



Every Child is Special



AI-based Personalized Rehabilitation for Dyslexia and Dyscalculia Adolescents

Group ID: 24-25J-233

OUR TEAM



Prof. Samantha Thelijjagoda
Supervisor



Dr. Junius Anjana
Co - Supervisor



Dr Asiri Hewamalage
External Supervisor



Silva T.U.D
IT21318320



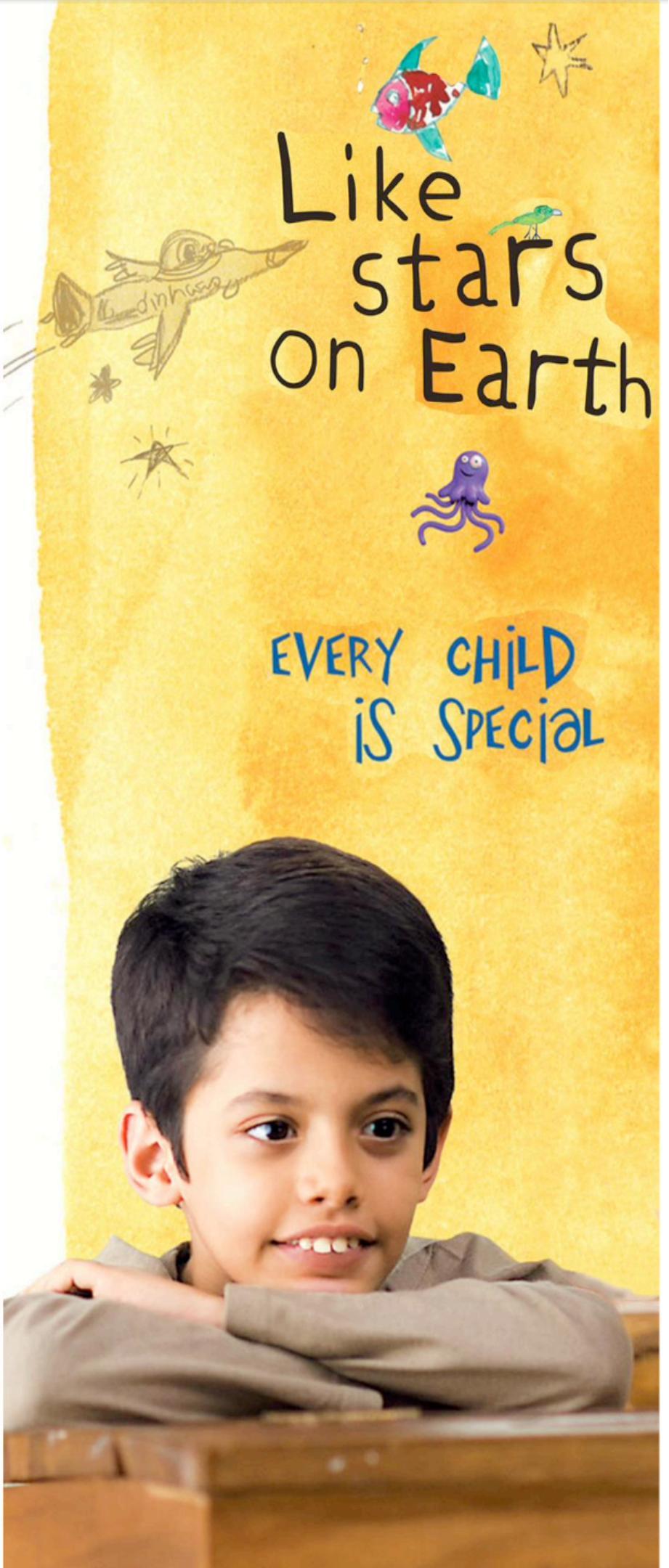
Madusanka G.K.I
IT21189944



Thalangama T.P
IT21223594



Dissanayake M.G.T.W
IT21319174



CONTENT

1. Introduction
2. Proven Gap and the Solution
3. System Overview Diagram
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6. Individual Components
7. Commercialization Aspect





INTRODUCTION



Learning Disabilities

Dyslexia

➤ Reading Challenges

➤ Writing Challenges

Most children have no idea

how they are supposed to see.

So when words look like this,
they assume everyone sees

the same way.

Dyscalculia

➤ Number Challenges

➤ Arithmetic Challenges

➤ Spatial Challenges



Grade	Multiple Impairments		Hearing Impairments		Visual Impairments		Speech Language Difficulties	Dyslexia	Intellectual Impairments	Physical Disabilities	Epilepsy	Emotional Problems	Other	Total											
			Complete	Half	Complete	Half																			
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F									
Grade 1	327	202	15	12	41	39	19	6	386	297	454	172	149	81	417	251	145	106	50	27	217	55	100	63	2320
Grade 2	258	170	16	14	58	55	24	11	485	394	410	179	172	86	510	271	148	111	50	36	263	65	84	69	2478
Grade 3	279	169	8	14	68	52	25	15	663	626	358	139	283	141	571	311	159	98	57	33	265	73	100	61	2336
Grade 4	256	135	9	13	80	47	37	13	736	652	304	149	291	141	609	356	173	95	60	34	224	72	97	65	2876
Grade 5	197	166	17	11	59	63	23	23	690	704	230	94	255	148	533	304	139	95	42	42	233	64	87	42	2505
Grade 6	138	108	10	12	88	52	25	15	600	745	155	46	303	133	403	196	127	83	48	30	212	54	92	62	2261
Grade 7	135	58	6	15	71	60	29	14	792	893	158	50	227	113	345	167	117	74	55	30	192	51	78	49	2205
Grade 8	107	59	11	11	60	78	23	16	904	942	128	54	203	68	323	159	120	70	53	39	239	59	71	40	2242
Grade 9	67	46	12	9	63	51	24	18	716	1020	96	44	226	102	294	132	106	77	40	31	184	52	71	35	1899
Grade 10	71	30	6	6	54	41	30	18	636	931	74	32	162	72	198	134	98	77	26	32	184	54	45	32	1584
Grade 11	42	25	12	12	44	36	10	18	613	736	54	29	120	52	170	114	64	74	19	24	135	36	33	23	1316
Grade 11 (Repeaters)	1	2	0	1	2	4	2	0	39	42	5	1	6	3	5	8	5	4	2	0	2	1	3	3	72
Total	1878	1170	122	130	688	578	271	167	7260	7982	2426	989	2397	1140	4378	2403	1401	964	502	358	2350	636	861	544	24534

Disability among Students in General Class and Government Schools, Recorded in the Year 2019



Proven Gap and The Solution

LexAyudha

Problem into a Solution

Lack of adaptive, emotionally-aware, and personalized multisensory

educational systems



Develop a personalized assistive learning platform



Our Solution align with Objective



Develop a personalized assistive learning platform for children with dyslexia and dyscalculia



- AI Driven real-time personalization
 - Chromatic Adjustments
 - Theme Adjustments
 - Speech pace Adjustments
 - Emotion Recognition
 - Adaptive Math Modules

Prototype to Functional Units



➤ Modular Breakdown

- Chromatic Variation Module: ASR + BERT (text adaptation)
- Personalized Feedback through Emotion Analysis: Custom CNN model
- Touch Math Integration: ASR + React.js for interactive math
- Personalized Speech pace Module: Hybrid CNN-RNN model

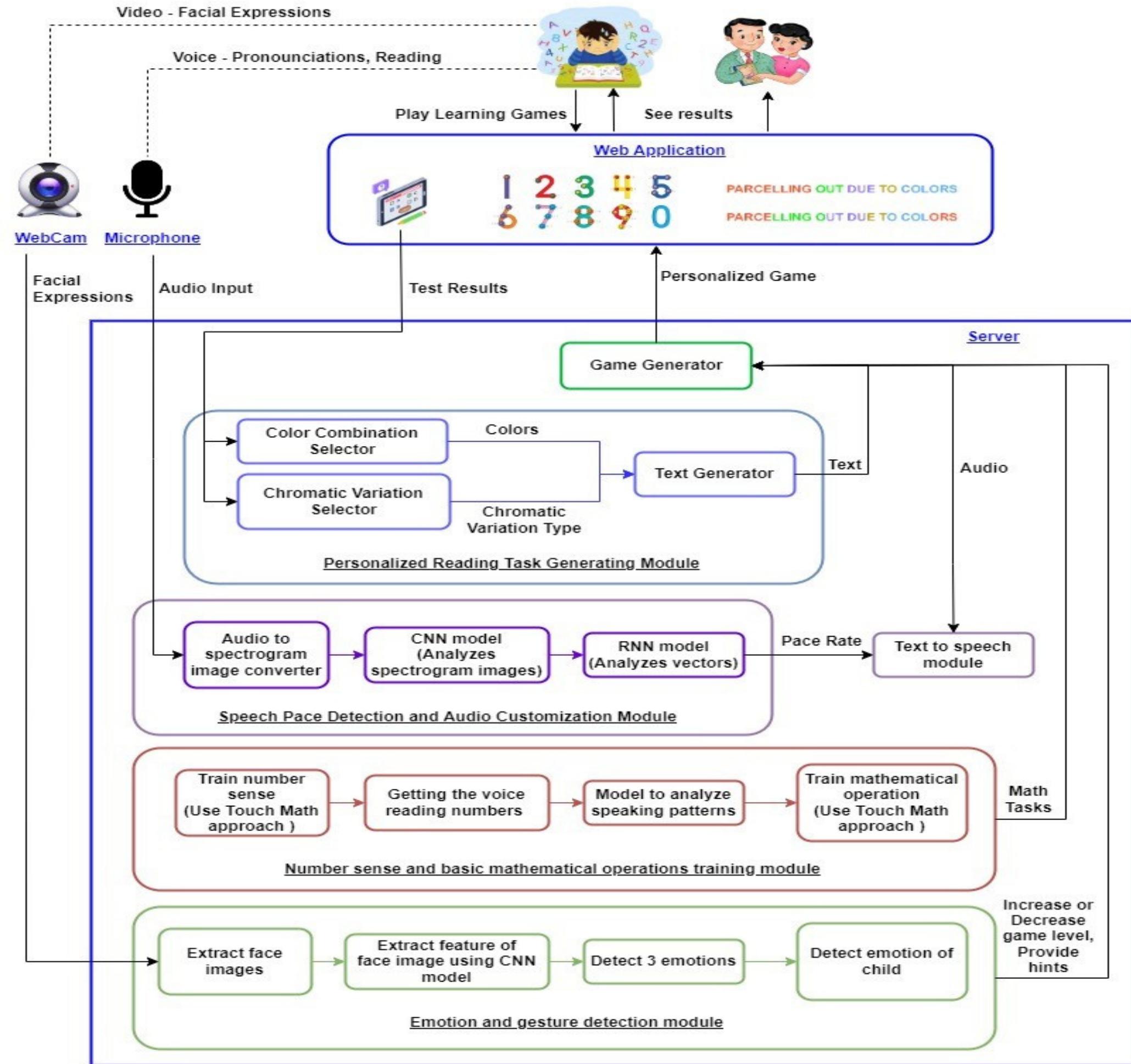
➤ Scalability

- Cloud base MongoDB for data storage
- Firebase storage bucket for media file storage
- Microservice deployment using Docker and Kubernetes





SYSTEM OVERVIEW DIAGRAM





SOFTWARE DEVELOPMENT PROCESS

Project Details

3 Implementation

- Break down user stories into tasks
- Assign tasks to team members
- Develop code according to architecture
- Conduct unit tests and code reviews



4 Testing

- Perform functional testing
- Execute integration tests
- Conduct regression testing
- Gather feedback and adjust.

5 Deployment

- Prepare deployment plan
- Perform system deployment
- Monitor initial deployment issues.

6 Maintenance

- Resolve issues and bugs
- Implement user feedback changes
- Ensure regular updates and improvements

Software Development Life Cycle



Figma Prototype

2 Design

- Create wireframes and prototypes
- Develop system architecture
- Plan database schemas and data flow
- Design user interface specifications

1 Requirement Gathering and Analysis

- Collect user stories and requirements
- Define acceptance criteria
- Analyze feasibility and risks
- Prioritize backlog items

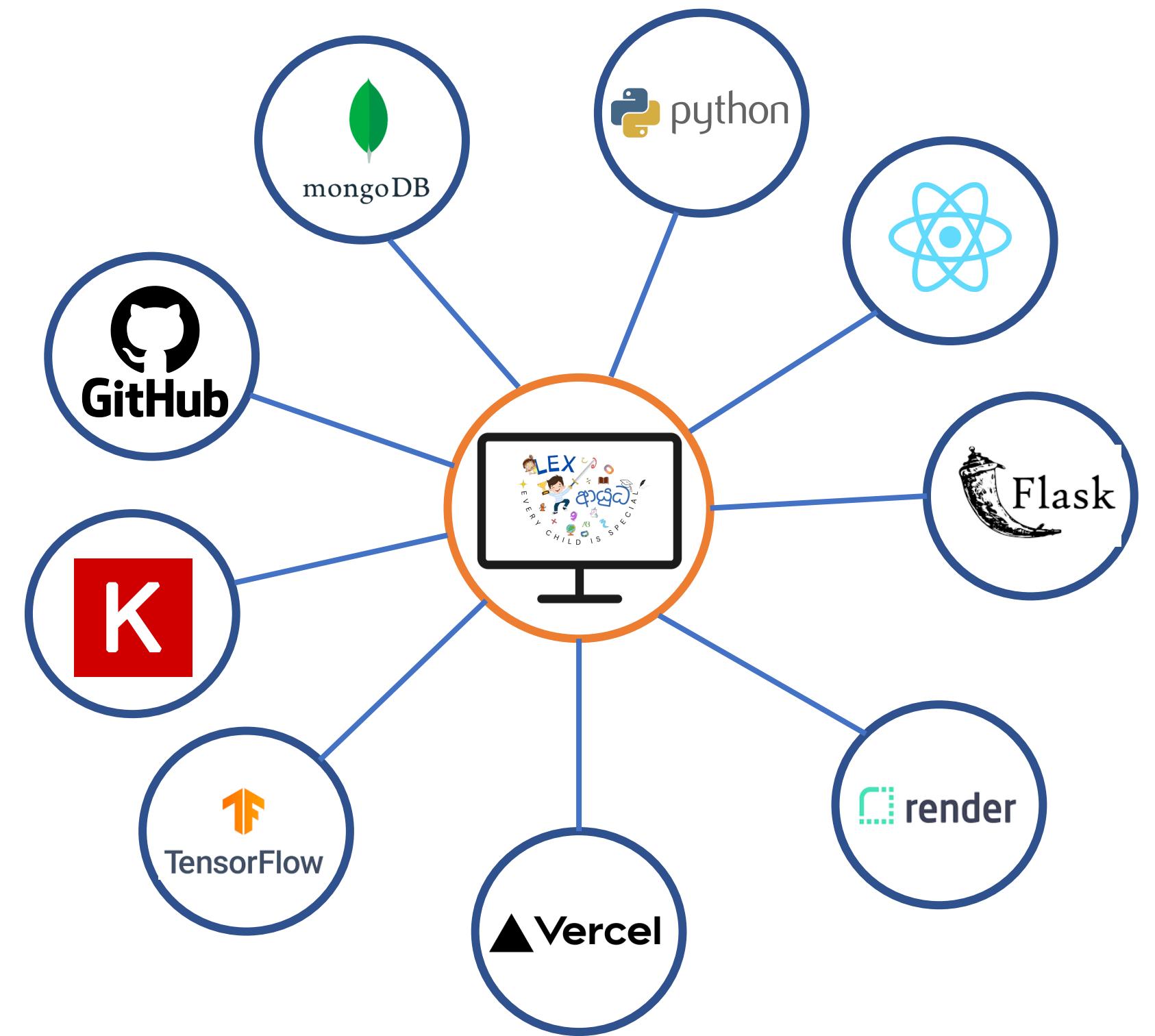


Project Management - Trello

Version Control - Github



TECHNOLOGIES



Frontend

- React
- Ant Design

Backend

- Flask
- Node Js
- RabbitMQ

Machine Learning and Deep learning

- Python
- Jupyter Notebook
- TensorFlow
- Keras
- OpenCV
- Keggale

Version Control and Project Management

- Github
- Trello

Technical Concepts

- Machine Learning
- Image Processing
- Convolutional Neural Network (CNN)
- Recurrent Neural Network (RNN)
- Containerization
- Microservices



