or her goals and challenges.

3.2 Ideation & Brainstroming

Step 1:

Team Gathering, Collaboration and Select the Problem Statement

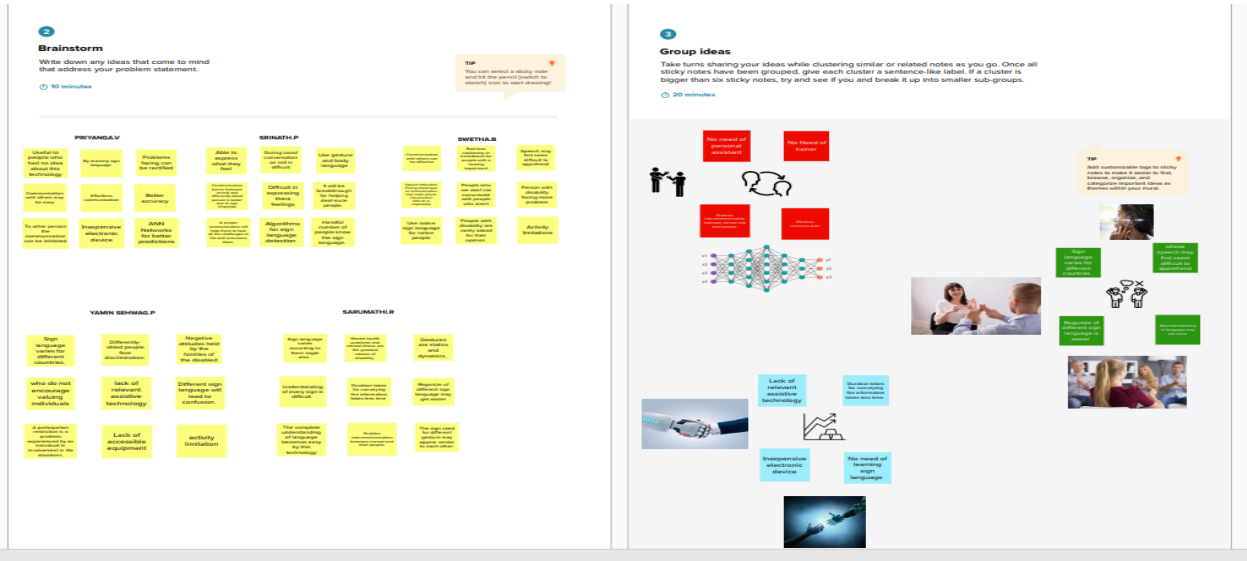
Team was gathered in mural app for collaboration.

The team members are

- Priyanga
- Swetha
- Sarumathi
- Srinath
- Yamin Sehwag

Step 2:

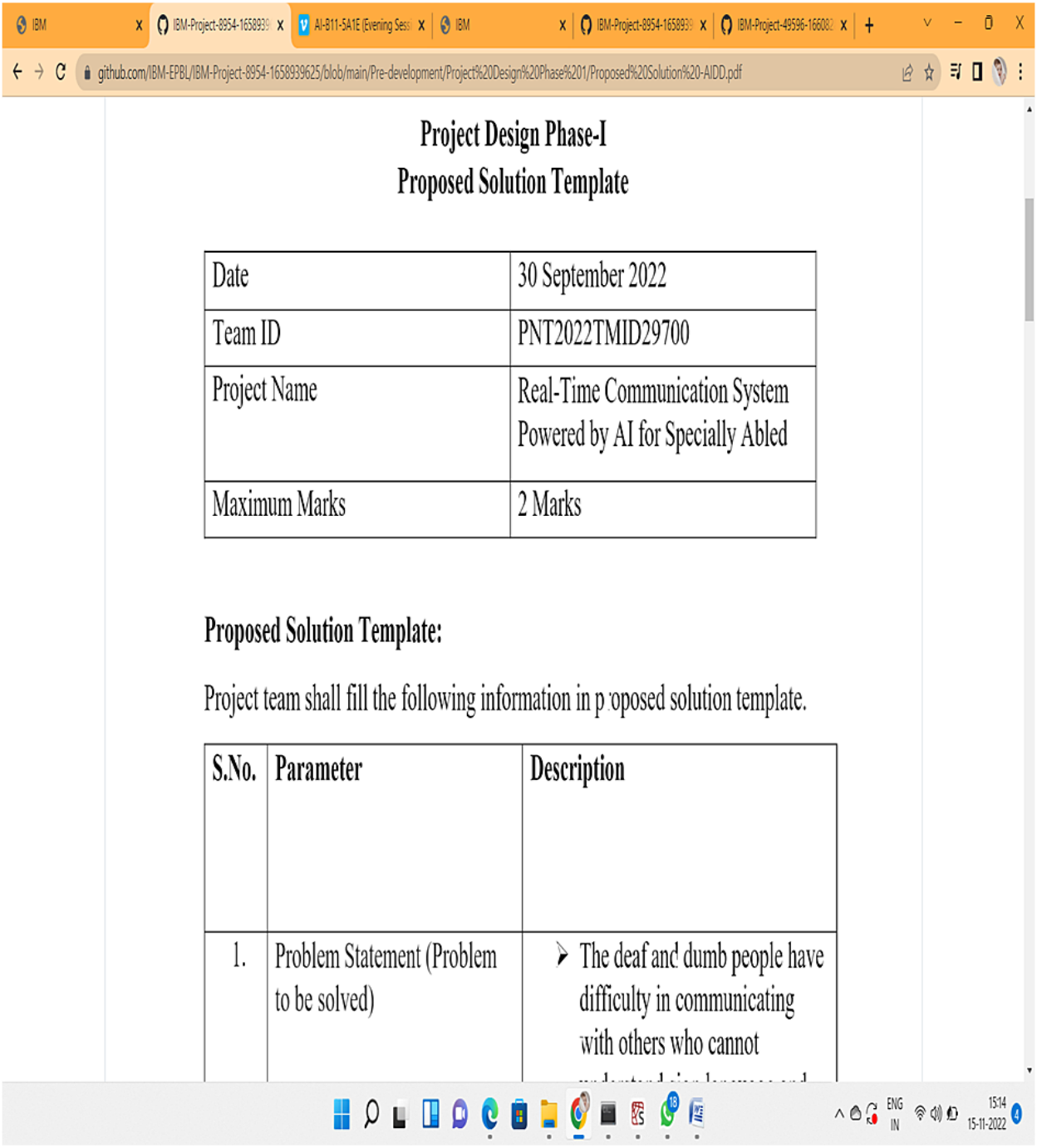
Brainstorm, Idea Listing and Grouping



Step 3:

Idea Prioritization

3.3 Proposed Solution



Project Design Phase-I
Proposed Solution Template

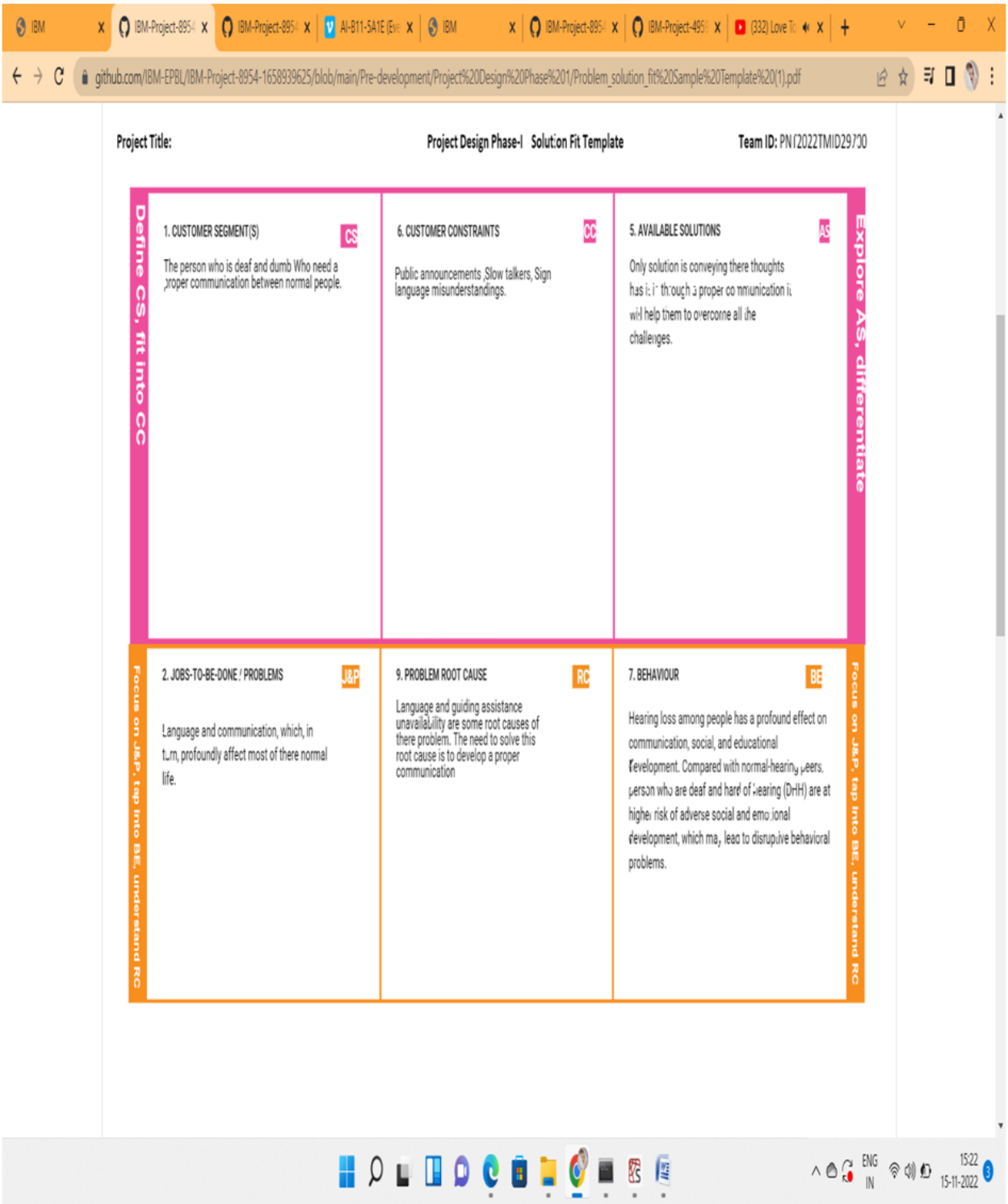
Date	30 September 2022
Team ID	PNT2022TMID29700
Project Name	Real-Time Communication System Powered by AI for Specially Abled
Maximum Marks	2 Marks

Proposed Solution Template:

Project team shall fill the following information in p oposed solution template.

