

PROJECT REPORT

DATE	19 November 2022
TEAM ID	PNT2022TMID50033
PROJECT NAME	Real-Time Communication System

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 speech cannot be used. Voice Conversion System with Hand Gesture Recognition and translation will be very useful to have a proper conversation between a normal person and an impaired person in any language.

The project aims to develop a system that converts the sign language into a human hearing voice in the desired language to convey a message to normal people, as well as convert speech into understandable sign language for the deaf and dumb. We are making use of a convolution neural network to create a model that is trained on different hand gestures. An app is built which uses this model. This app enables deaf and dumb people to convey their information using signs which get converted to human-understandable language and speech is given as output.

1.1 Project Overview

IN everyone's life – even Artificial intelligence is not designed to replace humans but rather to enhance our lives by helping us do things we are unable to do on our own. Many companies are working on this type of research, including Google Deepmind, IBM Watson, Apple Siri, Microsoft Cortana, etc., which means there will likely be many new developments soon. These innovations could positively impact those without disabilities – because they make everyday tasks easier and less time-consuming.

1.2 Purpose

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. AI fosters strong workplace communication. Using various analytics, AI can indicate the success rate of presentations and anticipate the types of interaction that are most suitable for your target audience.

2. LITERATURE SURVEY

2.1 Existing Problem

A problem statement is a concise description of the problem or issues a project seeks to address. The problem statement identifies the current state, the desired future state and any gaps between the two.

2.2 References

<https://www.techtarget.com/searchunifiedcommunications/definition/real-time-communications>

<https://timesofindia.indiatimes.com/readersblog/newtech/artificial-intelligence-is-like-artificial-god-for-specially-abled-39413/>

<https://lifezest.co/apps-for-disabled-people/>

2.3 Problem Statement Definition

A real time Digital communication system needs some modifications before transferring n different speech signals simultaneously on the same and/channel. The signals are sampled from analog audio signals with an introduction of quantization noise and sampling degradation.

3. IDEATION & PROPOSED SOLUTION



3.1 Empathy map canvas

what do thy think and feel?

- communication between deaf and dumb and a normal person has always been a challenging task.
- very difficult for mute people convey their message to normal people.

- to make deaf mute people feel independent and more confident.
- normal people are not trained for sign language.

what do they hear?

- it enable employee from across the world to communicate with each other 24*7 and share ideas or solve problem quickly.
- they teach about super talent.
- they give an approximat stage whether it will cure or not.

what do they say and do?

- people are same in nature, but their inability differ from one another.
- It may cause a serious impact to their life
- It's an responsible for all person to care the inability patient and make them to lead a normal life as we lead daily.

what do they see?

- Yet, there is a communication barrier between these deaf-

dumb with normal people.

- This application can provide a helpful tool for communication between the deaf and the external world.
- Talk application provides this experience for them hand movement and displays a certain function.

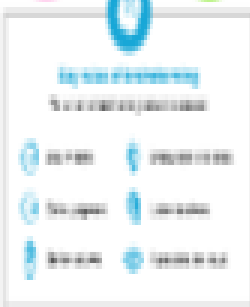
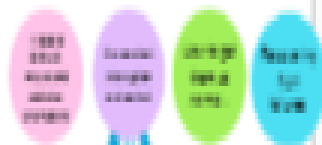
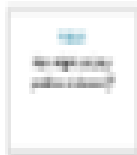
3.2 Ideation & Brainstorming

1

Define your problem statement

What problem are you trying to solve? Define your problem and the target audience. This will define the scope of your research.

[Learn more](#)



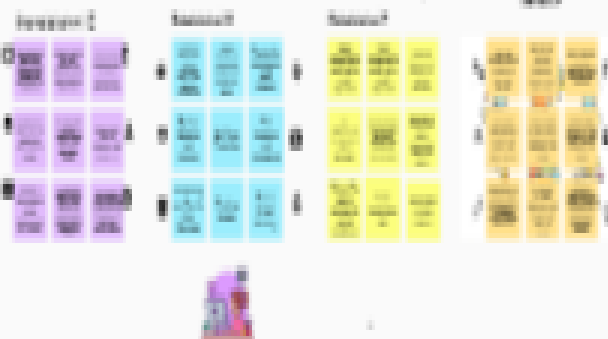
2

Research

What secondary data is available to inform your problem statement?

