INTERACTIVE, VISUAL LEARNING-BASED TOOL FOR HEARING-IMPAIRED CHILDREN TO IMPROVE LANGUAGE

22_23-J 18

Status Document - 1

Lelkada L L P S M
IT19001708

BSc (Hons) in Information Technology
Specializing in Data Science

Department of Information Technology

Sri Lanka Institute of Information Technology
Sri Lanka

February 2023

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1. INTRODUCTION

1.1 Introduction to Research Project

A personal and experience-oriented environment that utilizes residual hearing in the process of language learning provides an effective language platform for hearing-impaired children. Conventional learning applications that are only limited to a pre-defined set of vocabularies and a pre-defined set of activities are unable to provide a learning environment that a child is comfortable dealing with. Bringing the learning environment into the child's own world will attract the child to the learning platform.

Normal-hearing children learn their first language by interacting with a person who is on the same ground, repetitively and frequently. The hearing-impaired children also should be provided with a similar experience by offering activities and vocabulary in relation to the child's background, culture, and environment, as well as by bringing up the residual hearing to a functional level with proper appliances. Simulation and response to the child's auditory experience are essential in the utilization of residual hearing.

The learning platform should provide materials that are suitable for the child's current state of linguistic ability and age. Words and sentences included in those activities should be at an appropriate level of difficulty to ensure a seamless learning experience. When creating teaching materials, the level of difficulty in course materials should consider both phonographic difficulty and contextual difficulty.

Preparing learning materials that are contextually similar to the words that the child has learned improves the vocabulary and helps the child to grasp the links and patterns in a language. In order to ensure repetitive and frequent use of previously learned words, new content should be presented, combining previously learned contents appropriately.

Regardless of the child's background, learning materials presented through the application should ensure the contents are appropriate for a child to learn. Context and intonation of the materials must be appropriate for a child, and in order to ensure this,

content censoring should be done for every individual element presented through the application.

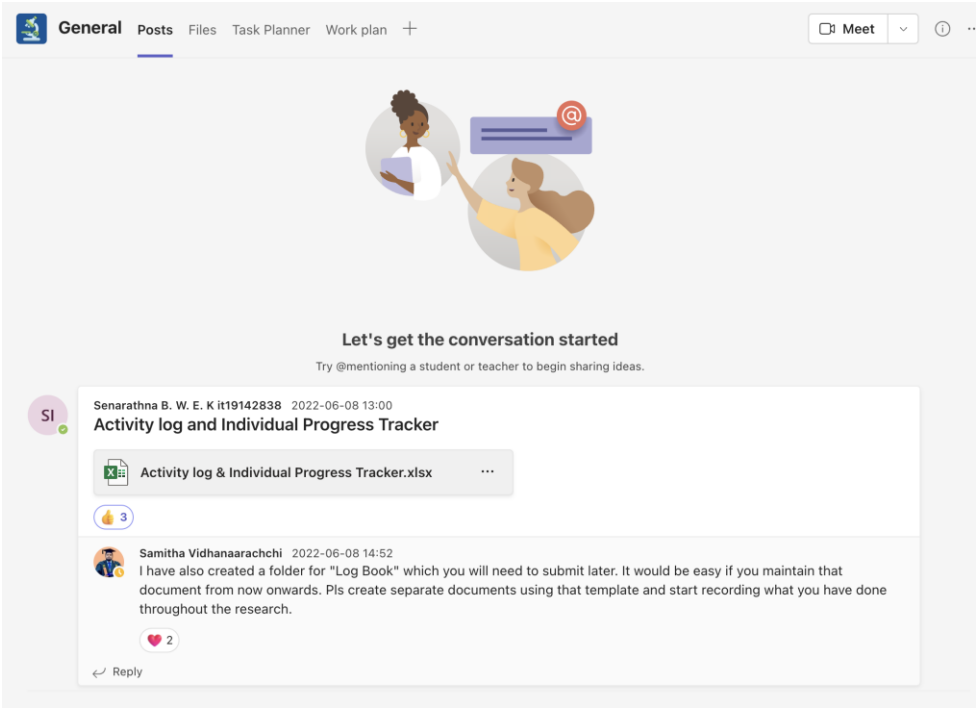
1.2 Introduction to Individual Component

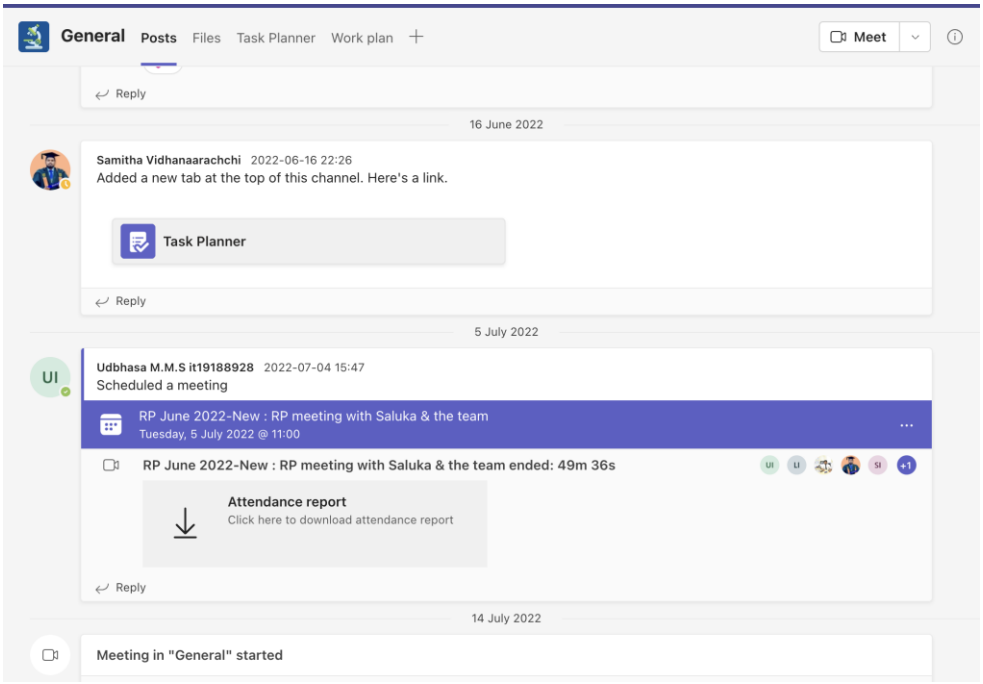
The main objective of this research is to implement an experience-oriented learning platform for hearing-impaired children to learn their first language by interacting with elements of the child's world that enable an effective linguistic acquiring process. Appropriate utilization of residual hearing and different activities that replicate the natural language acquisition process to close the linguistic skill gap between hearing peers. Providing learning materials that are suitable for the level of linguistic skill enables an effortless language-learning process.

Generating contextually similar words and sentences to the previously learned contents in a meaningful way improves the vocabulary and helps the child to grasp the syntaxes and semantics of the language effortlessly. Providing contextually similar words and sentences helps the child to understand and link different elements that the child interacts with every day and mimics the language learning process of a hearing peer. Presenting words and sentences in a way that matches the child's interest in order to motivate the child to keep interacting with the learning platform.

Ensuring the contents presented through the application is kid-friendly is a major consideration when creating a learning platform for children. Although the learning platform is built around the child's own world, the contents presented through the application are assured to be kid-friendly regardless of the child's background. In the process of content censoring, false negative scenarios are not accepted.

2. SCREENSHOTS OF CHATS





10 September 2022

UI

Udbhasa M.M.S it19188928 2022-09-10 14:27 Edited

This audio cd was received as a gift to Lelkada L.L.P.S.M it19001708 during her last visit to Delkanda Wikramarachchi hearing care centre.

Audio clips : Speech Audiometry in Sinhala

See less

Reply

5 October 2022

UI

Udbhasa M.M.S it19188928 2022-10-05 22:42

I added a tab at the top of this channel. Check it out!