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	➢ The deaf and dumb people have difficulty in communicating with others who cannot

3.4 Problem Solution



github.com/IBM-EPBL/IBM-Project-8954-1658939625/blob/main/Pre-development/Project%20Design%20Phase%201/Problem_solution_fit%20Sample%20Template%20(1).pdf

Project Title: **Project Design Phase-I Solution Fit Template** **Team ID:** PNT2022TMID29730

Define CS, fit into CC

1. CUSTOMER SEGMENT(S) CS

The person who is deaf and dumb Who need a proper communication between normal people.

6. CUSTOMER CONSTRAINTS CC

Public announcements ,Slow talkers, Sign language misunderstandings.

5. AVAILABLE SOLUTIONS AS

Only solution is conveying there thoughts has it through a proper communication it will help them to overcome all the challenges.

Explore AS, differentiate

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

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

Language and communication, which, in turn, profoundly affect most of there normal life.

9. PROBLEM ROOT CAUSE RC

Language and guiding assistance unavailability are some root causes of there problem. The need to solve this root cause is to develop a proper communication

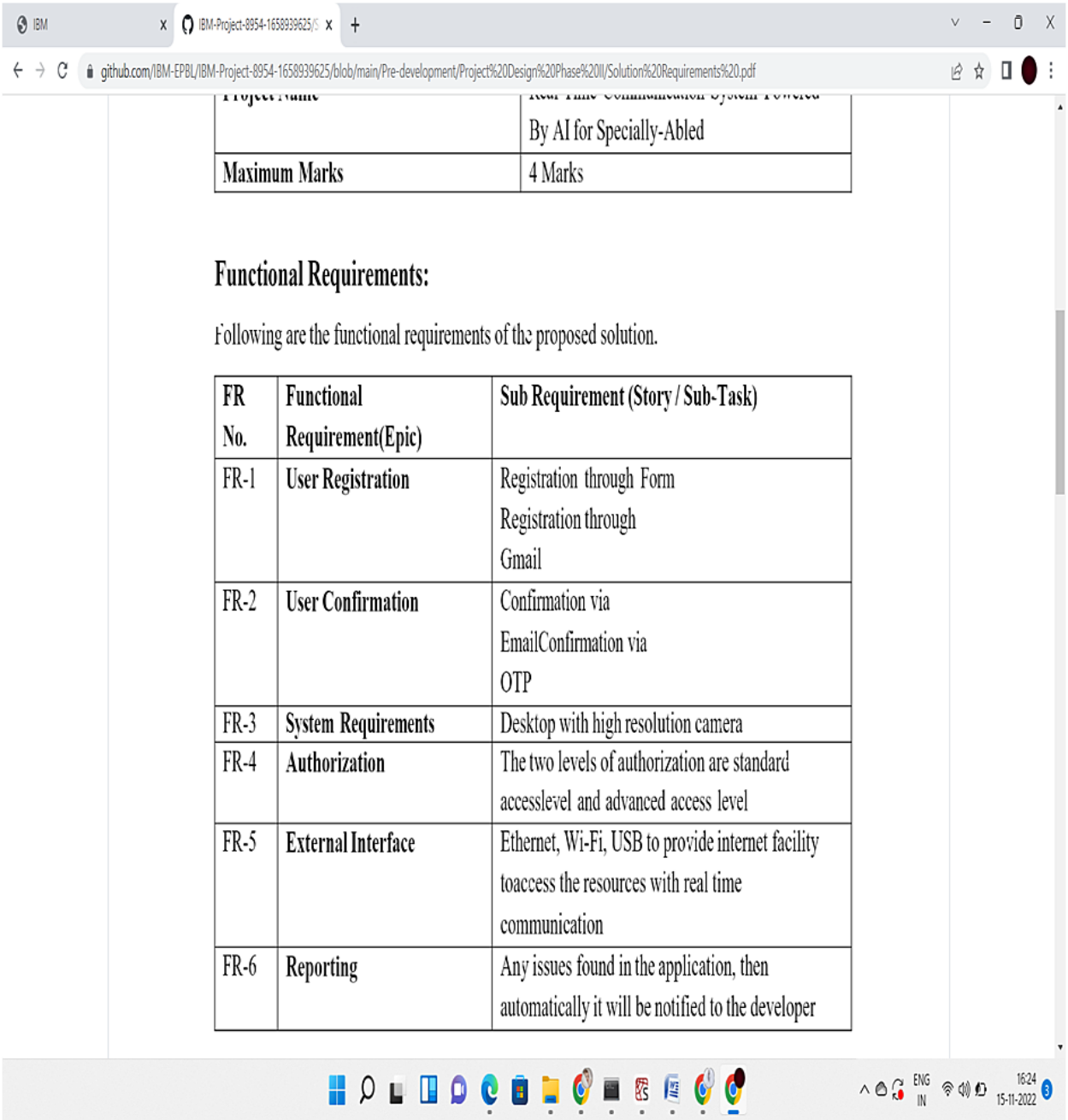
7. BEHAVIOUR BE

Hearing loss among people has a profound effect on communication, social, and educational development. Compared with normal-hearing peers, person who are deaf and hard of hearing (DrHH) are at higher risk of adverse social and emotional development, which may lead to disruptive behavioral problems.

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

REQUIREMENT ANALYSIS

4.1 Functional Requirement



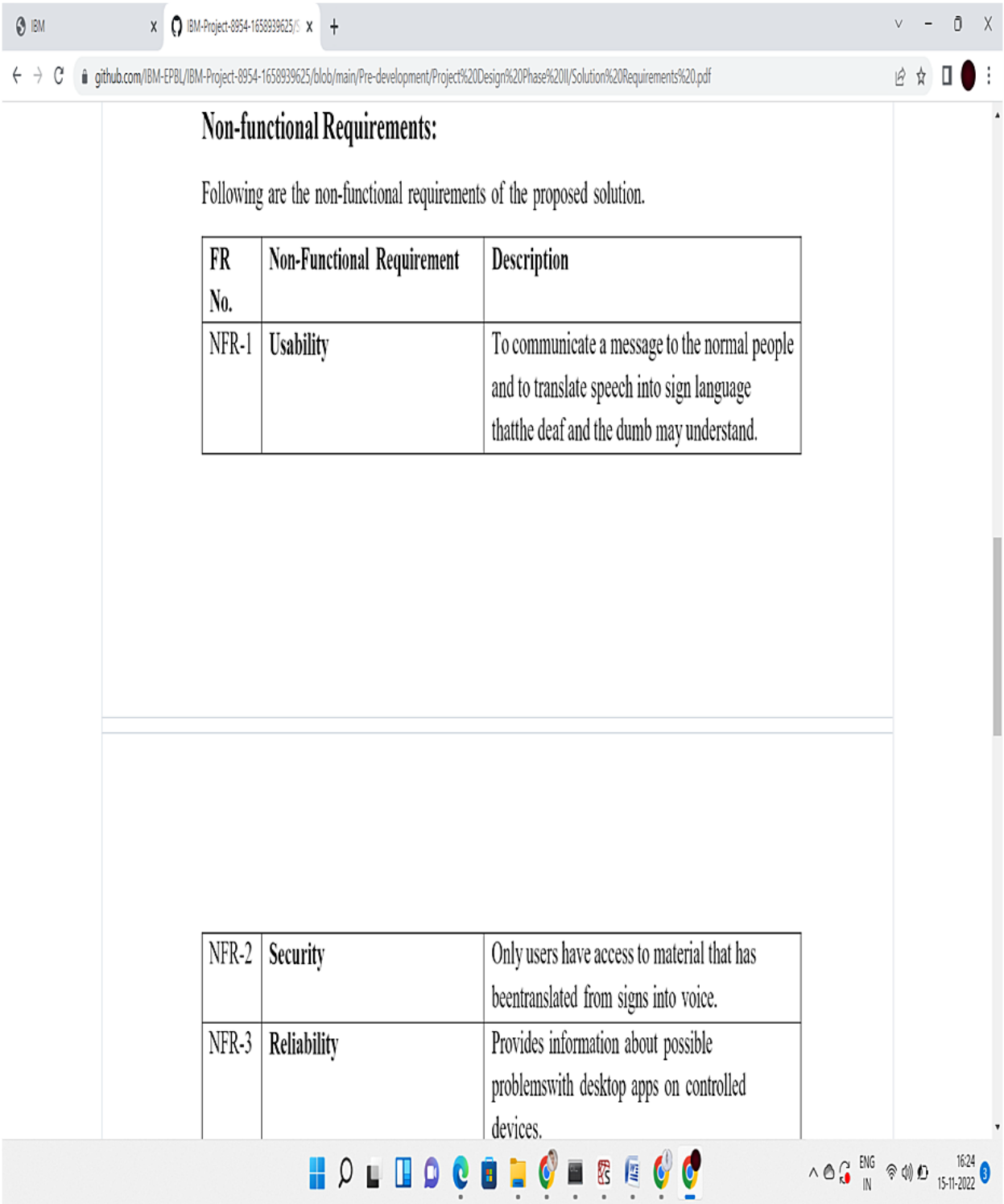
	By AI for Specially-Abled
Maximum Marks	4 Marks

Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement(Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail
FR-2	User Confirmation	Confirmation via EmailConfirmation via OTP
FR-3	System Requirements	Desktop with high resolution camera
FR-4	Authorization	The two levels of authorization are standard accesslevel and advanced access level
FR-5	External Interface	Ethernet, Wi-Fi, USB to provide internet facility toaccess the resources with real time communication
FR-6	Reporting	Any issues found in the application, then automatically it will be notified to the developer