[Learn more](#)

What secondary data is available to inform your problem statement?

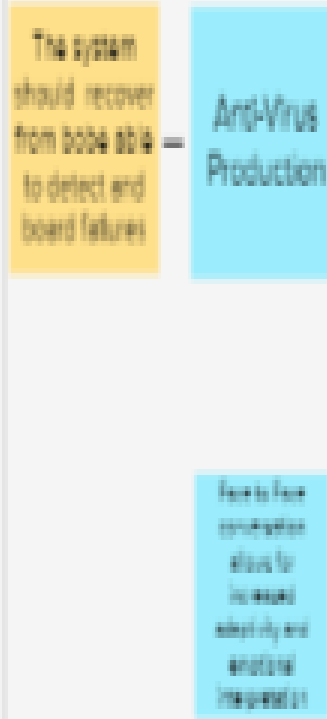


3

Design

How can you design your solution to solve the problem? Define your solution and the target audience. This will define the scope of your research.

[Learn more](#)



3.3 Proposed solution

Project team shall fill the following information in proposed solution template

S.NO	Parameter	Description
1	Problem Statement (Problem to be solved)	How to get them as normal , Recovering from failures . It lead to Overuse , Misuse , Addiction and Hacking
2	Idea / Solution Description	Secure Virtual Memory and Anti-virus protection . Design task to safeguard against error conditions.
3	Novelty/Unique ness	Vibration signalers to help deaf people aware of the door bell , phone , alarm

		clock , fire/smoke and baby cries.
4	Social impact/Custom er Satisfaction	Wire-Free reception with no seating restrictions . High sound fidelity for music and speech
5	Business model (Revenue Model)	Based on customer needs and features of products price will be handled.

3.4 Problem Solution Fit

1. CUSTOMER SEGMENT(S)

CS

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

- Deaf and dumb peoples

6. CUSTOMER CONSTRAINTS

CC

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

- The lack of sign language interpreters and the use of masks create additional constraints for deaf person

2. JOBS-TO-BE-DONE / PROBLEMS

J&P

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

- Healthcare
- Sign language interpreter
- Teacher for students with special needs

9. PROBLEM ROOT CAUSE

RC

What is the real reason that this problem exists?
What is the back story behind the need to do this job?
I.e. customers have to do it because of the change in regulations.

- This study concluded neonatal septicemia. Prematurity, Low birth weight, consanguinity, and birth asphyxia as the most common risk factor for deafness in children. In this study, waiting for improvement on behalf of parents and misguidance by

3. TRIGGERS

TR

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

- New product / service announcement
- Change in the marketing channel

4. EMOTIONS: BEFORE / AFTER

EM

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

10. YOUR SOLUTION

SL

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

- Sign language is transform into normal text format.

4.REQUIREMENT ANALYSIS

4.1 Functional Requirement

The functional requirements of the proposed solution

FR NO.	functional Requirement	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	LOW VISION: As a user who has trouble reading due to low vision, I want to be able to make the text larger on the screen so that I can read it. Registration through Gmail
FR-2	User Confirmation	IMPAIRED USER: As a user who is hearing - impaired, I want a turn on video captions so that I can understand what is being said in videos.

		Confirmation via Email
FR-3	User Registr ation	COLOR BLINDNESS: <p>As a user who is color blind, I want to links to be distinguishable on the page so that I can find the links and navigate the site.</p> Registration through Gmail

4.2 Non functional requirement

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

FR N o.	Non- Function al Require ment	Description
NF R-	Usability	1. Visual and Audio Help 2. Text size scaling 3. Reverse contrast

1		
NF R- 2	Security	Important information: <ol style="list-style-type: none"> 1. Walking in single file or in narrow space. 2. Steps, Stairs and Slope. 3 .Kerbs and Roads
NF R- 3	Reliability	To determine reliability measures are: <ol style="list-style-type: none"> 1. Test-Retest Repeatability 2. Individual Repeatability
NF R- 4	Performan ce	To determine predictors of success in reading with low vision aids, in terms of reading acuity, optimum acuity reserve, and maximum reading speed, for observers with low vision for various causes
NF R-	Availabili ty	Lack of adequate low vision services and barriers to their provision and uptake impact negatively on efforts to prevent