Work plan

Reply

10 October 2022

LI

Lelkada L.L.P.S.M it19001708 2022-07-04 20:37

https://www.figma.com/file/EqcdtJQW3yIvbTqBAQQMk0/Untitled?node-id=0%3A1

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Created with Figma

www.figma.com

Reply

UI

Udbhasa M.M.S it19188928 2022-07-04 20:45

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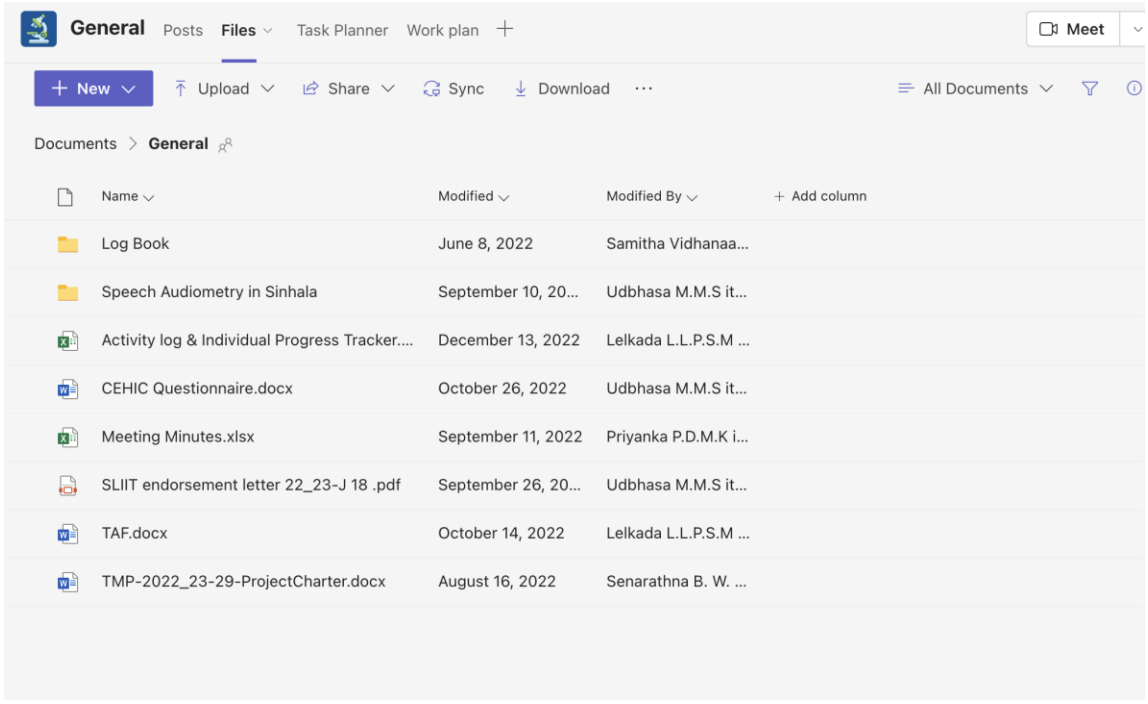
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Samitha Vidhanaa...
Speech Audiometry in Sinhala
September 10, 20...
Udbhasa M.M.S it...
Activity log & Individual Progress Tracker....
December 13, 2022
Lelkada L.L.P.S.M ...
CEHIC Questionnaire.docx
October 26, 2022
Udbhasa M.M.S it...
Meeting Minutes.xlsx
September 11, 2022
Priyanka P.D.M.K i...
SLIIT endorsement letter 22_23-J 18 .pdf