Best Practices

- Modularity
- Fallback Mechanisms
- API Gateways with RateLimits
- Rest API for Inter Server Communication
- RabbitMQ
- Error Logs
- Caching



RabbitMQ Dashboard – Async Messaging

The screenshot shows the CloudAMQP interface. On the left, a sidebar includes sections for Overview, Cluster, Definitions, MONITORING (Alarms, Diagnostics), Metrics, Log, and Networking (Firewall). The main area displays a "General" section with details like Region (azure-arm::eastus), Cluster (toucan.lmq.cloudamqp.com), Hosts (toucan-01.lmq.cloudamqp.com), and Created at (2025-05-01 09:32 UTC+00:00). Below this is an "Active Plan" section featuring a cartoon lemur icon and a "Loyal Lemming" badge. A "Upgrade plan" button is present. The bottom section is titled "AMQP details" and lists User & Vhost (glihgkdl), Password (***), Ports (5672), and URL (amqps://glihgkdl:***@toucan.lmq.cloudamqp.com/glihgkdl). There's also a "Limits" section with metrics for Open Connections (0 of 40), Max Idle Queue Time (28 days), Queues (7), and Messages (0).

AWS ECS Dashboard - Deployment

The screenshot shows the AWS ECS Task Details page for a service named "lexayudha_app-service-htm74at4". The top navigation bar shows the path: Amazon Elastic Container Service > Clusters > Lexayudha-Cluster > Services > lexayudha_app-service-htm74at4 > Tasks. The main content area shows a green banner indicating the service is updated. It includes tabs for Service overview, Health and metrics, Tasks (selected), Logs, Deployments, Events, Configuration and networking, Service auto scaling, and Tags. Under the Tasks tab, it shows one task (2ec381e598a64106adb178a506544229) with a status of Stopped. Below this is a table for Containers for task 2ec381e598a64106adb178a506544229, listing five containers: user, systemlog, spechrate, gateway, and email, all in a stopped state.

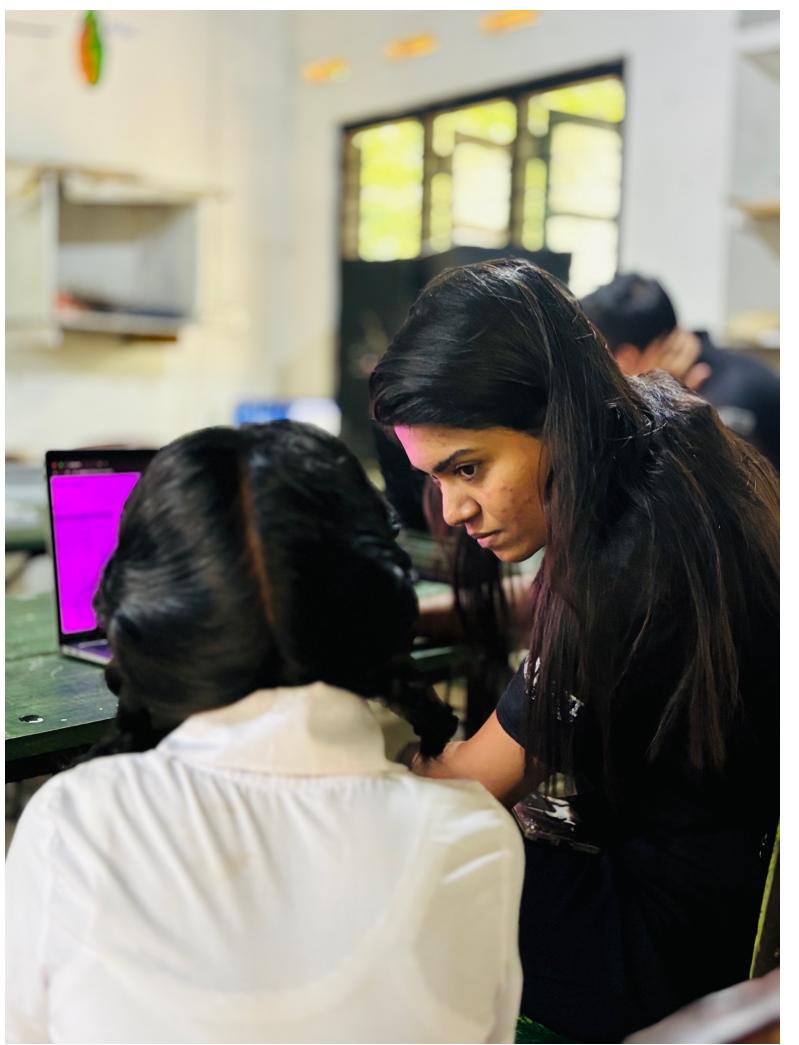
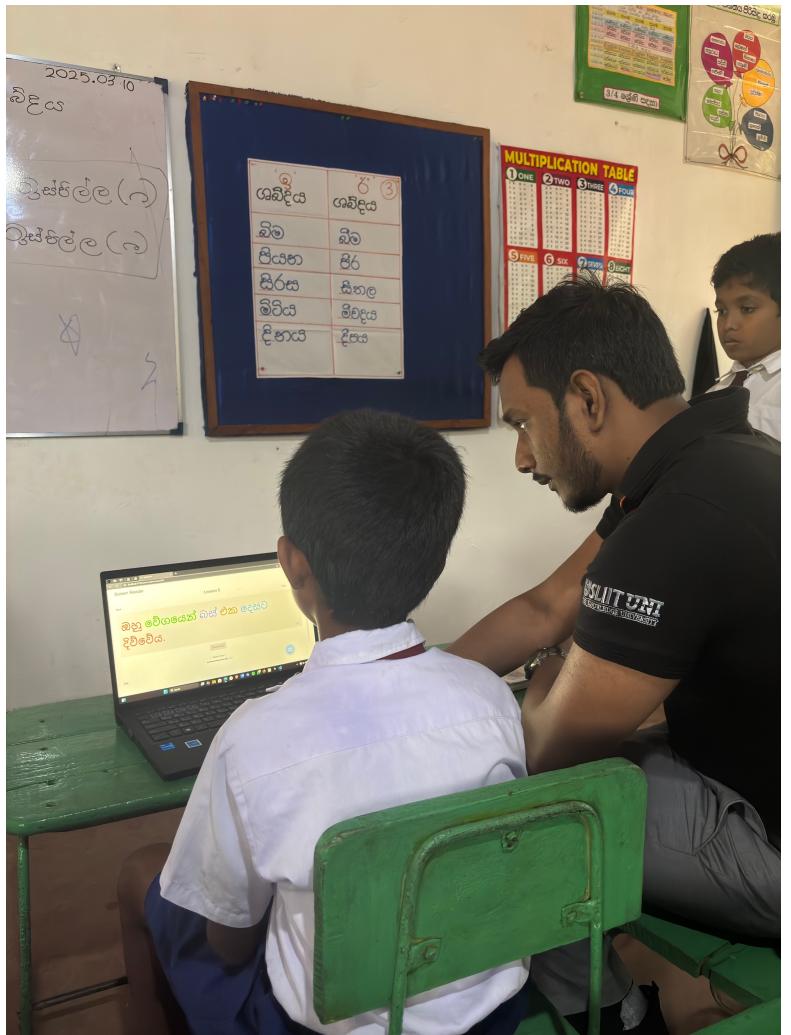
DockerHub - Containerization

The screenshot shows the DockerHub My Hub page. The sidebar includes sections for Explore, Repositories (selected), Collaborations, Settings, Default privacy, Notifications, Billing, Usage, Pulls, and Storage. The main area shows a "Repositories" section with a table of repositories under the namespace "chillbroh98". The table columns include Name, Last Pushed, Contains, Visibility, and Scout. The repositories listed are chillbroh98/lexayudha-user, chillbroh98/lexayudha-systemlog, chillbroh98/lexayudha-speechrate, chillbroh98/lexayudha-email, chillbroh98/lexayudha-auth, and chillbroh98/lexayudha-gateway, all pushed 1 day ago and containing images, with public visibility and inactive status. A "Create a repository" button is at the bottom right.

SendGrid Dashboard – Mail Service

The screenshot shows the SendGrid Dashboard. The top navigation bar shows the path: Twilio SendGrid > My SendGrid account. The main area features a chart titled "Hello! Here's your recent email activity." showing metrics over time from May 26 to 25. The chart includes segments for Requests (213), Delivered (75.59%), Opened (84.98%), Clicked (41.31%), Bounces (7.04%), and Spam Reports (0.00%). Below the chart is a section for "Important Next Steps" with a "Dismiss" button.

LexAyudha UAT and Feedback Collection





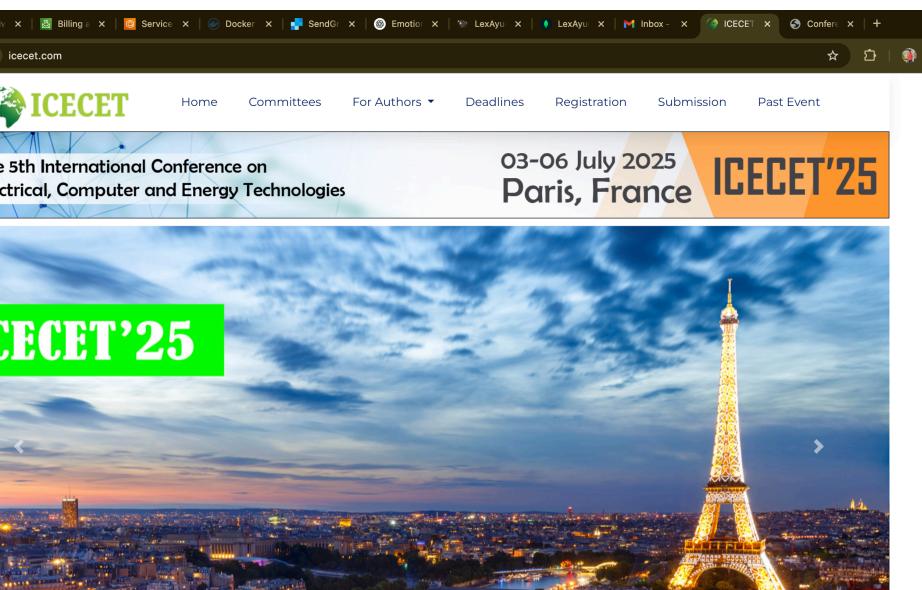
RESEARCH PUBLICATION & SLASSCOM REGISTRATION

Research Publication ICECET – camera

1 - 1 of 1				Show:	25	50	100	All	Clear All Filters
Paper ID	Title	Files	Status	Actions					
1835	<p>LexAyudha : Personalized AI-Driven Rehabilitation for Adolescents with Dyslexia and Dyscalculia</p> <p>Show abstract</p>	<p>Submission files:</p> <p>④ LexAyudha-Personalized AI-Driven Rehabilitation for Adolescents with Dyslexia and Dyscalculia.docx</p> <p>Camera Ready Submission files:</p> <p>④ LexAyudha Personalized AI-Driven Rehabilitation for Adolescents with Dyslexia and Dyscalculia.docx</p> <p>④ 2025145317.pdf</p> <p>④ Changelog and Figures.docx</p>	Paid_O Reviews	<p>Camera Ready:</p> <p><input type="checkbox"/> Edit Camera Ready Submission</p> <p><input checked="" type="checkbox"/> View Camera Ready Summary</p>					



SLAASCOM registration



SLASSCOM National Ingenuity Awards 2025 - Application Registration Status - Confirmed

SLASSCOM <no-reply@glueup.com>
Reply-To: Thulana Jayarathna <thulana.nuwani@slasscom.lk>
To: Umesha Silva <it21318320@my.sliit.lk>

Registration Confirmed

You are successfully registered for SLASSCOM National Ingenuity Awards 2025 - Application.