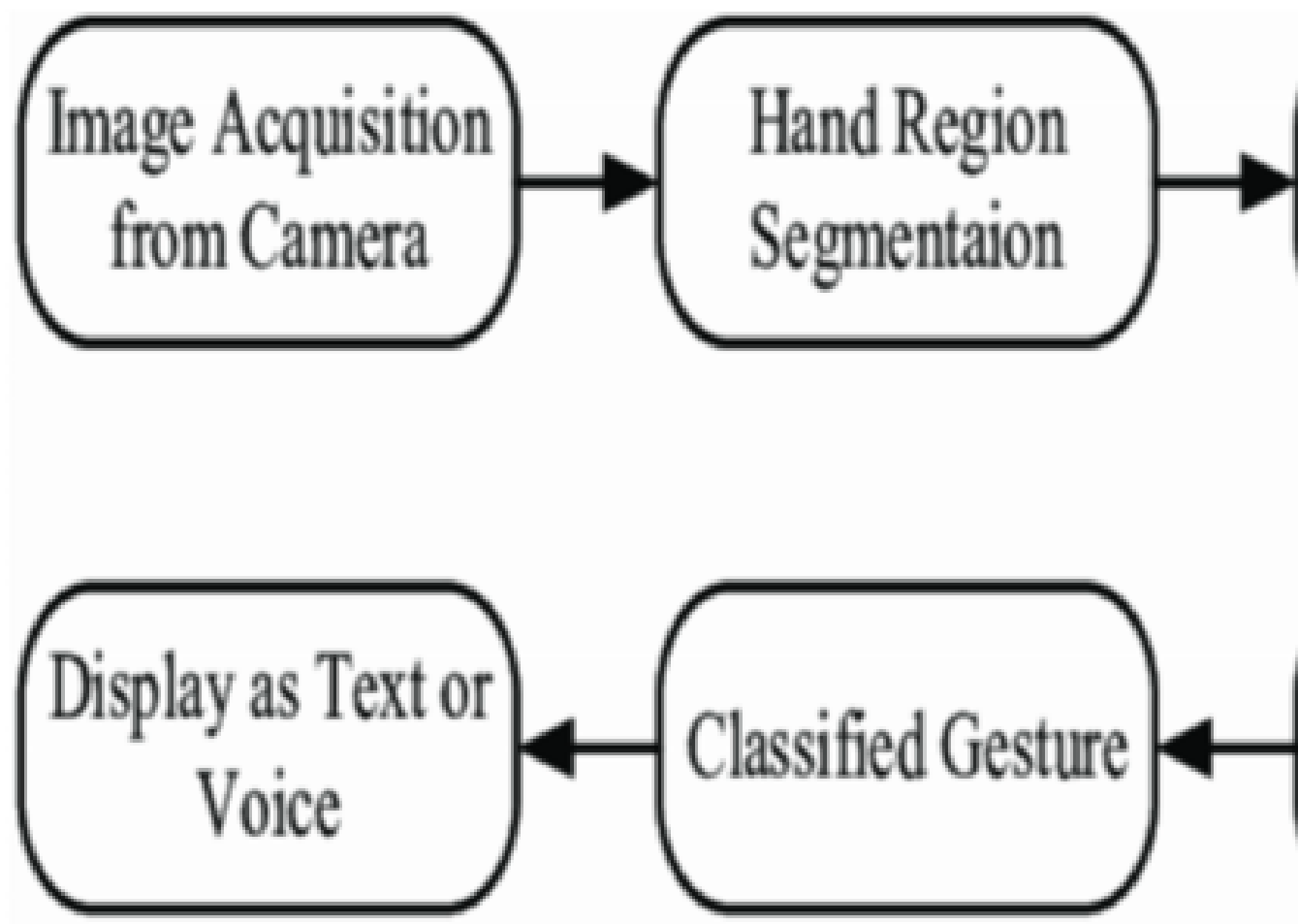
5		visual impairment and blindness.
NF R- 6	Scalability	There is a large selection of device to help people with low vision. Some are “Optical”, glass lenses such as magnifying glasses and telescopes

5. PROJECT PLANNING & SCHEDULING

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. It shows how data enters and leaves the system, what changes the information, and where data is stored.

Example: DFD Level 0 (Industry Standard)



User Stories

for the product Use the below template to list all the user stories.