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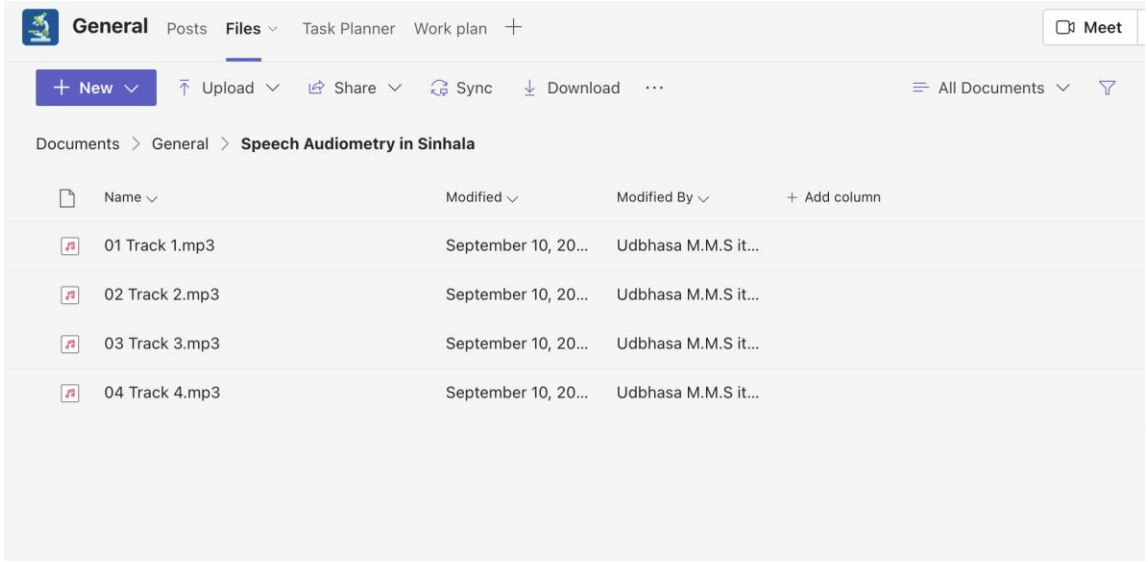
Senarathna B. W. ...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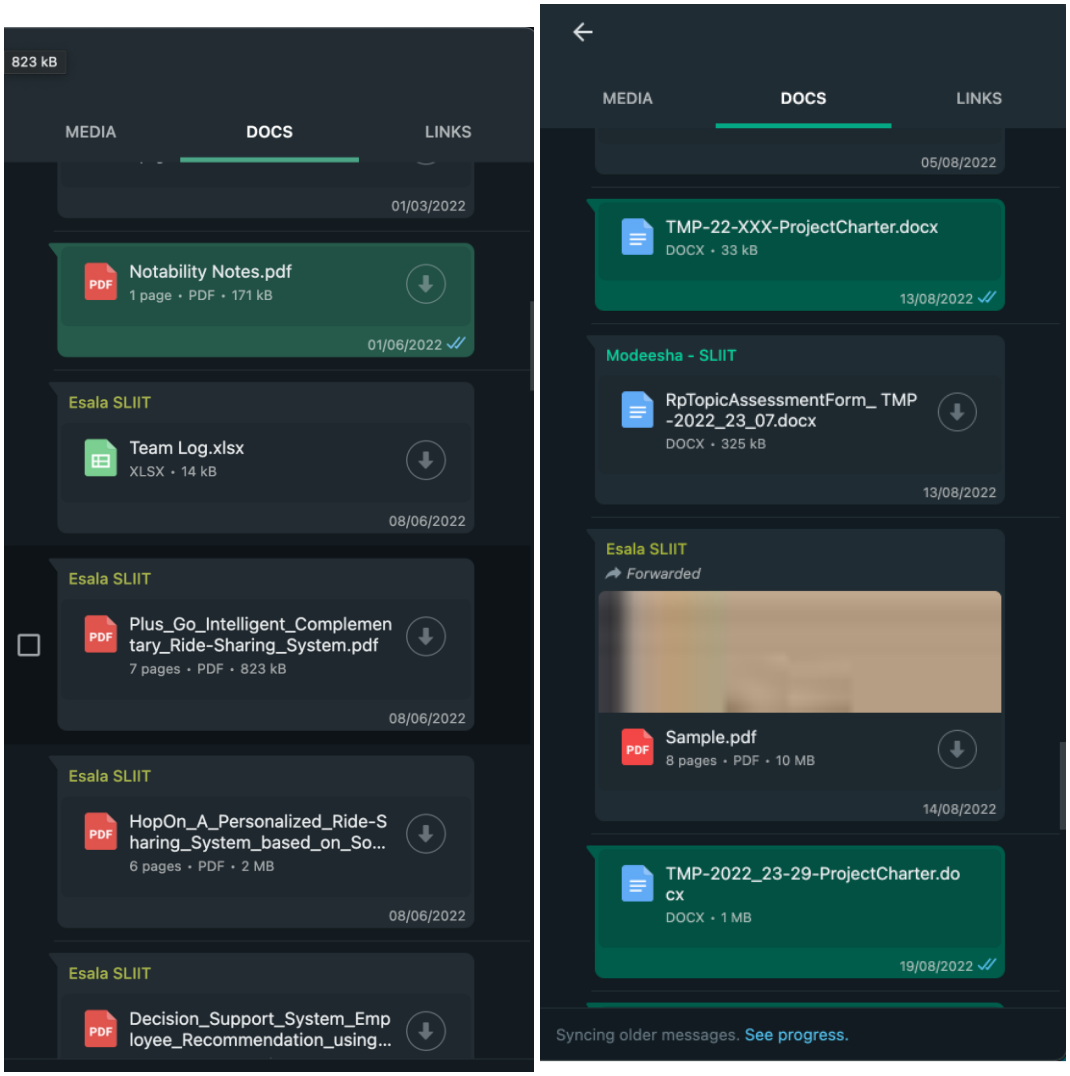
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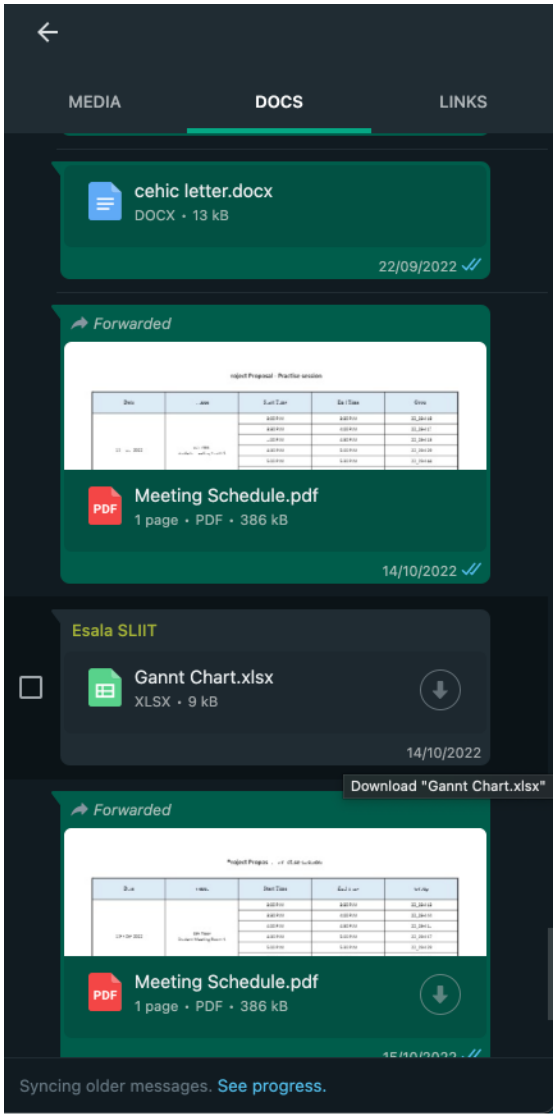
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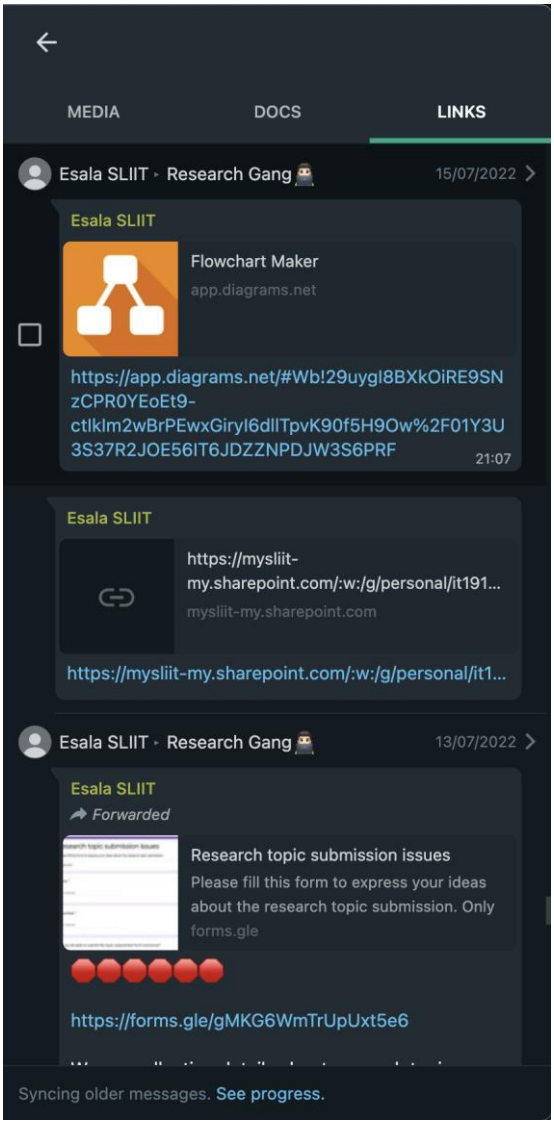
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13/07/2022
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Research topic submission issues
Please fill this form to express your ideas about the research topic submission. Only
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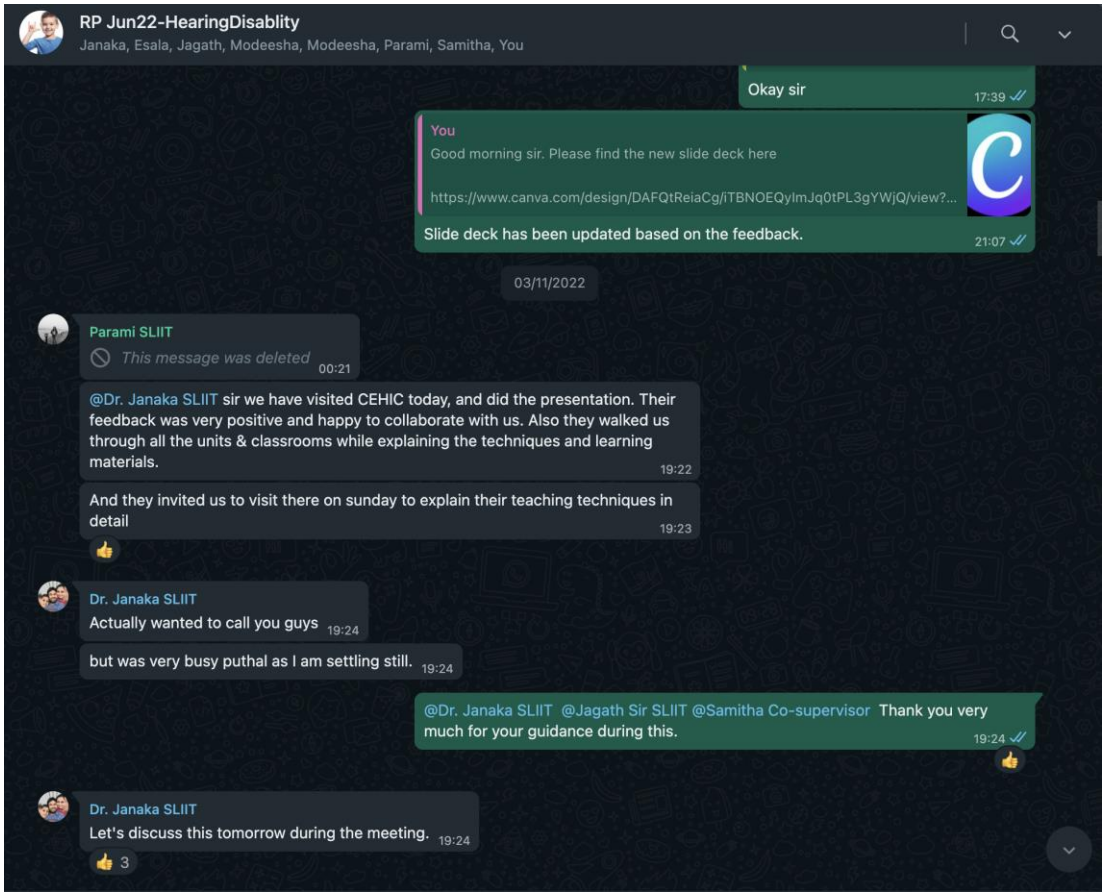
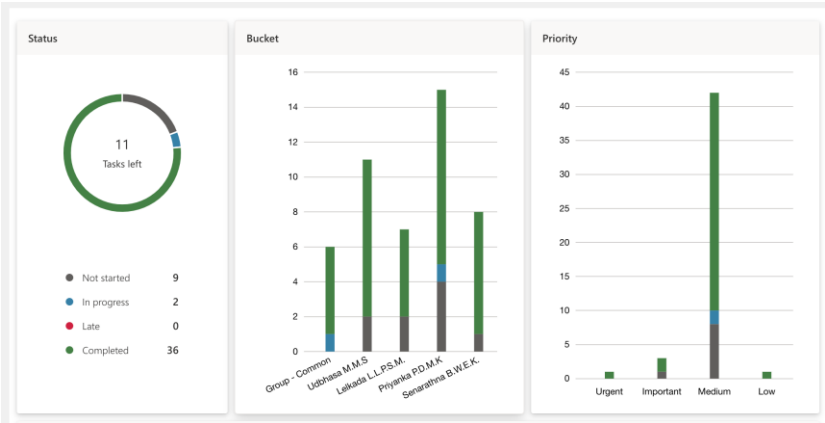