4.2 Non Functional Requirement



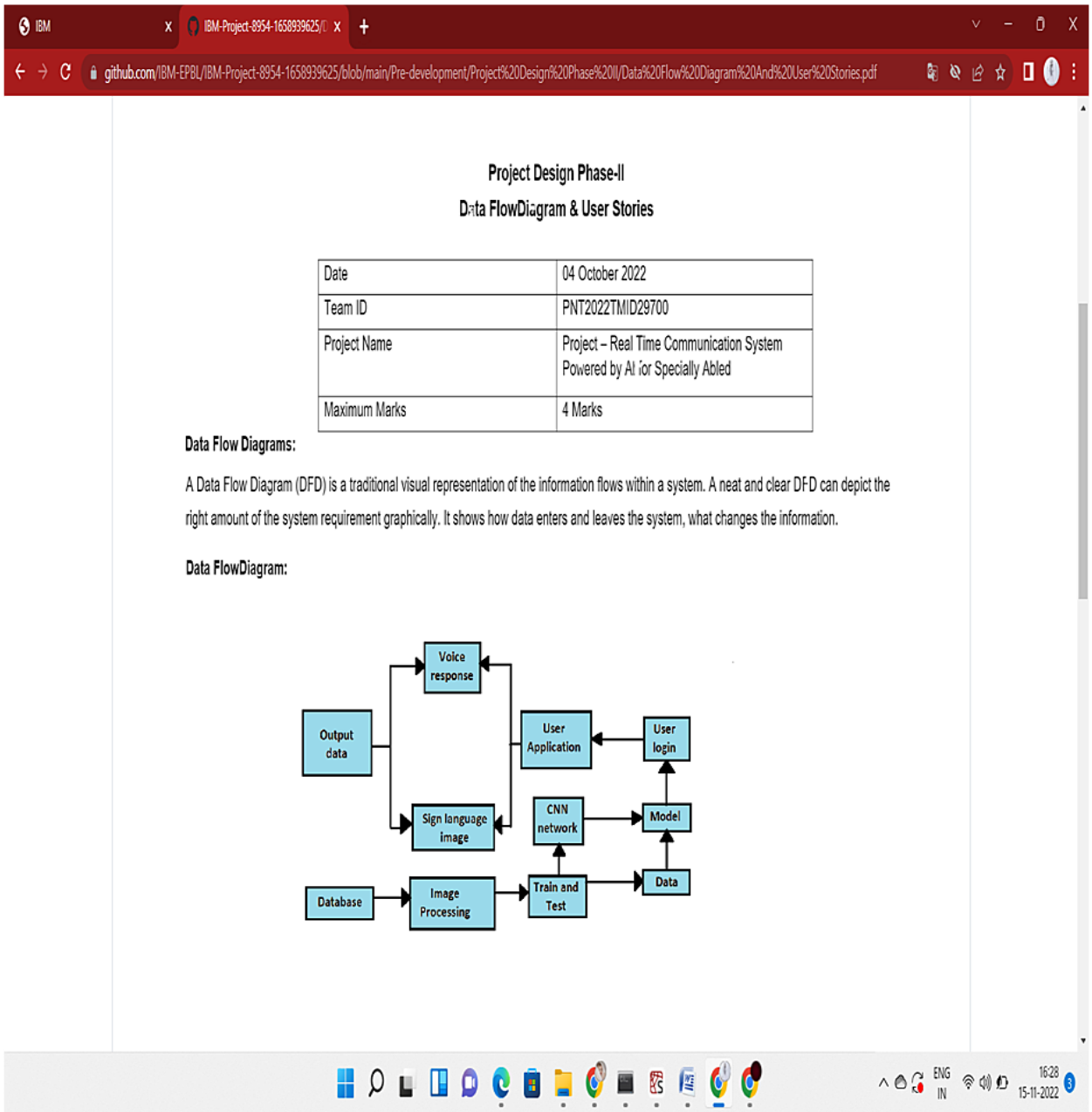
Non-functional Requirements:

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

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	To communicate a message to the normal people and to translate speech into sign language thatthe deaf and the dumb may understand.
NFR-2	Security	Only users have access to material that has beentranslated from signs into voice.
NFR-3	Reliability	Provides information about possible problemswith desktop apps on controlled devices.

PROJECT DESIGN

5.1 Data Flow Diagrams



Project Design Phase-II

Data FlowDiagram & User Stories

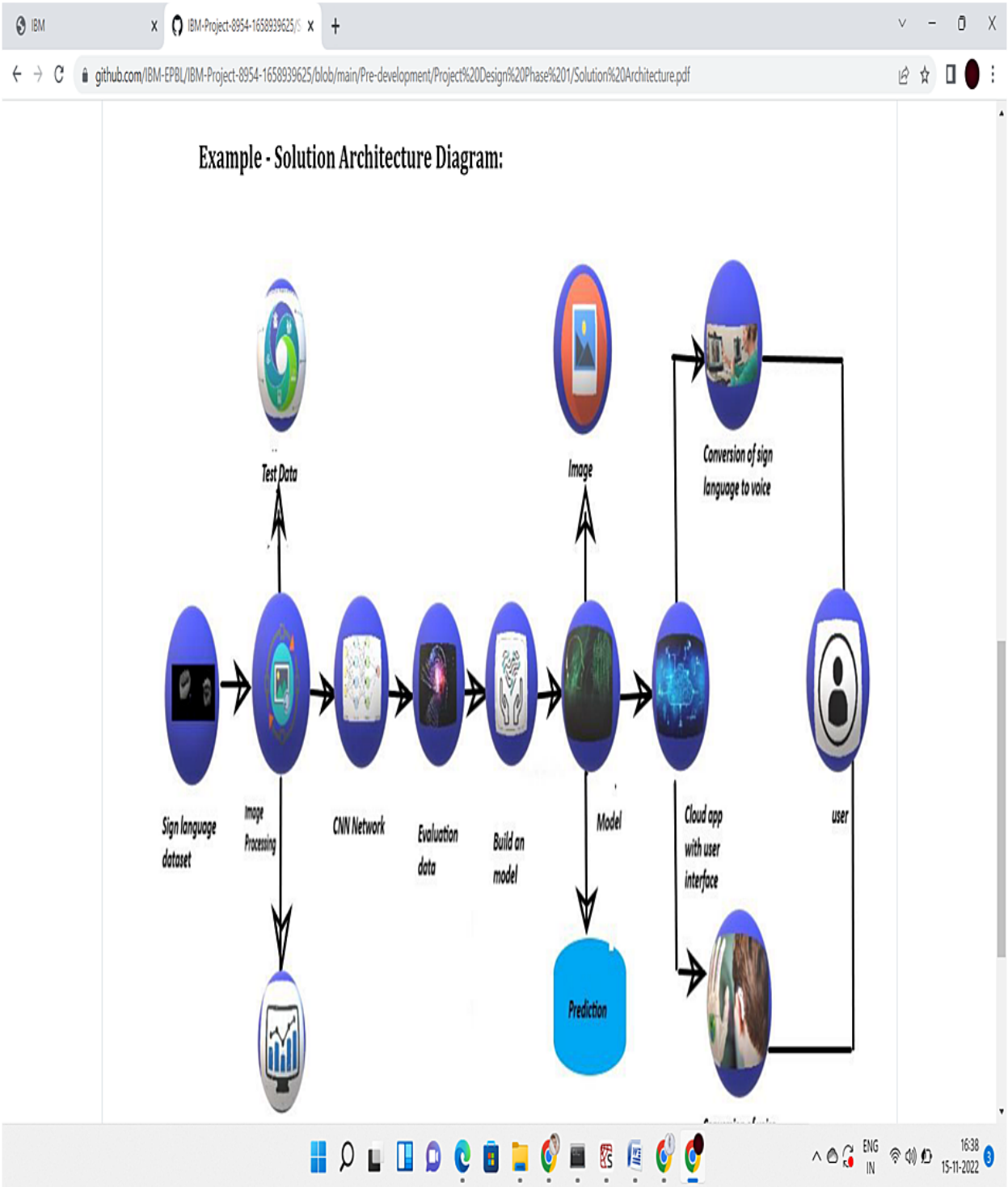
Date	04 October 2022
Team ID	PNT2022TMID29700
Project Name	Project – Real Time Communication System Powered by AI for Specially Abled
Maximum Marks	4 Marks

Data Flow Diagrams:

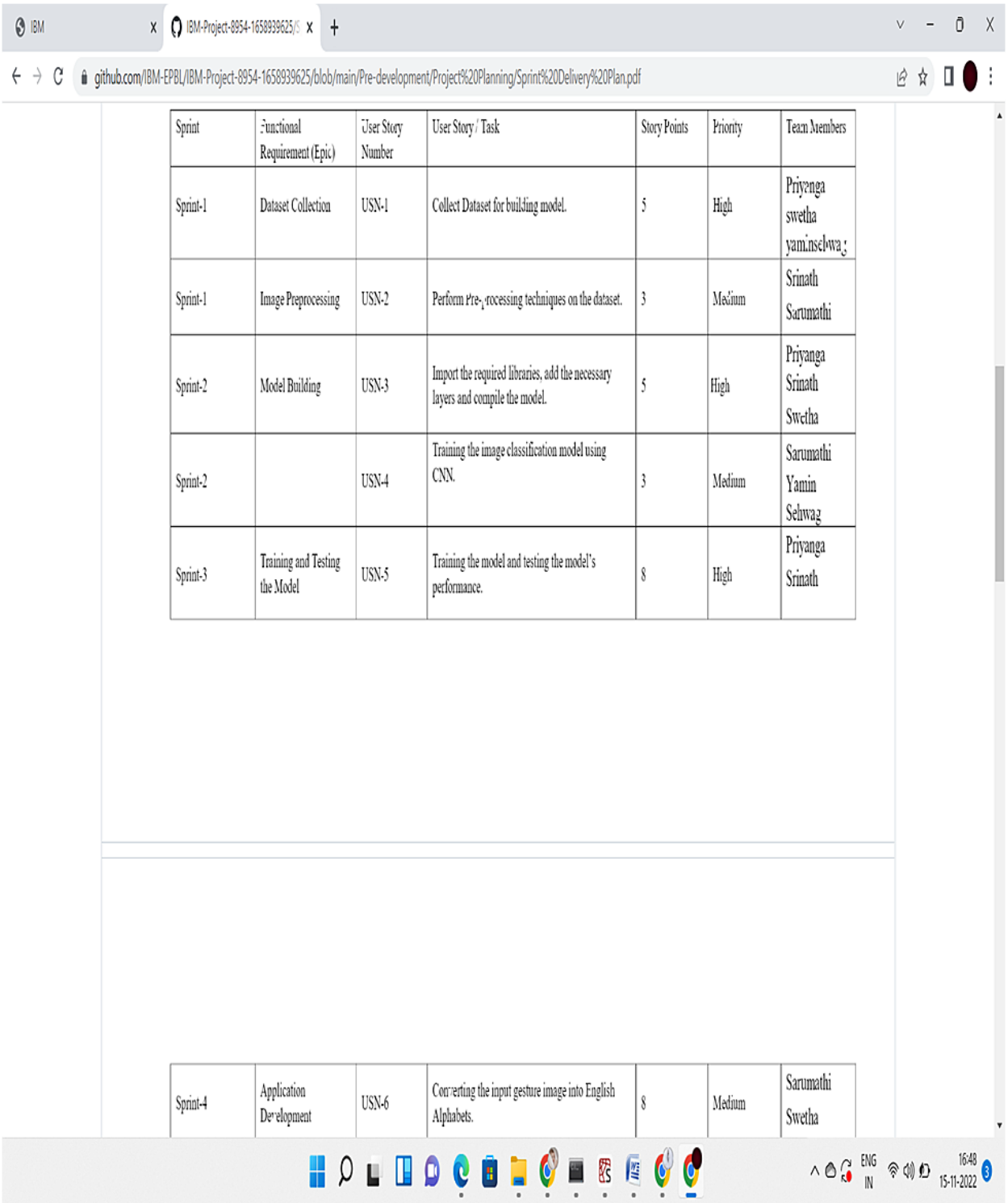
A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information.