		ECER EVENTS W.L.L.		
World Wide Commercial Building, No:72, Al Hilal, D Ring Road, Doha, Qatar				
INVOICE				
Customer Details		Invoice No	Date	
Customer/Company: Ishara Madusanka		Q20251296	17.04.2025	
Address :	Sri Lanka Institute of Information Technology, SLIIT Malabe Campus, New Kandy Rd, Malabe 10115 - Sri Lanka	Customer Code	Due Date	
		ICECET-1835	18.04.2025	
Phone:	94766859740			
Email:	it21189944@my.sliit.lk			
Description	Quantity	Unit	Unit Price (QAR)	Amount (QAR)
ICECET 2025 Paris-France Conference registration fee (Conference dates: 03-06 July 2025)	1	PCS	1445,50	1445,50

Research Payment : QAR 1445



INDIVIDUAL COMPONENTS



IT21318320 | Silva T.U.D

BSc (Hons) Degree in Information Technology (specializing in Software Engineering)



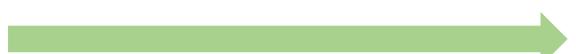
Teaching based on Chromatic Variations For Dyslexics to improve Reading Skills

Visual Stimuli and Reading: The Influence of Color



Dyslexia Reading Rulers and Dyslexia Glasses

INSPIRATION TO
REALITY



LexAyudha Chromatic Variation based Module



Research Gaps into Features

	A	B	C	D	Lexayudha
Chromatic Variation approach	✓	✗	✗	✗	✓
Color variation effectiveness	✗	✓	✓	✗	✓
Complexity adjustments	✗	✗	✗	✗	✓
Personalized Lessons	✗	✗	✗	✗	✓
Text to Speech	✗	✗	✗	✓	✓

A - On the Role of Color in Reading and Comprehension Tasks in Dyslexic Children and Adults

C - Nessy

B - Chromatic visual evoked potentials: A review of physiology, methods and clinical applications

D – Claro Speek



- ❖ Predefined lesson planning
- ❖ Personalized Lesson Creation
- ❖ Application of chromatic variations



- ❖ Customizable PDF viewer
- ❖ Realtime Feedback

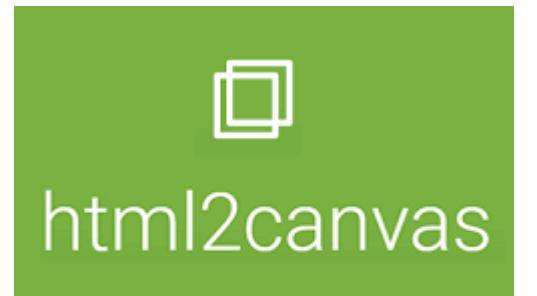
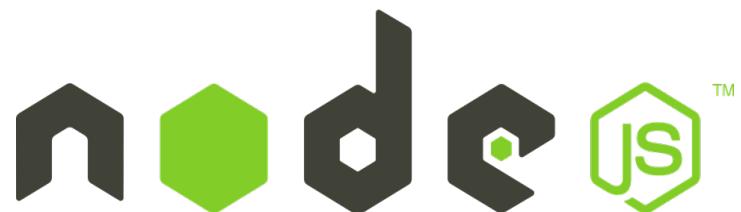
Component Technologies



Flask



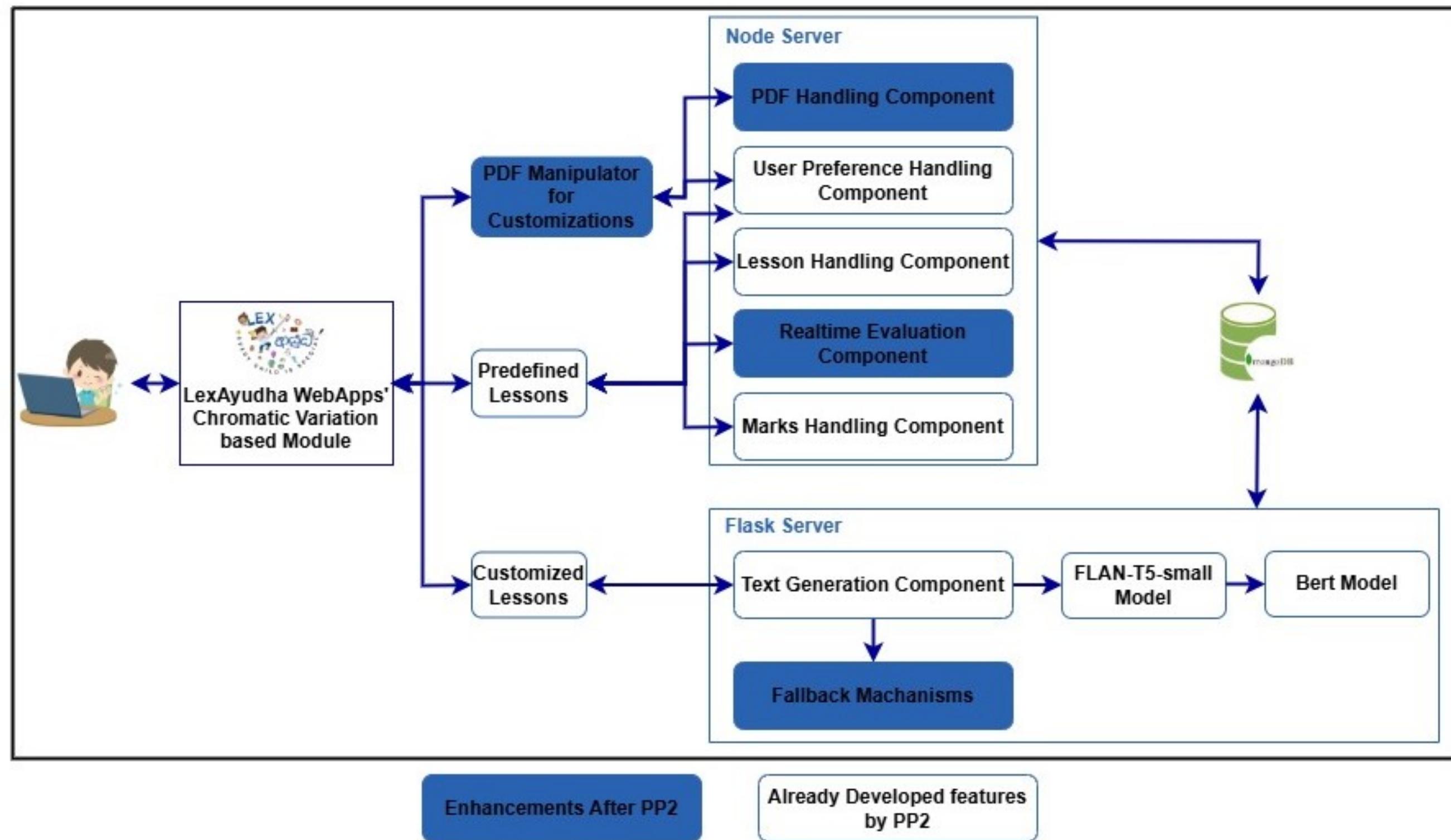
TensorFlow



Google
BERT



Methodology



Smart Design Choices: NFRs & Best Practices



Non-Functional Requirements

- ❖ Fast performance with lightweight models
- ❖ Reliable output using fallback logic
- ❖ Scalable design (easy to upgrade models)
- ❖ Easy to use - simple function calls
- ❖ Modular code for easy maintenance
- ❖ Always available - caching + fallback

Best Practices

- ❖ Modular, reusable code
- ❖ Prompt engineering over retraining
- ❖ Used Hugging Face Transformers
- ❖ Configurable parameters
- ❖ Caching for efficiency
- ❖ Error handling & logging
- ❖ Fallback for reliability
- ❖ Evaluated model accuracy

Design and Development Aspects



Design Aspect (Architecture & Planning)

- ❖ Caching : Improves performance
- ❖ Fallback Mechanism : Ensures output availability
- ❖ Prompt Engineering : Guides FLAN-T5 toward desired outputs
- ❖ Modular Design : Separates components

Development Aspect (Implementation & Engineering)

- ❖ Transformers Integration : Uses Hugging Face library
- ❖ Post-Processing : Applies regex and cleaning rules
- ❖ Error Handling : Catches exceptions
- ❖ Configurable Parameters : Allows easy customization



Model & Dataset Justification

Dataset Selection

- ❖ Relevance to Task
- ❖ Quality and Cleanliness
- ❖ Balanced Classes

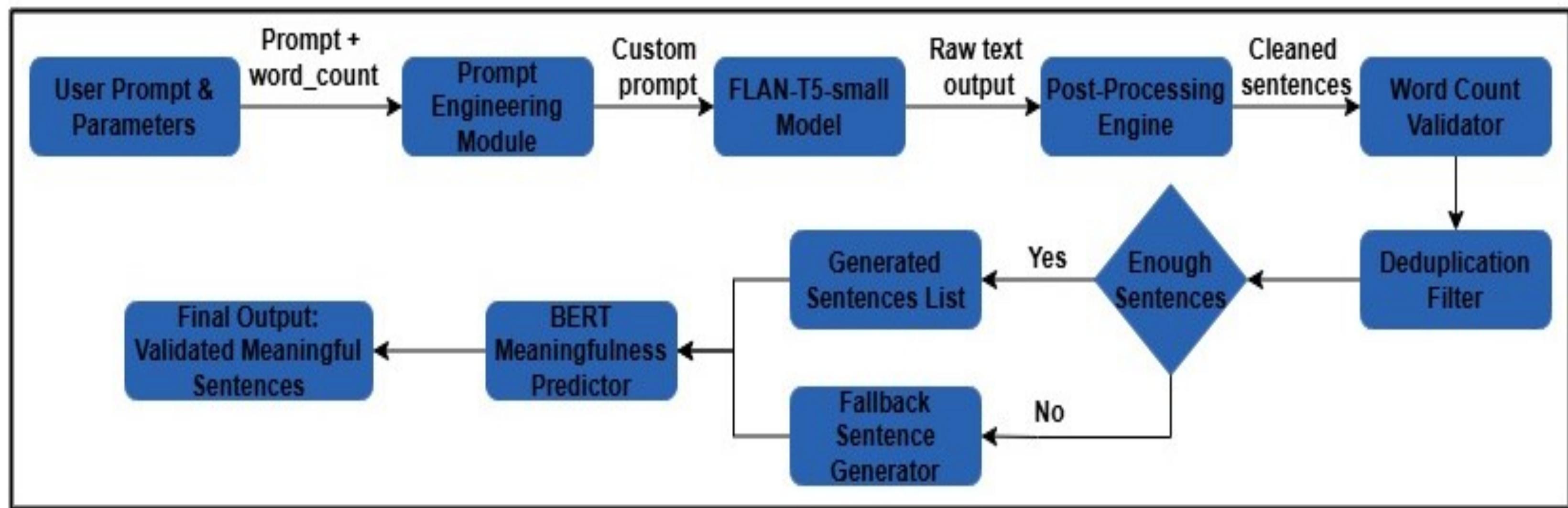
Model Selection

- ❖ FLAN-T5-small: Zero-Shot Generation
- ❖ Lightweight and Efficient
- ❖ Bert for Semantic Evaluation
- ❖ Fine-Tuned BERT: Custom Adaptation
- ❖ Modular Use of Models

FEATURE	FLAN-T5-SMALL	T5-BASE	GPT-2 SMALL	BERT + CLASSIFIER
Zero-shot Capable	✓ Yes	✗ No	✗ No	✗ No
Lightweight & Fast	✓ Yes	⚠ Slower	⚠ Slower	⚠ Requires fine-tuning
Prompt Engineering Friendly	✓ High	✓ Medium	⚠ Limited	✗ Not ideal
Sentence Meaningfulness Evaluation	✗ No	✗ No	✗ No	✓ Yes (with fine-tuning)
Semantic Understanding	✓ Good	✓ Better	⚠ Weaker	✓ Best for meaning
Our Choice	✓ Used	-	-	✓ Used



Key Components of the sub system

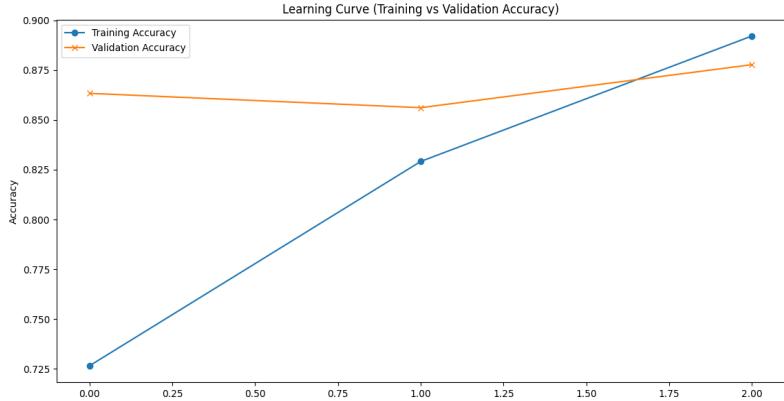


Model Accuracy

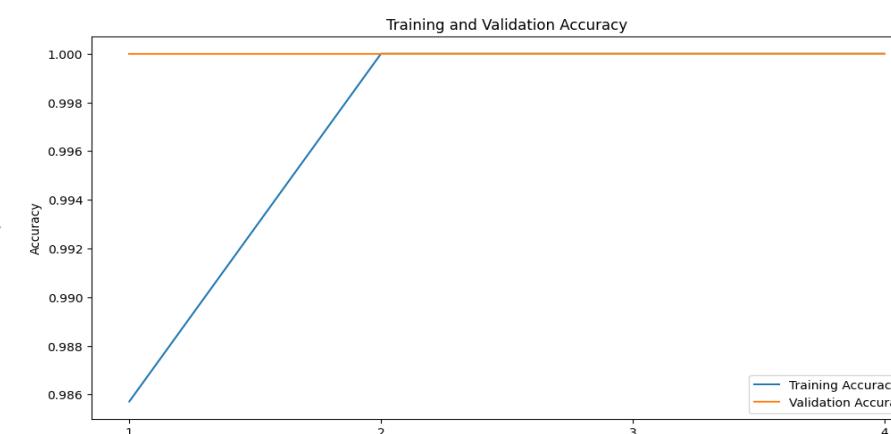


FLAN-T5 (Sentence Generation)

- ❖ Manual Evaluation of Output Quality
- ❖ Constraint Validation
- ❖ Diversity Check
- ❖ Prompt Strategy Comparison