3. WORK PLANNER RECORDS



Lelkada L.L.P.S.M.

Add task

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~~grammar check model training~~

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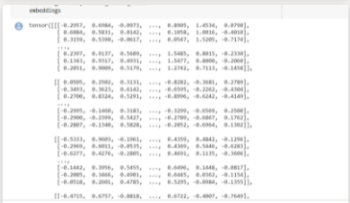

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~~word generation - word2vec development~~

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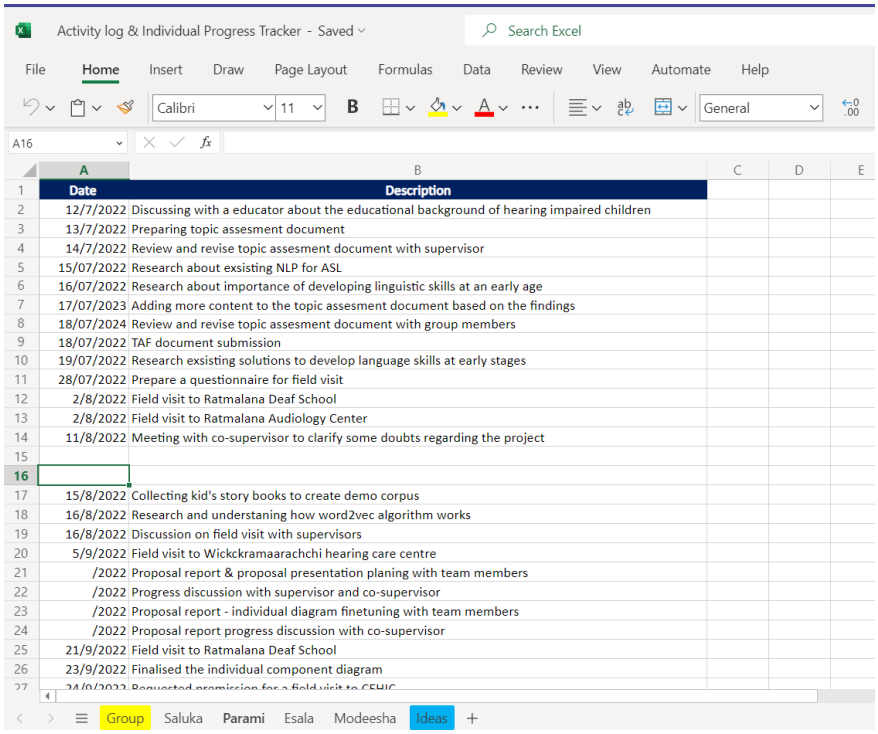
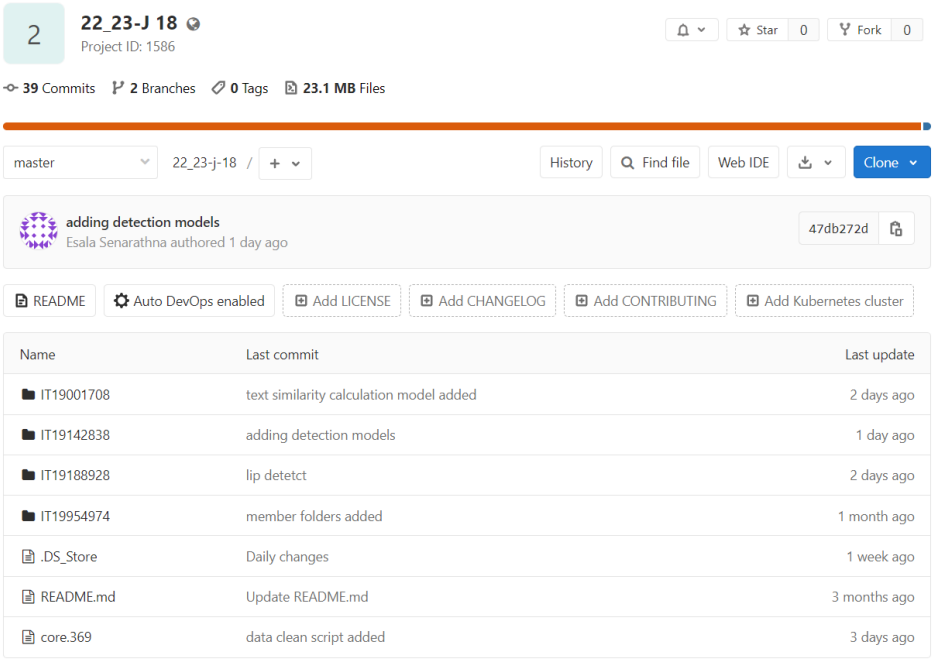


Activity log & Individual Progress Tracker - Saved

Date	Description
12/7/2022	Discussing with a educator about the educational background of hearing impaired children
13/7/2022	Preparing topic assesment document
14/7/2022	Review and revise topic assesment document with supervisor
15/07/2022	Research about exsisting NLP for ASL
16/07/2022	Research about importance of developing linguistic skills at an early age
17/07/2023	Adding more content to the topic assesment document based on the findings
18/07/2024	Review and revise topic assesment document with group members
18/07/2022	TAF document submission
19/07/2022	Research exsisting solutions to develop language skills at early stages
28/07/2022	Prepare a questionnaire for field visit
2/8/2022	Field visit to Ratmalana Deaf School
2/8/2022	Field visit to Ratmalana Audiology Center
11/8/2022	Meeting with co-supervisor to clarify some doubts regarding the project
15/8/2022	Collecting kid's story books to create demo corpus
16/8/2022	Research and understaning how word2vec algorithm works
16/8/2022	Discussion on field visit with supervisors
5/9/2022	Field visit to Wickckramaarachchi hearing care centre
/2022	Proposal report & proposal presentation planing with team members
/2022	Progress discussion with supervisor and co-supervisor
/2022	Proposal report - individual diagram finetuning with team members
/2022	Proposal report progress discussion with co-supervisor
21/9/2022	Field visit to Ratmalana Deaf School
23/9/2022	Finalised the individual component diagram

Group Saluka Parami Esala Modeesha Ideas

4. GITLAB CONTRIBUTION HISTORY



22_23-J 18

Project ID: 1586

Star 0 Fork 0

39 Commits 2 Branches 0 Tags 23.1 MB Files

master 22_23-j-18 / History Find file Web IDE Clone

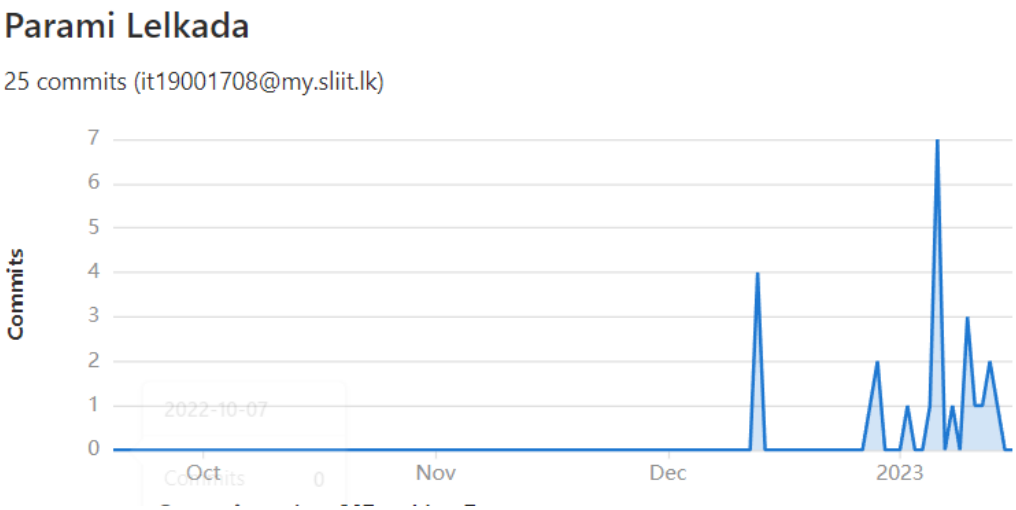
adding detection models

Esala Senarathna authored 1 day ago

47db272d

README Auto DevOps enabled Add LICENSE Add CHANGELOG Add CONTRIBUTING Add Kubernetes cluster

Name	Last commit	Last update
IT19001708	text similarity calculation model added	2 days ago
IT19142838	adding detection models	1 day ago
IT19188928	lip detetct	2 days ago
IT19954974	member folders added	1 month ago
.DS_Store	Daily changes	1 week ago
README.md	Update README.md	3 months ago
core.369	data clean script added	3 days ago