Data FlowDiagram:

5.2 Solution Architecture

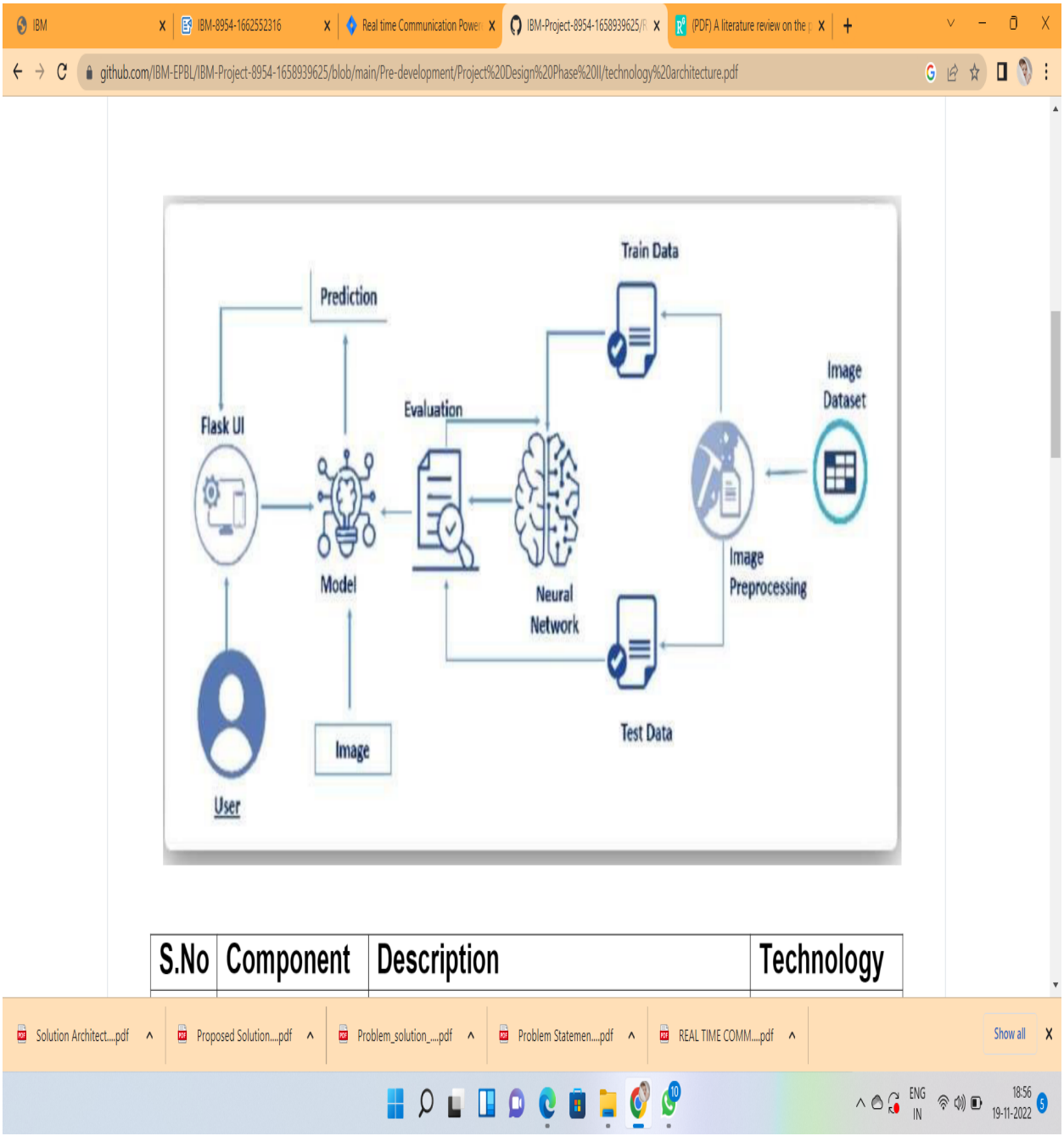


5.3 User Stories



Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Dataset Collection	USN-1	Collect Dataset for building model.	5	High	Priyanga swetha yaminselwag
Sprint-1	Image Preprocessing	USN-2	Perform Pre-processing techniques on the dataset.	3	Medium	Srinath Sarumathi
Sprint-2	Model Building	USN-3	Import the required libraries, add the necessary layers and compile the model.	5	High	Priyanga Srinath Swetha
Sprint-2		USN-4	Training the image classification model using CNN.	3	Medium	Sarumathi Yamin Selwag
Sprint-3	Training and Testing the Model	USN-5	Training the model and testing the model's performance.	8	High	Priyanga Srinath
Sprint-4	Application Development	USN-6	Converting the input gesture image into English Alphabets.	8	Medium	Sarumathi Swetha