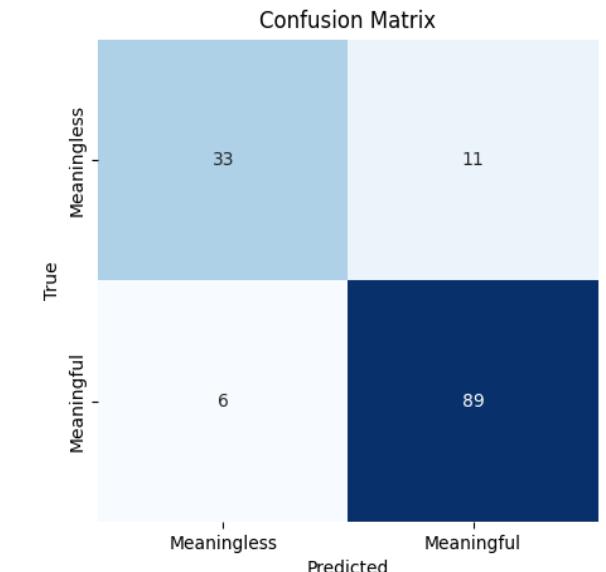
By PP2



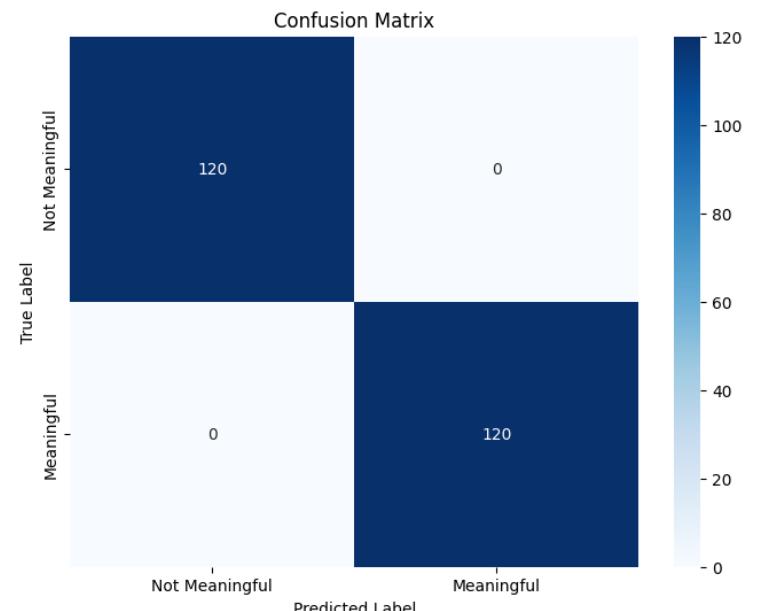
Now

Fine-tuned BERT (Meaningfulness Predictor)

- ❖ Accuracy on Test Set
- ❖ Confusion Matrix Analysis
- ❖ F1 Score for Class Balance
- ❖ Model Confidence Scores



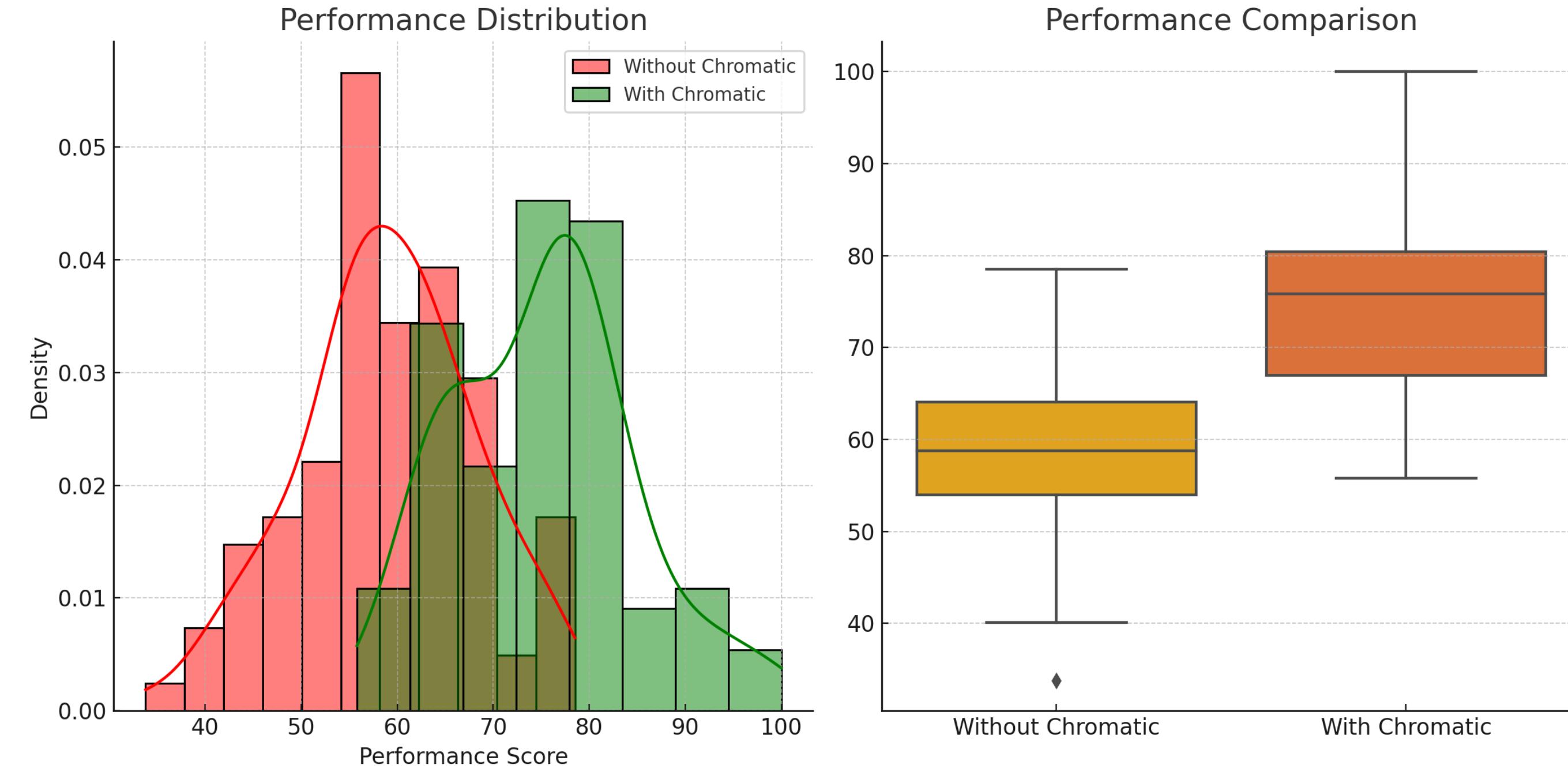
By PP2



Now

Component Statistics

Results and Statistics of UAT



Plan to Product: Evidence of Completion



FEATURE	STATUS IN PROPOSAL	STATUS IN PP2	STATUS IN FINAL VERSION
Automated Sentence Generation	<input checked="" type="checkbox"/> Planned	<input checked="" type="checkbox"/> Implemented	<input checked="" type="checkbox"/> Fully Functional
Chromatic Variations	<input checked="" type="checkbox"/> Planned	<input checked="" type="checkbox"/> Implemented	<input checked="" type="checkbox"/> Enhanced with Customization
Evaluation System	<input checked="" type="checkbox"/> Planned	<input checked="" type="checkbox"/> Implemented	<input checked="" type="checkbox"/> Improved with Detailed Reports
Real-time User Feedback	<input type="checkbox"/> Not in Proposal	<input checked="" type="checkbox"/> Added in PP2	<input checked="" type="checkbox"/> Live Feedback During Quizzes
PDF Viewer with Customization	<input type="checkbox"/> Not Planned	<input type="checkbox"/> Not Implemented	<input checked="" type="checkbox"/> Added in Final Version
Printable Lesson Download	<input type="checkbox"/> Not Planned	<input type="checkbox"/> Not Implemented	<input checked="" type="checkbox"/> Fully Implemented
Performance Report with Analysis	<input type="checkbox"/> Not Planned	<input type="checkbox"/> Not Implemented	<input checked="" type="checkbox"/> Includes Correct/Wrong/Missed Words



IT21223594 | Thalangama T.P

BSc (Hons) Degree in Information Technology (specialization in Software Engineering)



ENHANCING READABILITY AND SPEAKING SKILLS IN DYSLEXIC ADOLESCENTS THROUGH PERSONALIZED SPEECH PACE

Overview

Speech Pace Module in Summary



- Provides Personalized Speech Pace for Each User
- Leverage Deep Learning Techniques at its Core
- Incorporates Google TTS for Natural Feedback
- Aimed at Improving the Speech Comprehension

Objectives

SPECIFIC OBJECTIVE – ACHIEVED

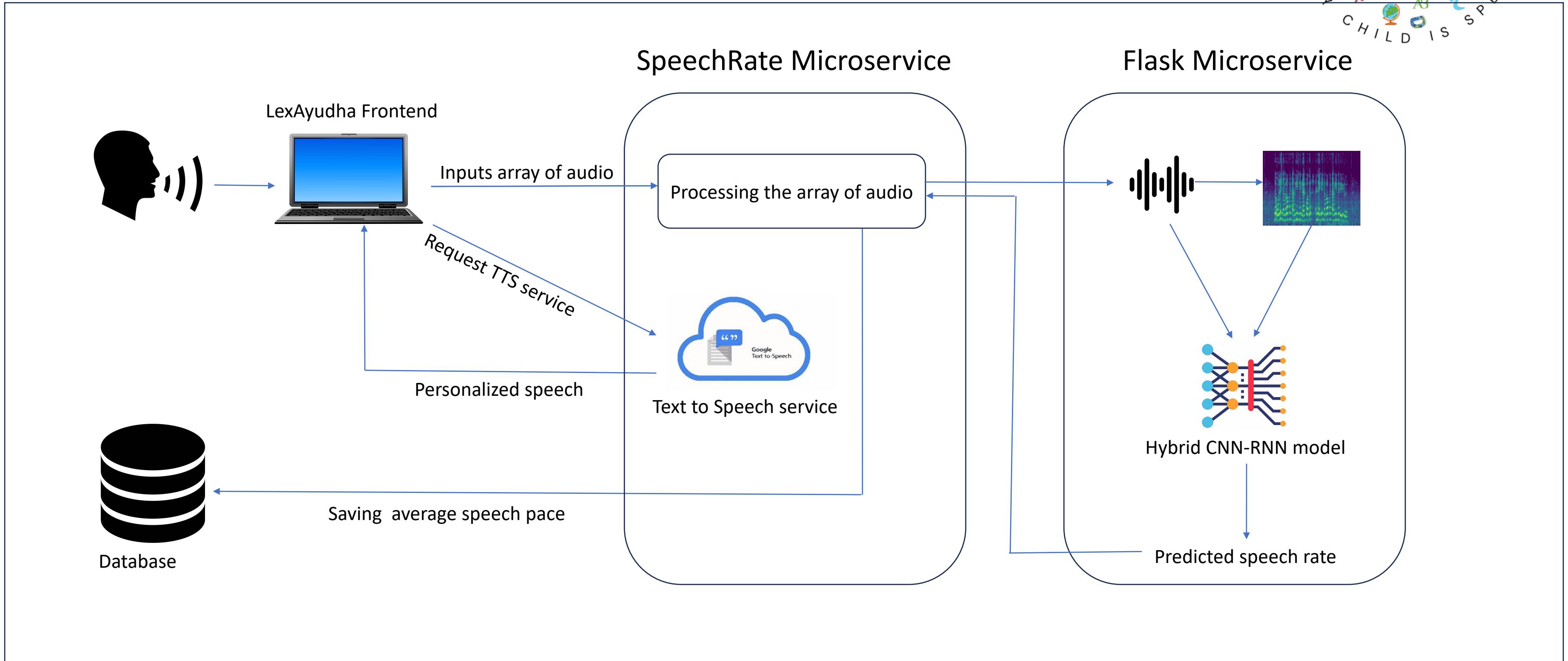
Developed AI speech pace system for personalized learning

SUB OBJECTIVES Completed

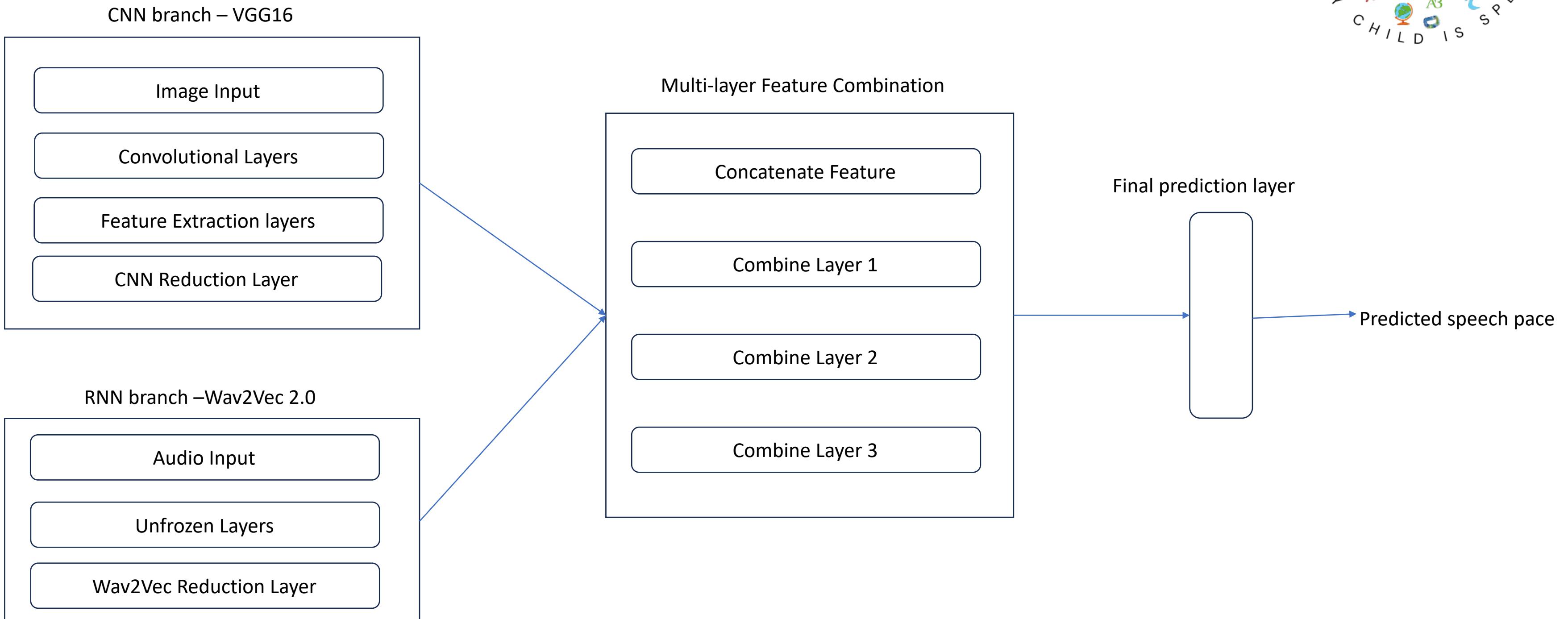
- Detect speech pace through voice data.
- Analyzing voice features.
- Integrating detected speech pace with text to speech(TTS) model
- System evaluation and validation.