User	Funct		User	Accep	Priori	Relea

Type	Functional Requirement (Epic)	User Story Number	Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Home	USN-1	As a user, I can view the awareness guide and awareness to use this application	I can view the awareness to use this application and its limitations	Low	Sprint-1

			ion.			
		USN-2	As a user, I'm allowed to view the guided video to use the interfa ce of this	I can gain knowle dge to use this applicat ion by a practic al method	Low	Sprint-1

			applicat ion			
		USN-3	As a user, I can read the instruct ions to use this applicat ion	I can read instruct ions also to use it in a user- friendly metho d.	Low	Sprint- 2
	Recogn ize	USN-4	As a user, In	I can choose	High	Sprint- 2

			this predicti on page I get to choose the image	the image from our local system and predict the output		
	Predict	USN-6	As a user, I'm Allow	I can upload and choose	Medi um	Sprint- 3

			ed to upload and choose the image to be upload ed	the image from the system storage and also in any virtual storage.		
		USN-7	As a user, I will	I can able to train	High	Sprint- 4

			train and test the input to get the maxim um accura cy of output.	and test the applicat ion until it gets maxim um accura cy of the result		
		USN-8	As a user, I can access	I can acce ss the MNI	Medi um	Sprint- 3

			the MNIST data set	ST data set to produce the accurate result.		
		USN-9	As a user, I can view the guide to use the web app.	I can view the awareness of this application and its limitations	Low	Sprint-1

				ons		
--	--	--	--	-----	--	--

	Recognize	USN-10	As a user, I can use the web application virtually anywhere	I can use the application portably anywhere	High	Sprint-1
		USN-11	As it is an open	I can use it	Medium	Sprint-2

			source, can use it cost freely.	without any payme nt to be paid for it to access		
		USN- 12	As it is a web applicat ion, it is installat ion free	I can use it without the installat ion of the	Medi um	Sprint- 4

				applicat ion or any softwar e.		
	predict	USN- 13	As a user, I'm Allow ed to upload and choose the	I can upload and choose the image from the system	Medi um	Sprint- 3

			image to be upload ed	storage and also in any virtual storage		
--	--	--	--------------------------------	--	--	--

5.2 Technical Architecture :

Table-: Components & Technologies

S. No	Component	Description	Technology
1	User Interface	How user interacts with application e.g. Web UI, Mobile App, Chatbot etc	HTML, CSS, JavaScript / Angular Js / React Js etc
2	Application Logic-1	It deals with variety of frameworks, libraries and supports required to develop the project	Java / Python
	Application	Helps in converting	IBM Watson

3	ion Logic-2	human voice into written words, In simple it is used to convert speech to text.	STT service
4	Applicat ion Logic-3	Provides fast, consistent and accurate answers during the execution phase of the project	IBM Watson Assistant
5	Databa se	It can be numerical, categorical or time- series data	MySQL, NoSQL, etc.
6	Cloud Databa	Enables the user to use host database without	IBM DB2, IBM Cloud ant etc

	se	buying the additional hardware	
7	File Storage	File storage should be highly flexible, scalable and effective	IBM Block Storage or Other Storage Service or Local File system
8	External API-1	Used to access the information in the cloud	IBM Weather API, etc.
9	External API-2	Used to access the information for data driven decision making	Aadhar API, etc.
	Machi	Machine learning	Real time

10	ne Learni ng Model	considered an application that used to increase computer ability. It can be defined as an algorithm that focuses on computer program development.	communication using AI for specially abled
11	Infrastr ucture (Server / Cloud)	Application Deployment on Local System / Cloud Local Server Configuration: Install the windows version and execute	Local, Cloud Foundry, Kubernetes, etc.

		the installer. Select APACHE to install web serve.	
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Table-2: Application Characteriistics

S. No	Chara cterist ice	Description	Technology
1	Open- Source	The frameworks used are	TensorFlow,P yTorch,Scikitl

	Frame works		earn,XGBoos t, Apache MXNet
2	Securi ty Implem entatio ns	the security / access controls implemented, use of firewalls etc.	Identify, Prevent and Respond
3	Scalab le Archite cture	the scalability of architecture (3 – tier, Microservices)	Data , models, operate at size, speed and complexity