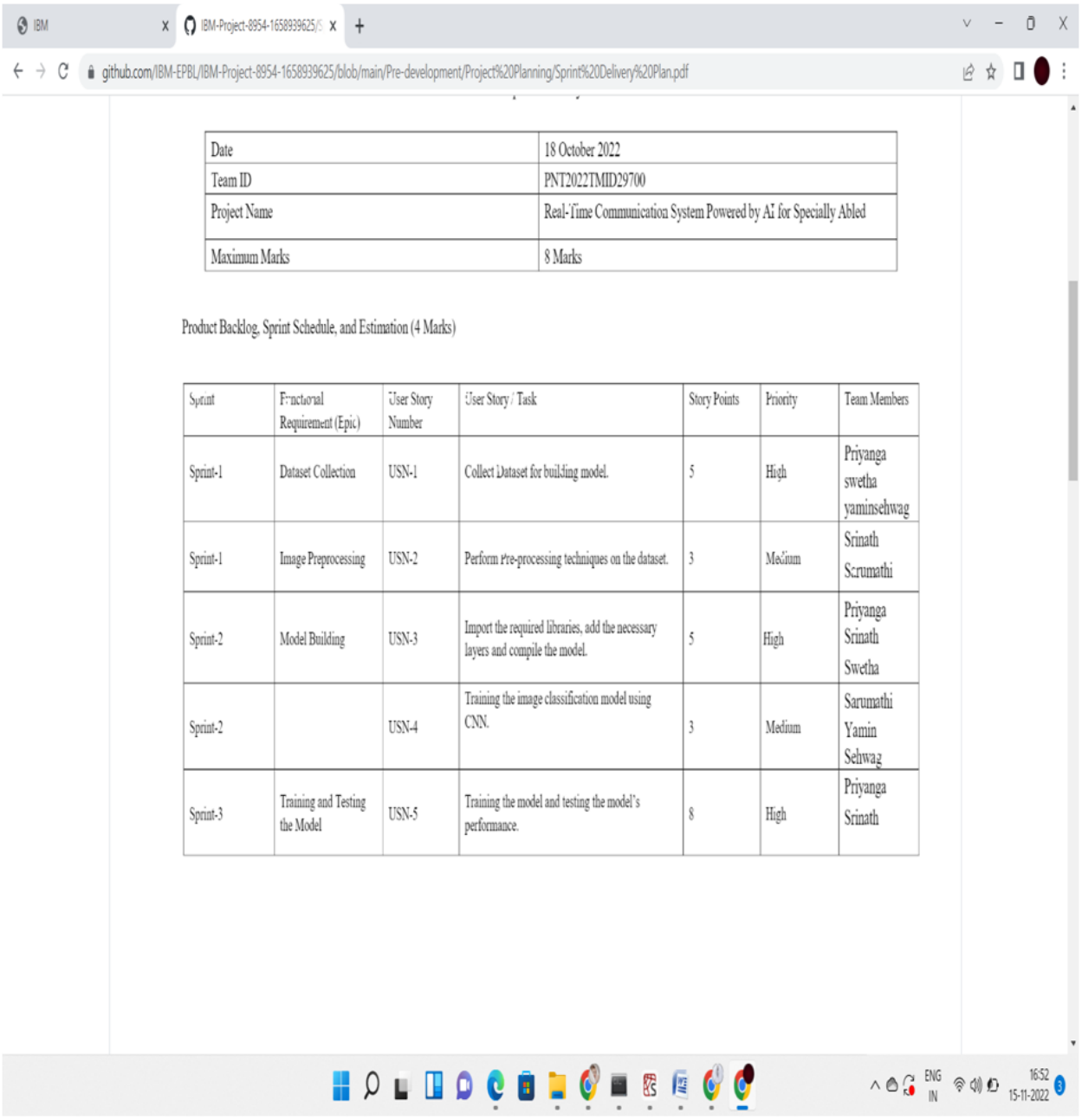
5.4 TECHNOLOGY ARCHITECTURE



S.No	Component	Description	Technology

PROJECT PLANNING AND SCHEDULING

6.1 Sprint Planning & Estimation

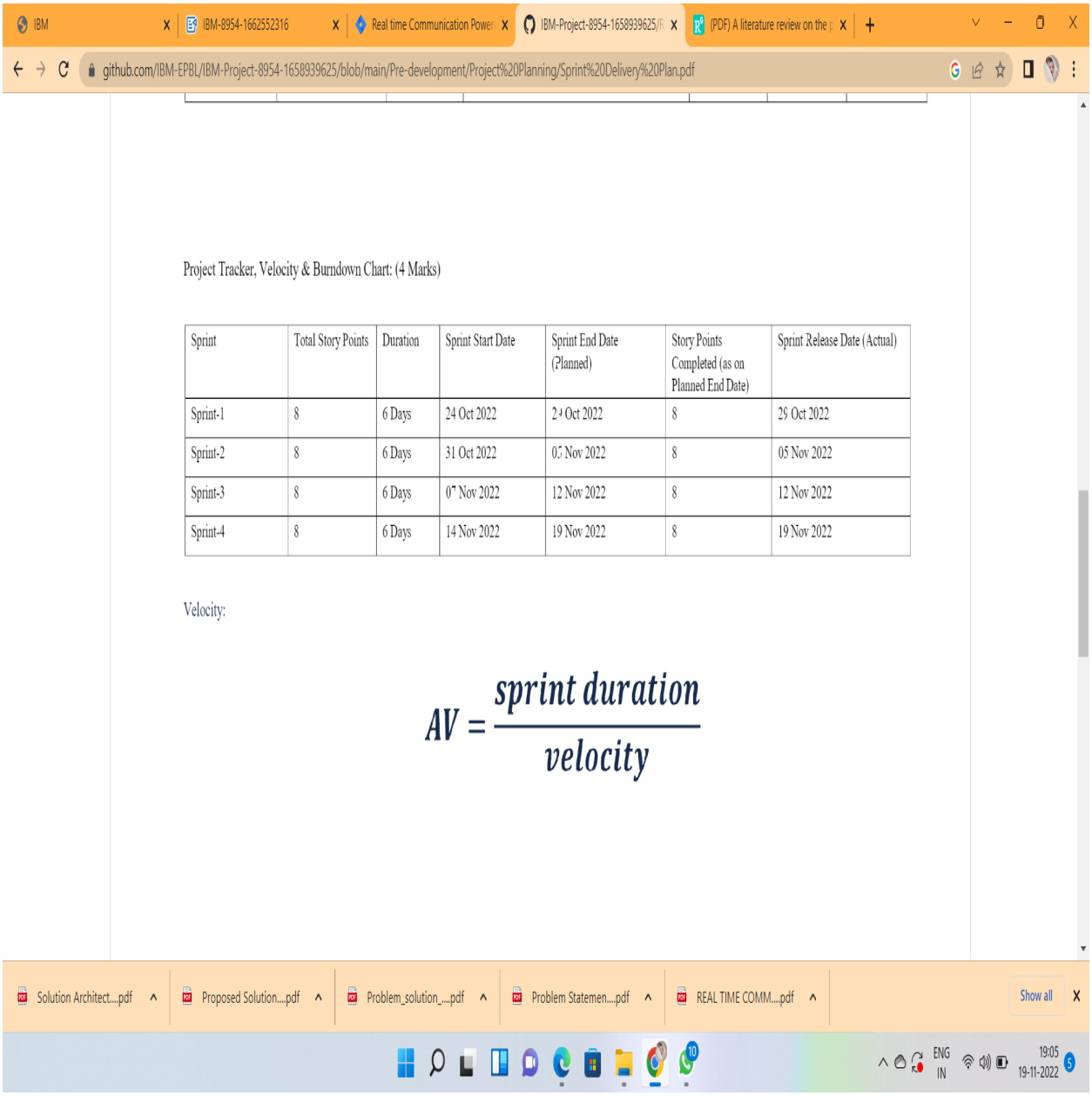


Date	18 October 2022
Team ID	PNT2022TMID29700
Project Name	Real-Time Communication System Powered by AI for Specially Abled
Maximum Marks	8 Marks

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

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Dataset Collection	USN-1	Collect Dataset for building model.	5	High	Priyanga swetha yaminsehwag
Sprint-1	Image Preprocessing	USN-2	Perform Pre-processing techniques on the dataset.	3	Medium	Srinath Scrumathi
Sprint-2	Model Building	USN-3	Import the required libraries, add the necessary layers and compile the model.	5	High	Priyanga Srinath Swetha
Sprint-2		USN-4	Training the image classification model using CNN.	3	Medium	Sarumathi Yamin Sehwag
Sprint-3	Training and Testing the Model	USN-5	Training the model and testing the model's performance.	8	High	Priyanga Srinath

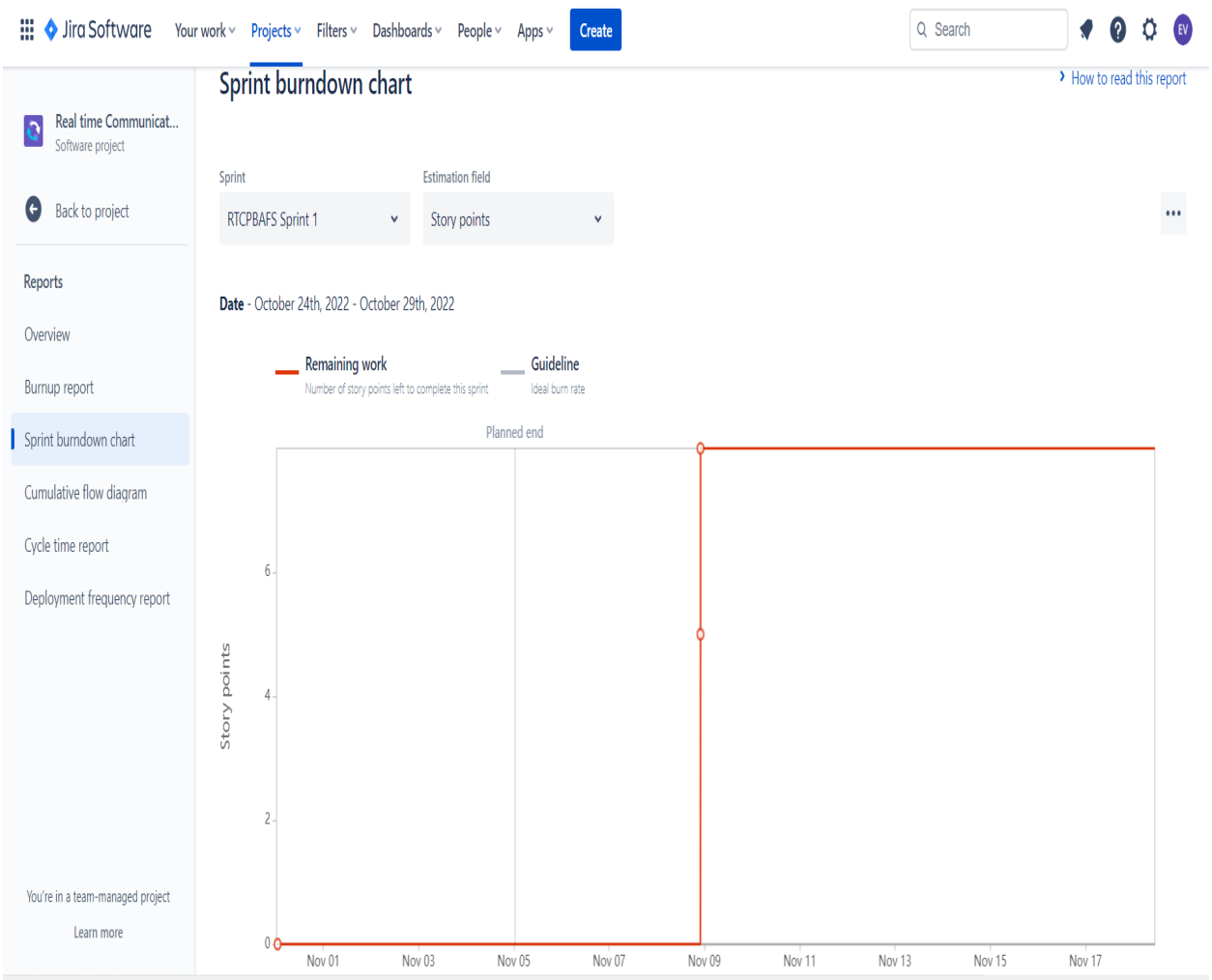
6.2 Sprint Delivery Schedule



6.3 Reports from JIRA

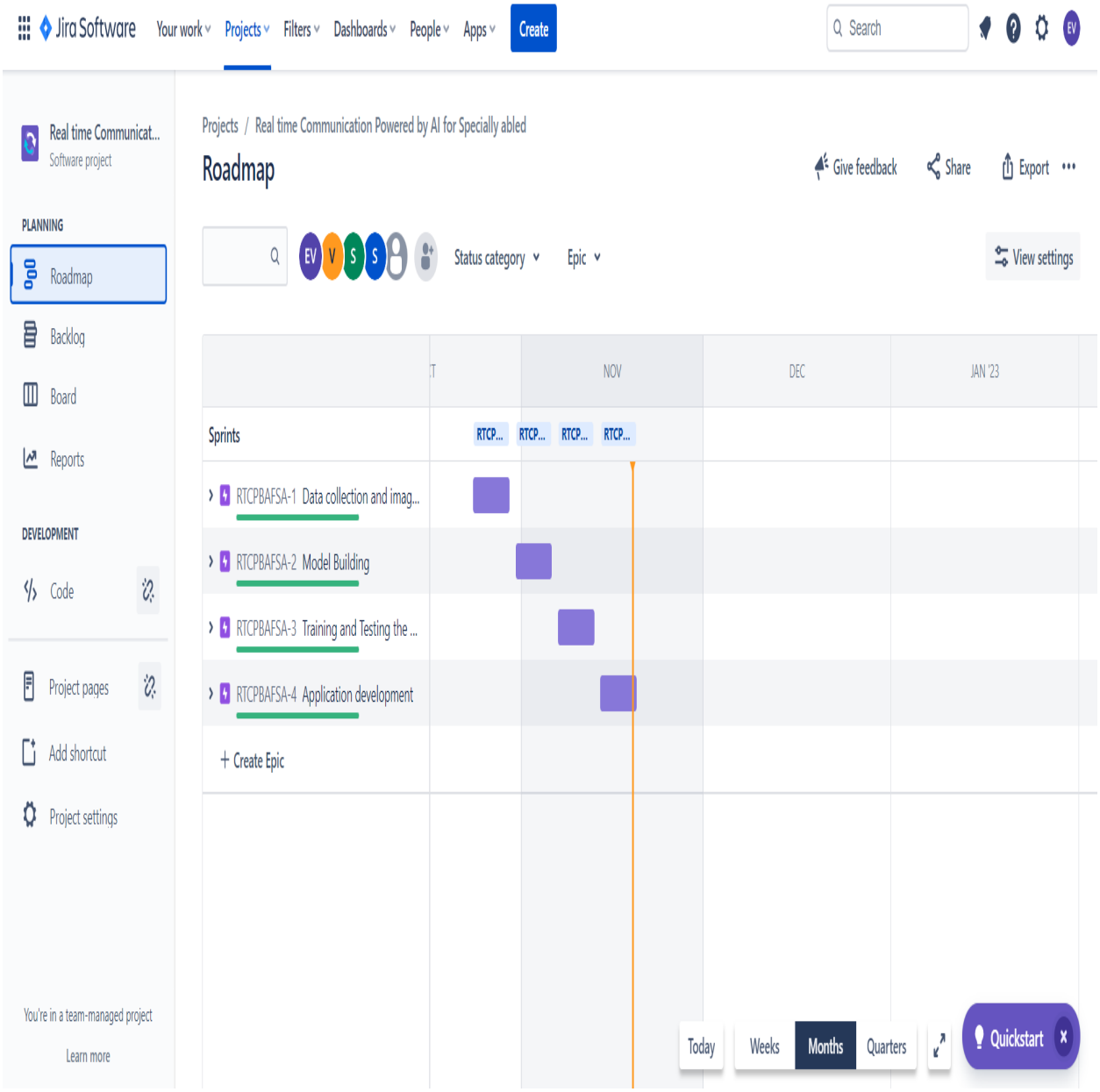
Step 1:

Sprint burndown chart



Step 2:

Roadmap



CODING & SOLUTIONING

7.1 Feature 1

```
<html lang="en">
<head>

    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <meta http-equiv="X-UA-Compatible" content="ie=edge">
    <title>Signlangue Classification</title>
    <link href="https://cdn.bootcss.com/bootstrap/4.0.0/css/bootstrap.min.css" rel="stylesheet">
    <script src="https://cdn.bootcss.com/popper.js/1.12.9/umd/popper.min.js"></script>
    <script src="https://cdn.bootcss.com/jquery/3.3.1/jquery.min.js"></script>
    <script src="https://cdn.bootcss.com/bootstrap/4.0.0/js/bootstrap.min.js"></script>
    <link href="{{ url_for('static', filename='css/styles.css') }}" rel="stylesheet">
     <style>

     .bg-dark {
          background-color:white;
     }
     #result {
          color:#fff;
     }
     body{
     background-image: url("https://images.unsplash.com/photo-1668610662494-1bc9d49a22bc?ixlib=rb-
4.0.3&ixid=MnwxMjA3fDB8MHxlZGl0b3JpYWwtZmVlZHw3MHx8fGVufDB8fHx8&auto=format&fit=crop
    background-color:#0b0b0b;
    background-size: cover;
     }

#grid{
     display: grid;
     grid-template-columns: auto auto;
     grid-template-rows:auto auto ;
     grid-row-gap: 5px;
     grid-column-gap: 5px;
```

```
}
.box1{
    grid-column-start: 1;
    grid-column-end: 4;
    padding-top:5px;
    font-family: 'Rubik Dirt', cursive;
    font-size: 80px;
    text-shadow: 10px 10px 20px whitesmoke;
    color:red;
    text-align:center;

}

.box3{
    grid-column-start: 1;
    grid-column-end: 4;
    padding-left: 185px;
}

#flex{
    display:flex;
    flex-wrap: wrap;
}
.home{
    flex-basis:750%;
    flex-grow: 0;
    flex-shrink: 1;
    padding-left: 75px;
    margin-left: 150px;
    display: inline-block;
}

.home ul{
    display:inline-block;
    padding: 20px;
    border-radius: 5px;
    list-style-type: none;
    font-size: 35px;
    font-family: 'Noto Serif', serif;
    text-shadow: 10px 10px 15px wheat;
```

```
}
.home li{
  float:left;
}
.home a{
    text-decoration: none;
    padding: 50px;
    color: white;
    display: inline-block;
    transition:color 0.2s,
               font-size 0.2s,
               text-decoration-line 0.2s;

}
 .home a:hover{
    color: deeppink;
    text-decoration-line: underline;
    font-size: 50px;
    overflow: hidden;
}
::selection{
    background-color: gold;
    color: darkgreen;
}

#welcome{
    display:flex;
    flex-wrap: wrap;
}
#welcome div{
    border-radius: 50px;
    transition:all 0.5s;

}
.item1{
    flex-basis: 5%;
    flex-grow: 0;
    flex-shrink: 1;
}
```

```
.item2{
    flex-basis:80%;
    flex-grow: 1;
    flex-shrink: 0;
    height:640px;
    justify-content: center;
    align-items: center;
    background-image: url("openingimage.jpg");
    background-repeat: no-repeat;
    background-size: cover;
    background-position: center;
    box-shadow: 7px 7px 100px violet;

    }
    .item3{
        flex-basis:5%;
        flex-grow: 0;
        flex-shrink: 1;
    }
    .text1{
        color: white;
        text-align: center;
        justify-content: center;
        font-size: 100px;
        padding-top: 270px;
        font-family: "Sofia", sans-serif;
    }
    @keyframes fade-inout{
        0%{opacity: 1;}
        100%{opacity:0;}
    }
    .fadeout{
        animation: fade-inout 1.5s infinite alternate;
        text-align: center;
        word-spacing: 20px;
        font-family: 'Noto Serif', serif;
        text-shadow: 10px 10px 15px black;
    }
    #welcome:hover{
      padding: 20px;
      size: 50px;
```

```
    }
@media all and(max-width:640px){
    .box2 #welcome{
        flex-basis: 100%;
        display: none;
    }
}
@media all and(min-width:360){
    .box1 #welcome{
        flex-basis: 100%;
    }
}
section{
    min-height:100vh;
    width:100%;
    display: flex;
    align-items:center;
    justify-content: center;
}
.layout{
    width: 90%;
    max-width: 1000px;
    margin: 0 auto;
    display: flex;
    align-items:center;
    justify-content: center;
}
.left{
    width:50%;
    height: 600px;
    background: url("https://encrypted-tbn0.gstatic.com/images?q=tbn:ANd9GcQdgg7tevUo2q9JblYyVcTuq6F
center/ cover;
    border-radius: 8px;
    border: 5px solid whitesmoke;
    box-shadow: 5px 5px 100px red;
    padding-right: 500px;
    margin-left: -100px;
}
.right{
    width:40%;
    max-height: 550px;
```

```
    background-color:white;
    display: flex;
    align-items:flex-start;
    justify-content: center;
    padding: 50px;
    border-radius: 20px;
    color: brown;
    margin-left: -100px;
}
.right h1{
    font-size: 40px;
    font-weight: lighter;
    padding-top: 20px;

}
.right p{

    font-weight: 500;
    line-height: 25px;
    font-family: 'Noto Serif', serif;
}
.right a{
    text-decoration: none;
    text-transform: uppercase;
    color: black;
    padding: 20px 30px;
    display: inline-block;
    letter-spacing: 2px;
    background-color:black;
    border-radius: 20px;
    color:white;

}
@media only screen and (max-width:768px){
    .layout{
        flex-direction: column;
        width: 100%;
        margin: 0 30px;
    }
    .left{
```

```
        width: 100%;
        height: 400px;
}
.right{
        width: 90%;
        margin:0;
        margin-top: -100px;
}
.item2{
        flex-basis: 100%;
        width:100%;
        background-image: cover;
        margin-top: 100px;
}
.home ul{
        flex-basis: 20%;
        width: 50%;
        margin: -200px;
        margin-top: 100px;
}
.text1{
        display: none;
}
.mess1 p{
        display:none;
}
.mess1 h1{
        float:left;
        margin-left: -370px;
}
.mess1 a{
        display:inline-block;
        margin-left: -570px;
}
.box2{
        margin-top:300px;
        margin-left: 150px;
        margin-bottom: 100px;
}
.item1 .item3{
        flex-basis: 0%;
```

```
    }
}

#rotate{
    display: flex;
    justify-content: center;
    align-items:center;
    min-height: 100vh;
}
.round{
    position: relative;
    width: 200px;
    height: 200px;
    transform-style: preserve-3d;
    animation: animate 20s linear infinite;
}
@keyframes animate
{
    0%
    {
        transform: perspective(1000px) rotateY(0deg);
    }
    100%
    {
        transform: perspective(1000px) rotateY(360deg);
    }
}
.round span{
    position: absolute;
    top: 0;
    left: 0;
    width: 100%;
    height: 100%;
    transform-origin: center;
    transform-style: preserve-3d;
    transform: rotateY(calc(var(--i)*45deg)) translateZ(400px);
    -webkit-box-reflect:below 0px linear-gradient(transparent,transparent,#0004);
}
.round span img{
    position: absolute;
    top:0;
```

```
    left: 0;
    width: 100%;
    height: 100%;
    object-fit: cover;
    border: 2px solid white;
    border-radius: 5px;
    box-shadow: 7px 7px 100px violet;
}
.horizontal{
    color: aliceblue;
    size: 30px;
}
#footer{
    width: 100%;
    position: absolute;
    background: linear-gradient(to right,#0b0b0b,#565454);
    color:#fff;
    padding: 100px 0 30px;
    border-top-left-radius: 125px;
    font-size: 13px;
    line-height: 20px;
    border: 1px solid white;
    box-shadow: 7px 7px 100px red;
}
.row1{
    width: 85%;
    margin: auto;
    display: flex;
    flex-wrap: wrap;
    align-items:flex-start;
    justify-content: space-between;
}
.col1{
    flex-basis: 25%;
    padding: 10px;
}
.col1:nth-child(2){
    flex-basis: 15%;
}
.logo1{
    width:80px;
```

```
    margin-bottom: 30px;
    border-radius: 50% 50%;
    border: 2px solid ;
    box-shadow: 7px 7px 100px white;
}
.col1 h3{
    width: fit-content;
    margin-bottom: 40px;
    position: relative;
    font-family: 'Abril Fatface', cursive;
    font-size: 25px;
    letter-spacing: 2px;
    color:white;
}
.email-id1{
    width: fit-content;
    border-bottom: 2px solid #ccc;
    margin: 20px 0;
}
.foot ul li{
    list-style: none;
    margin-bottom: 15px;
    font-size: 20px;

}
.foot ul li a{
    text-decoration:none;
    color:white;
}
.foot ul li a:hover{
    text-decoration: underline;
    font-size: 25px;
    color:aqua;
}
form{
    padding-bottom: 15px;
    display: flex;
    align-items: center;
    justify-content:space-between;
    border-bottom: 2px solid white;
    margin-bottom:50px;
```

```
}
form .fa-solid{
    font-size: 18px;
    margin-right: 10px;
}
form input{
    width: 100%;
    background: transparent;
    color: #ccc;
    border: 0;
    outline: none;
}
form button{
    background: white;
    border: 0;
    outline: none;
    cursor: pointer;
}
form .fas-solid{
    font-size: 16px;
    color:black;
}
.social-icons .fa-brands{
    width: 40px;
    height: 40px;
    border-radius: 50%;
    text-align: center;
    line-height: 40px;
    font-size: 20px;
    color: #000;
    background:#fff;
    margin-right: 15px;
    cursor: pointer;
}
hr{
    width: 90%;
    border: 0;
    border-bottom: 1px solid #ccc;
    margin: 20px auto;
}
.copyright{
```

```
    text-align: center;
}
.underline{
    width: 100%;
    height: 5px;
    background: #767676;
    border-radius: 3px;
    position: absolute;
    top:25px;
    left: 0;
    overflow: hidden;
}
.underline span{
    width: 15px;
    height: 100%;
    background: #fff;
    border-radius: 3px;
    position: absolute;
    top: 0px;
    left:10px;
    animation: moving 2s linear infinite;
}
@keyframes moving{
    0%{
        left: -20px;
    }
    100%{
        left:100%;
    }
}
@media (max-width:700px)
{
    #footer{
        bottom:unset;
    }
    .col1{
        flex-basis: 100%;
    }
    .col1:nth-child(2){
        flex-basis:100%;
    }
```

```
}

.signs{

    color: white;
}

    </style>
</head>

<body>

   <div id="grid">
      <div class="box1 item logo ">
         <h1>REAL TIME COMMUNICATION FOR SPECIALLY ABLED PERSON</h1>
      </div>
      <div class="box2 item"></div>

   </div>
   <div>
   <br>
   <br>
   <br>
   </div>
    <div id="flex">
      <div class="home" >
         <ul>
            <li><a href="index.html" class="button">Home</a></li>
            <li><a href="contacts.html" class="button">Sign To Voie Conversion</a></li>
            <li><a href="about.html" class="button">About</a></li>

         </ul>
      </div>
   </div>
   <div><br>
   <br>
   <br>
   <br>
   <br>
   <br>
```

```
    </div>
     <div id="welcome">
       <div class="item1"></div>
       <div class="item2">
          <div><h1 class="text1 fadeout font-effect-neon">An AI Based solution for special people</h1>
       </div>
       </div>
       <div class="item3"></div>
    </div>
    <div><br>
    <br>
    <br>
    <br>
    <br>
    <br>
   </div>
   <section>
     <div class="layout">
          <div class="left"></div>
          <div class="right">
              <div class=content1>
              <div><h1>App based CNN model</h1></div>
              <br>
              <div><p>An app based cnn network model to provide communication for the specially abled person
                  uses cnn (convolutional neural network) for the deaf and dumb to understand provide the commun

                  voice provision.
              </p> </div>
              <br>
          </div>
     </div>
</section>
<div><br>
    <br>
    <br>
    <br>
    </div>
    <div>
       <br>
       <br>
       <br>
```

```
      <br>
    </div>
     <div id="rotate">
      <div>
        <div class="round">
          <span style="--i:1"><img src="https://images.unsplash.com/photo-1565562195689-739680900319?ix
4.0.3&ixid=MnwxMjA3fDB8MHxzZWFyY2h8MTV8fGRlYWYlMjBhbmQlMjBkdW18ZW58MHx8MHx8&
alt="image" width="1000px"height="1000px"></span>
          <span style="--i:2"><img src="https://images.unsplash.com/photo-1565562193381-576c27829023?ix
4.0.3&ixid=MnwxMjA3fDB8MHxzZWFyY2h8MTZ8fGRlYWYlMjBhbmQlMjBkdW18ZW58MHx8MHx8&
alt="image" width="1000px"height="1000px"></span>
          <span style="--i:3"><img src= "https://media.istockphoto.com/id/1254018943/photo/a-woman-suffer
hurts-due-to-otitis-media-cerumen.jpg?b=1&s=170667a&w=0&k=20&c=bstLhx8IoyZsQF0rN5p0IZtVhWU48
width="1000px"height="1000px"></span>
          <span style="--i:4"><img src="https://images.unsplash.com/photo-1580576079917-b66047bed513?ix
4.0.3&ixid=MnwxMjA3fDB8MHxzZWFyY2h8MTR8fGRpc2FibGVkJTIwcGVvcGxlfGVufDB8fDB8fA%3D
alt="image" width="1000px"height="1000px"></span>
          <span style="--i:5"><img src="https://media.istockphoto.com/id/1180549312/photo/smiling-mixed-e
language.jpg?s=612x612&w=0&k=20&c=wkb5Y7qpvgnCX7m4w27dNSb46d3rwMBLXLOI4MbBJdc=" alt=
width="1000px"height="1000px"></span>
          <span style="--i:6"><img src="https://media.istockphoto.com/id/1257016195/photo/smiling-caucasia
kid.jpg?s=612x612&w=0&k=20&c=6hSbiiqirNzSSF5QfoBQVrzjP0QWnb6IPcmiYuTCQKY=" alt="image" w
          <span style="--i:7"><img src="https://image.shutterstock.com/image-photo/young-deaf-mute-couple-
width="1000px"height="1000px"></span>
          <span style="--i:8"><img src="https://encrypted-
tbn0.gstatic.com/images?q=tbn:ANd9GcTEjmgQ3loP5ysjGJEly4IdpWl7463dm3n9Rg&usqp=CAU" alt="imag
        </div>
      </div>
    </div>
    <br>
    <br>
    <div class="horizontal"><hr></div>
    <div><br>
    <br>
    <br>
    <br>
</div>
<br>
    <div class="container">
      <div id="content" style="margin-top:2em">
```