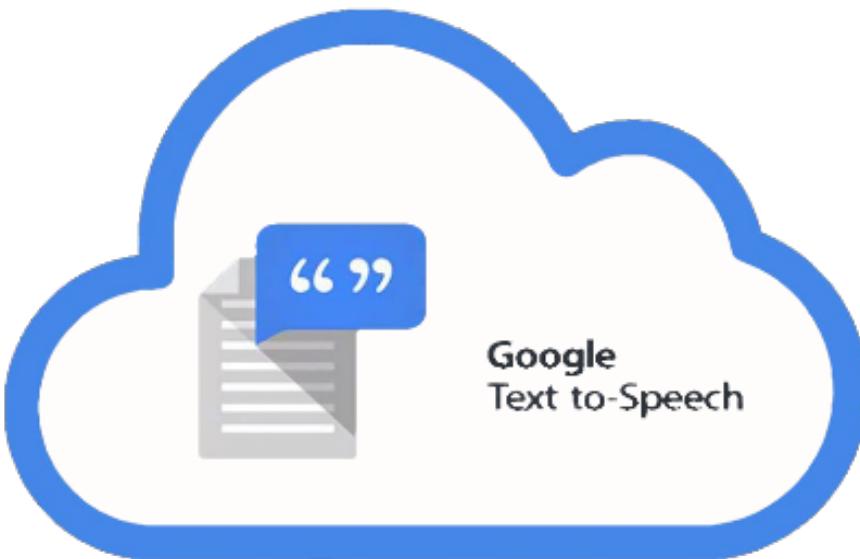
Component Diagram



Model Architecture



Component Technologies



matplotlib



Flask

Pydub



TensorFlow



Model Selection Process

Reasons

VGG-16 Model Pre-Trained on ImageNet Dataset

- Pretrained on 1.2M images, providing a strong foundation for visual feature learning.
- Performs well with limited data through effective transfer learning.
- Simple architecture with deep layers, making it both powerful and easy to adapt.

➤ Dataset

➤ [Non-Native Children English Speech \(NNCES\)](#)
[Corpus on Kaggle](#)

Wav2Vec 2.0 RNN Model

- Excellent in Handling noisy and real-world audio.
- Pretrained on thousands of hours of diverse speech data.
- Captures long-term patterns with Transformer layers.

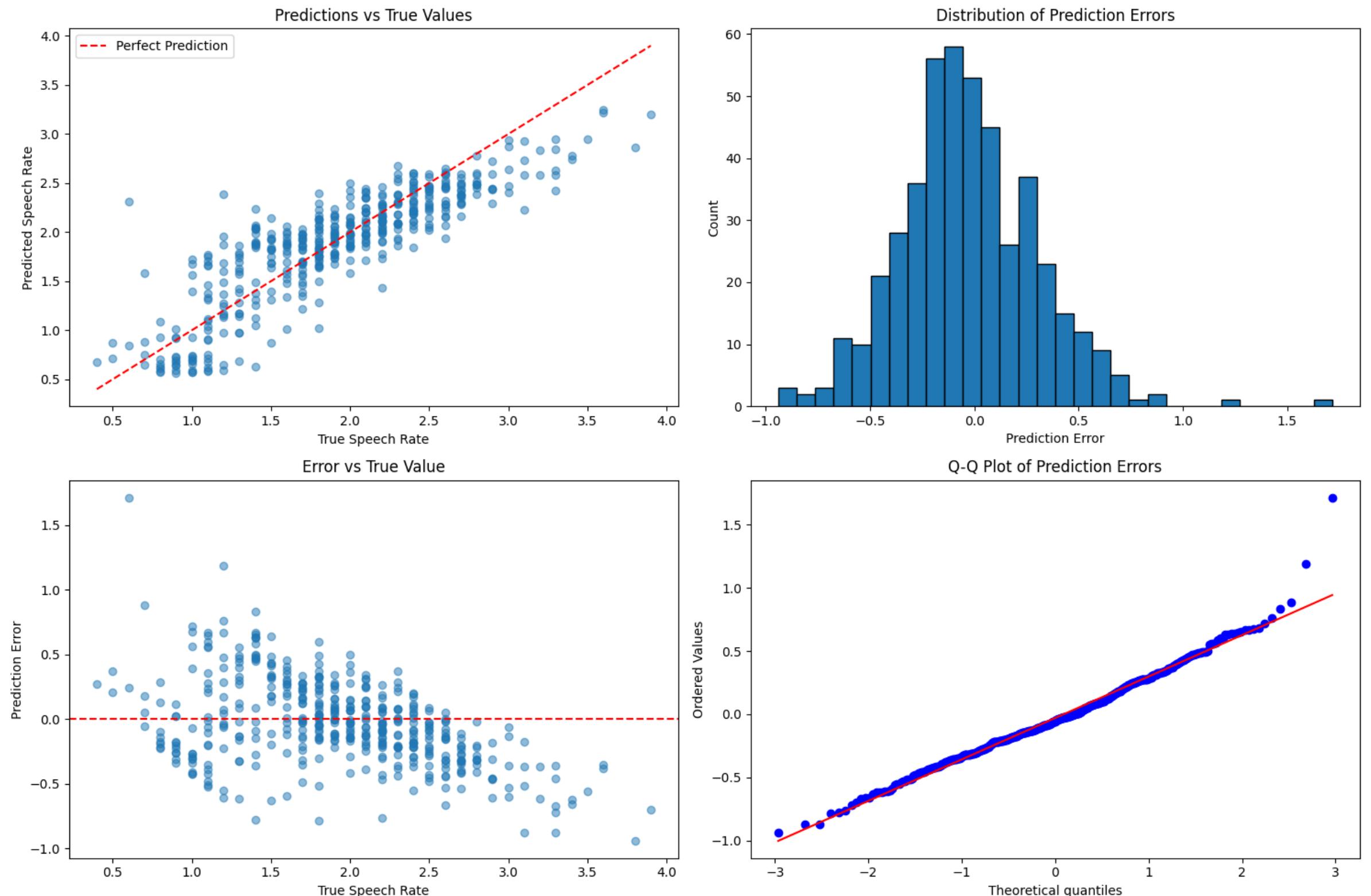


Visit Dataset



Model Performance

Model Performance Metrics



Evidence of Completion

Model Completed Integration



POST | http://127.0.0.1:5000/api/v1/predict/speech

Params Authorization Headers (10) Body Scripts Settings

Body Cookies Headers (5) Test Results

Pretty Raw Preview Visualize JSON

```
1 {  
2   "prediction": 1.8048804998397827  
3 }
```

Fig 1. API Testing results

Speech Rate: 0.97

Read Aloud Select Theme

Fig 2. A Snapshot of Integrated UI

```
Speech prediction for speechAudio_1.wav: 0.886271595954895
Speech prediction for speechAudio_2.wav: 1.114494800567627
Speech prediction for speechAudio_3.wav: 0.7277613878250122
Speech prediction for speechAudio_4.wav: 1.1363344192504883
calculated average Speech rate : 0.97
```

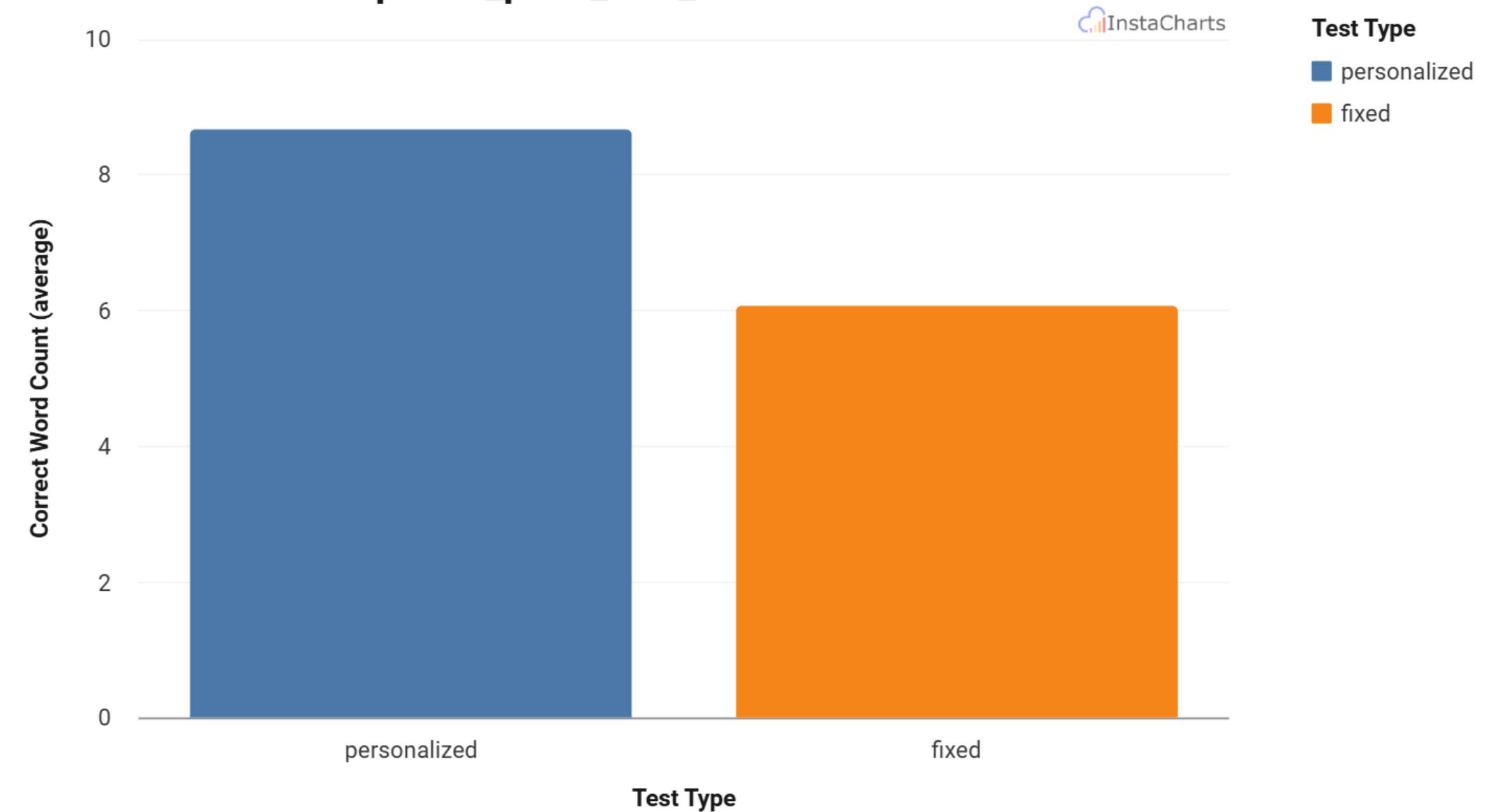
Fig 3. A Snapshot of model inference

Component Statistics

Results and Statistics of UAT



speech_pace_test_results.csv





IT21189944 | Madusanka G.K.I

BSc (Hons) Degree in Information Technology (specialization in Software Engineering)



EMOTION RECOGNITION TO PROVIDE REAL-TIME ADAPTIVE FEEDBACK AND ADJUST ACTIVITY DIFFICULTY

Literature Review

Personalized
Rehabilitation

	A	B	C	D	E	LexAyudha
Nena Shilpa	✓	✓	✓	✓	✓	✓
Alexa	✗	✗	✗	✗	✗	✗
Welippila	✗	✗	✗	✗	✗	✗
Gamified Learning Journal	✗	✗	✗	✗	✗	✗
Gamified Learning Nerodevelopment	✗	✗	✗	✗	✗	✗
Rehabilitation Activity	✓	✓	✓	✓	✓	✓
Report Generation	✓	✗	✗	✗	✗	✓
Detect User's emotion	✗	✗	✗	✗	✗	✓
Provide Personalized feedback to guardian	✗	✗	✗	✗	✗	✓
Focus on Student's stress level	✗	✗	✗	✗	✗	✓
Keep track of progress	✓	✓	✓	✗	✗	✓



Research Problem



- Real time emotion detection to reduce stress level
- Support student by dynamically changing the activity difficulty
- Personalized Feedback to guardian with child's emotion status



Solution

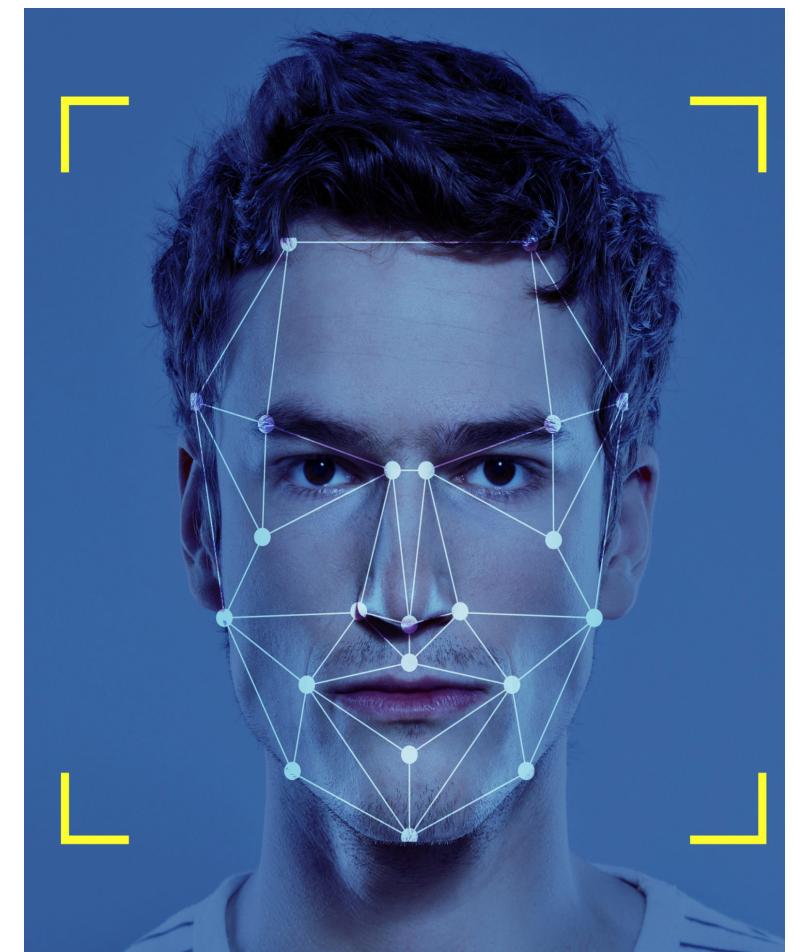


SPECIFIC OBJECTIVE

Emotion Recognition to provide real-time adaptive feedback and adjust activity difficulty dynamically