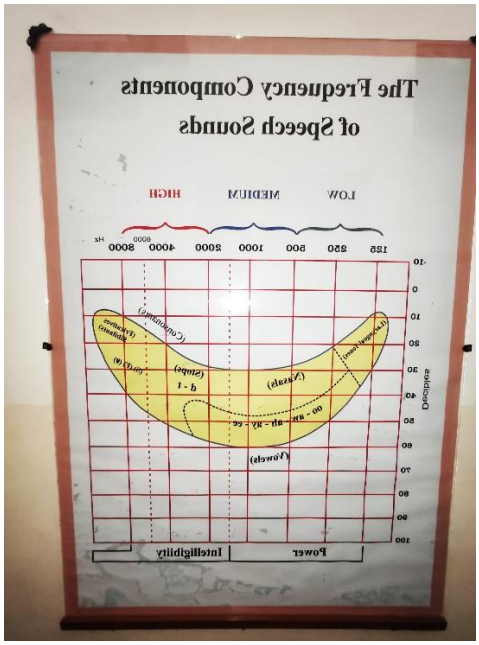
5. FIELD VISITS

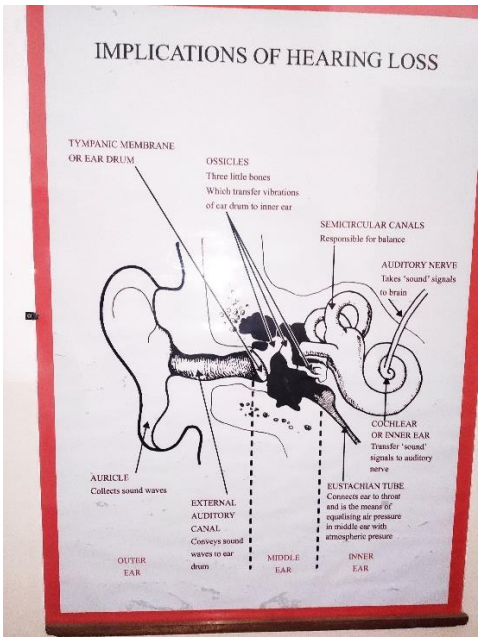
5.1 Physical Meetings

Photographs taken on field visit to CEHIC


CEHIC

Photographs taken from field visit to Wickramarachchi Hearing Care Centre

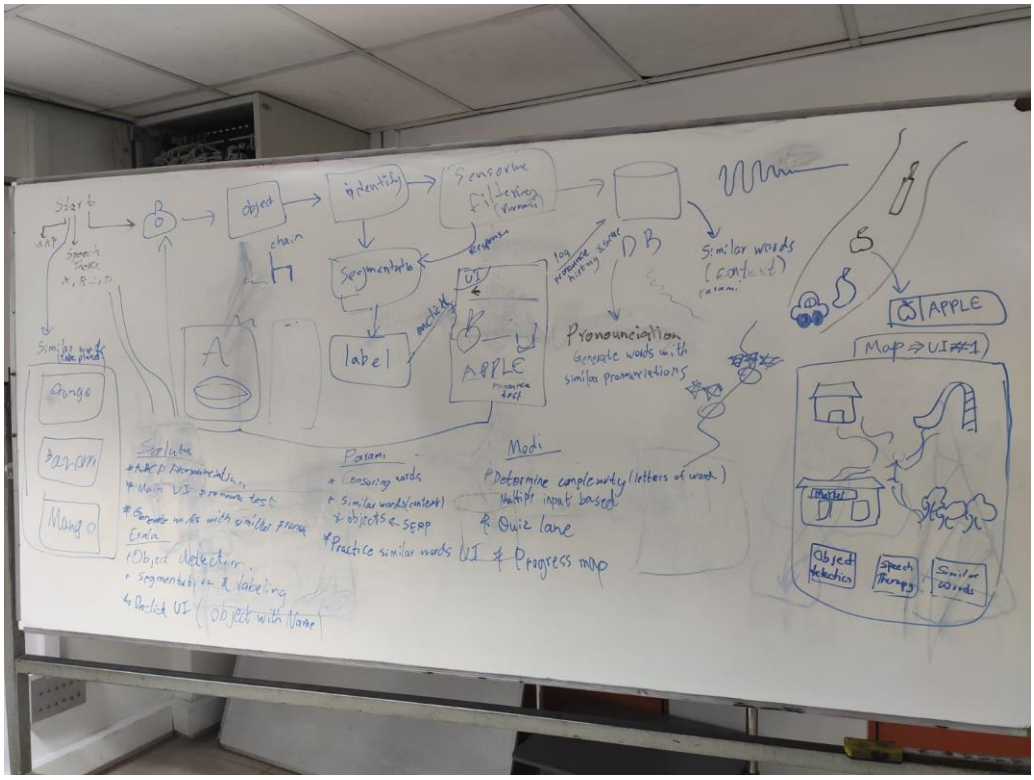




6. MEETINGS

6.1 Physical Meetings

Photographs taken at physical group meetings and planning sessions



6.2 Online Meetings

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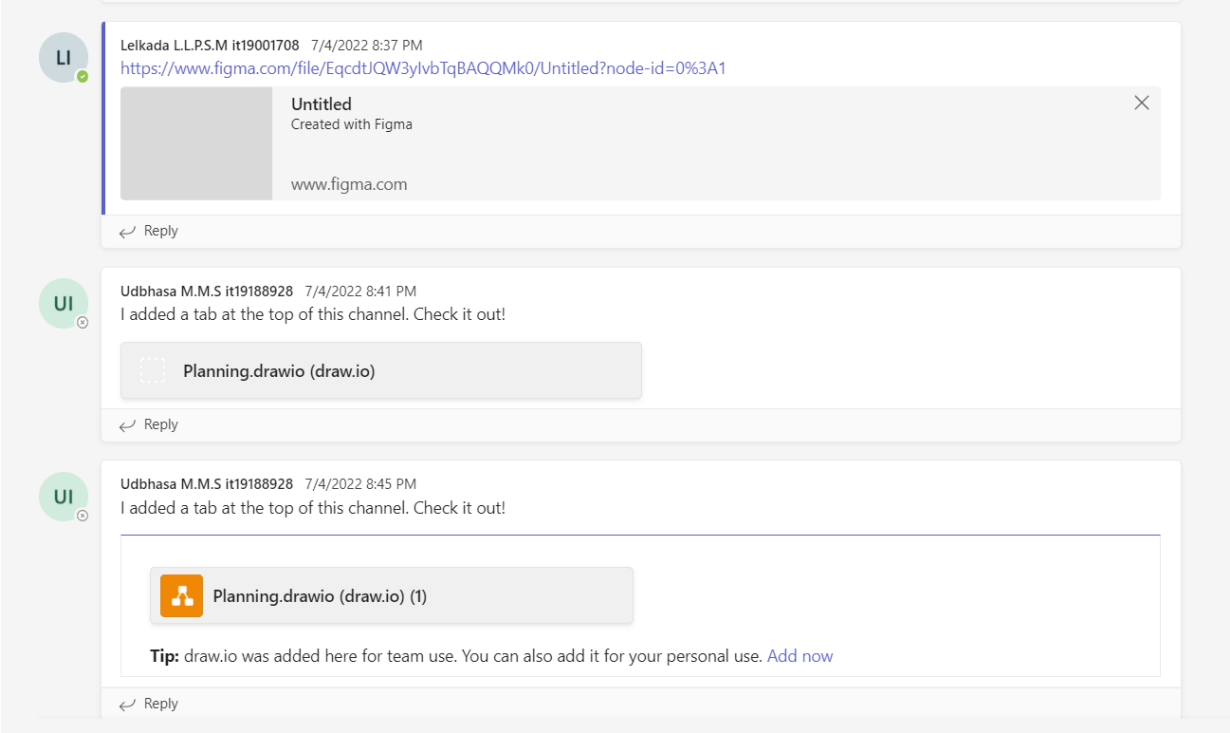