<h3>Signlanguage Classification: </h3>

Sign languages (also known as signed languages) are languages that use the visual-manual moda
words. Sign languages are expressed through manual articulation in combination with non-manual markers. Sig
with their own grammar and lexicon.[1] Sign languages are not universal and are usually not mutually intelligib
among different sign languages.

Linguists consider both spoken and signed communication to be types of natural language, meani
protracted aging process and evolved over time without meticulous planning.[3] Sign language should not be co
nonverbal communication.

Wherever communities of deaf people exist, sign languages have developed as useful means of co
cultures. Although signing is used primarily by the deaf and hard of hearing, it is also used by hearing individua
those who have trouble with oral language due to a disability or condition (augmentative and alternative commu
including children of deaf adults.

<h4 class="mt-5">Sign Detection</h4>
<img src="{{ url_for('video') }}" width="100%">
<footer>
<script src="{{ url_for('static', filename='js/main.js') }}" type="text/javascript"></script>
</footer>


```
    </div>
    <div><br>
        <br>
        <br>
        <br>
        </div>
        <div>
            <br>
            <br>
            <br>
            <br>
        </div>
<div id="footer">
    <div class="row1">
        <div class="col1">
            <p></p>
        </div>
        <div class="col1 foot">
            <h3>Links <div class="underline"><span></span></h3>
            <ul>
                <li><a href="index.html" >Home</a></li>
                <li><a href="about.html">About</a></li>
                <li><a href="contacts.html">Contacts</a></li>
            </ul>
        </div>
        <div class="col1">
            <h3>Newsletter <div class="underline"><span></span></h3>
            <form>
                <i class="fa-solid fa-envelope"></i>
                <input type="email" placeholder="Enter your Email id" required>
                <button type="submit"><i class="fas-solid fa-arrow-right"></i></button>
            </form>
            <div class="social-icons">
                <i class="fa-brands fa-facebook"></i>
                <i class="fa-brands fa-whatsapp"></i>
                <i class="fa-brands fa-instagram"></i>
                <i class="fa-brands fa-twitter"></i>

            </div>
        </div>
    </div>
```

```
        <hr>
        <p class="copyright">Sri webdesign &copy 2022 - All Rights Reserved </p>
    </div>
    <footer>
        <script src="{{ url_for('static', filename='js/main.js') }}" type="text/javascript"></script>
    </footer>
</body>



</html>
```

9.2 Feature 2

```
$(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(' +
                                + ')');
                                                $('#imagePreview').hide();
                                                $('#imagePreview').fadeIn(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').fadeIn(600);
                    $('#result').text(' Result:  ' + data);
                    console.log('Success!');
                },
            });
        });

    });
```

8.3 Feature 3

.img-
preview

```
{
    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:white;
    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);}
}
```

TESTING

8.1 Test Cases

					Date	5-Nov-22							
					Team ID	PNT2022TMID29700							
					Project Name	Real time communication powered by AI for specially abled							
					Maximum Marks	4 marks							
Test case ID	**Feature Type**	**Component**	**Test Scenario**	**Pre-Requisite**	**Steps To Execute**	**Test Data**	**Expected Result**	**Actual Result**	**Status**	**Comments**	**TC for Automation(Y/N)**	**BUG ID**	**Executed By**
Detection_01	User Interface webpage	Register Page	Verify user is able to see the Registration page	Active server and internet connection with frontend code for Detection	1.Enter Website URL and Search the URL 2.Display the Register Page to the user	http://127.0.0.1:5000	Register Page will be display withthe Process of Front end	Worked as expected	Pass	User can view the registration page	Yes	--	PNT2022TMID29664 Team
Detection_02	User interface webpage	Register page	Verify user is able to register with user credentials	Active server and internet connection with frontendcode for Detection	1.Enter Website URL and Search the URL 2.Display the Register Page to the User 3.Able to register in registration page	http://127.0.0.1:5000	Successfully registered	Worked as expected	pass	User can register	Yes	--	PNT2022TMID29700 Team
Detection_03	User interface webpage	Login page	Verify user is able to see the login page	Active server and internet connection with frontendcode for Detection HTML Search Tag with the valid URL	1.Enter Website URL and .Search the URL 2.Display the login Page to the user	http://127.0.0.1:5000	Login Page will be display with the Process of Front end	Worked as expected	Pass	user can view the login page	yes	--	PNT2022TMID29700 Team
Detection_04	User interface webpage	Login page	Verify user is able to login using user credentials	Active server and internet connection with frontendcode for Detection HTML Search Tag with the valid URL	1.Enter Website URL and Search the URL 2.Display the Login Page to the User 3.Able to login in login page	http://127.0.0.1:5000	Successful login	Worked as expected	pass	User can login into web app	Yes	--	PNT2022TMID29700 Team
Detection_05	conversion	Detection Page	Verify user is able to see the hand sign to alphabet conversion page	Active server and internet connection	1.Enter URL (https://127.0.0.1:5000) and check 2.The Url will redirect to theconversion page	http://127.0.0.1:5000	Able to see Conversion page	Worked as expected	pass	User can see the conversion page	yes	--	PNT2022TMID29700 Team
Detection_06	Prediction	Detection Page	Verify user can able to show the hand sign in live camera	Active server and internet connection	1.Enter URL (https://127.0.0.1:5000) and check 2.The Url will redirect to theconversion page 3.Show hand sign in front of camera.	http://127.0.0.1:5000	Able to show hand sign in camera	Worked as expected	pass	User can show hands in front of camera	yes	--	PNT2022TMID29700 Team
Detection_07	prediction	Detection Page	Verify the user able to get the corresponding alphabet for their hand sign	Active server and internet connection	1.Enter URL (https://127.0.0.1:5000) and check 2.The Url will redirect to theconversion page 3.Show hand sign in front of camera. 4.Get corresponding alphabet as output	http://127.0.0.1:5000	Able to get the predicted alphabet for the hand sign	Worked as expected	pass	User can get the conversion results.	yes	--	PNT2022TMID29700 Team