SUB OBJECTIVES

- Detect emotion and identify the emotion class
- Dynamically change acitivity difficulty
- Keep track of student emotional records with relevet activity
- Generate Personalized feedback for guardian

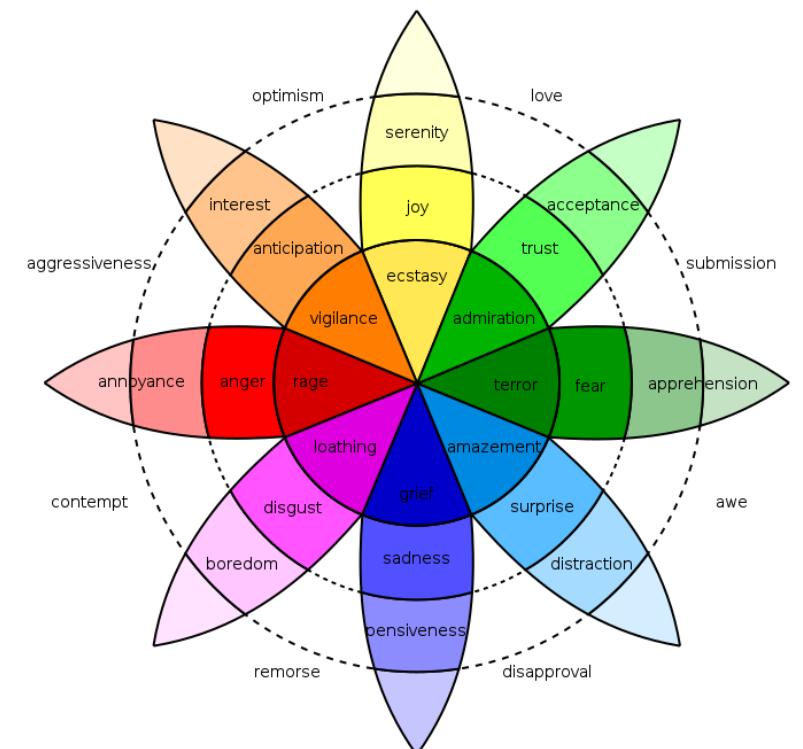


Objectives Cont.



Key Emotions (5): Paul Ekman's Theory

1. Happiness
 2. Sadness
 3. Surprise
 4. Anger
 5. Neutral

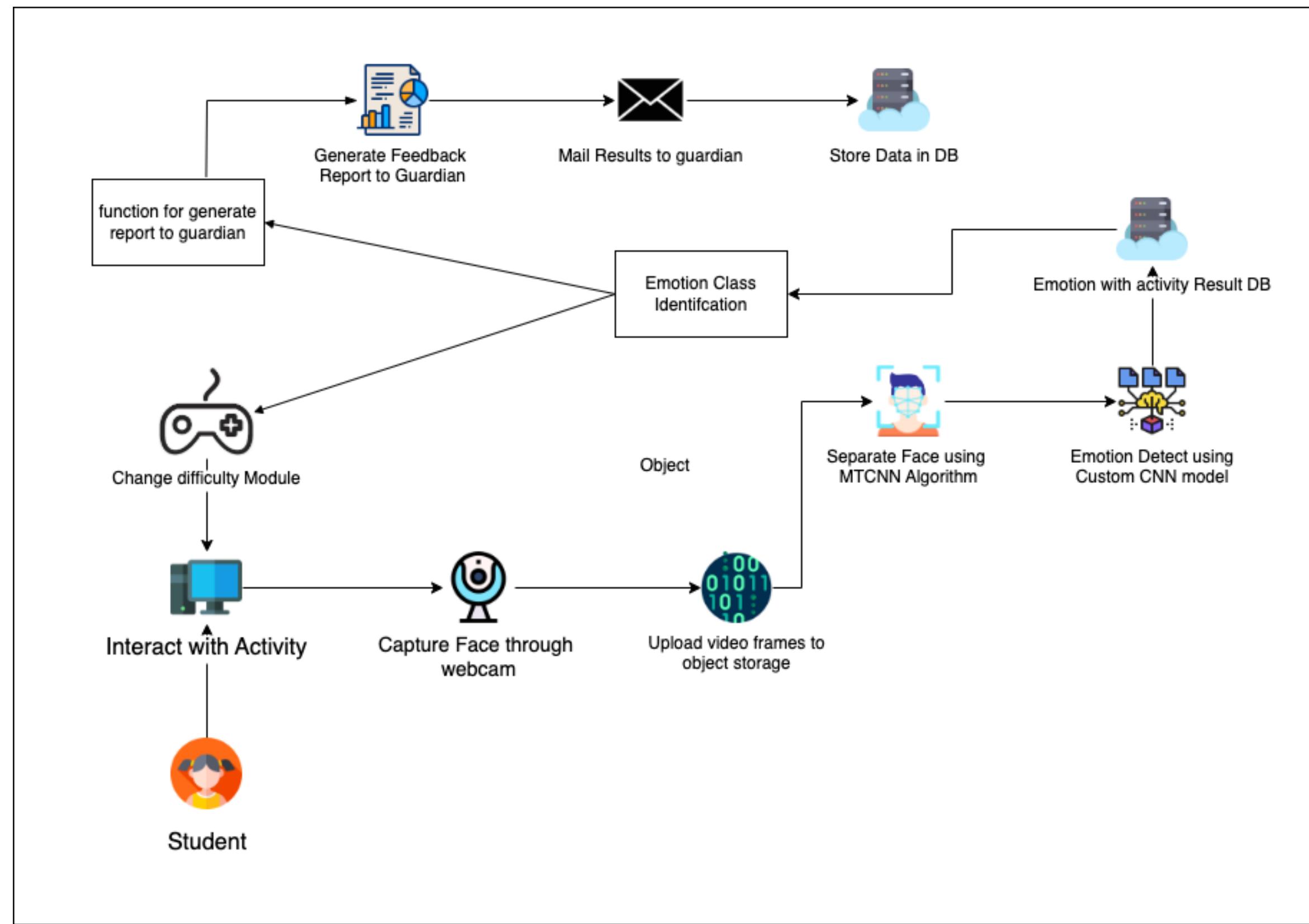


Main Classes (3): Custom Algorithm

1. Distraction (extended period of neutral, surprise)
 2. Frustration (sadness, anger)
 3. Engagement (happiness, lower frequency of neutral/sadness)



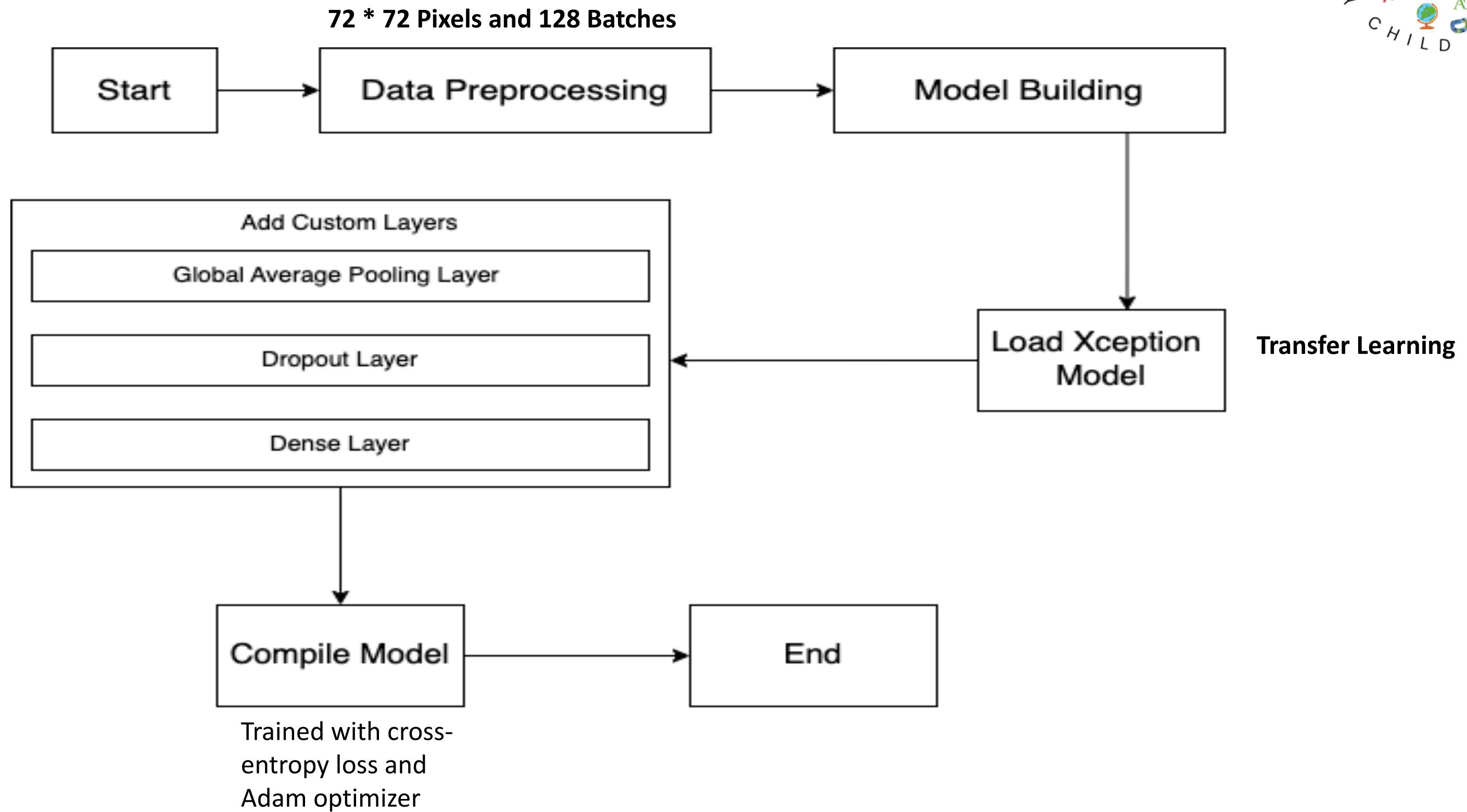
System Diagram



Flow Chart - Model



Change Top
Classification Layers



Custom Algorithm to Detect Emotion Class



```
# Check if there's a happy emotion just before or after a neutral
for i, entry in enumerate(emotion_entries):
    emotion = entry["Emotion"]

    # Basic emotion categorization
    if emotion in FRUSTRATION_EMOTIONS:
        counts["frustration"] += 1
    elif emotion in DISTRACTION_EMOTIONS:
        counts["distraction"] += 1
    elif emotion in ENGAGEMENT_EMOTIONS:
        counts["engagement"] += 1

    # Special handling for neutral emotions
    if emotion == "neutral":
        consecutive_neutral += 1

    # Check context of neutral emotion
    has_nearby_happy = False

    # Look at nearby entries for context (up to 2 entries before and after)
    nearby_range = 2
    for j in range(max(0, i-nearby_range), min(total, i+nearby_range+1)):
        if j != i and emotion_entries[j]["Emotion"] == "happy":
            has_nearby_happy = True
            break

        if consecutive_neutral >= neutral_threshold:
            # Extended neutral periods suggest distraction
            counts["distraction"] += 0.7
    elif has_nearby_happy:
```

PROBLEMS OUTPUT TERMINAL PORTS DEBUG CONSOLE

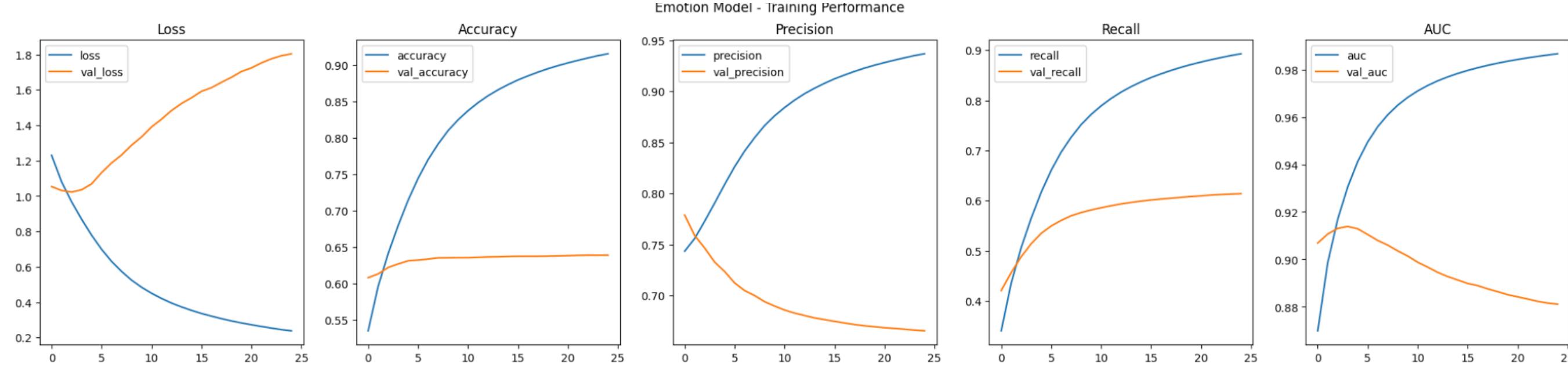
```
127.0.0.1 -- [26/May/2025 11:27:00] "POST /emotion/predict HTTP/1.1" 200 -
Emotion predicted: {'emotion': 'neutral', 'percentages': {'frustration': 57.1, 'distraction': 32.1, 'engagement': 10.7}, 'alert': 'Frustrated'}
127.0.0.1 -- [26/May/2025 11:27:01] "POST /emotion/predict HTTP/1.1" 200 -
Emotion predicted: {'emotion': 'neutral', 'percentages': {'frustration': 51.1, 'distraction': 38.0, 'engagement': 10.9}, 'alert': 'Frustrated'}
127.0.0.1 -- [26/May/2025 11:27:03] "POST /emotion/predict HTTP/1.1" 200 -
Emotion predicted: {'emotion': 'neutral', 'percentages': {'frustration': 45.5, 'distraction': 40.9, 'engagement': 13.6}, 'alert': 'Frustrated'}
200 -
Downloads/SLIIT/1. Research/3. Implementation/LexAyudha-
PI/EmailServices/server.js
14.8, 'distraction': 44.0, 'engagement': 11.2}, 'alert': 'Frustrated'}
200 -
127.0.0.1 -- [26/May/2025 11:27:04] "OPTIONS /emotion/predict HTTP/1.1" 200 -
Emotion predicted: {'emotion': 'sad', 'percentages': {'frustration': 48.6, 'distraction': 41.0, 'engagement': 10.4}, 'alert': 'Frustrated'}
127.0.0.1 -- [26/May/2025 11:27:05] "POST /emotion/predict HTTP/1.1" 200 -
Emotion predicted: {'emotion': 'sad', 'percentages': {'frustration': 48.6, 'distraction': 41.0, 'engagement': 10.4}, 'alert': 'Frustrated'}
127.0.0.1 -- [26/May/2025 11:27:06] "POST /emotion/predict HTTP/1.1" 200 -
[]
```