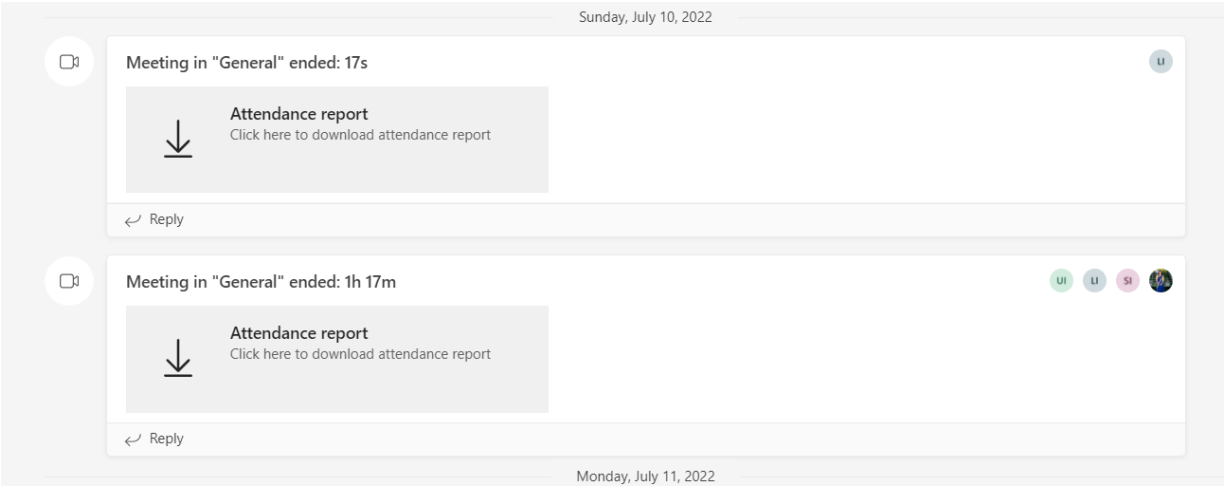

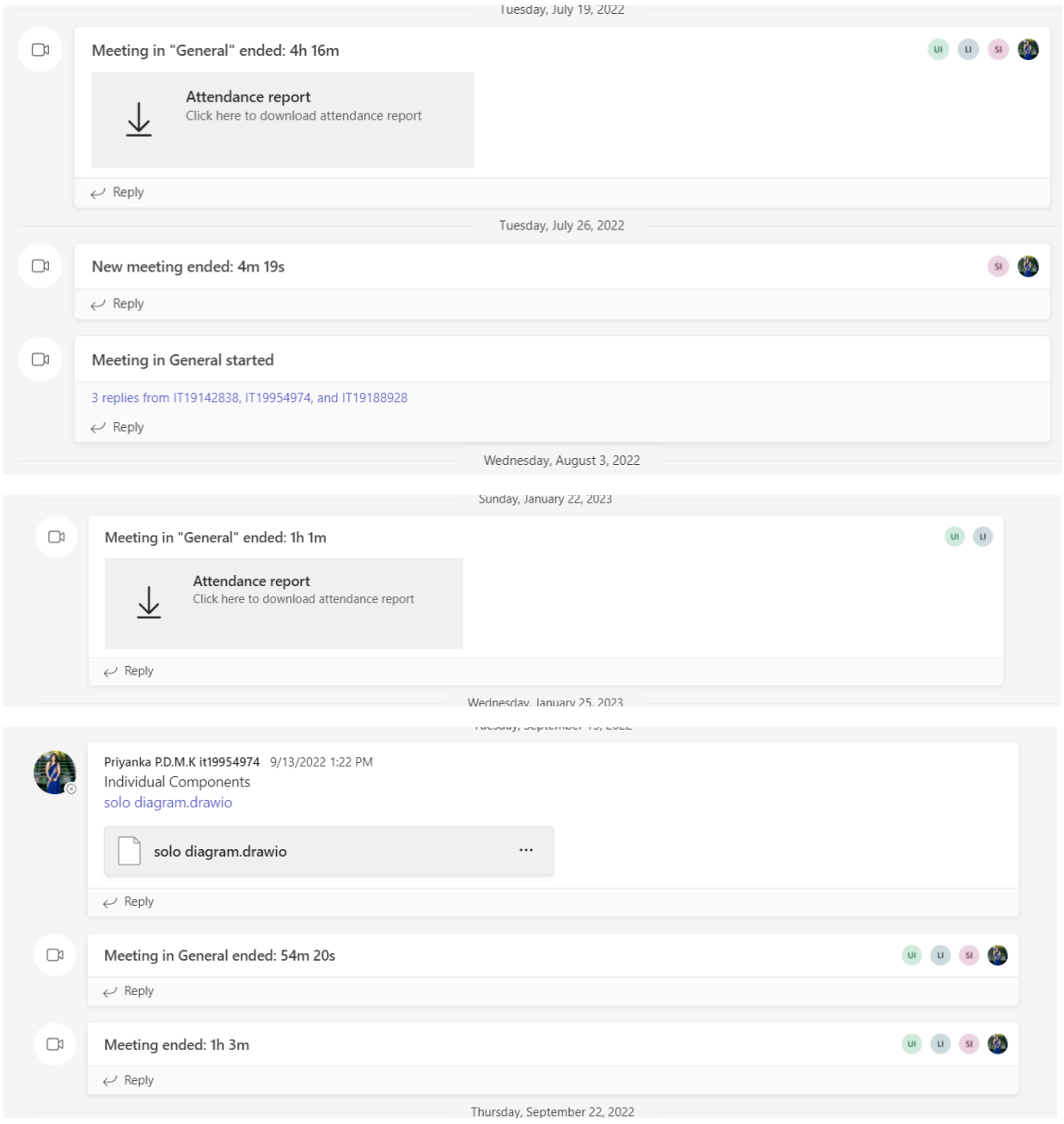
Tuesday, July 19, 2022
Meeting in "General" ended: 4h 16m
Attendance report
Click here to download attendance report
Reply
Tuesday, July 26, 2022
New meeting ended: 4m 19s
Reply
Meeting in General started
3 replies from IT19142838, IT19954974, and IT19188928
Reply
Wednesday, August 3, 2022
Sunday, January 22, 2023
Meeting in "General" ended: 1h 1m
Attendance report
Click here to download attendance report
Reply
Wednesday, January 25, 2023
Priyanka P.D.M.K it19954974 9/13/2022 1:22 PM
Individual Components
solo diagram.drawio
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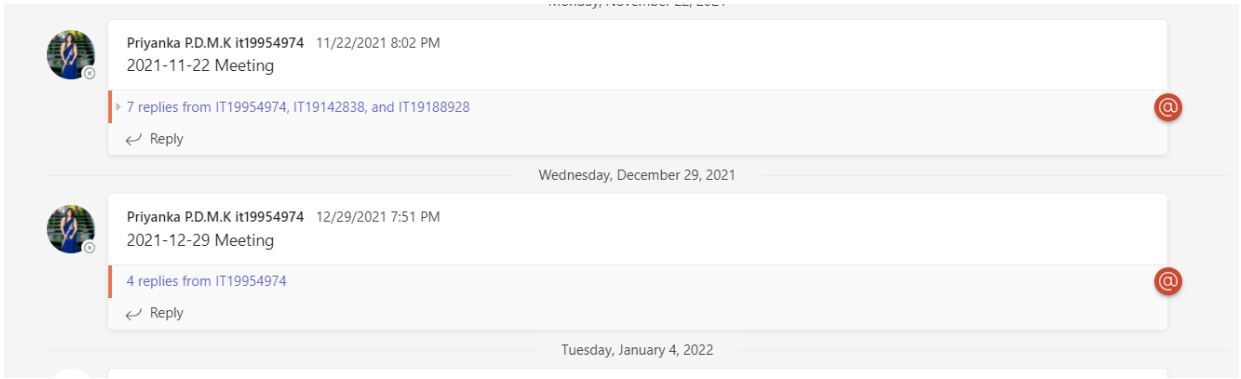
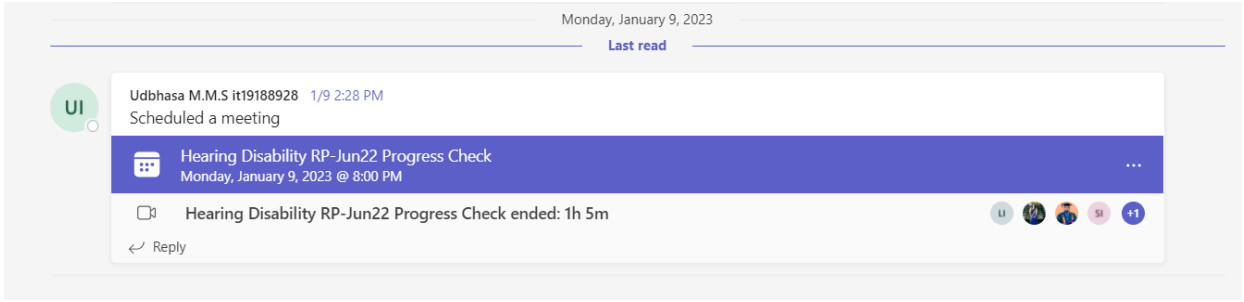
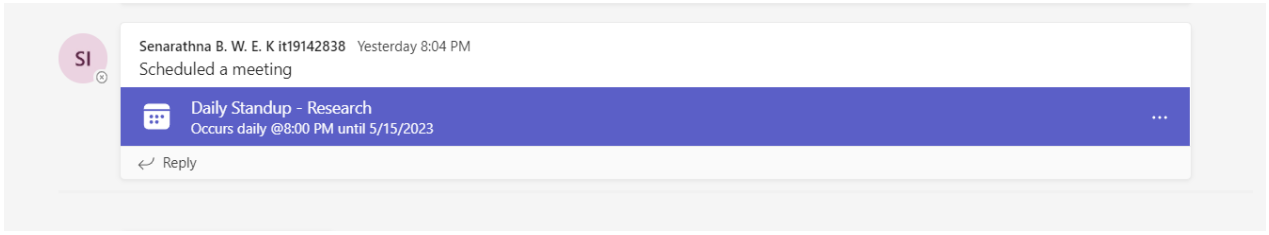
Reply
Meeting in General ended: 54m 20s
Reply
Meeting ended: 1h 3m
Reply
Thursday, September 22, 2022