4	Availab ility	the availability of application (e.g. use of load balancers, distributed servers etc.)	Image and facial recognition, lip reading, text summarizatio n, real time captioning
5	Perfor mance	Design consideration for the performance of the application (number of requests per sec, use of Cache, use of CDN's) etc.	Full and effective participation , equality of opportunity, accessibility

5.3 User stories:

User type	Functional requirement	User story number	User story /task	Acceptance criteria	Priority	Release
customer device	Data Collection	USN-1	Collect Datas et .	I can access my device	High	sprint 1
		USN-2	Image	device	Med	sprint

			pre proce ssi ng	work through action	iu m	1
	Model Building	USN- 3	Impo rt the requi red librar ies, add the nece ssa ry laye rs and com pile the mod el	various action was inbuild	Hi gh	sprint 2

		USN-4	Train ing the ima ge class ificati on mod el usi ng CNN	recognize the image	M ed i u m	sprint 1
	Traini ng and Testing	USN-5	Train ing the mod el and testi ng the mod el's	testing through local case	Hi gh	sprint 1

			perfo rman ce			
User custo mer	Imple mentat ion of the applica tion	USN- 6	Con verti ng the input sign lang uage imag es into Engli sh alph abe ts	invent to public	M ed i u m	sprint 1

6.PROJECT PLANNING AND SCHEDULING

6.1 sprint planning and estimation

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Data Collection	USN-1	Collect Dataset .	9	High	Thanal aksh mi C Subala kshmi M Mahal aksh mi T Velvalli P

Sprint-1		USN-2	Image preprocessing	8	Medium	<p>Thanal akshmi C</p> <p>Subala kshmi M</p> <p>Mahal akshmi T</p> <p>Velvalli P</p>
Sprint-2	Model Building	USN-3	Import the required libraries, add the necessary layers	10	High	<p>Thanal akshmi C</p> <p>Subala kshmi M</p> <p>Mahal akshmi T</p> <p>Velvalli</p>

			and compi le the model			P
Sprin t-2		USN- 4	Traini ng the image classif icati on model using CNN	7	Medi um	Thanal aksh mi C Subala kshmi M Mahal aksh mi T Velvalli P
Sprin t-3	Traini ng and Testi ng	USN- 5	Traini ng the model and testi ng the model	9	High	Thanal aksh mi C Subala kshmi M

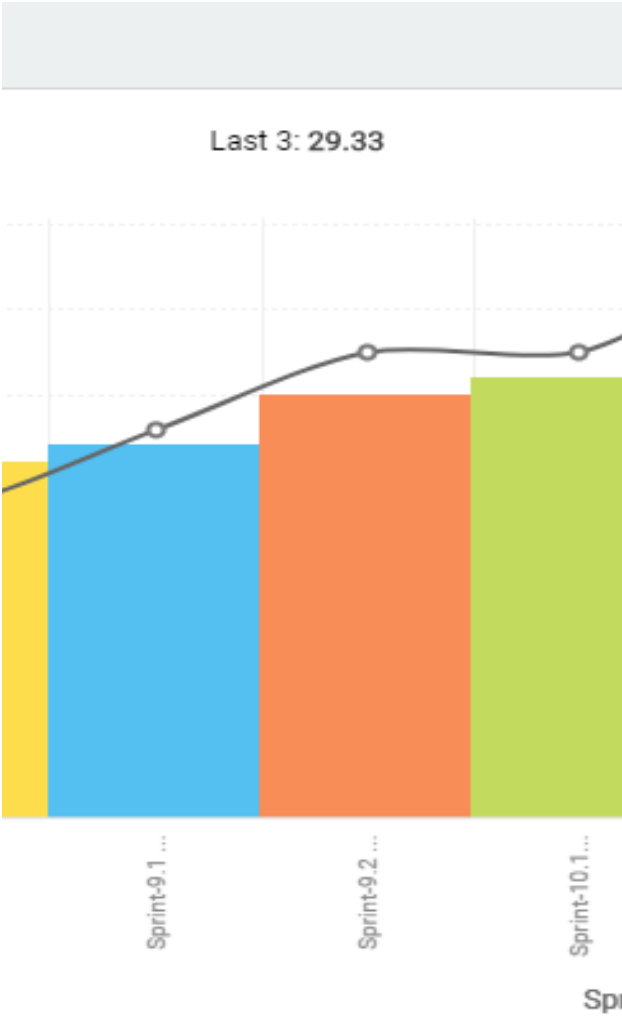
			's perfor man ce			Mahal aksh mi T Velvalli P
Sprin t-4	Imple ment ation of the applic ation	USN- 6	Conv erting the input sign langu age imag es into Engli sh alpha bets	8	Medi um	Thanal aksh mi C Subala kshmi M Mahal aksh mi T Velvalli P