8.2 UAT

Step 1

Defect Analysis

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	11	7	4	2	24
Duplicate	1	0	2	0	3
External	2	3	2	1	8
Fixed	10	5	3	14	32
Not Reproduced	0	0	1	0	1
Skipped	0	0	1	1	2
Won't Fix	1	0	0	1	1
Totals	25	15	13	26	70

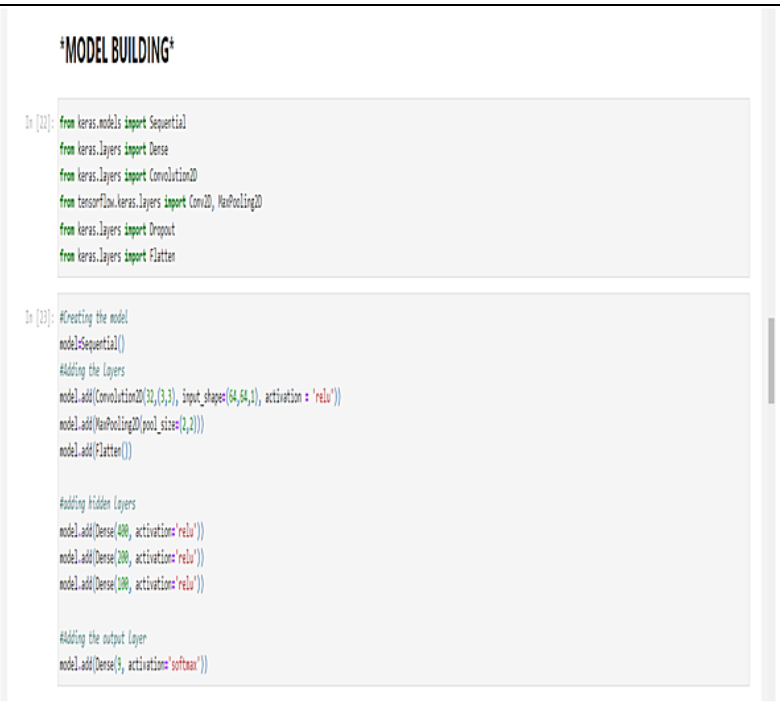
Step 2

Test case Analysis

Section	Total Cases	Not Tested	Fail	Pass
CNNEngine	7	0	0	7
ClientApplication	15	0	0	15
Security	2	0	0	2
Outsource Shipping	0	0	0	0
Exception Reporting	9	0	0	9
Final ReportOutput	4	0	0	4
Version Control	2	0	0	2

RESULTS

9.1 Performance metrics

S.No.	Parameter	Values	Screenshot
	Model Summary	Total params: 1,103,721 Trainable params: 1,103,721 Non-trainable params:0	

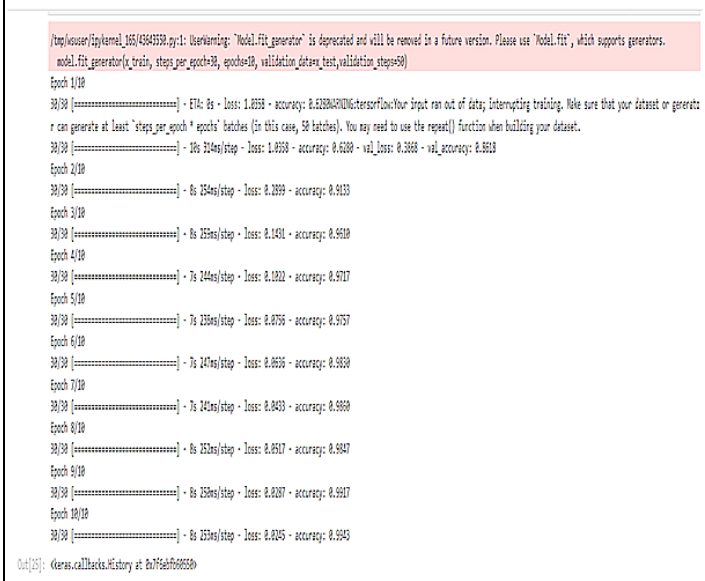
MODEL BUILDING

```
In [12]: 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
```

```
In [13]: #Creating the model
         model=Sequential()
         #Adding the layers
         model.add(Convolution2D(32,(3,3), input_shape=(64,64,1), activation = 'relu'))
         model.add(MaxPooling2D(pool_size=(2,2)))
         model.add(Flatten())

         #adding hidden layers
         model.add(Dense(400, activation='relu'))
         model.add(Dense(200, activation='relu'))
         model.add(Dense(100, activation='relu'))

         #Adding the output layer
         model.add(Dense(9, activation='softmax'))
```

	Accuracy	Training Accuracy - 0.9858 Validation Accuracy - 0.9860	
	Confidence Score (OnlyYolo Projects)	Class Detected – N/A Confidence Score– N/A	N/A

ADVANTAGES

- Gives people who have more hearing impairment

more confidence.

- The proposed model here produces enormous accuracy of classification.
- Imagesof enormous can be resized within the d itself.
- Vast datasets can also be trained and tested.
- Enables Children to Communicate Effectively.
- Decreases Frustration.
- Improves Child-Parent Communication.
- Helps Children Remember Words.
- Increases Self Esteem.
- Provides An Insight Into Your Child's World.
- Sign language Is for Everyone.
- Builds Relationships.

DISADVANTAGES

- Finger spelling, which is a representation of the letters of the written alphabet using only your hands.
- Sign supported speech, which combines spoken and sign language and is used as a basis for learning the grammatical structure of spoken language.
- Cued speech, which facilitates speech reading.

CONCLUSION

The broad spectrum of AI technologies provide a result of sign language is covered. Starting from sign language capturing methods for the collection of sign language data and moving on to sign language recognition and representation techniques for the identification and translation of sign language, this review highlights all important technologies for the construction of a complete AI-based sign language system. Additionally, it explores the in-between relations among the AI technologies and presents their advantages and challenges. Finally, it presents groundbreaking sign language applications that facilitate the communication between hearing-impaired and speaking people, as well as enable the social inclusion of hearing-impaired people in their everyday life. The aim

of this review is to familiarize researchers with sign language technologies and assist them towards developing better approaches.

Several devices have been used to acquire sign data, such as Data glove, Kinect, Leap motion controller and Camera in acquiring data. Despite the fact that these devices have contributed to the performance and accuracy of the ASLR system. These devices have some shortcomings, such as high cost and inconvenience to use associated with dataglove. The image acquired from a low-resolution camera also affects the recognition accuracy of the system. Therefore, there is a need for more research that fuses images from multiple devices such as a camera, dataglove, and Kinect to acquired images to produce better results without feature extraction. Skin colour segmentation and edge detection techniques have demonstrated robust improved segmentation performance. Hybridization of two or more feature extraction techniques has also been shown to produce more robust recognition features.

APPENDIX

Source code:

```
 from flask import Flask,render_template,Response

import cv2

from cvzone.HandTrackingModule import HandDetector
from cvzone.ClassificationModule import Classifier
import numpy as np
import math

app=Flask(__name__)


def generate_frames():
    camera=cv2.VideoCapture(0)

    detector = HandDetector(maxHands=1)
    classifier = Classifier("Model/model.h5","Model/labels.txt")

    offset = 20
    imgSize = 300

    folder = "/Data/C"
    counter = 0

    labels = ["A", "B", "C","D","E","F","G","H","I"]
    while True:

        ## read the camera frame
        success,img=camera.read()
        if not success:
            break
```

```
        else:
            imgOutput = img.copy()
            hands, img = detector.findHands(img)
            if hands:
                hand = hands[0]
                x, y, w, h = hand['bbox']

                imgWhite = np.ones((imgSize, imgSize, 3), np.uint8) * 255
                imgCrop = img[y - offset:y + h + offset, x - offset:x + w +
offset]

                imgCropShape = imgCrop.shape

                aspectRatio = h / w

                if aspectRatio > 1:
                    k = imgSize / h
                    wCal = math.ceil(k * w)
                    imgResize = cv2.resize(imgCrop, (wCal, imgSize))
                    imgResizeShape = imgResize.shape
                    wGap = math.ceil((imgSize - wCal) / 2)
                    imgWhite[:, wGap:wCal + wGap] = imgResize
                    prediction, index = classifier.getPrediction(imgWhite,
draw=False)
                    print(prediction, index)

                else:
                    k = imgSize / w
                    hCal = math.ceil(k * h)
                    imgResize = cv2.resize(imgCrop, (imgSize, hCal))
```

```
                imgResizeShape = imgResize.shape
                hGap = math.ceil((imgSize - hCal) / 2)
                imgWhite[hGap:hCal + hGap, :] = imgResize
                prediction, labelsindex =
classifier.getPrediction(imgWhite, draw=False)

            cv2.rectangle(imgOutput, (x - offset, y - offset-50),
                          (x - offset+90, y - offset-50+50), (255, 0, 255),
cv2.FILLED)
            cv2.putText(imgOutput, labels[index], (x, y -26),
cv2.FONT_HERSHEY_COMPLEX, 1.7, (255, 255, 255), 2)
            cv2.rectangle(imgOutput, (x-offset, y-offset),
                          (x + w+offset, y + h+offset), (255, 0, 255), 4)




        ret,buffer=cv2.imencode('.jpg',imgOutput)
        imgOutput=buffer.tobytes()

        yield(b'--img\r\n'
              b'Content-Type: image/jpeg\r\n\r\n' + imgOutput +
b'\r\n')



@app.route('/')
def index():
   return render_template('index.html')
```

```
@app.route('/video')
def video():
    return Response(generate_frames(),mimetype='multipart/x-mixed-replace; boundary=img')

if __name__=="__main__":
    app.run(debug=True)
```

Github Link :https://github.com/IBM-EPBL/IBM-Project-8954-1658939625

Demo Link :https://youtu.be/rrcV2nedLxl