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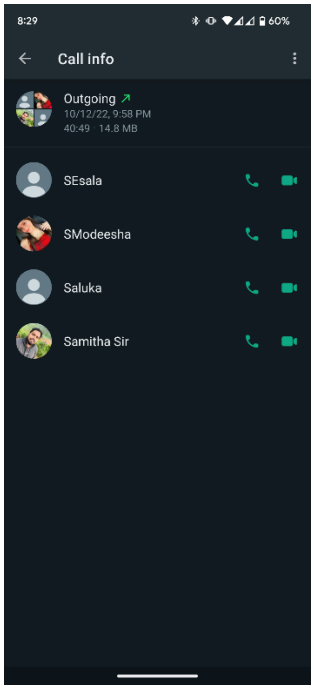
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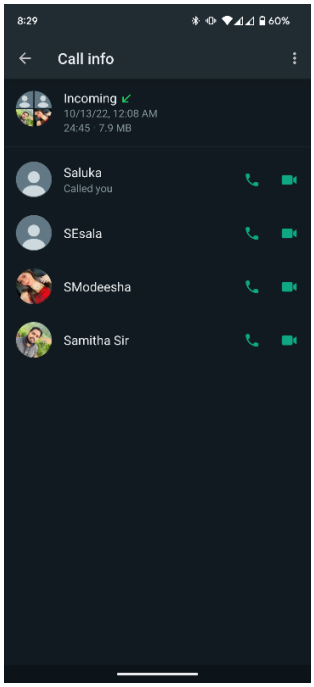
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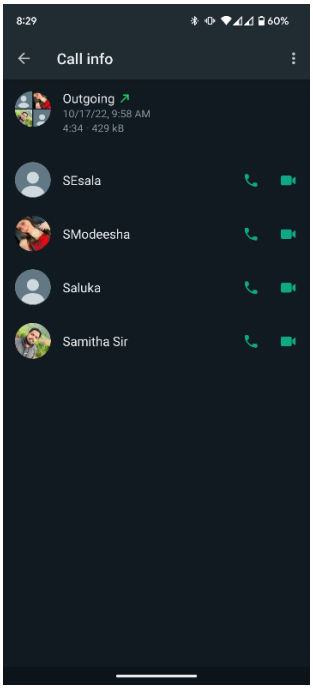
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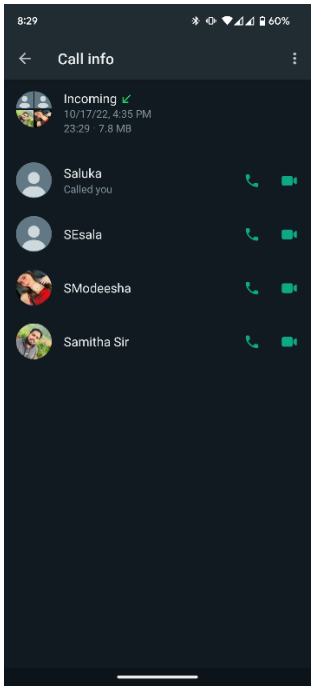
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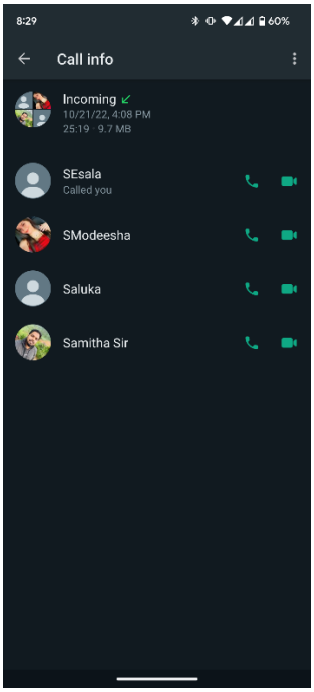
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Saluka
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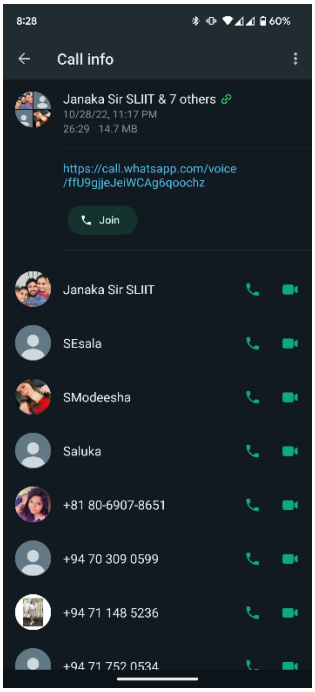
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Janaka Sir SLIIT & 7 others
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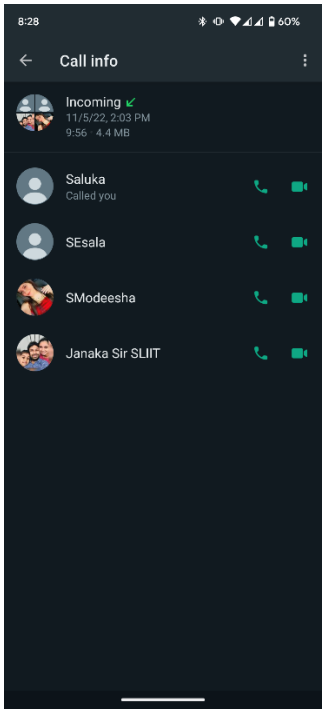
+94 70 309 0599
+94 71 148 5236
+94 71 752 0534



7. TASK OUTPUTS

```
#The dense vector representations of text are contained within the outputs 'last_hidden_state' tensor
embeddings = output.last_hidden_state
embeddings
```

```
tensor([[[-0.2957,  0.6984, -0.0973,  ...,  0.8905,  1.4534,  0.0790],
         [ 0.6084,  0.5831,  0.0142,  ...,  0.1058,  1.0016, -0.4010],
         [ 0.3159,  0.5390, -0.0617,  ...,  0.0547,  1.5205, -0.7174],
         ...,
         [ 0.2397,  0.9137,  0.5609,  ...,  1.5485,  0.8015, -0.2330],
         [ 0.1343,  0.9317,  0.4931,  ...,  1.5477,  0.8000, -0.2060],
         [ 0.2051,  0.9009,  0.5179,  ...,  1.2742,  0.7113, -0.1458]],

        [[ 0.0505,  0.2502,  0.3131,  ..., -0.8282, -0.3681,  0.2789],
         [-0.3493,  0.3623,  0.6142,  ..., -0.6595, -0.2262, -0.4304],
         [ 0.2700,  0.8324,  0.5291,  ..., -0.8996, -0.6242, -0.4149],
         ...,
         [-0.2995, -0.1460,  0.3183,  ..., -0.3299, -0.6569,  0.2500],
         [-0.2900, -0.2399,  0.5427,  ..., -0.2789, -0.6867,  0.1762],
         [-0.2807, -0.1340,  0.5828,  ..., -0.2052, -0.6964,  0.1302]],

        [[-0.5333,  0.9603, -0.1961,  ...,  0.4359,  0.4842, -0.1296],
         [-0.2969,  0.6011, -0.0535,  ...,  0.4369,  0.5446, -0.6283],
         [-0.6277,  0.4276, -0.2805,  ...,  0.4691,  0.1135, -0.3606],
         ...,
         [-0.1442,  0.3956,  0.5455,  ...,  0.6496,  0.1448, -0.0817],
         [-0.2085,  0.3466,  0.4901,  ...,  0.6445,  0.0362, -0.1154],
         [-0.0518,  0.2601,  0.4785,  ...,  0.5295, -0.0984, -0.1355]],

        [[-0.4715,  0.6757, -0.8818,  ...,  0.6722, -0.4007, -0.7649],
         [ 0.0566,  0.6669, -0.7236,  ...,  0.9365,  0.0215, -0.8219],
         [-0.3619,  0.5638, -0.5678,  ...,  1.0558, -0.4939, -0.2260],
```