6.2 sprint delivery and schedule:

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	10	6 Days	24 Oct 2022	29 Oct 2022	8	29 Oct 2022
Sprint-2	10	6 Days	31 Oct 2022	04 Nov 2022	5	04 Nov 2022
Sprint-3	10	6 Days	07 Nov 2022	11 Nov 2022	7	11 Nov 2022
Sprint-4	10	6 Days	14 Nov 2022	18 Nov 2022	5	18 Nov 2022

Velocity:

$AV = \frac{\text{sprint duration}}{\text{velocity}}$



$$AV = 6/10 = 0.6$$

6.3 Report from JIRA:

AI-Powered Nutrition ...
Software project

Back to project

Reports

Overview

Burndown report

Sprint burndown chart

Cumulative flow diagram

Cycle time report

Deployment frequency report

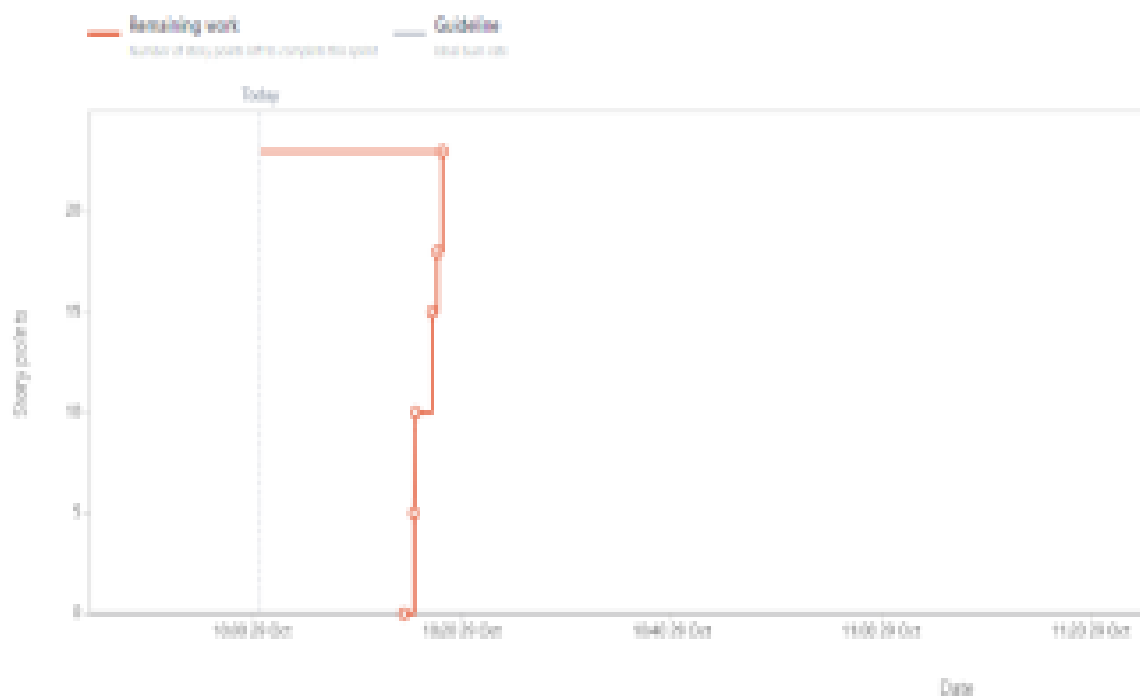
You're in a team-managed project
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Projects / AI-Powered Nutrition Analyzer For Fitness Enthusiasts / Reports

Sprint burndown chart

Sprint: APNAFFE Sprint 1 Estimation field: Story points

Date - October 28th, 2022 - October 30th, 2022



Report: APNAFFE Sprint 1

[Scope changes log](#)

7.CODING&&SOLUTION


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

```
In [ ]: # Compiling the Model
model.compile(loss='categorical_crossentropy',optimizer='adam',metrics=['accuracy'])
```

```
In [ ]: # reading code from a file
f = open('main.py', 'r')
temp = f.read()
f.close()

code = compile(temp, 'main.py', 'exec')
exec(code)
```