Evidence of Completion

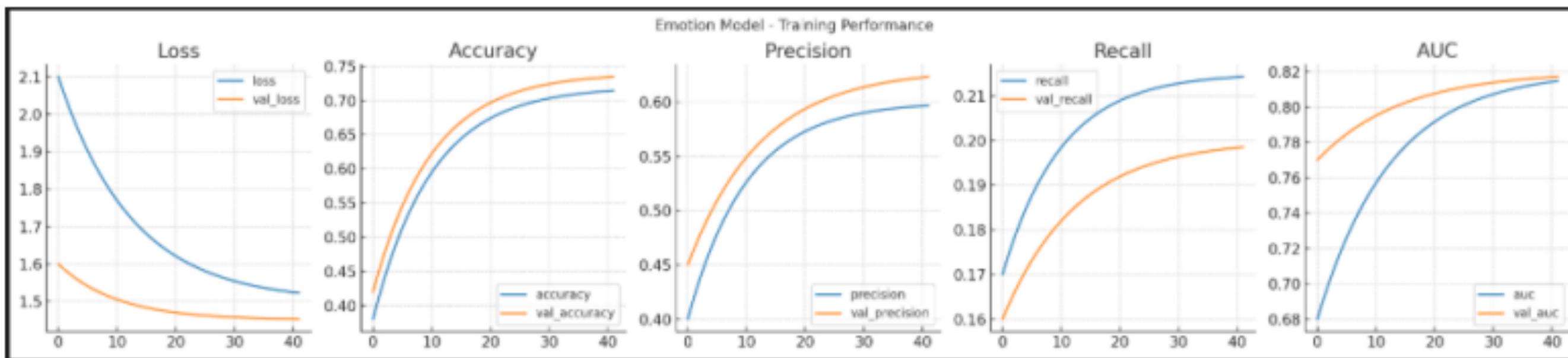
Model Training Results Comparison



By PP 1



Current



Training and validation loss over epochs

Evidence of Completion

Emotion Model Summary

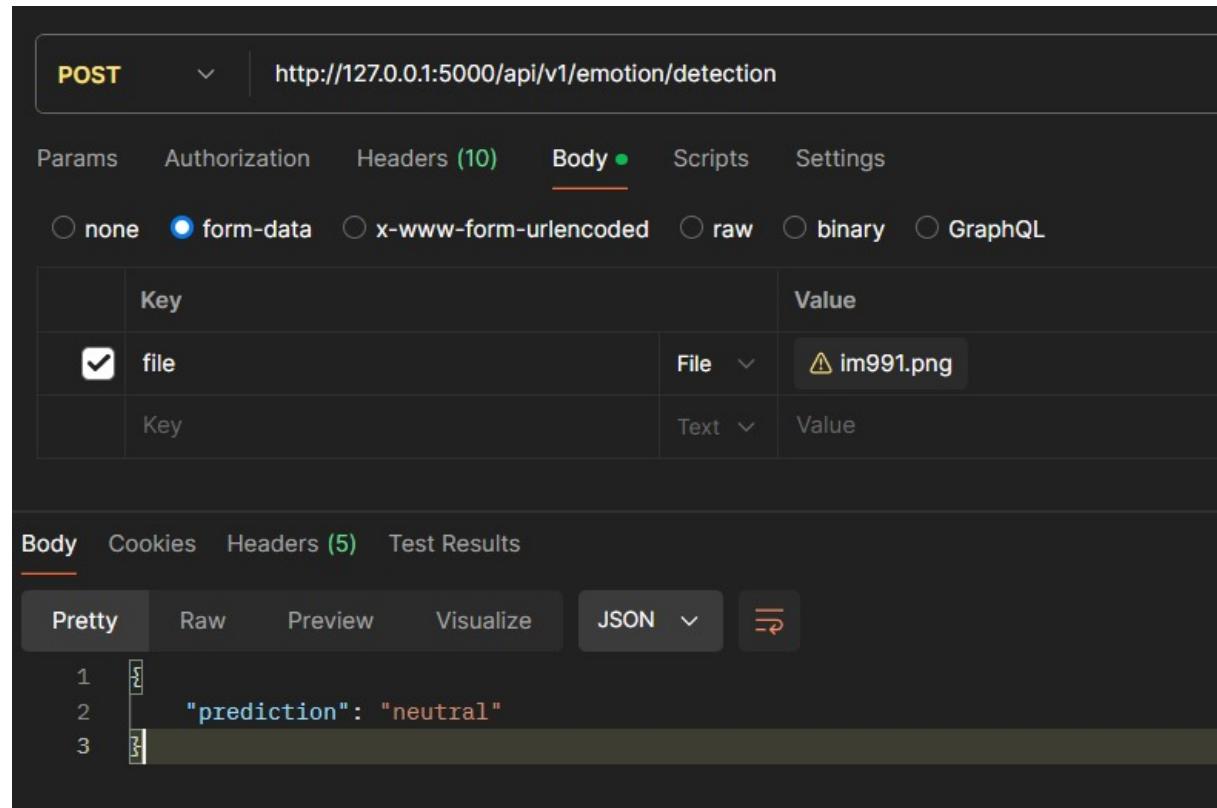


Model: "model"		
Layer (type)	Output Shape	Param #
input_2 (InputLayer)	[None, 72, 72, 3]	0
xception (Functional)	(None, 3, 3, 2048)	20861480
global_average_pooling2d (GlobalAveragePooling2D)	(None, 2048)	0
dropout (Dropout)	(None, 2048)	0
dense (Dense)	(None, 7)	14343
<hr/>		
Total params:	20,875,823	
Trainable params:	20,821,295	
Non-trainable params:	54,528	
<hr/>		

```
Epoch 1/25
225/225 [=====] - 169s 717ms/step - loss: 1.2297 - categorical_accuracy: 0.5352 - precision: 0.7434 - recall: 0.3401 - ...
Epoch 2/25
225/225 [=====] - 36s 159ms/step - loss: 0.9304 - categorical_accuracy: 0.6574 - precision: 0.7682 - recall: 0.5308 - ...
Epoch 3/25
225/225 [=====] - 34s 151ms/step - loss: 0.7411 - categorical_accuracy: 0.7304 - precision: 0.8065 - recall: 0.6476 - ...
Epoch 4/25
225/225 [=====] - 67s 297ms/step - loss: 0.5743 - categorical_accuracy: 0.7944 - precision: 0.8439 - recall: 0.7408 - ...
Epoch 5/25
225/225 [=====] - 43s 192ms/step - loss: 0.4181 - categorical_accuracy: 0.8535 - precision: 0.8819 - recall: 0.8239 - ...
Epoch 6/25
225/225 [=====] - 43s 192ms/step - loss: 0.2992 - categorical_accuracy: 0.8947 - precision: 0.9127 - recall: 0.8791 - ...
Epoch 7/25
225/225 [=====] - 43s 192ms/step - loss: 0.2197 - categorical_accuracy: 0.9238 - precision: 0.9334 - recall: 0.9151 - ...
Epoch 8/25
225/225 [=====] - 38s 168ms/step - loss: 0.1787 - categorical_accuracy: 0.9401 - precision: 0.9465 - recall: 0.9340 - ...
Epoch 9/25
225/225 [=====] - 43s 190ms/step - loss: 0.1303 - categorical_accuracy: 0.9572 - precision: 0.9611 - recall: 0.9537 - ...
Epoch 10/25
225/225 [=====] - 43s 190ms/step - loss: 0.1231 - categorical_accuracy: 0.9577 - precision: 0.9617 - recall: 0.9544 - ...
Epoch 11/25
225/225 [=====] - 43s 191ms/step - loss: 0.1113 - categorical_accuracy: 0.9629 - precision: 0.9655 - recall: 0.9599 - ...
Epoch 12/25
225/225 [=====] - 43s 192ms/step - loss: 0.0960 - categorical_accuracy: 0.9680 - precision: 0.9705 - recall: 0.9659 - ...
Epoch 13/25
...
Epoch 24/25
```

Evidence of Completion

API Request and Face Detected Mongo DB results



```
POST http://127.0.0.1:5000/api/v1/emotion/detection

Params Authorization Headers (10) Body Scripts Settings
 none  form-data  x-www-form-urlencoded  raw  binary  GraphQL

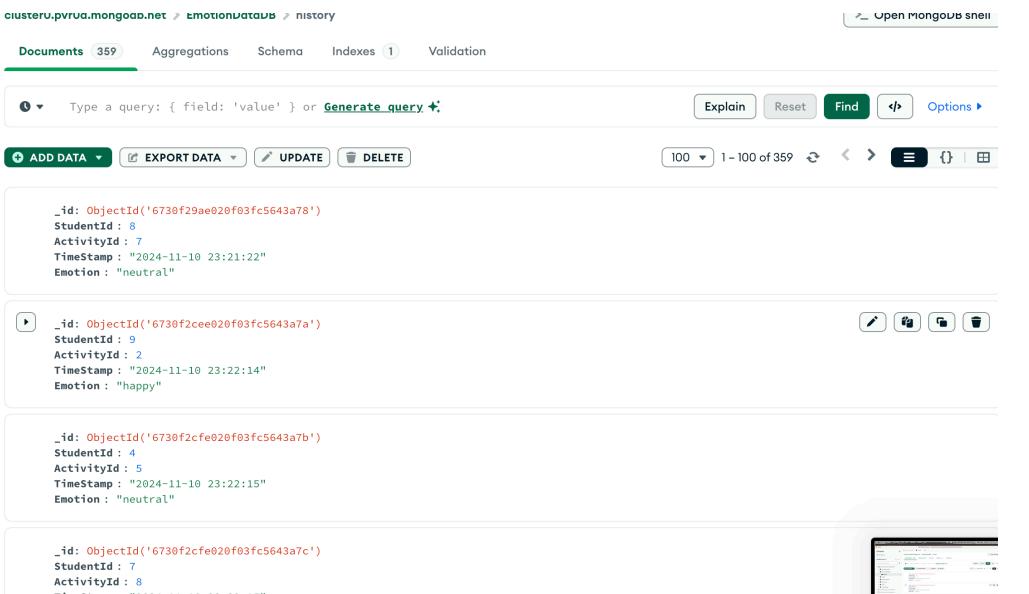
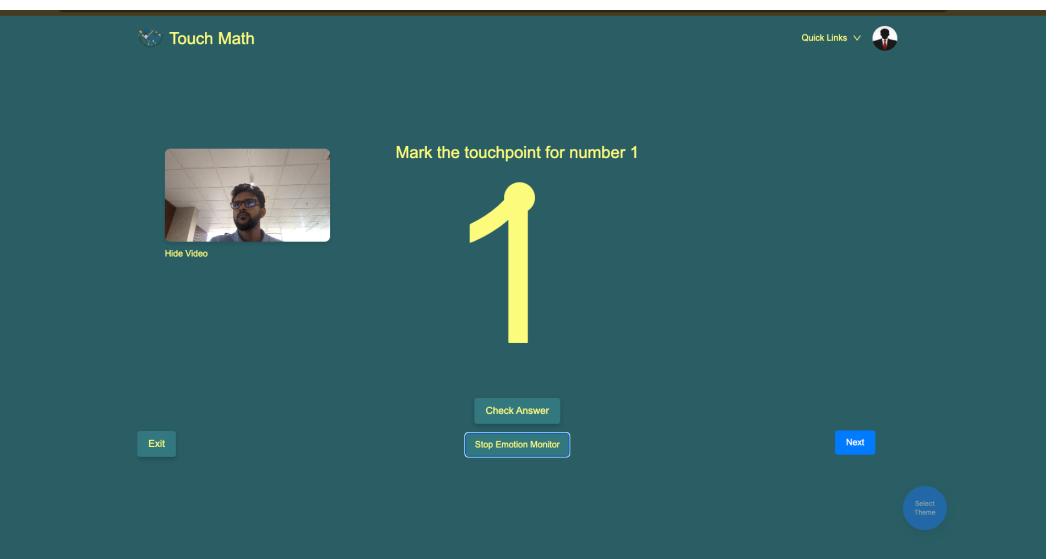


| Key  | Value                                         |
|------|-----------------------------------------------|
| file | File <input type="button" value="im991.png"/> |
| Key  | Text <input type="button" value="Value"/>     |



Body Cookies Headers (5) Test Results
Pretty Raw Preview Visualize JSON 
```

```
1
2   "prediction": "neutral"
3
```