trouble
services
foreign
shares
support
can
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vault
jewellery
jewels
friends
bank
currency
rates
cutting
bank
thieves
fox
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bank
his
bank
river
soldiers
array
cubs
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flowers
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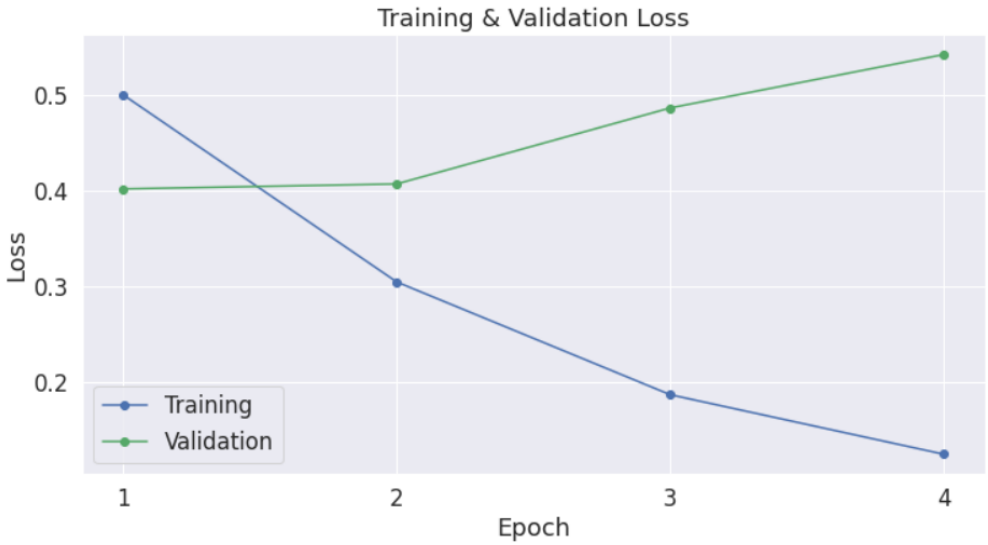
Training & Validation Loss
Loss
0.5
0.4
0.3
0.2
Training
Validation
1
2
3
4
Epoch

```
from transformers import AutoTokenizer, AutoModel
import torch

#initialize our model and tokenizer:
tokenizer = AutoTokenizer.from_pretrained(modelPath)
model = AutoModel.from_pretrained(modelPath)

# initialize dictionary: stores tokenized sentences
token = {'input_ids': [], 'attention_mask': []}
for sentence in train_text:
----
    # encode each sentence, append to dictionary
    new_token = tokenizer.encode_plus(sentence, max_length=128,
                                      truncation=True, padding='max_length',
                                      return_tensors='pt')
----
    #print(new_token)
    token['input_ids'].append(new_token['input_ids'][0])
    token['attention_mask'].append(new_token['attention_mask'][0])
```

```
# reformat list of tensors to single tensor
token['input_ids'] = torch.stack(token['input_ids'])
token['attention_mask'] = torch.stack(token['attention_mask'])
```

```
#Process tokens through model:
output = model(**token)
output.keys()
```

```
#The dense vector representations of text are contained within the outputs 'last_hidden_state' tensor
embeddings = output.last_hidden_state
#embeddings
```

```
embeddings.shape
```

8. GANTT CHART

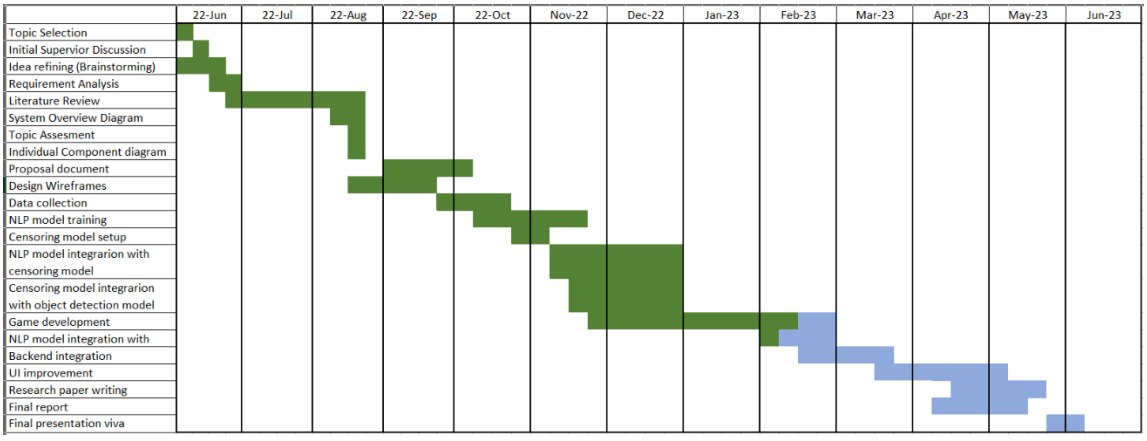

Figure 2: Gantt chart

9.WORK-BREAKDOWN STRUCTURE

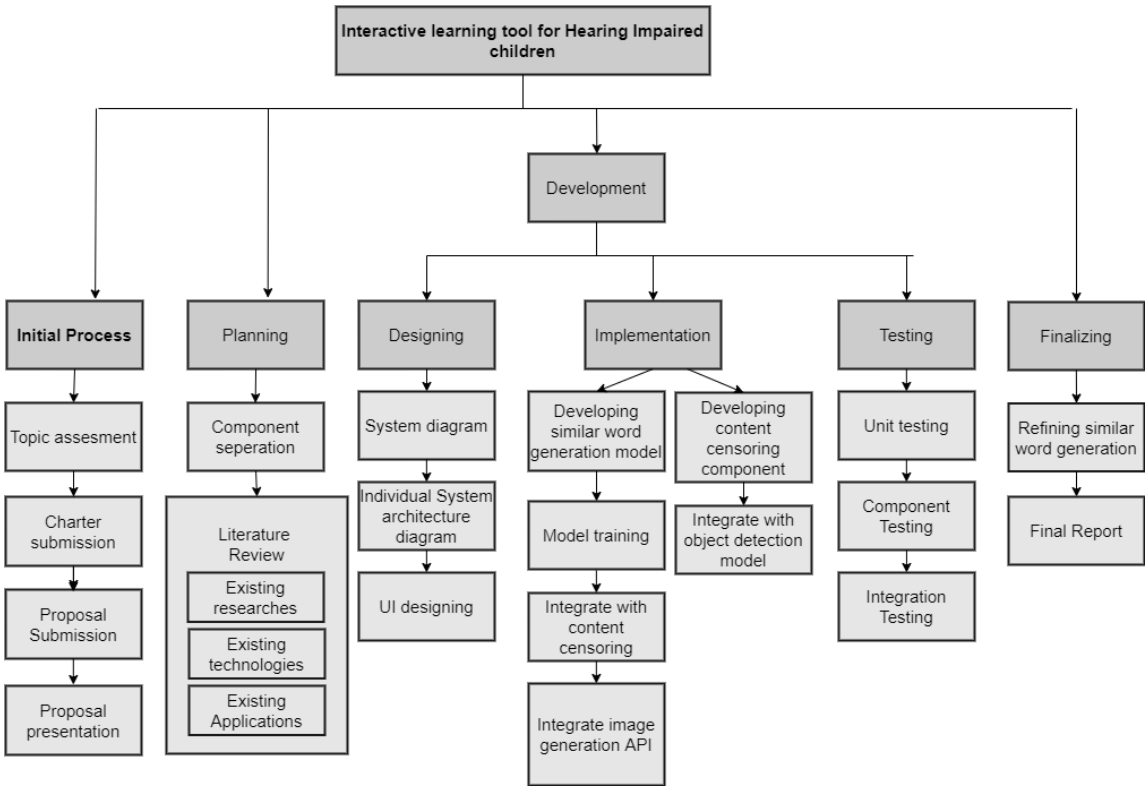

Figure 1: WBS