Saving the Model

```
In [ ]: model.save('asl_model_84_54.h5')
```

8. TESTING:

8.1 Test case:

Real-Time Communication System
Powered by AI for Specially Abled

Saving the Model

```
In [15]: model.save('asl_model_84_54.h5')
```

Testing the model

```
In [16]: import numpy as np
         from tensorflow.keras.models import load_model
         from tensorflow.keras.preprocessing import image
```

```
In [18]: model=load_model('asl_model_84_54.h5')
         img=image.load_img(r'/content/drive/MyDrive/Dataset/test_set/D/2.png',
                           target_size=(64,64))
```

```
In [19]: img
```

```
Out[19]:
```



```
In [20]: x=image.img_to_array(img)
```

```
In [21]: x.ndim
```

```
Out[21]: 3
```

```
In [22]: x=np.expand_dims(x,axis=0)
```

```
In [23]: x.ndim
```

```
Out[23]: 4
```

```
In [24]: pred=np.argmax(model.predict(x),axis=1)
```


8.2 User Acceptance Testing:

3. TestCaseAnalysis

This report shows the number of test cases that

Section
PrintEngine
ClientApplication
Security
OutsourceShipping
ExceptionReporting
FinalReportOutput
VersionControl

9.Result

9.1 Performance metrics:

12.FUTURE SCOPE

1. Through image recognition technology, AI understands and describes photos to people.
2. The speech-to-text and text-to-speech technologies help overcome communication impediments
3. The product in AI that narrates the entire world around the user through texts, describing whereabouts and the looks of the nearby people, faces and emotions.
4. Autonomous vehicles are in trend and their success is expected. It can be beneficial to people living with limited physical mobility.

13. Appendix source code:

```
1  import cv2
2
3  video = cv2.VideoCapture(0)
4
5  while True:
6      ret, frame = video.read()
7      cv2.imshow("Frame", frame)
8      k = cv2.waitKey(1)
9      if k == ord('q'):
10         break
11
12  video.release()
13  cv2.destroyAllWindows()
```

```
1  <!DOCTYPE html>
2  <html>
3  <head>
4  <meta name="viewport" content="width=device-wi
5  <style>
6  body {font-family: Arial, Helvetica, sans-seri
7
8  /* Full-width input fields */
9  input[type=text], input[type=password] {
10     width: 100%;
11     padding: 12px 20px;
12     margin: 8px 0;
13     display: inline-block;
14     border: 1px solid #ccc;
15     box-sizing: border-box;
16 }
17
18 /* Set a style for all buttons */
19 button {
20     background-color: #04AA6D;
21     color: white;
22     padding: 14px 20px;
23     margin: 8px 0;
24     border: none;
25     cursor: pointer;
26     width: 100%;
27 }
```

```
28
29 button:hover {
30     opacity: 0.8;
31 }
32
33 /* Extra styles for the cancel button
34 .cancelbtn {
35     width: auto;
36     padding: 10px 18px;
37     background-color: #f44336;
38 }
39
40 /* Center the image and position text below it
41 .imgcontainer {
42     text-align: center;
43     margin: 24px 0 12px 0;
44     position: relative;
45 }
46
47 .img.avatar {
48     width: 40%;
49     border-radius: 50%;
50 }
51
52 .container {
53     padding: 16px;
```

```
55
56 span.psw {
57     float: right;
58     padding-top: 16px;
59 }
60
61 /* The Modal (background) */
62 .modal {
63     display: none; /* Hidden by default */
64     position: fixed; /* Stay in place */
65     z-index: 1; /* Sit on top */
66     left: 0;
67     top: 0;
68     width: 100%; /* Full width */
69     height: 100%; /* Full height */
70     overflow: auto; /* Enable scroll if needed */
71     background-color: rgb(0,0,0); /* Fallback color */
72     background-color: rgba(0,0,0,0.4); /* Black w/ opacity */
73     padding-top: 60px;
74 }
75
76 /* Modal Content/Box */
77 .modal-content {
78     background-color: #fefefe;
79     margin: 5% auto 15% auto; /* 5% from the top, 15% from the bottom, 5% from the left and right */
80     border: 1px solid #888;
81     width: 80%; /* Could be more or less, depending on page */
82 }
```

```
82     }
83
84     /* The Close Button (x) */
85     .close {
86         position: absolute;
87         right: 25px;
88         top: 0;
89         color: #000;
90         font-size: 35px;
91         font-weight: bold;
92     }
93
94     .close:hover,
95     .close:focus {
96         color: red;
97         cursor: pointer;
98     }
99
100    /* Add Zoom Animation */
101    .animate {
102        -webkit-animation: animateroom 0.6s;
103        animation: animateroom 0.6s
104    }
105
106    @-webkit-keyframes animateroom {
107        from {-webkit-transform: scale(0)}
108        to {-webkit-transform: scale(1)}
109    }
```

```

111 @keyframes animatezoom {
112     from {transform: scale(0)}
113     to {transform: scale(1)}
114 }
115
116 /* Change styles for span and cancel button on extra screen
117 @media screen and (max-width: 300px) {
118     span.psw {
119         display: block;
120         float: none;
121     }
122     .cancelbtn {
123         width: 100%;
124     }
125 }
126 </style>
127 </head>
128 <body>
129
130 <h2>REAL TIME COMMUNICATION SYSTEM POWERED BY AI
131
132 <button onclick="document.getElementById('id01').
133
134 <div id="id01" class="modal">
135
136     <form class="modal-content animate" action="/a
137     <div class="imagecontainer">