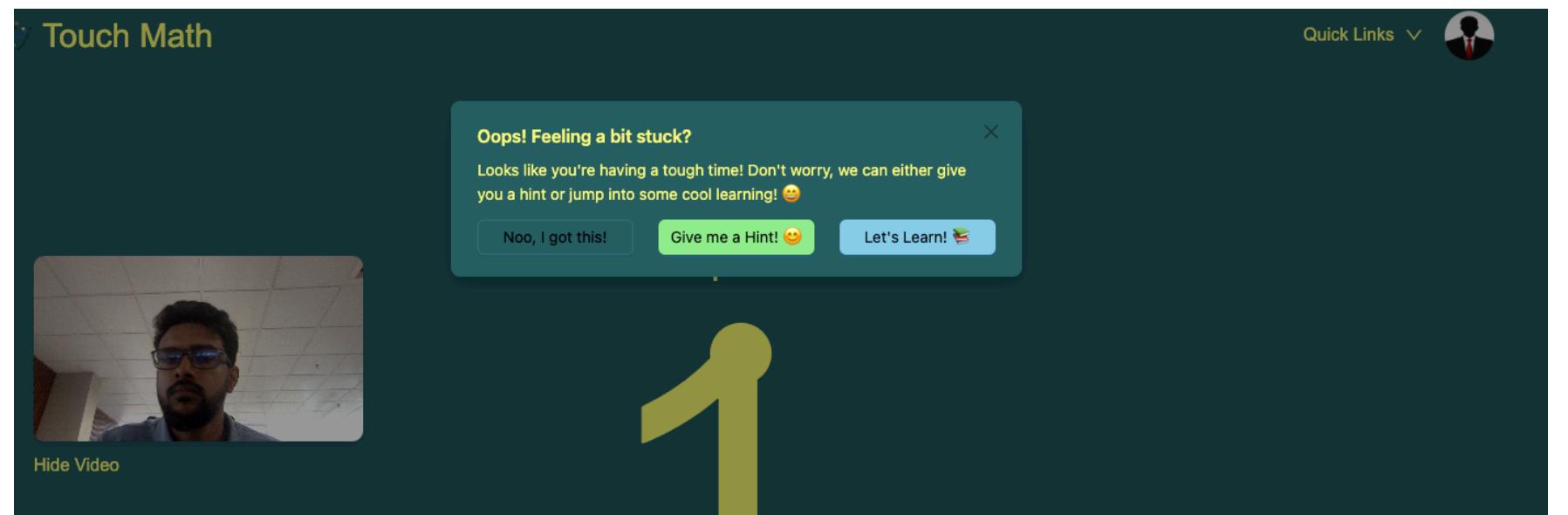


```
_id: ObjectId('6730f29ae020f03fc5643a78')
StudentId: 8
ActivityId: 7
TimeStamp: "2024-11-10 23:21:22"
Emotion: "neutral"

_id: ObjectId('6730f2cce020f03fc5643a7a')
StudentId: 9
ActivityId: 2
TimeStamp: "2024-11-10 23:22:14"
Emotion: "happy"

_id: ObjectId('6730f2cfe020f03fc5643a7b')
StudentId: 4
ActivityId: 5
TimeStamp: "2024-11-10 23:22:15"
Emotion: "neutral"

_id: ObjectId('6730f2cfe020f03fc5643a7c')
StudentId: 7
ActivityId: 8
TimeStamp: "2024-11-10 23:22:15"
```





IT21319174 | Dissanayake M.G.T.W

BSc (Hons) Degree in Information Technology (specialization in Software Engineering)



TOUCH MATH APPROACH FOR ENHANCING NUMBER SENSE AND MATHEMATICAL OPERATIONS

Background

For Dyscalculic adolescents,



- Hard to identify numbers.
 - Memorable and auditory learning is precious.
-
- Lack Analytical Skills
 - Insufficiency of Traditional Methods
 - Need Alternative Approaches
 - Need more personalized study process



Literature Review



	A	B	C	D	Lexayudha
Use TouchMath Approach	✓	✓	✓	✗	✓
Technology Integration	✗	✓	✓	✓	✓
Personalized Activities	✗	✗	✗	✓	✓
Use Attractive interfaces (Multisensory)	✗	✗	✗	✓	✓
Voice Recognition Techniques	✗	✗	✗	✓	✓
Provide activities to improve the math concepts.	✗	✗	✗	✓	✓
Teaching Process	✗	✓	✓	✓	✓

A - A review of the articles about TouchMath

C - TouchMath Tutor Kindergarten Demo

B - Touch math pro

D - Nanashilpa

Objectives

NOVELTY OBJECTIVE

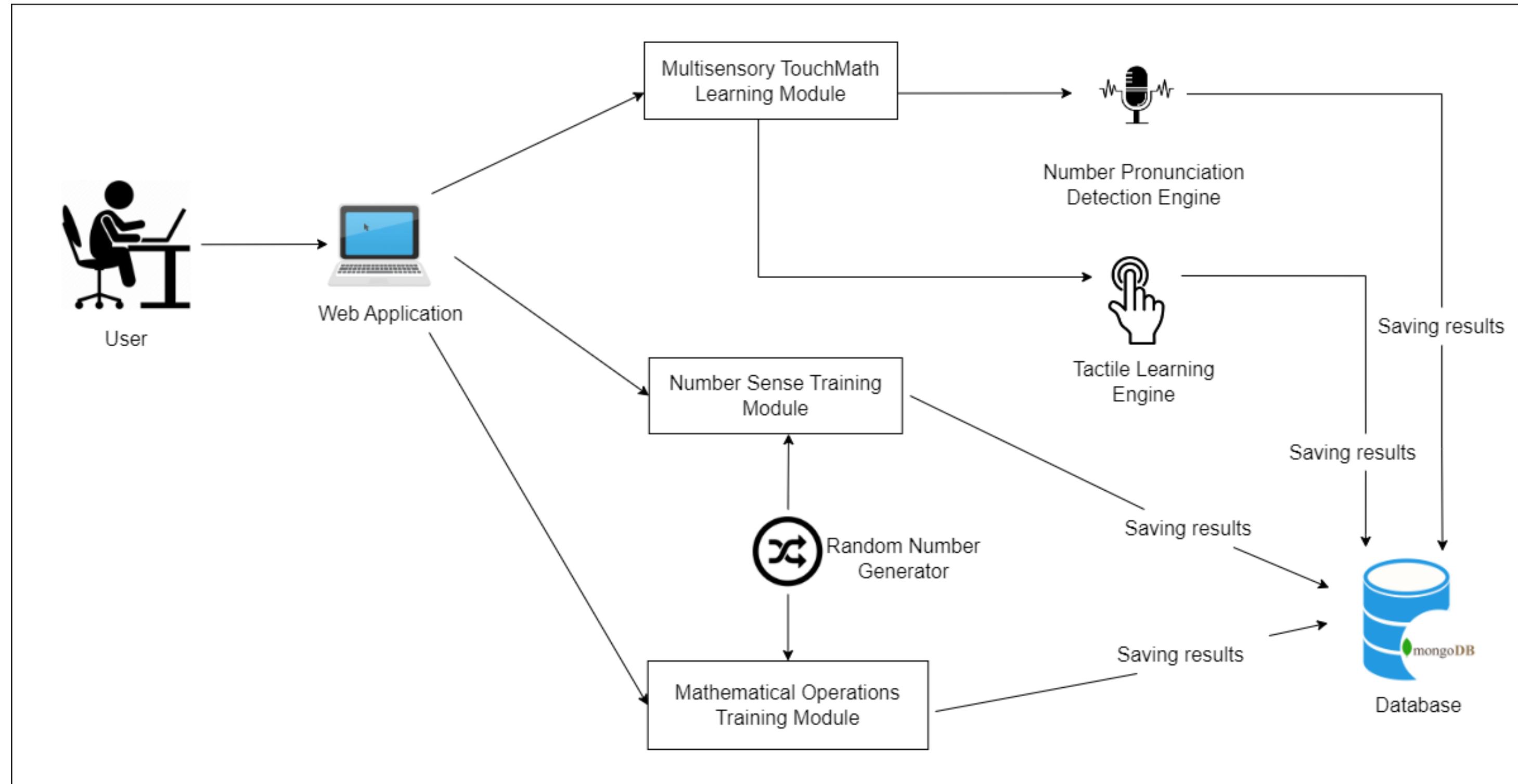
- Implement teaching numbers with text-to-speech feature.
- Integrate voice recognition to analyze number pronunciation

OTHER SUB OBJECTIVES

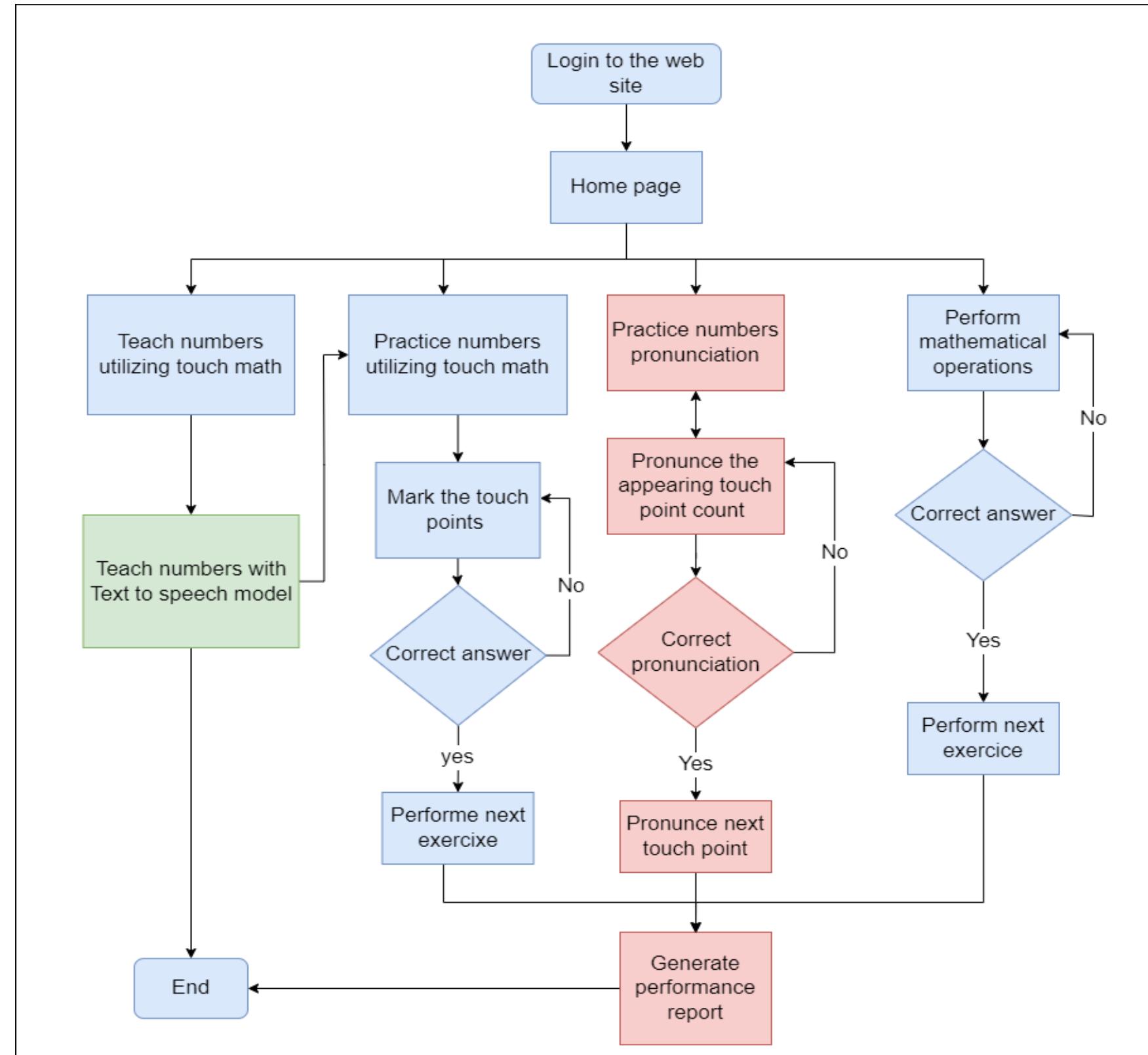
- Providing practice sessions, utilizing touch mach approach
- Providing mathematical operations utilizing touch mach approach
- Generate performance report



Methodology



Flow Chart



Enhancements



- Generated the questions starting from the lower complexity to upper.
- Created the navigation to the home page.
- Implemented the backward counting practices.

A screenshot of a web-based game titled "Backward Counting Game". The title is displayed prominently at the top center. Below the title, a question is posed: "What is the 4th number before 32?". Three buttons are provided for selection: "25", "30", and "28". A green button labeled "Next Question" is located at the bottom right. The background is dark teal. At the top, there is a navigation bar with links for "LexAyudha", "Backward game", "Quick Links", and a user profile icon. In the bottom right corner, there is a "Select Theme" button.

Evidence of Completion

Let's Learn Number 5

Number Quick Select

0 1
2 3
4 5

Select Theme

Number Sense

Touch Math Addition Teaching

7 + 2 =

Select Theme

Start Teaching

Next Lesson

Touch Math

Touch Math Practice

Currently practicing: Number 3

1 2 3 4 5 6 7 8 9

Say: 1.

Select Theme

Number Sense

Quiz Summary

No	Question	Your Answer	Correct Answer	Result
1	9 + 4	13	13	Correct
2	5 + 5	10	10	Correct
3	4 + 1	5	5	Correct
4	21 + 1	78	22	Wrong
5	87 + 2	67	89	Wrong
6	58 + 6	47	64	Wrong
7	70 + 19	89	89	Correct
8	32 + 99	134	131	Wrong
9	72 + 86	158	158	Correct
10	87 + 55	56	142	Wrong

Total Score 50 / 100

Select Theme





COMMERCIALIZATION ASPECT

Monetizing Aspect



➤ Subscription based business model.

Silver

Free

Per Month

- for individual use
- trial AI features

Gold

\$2

Per Month

- for parents
- add up to 3 user accounts
- enabled personalization

Platinum

\$3

Per Month

- for teachers
- add up to 15 user accounts
- advanced personalization

Marketing Aspect



Primary Target Audience: The parents of learning divergent adolescents

Secondary Target Audience: Educators, Special education professionals

- Digital Marketing Initiative
- Social media marketing
 - Facebook page.
- Partnerships
 - Collaboration with schools
 - Collaboration with dyslexic educational institutes



Expected Budget



Description	Cost
Vercel – Frontend Deployment	Free Tier
AWS – Backend Deployment	Free Tier 80\$ a month pay as you go
Mongo DB	Free Tier
Google Text to Speech	1 hour free for month \$0.006 per 15 seconds over 60 mins up to 1 million mins
Google Colab Pro	\$9.99



THANK YOU

AI-based Personalized Rehabilitation for Dyslexia and Dyscalculia Adolescents