```

```
219     height: 90px;
220     border-radius: 4px;
221     border: 2px solid whitesmoke;
222     box-shadow: 0 1px 2px 0 rgba(0, 0, 0, 0.1);
223     position: absolute;
224     bottom: 5px;
225     left: 10px;
226     background: white;
227 }
228
229 .display-cover {
230     display: flex;
231     justify-content: center;
232     align-items: center;
233     width: 70%;
234     margin: 5% auto;
235     position: relative;
236 }
237
238 video {
239     width: 100%;
240     background: rgba(0, 0, 0, 0.2);
241 }
242
243 .video-options {
244     position: absolute;
245     left: 20px;
```



```
279 .controls > button > svg {
280     height: 20px;
281     width: 18px;
282     text-align: center;
283     margin: 0 auto;
284     padding: 0;
285 }
286
287 .controls button:nth-child(1) {
288     border: 2px solid #02082E;
289 }
290
291 .controls button:nth-child(1) svg {
292     color: #02082E;
293 }
294
295 .controls button:nth-child(2) {
296     border: 2px solid #008496;
297 }
298
299 .controls button:nth-child(2) svg {
300     color: #008496;
301 }
302
303 .controls button:nth-child(3) {
304     border: 2px solid #008541;
305 }
```

```
307     .controls button:nth-child(3) svg {
308         color: #008541;
309     }
310
311     .controls > button {
312         width: 45px;
313         height: 45px;
314         text-align: center;
315         border-radius: 100%;
316         margin: 0 6px;
317         background: transparent;
318     }
319
320     .controls > button:hover svg {
321         color: white;
322     }
323 </style>
324
325 <script>
326     // Get the modal
327     var modal = document.getElementById('i
```



```
422     };
423
424     const doScreenshot = () => {
425         canvas.width = video.videoWidth;
426         canvas.height = video.videoHeight;
427         canvas.getContext('2d').drawImage
428         screenshotImage.src = canvas.toDataURL();
429         screenshotImage.classList.remove('hidden');
430     };
431
432     pause.onclick = pauseStream;
433     screenshot.onclick = doScreenshot;
434 </script>
435
436 </body>
437 </html>
```

```
1  .bs-icon {
2    --bs-icon-size: .75rem;
3    display: flex;
4    flex-shrink: 0;
5    justify-content: center;
6    align-items: center;
7    font-size: var(--bs-icon-size);
8    width: calc(var(--bs-icon-size) * 2);
9    height: calc(var(--bs-icon-size) * 2);
10   color: var(--bs-primary);
11 }
12
13 .bs-icon-xs {
14   --bs-icon-size: 1rem;
15   width: calc(var(--bs-icon-size) * 1.5);
16   height: calc(var(--bs-icon-size) * 1.5);
17 }
18
19 .bs-icon-sm {
20   --bs-icon-size: 1rem;
21 }
22
23 .bs-icon-md {
```