LEXAYUDHA: AI-BASED PERSONALIZED REHABILITATION FOR DYSLEXIA AND DYSCALCULIA ADOLESCENTS

Project ID: 24-25J_233

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DECLARATION

We declare that this is our own work, and this proposal does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any other university or Institute of higher learning and to the best of our knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

Name	Student ID	Signature
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The above candidates are carrying out research for the undergraduate Dissertation under my supervision.

Signature of the supervisor:  Date: 2024/08/23

Abstract

This proposal for a study that aims at designing an emotion recognition system for detecting stress in dyslexia and dyscalculia to create a stress-free learning environment for students. These learning disabilities are affected approximately 10% of global population and about 5% of students has severe symptoms and require specialized education process. According to the studies, these students have been found to have stress levels of 20 - 30% higher when engaged in learning tasks when it compares to their peers which can significantly affect their academic performance and overall well – being. [1]

The system will be designed to use modern artificial technology that includes selected machine learning evoked to identify emotional status of students from their expressions. This will make the system to change the difficulty level of the educative tasks as well as the method of delivery based on the emotional states that an individual student set for him or herself. Initial simulations of the proposed method show that the level of stress may be decreased by up to 25% if the corresponding adaptive approach is applied as a component of educational environment support. [2]

Therefore, this research intends to advance the area of inclusive education, by incorporating the use of Emotion detection as one of the important tools in the learning process for the students with learning disorders. Using facial expression analysis would help students with dyslexia and dyscalculia to get the emotional help they require.

***Keywords**: Dyslexia, Dyscalculia, AI-driven personalization, Emotion recognition, Adaptive learning, stress detection, Artificial intelligence, Machine Learning, Personalized learning*

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

CNN - Convolutional Neural Networks

RNN - Recurrent Neural Networks

UCSF – University of California, San Francisco

MTCNN - Multi-Task Cascaded Convolutional Networks

AI – Artificial Intelligence

1. INTRODUCTION

Learning disabilities such as dyslexia and dyscalculia affect a number of students and affects their way of learning with word and number patterns. Traditionally, these particular learning difficulties have been managed by these specific educational approaches. However, recent studies have highlighted the importance of considering students' emotional well-being as a critical factor in their learning success. Emotional states such as frustration and distraction can exacerbate learning difficulties, while engagement and positive emotions are associated with better educational outcomes. Hence, emotion detection in context of learning environment is currently under the spotlight of modern studies when designing Smart Learning Environment which aiming to create adaptive systems that respond to students' emotional needs in real-time. [3]

Emotion detection techniques, particularly facial expression recognition, have become a central tool for adapting educational content in real-time based on students' emotions. [4] Thus, these systems can also recognize key emotions like happiness, sadness, anger, and surprise which can be enabling educators to adjust the learning experience accordingly. [5] To this, knowledge of computer vision and machine learning is crucial because these are the critical technologies for recognizing and interpreting emotions correctly. [4]

Today, emotion recognition is most often performed by means of deep learning models, including convolutional neural networks (CNNs) for facial emotion recognition, and recurrent neural networks (RNNs) for analyzing temporal patterns of physiological signals. Research has also moved towards multimodal approaches, combining data from multiple sources (e.g., facial expressions, voice, and physiological signals) to improve emotion detection accuracy. [6] These advancements have paved the way for more responsive and personalized learning experiences in digital education platforms. [7]

However, the adaptation of emotion detection system in an environment tailored to students with dyslexia and dyscalculia for practical use has not received much attention. Overarchingly, most existing approaches do not account for the unique

emotional responses of these students, which can be positively different from that of normal students. Previous studies have applied generalized emotional baselines, which can be ineffective for students with learning disabilities

This project proposes to develop further the idea of emotion detection technologies, while trying to address the needs of students with dyslexia and dyscalculia the proposed system will use facial expression recognition to detect emotions and dynamically adjust educational activities to reduce stress and enhance engagement. By focusing on the specific emotional profiles of these students, this approach will provide a more tailored and effective learning environment, addressing gaps in current research and offering a new avenue for improving educational outcomes for students with learning disabilities.

1.1 Background and Literature Review

The integration of emotion detection into learning technologies has gained significant attention in the last decade. States such as frustration, anxiety, and distraction are well-known to have a negative effect on the learning process especially for learning disabled children with dyslexia and dyscalculia. Previous literatures had demonstrated mostly on the academic domains of these disabilities with less attention paid to the emotional experiences of the students. But along the recent advances of affective computing new opportunities for developing the adaptive environment of learning have appeared that can take into account not only cognitive aspects of the learner but also their emotional state.

Emotion detection technologies have been adopted in general education to enhance the learning outcomes. Other approaches like facial expression recognition, voice analysis and monitoring physiological signs have been used to determine learners' emotions and adjust the learning content accordingly. [7] Among all these, facial expression recognition has received main attention due to its non-invasive nature and the availability of vast datasets that can be used to train deep learning models. These technologies rely on machine learning, specifically deep learning algorithms, to accurately detect emotions like happiness, sadness, anger, and surprise. [8] As for

school environment, such emotion detection systems can be useful to diagnose students' emotional distress and apply necessary measures.

The recent research highlights the usability of personal emotion detection systems for students having dyslexia and dyscalculia. These systems can help create a more supportive and adaptive learning environment by tailoring educational content based on the individual emotional states of these students. [9] For example, facial emotion recognition helps identify signs of frustration or disengagement in learner's with dyslexia so that the guardian can provide additional support when needed

The majority of the emotion detection systems have been used in general learning settings; and few researches has focused on their use for students with learning disabilities. Students with dyslexia and dyscalculia often experience higher levels of frustration and stress compared to their peers, making emotion detection particularly valuable in these contexts. [1] thus, emotion detection is even more important for such kids. Emotion detection could be very effective for this dyslexia and dyscalculia students according to the new collaborative study by UC San Francisco neuroscientists with the UCSF Dyslexia Centre and UCSF Memory and Aging Centre. [10]

Additionally, the integration of personalized feedback mechanisms for guardians has been identified as a critical component in enhancing educational outcomes for these students. Most of the existing gamified learning experience not provide personalized feedback for the guardian about the student education experience and the emotional state. Providing guardians with detailed reports and progress analyses, including comparisons of engagement with and without learning activities, can facilitate better support and interventions at home. This approach not only aids in tracking progress but also helps in aligning home support with the adaptive strategies used in the educational environment.

However, despite these promising developments, the application of emotion detection systems for students with dyslexia and dyscalculia is still in its beginning. Most existing systems apply generalized emotional baselines, which do not adequately reflect the emotional challenges faced by these students. As a result, there is a growing need for research that explores how emotion detection systems can be adapted to the specific needs of students with learning disabilities.

This project builds on the current literature by developing an emotion detection system that is specifically tailored to students with dyslexia and dyscalculia. The proposed system will use facial expression recognition to detect emotions in real-time and dynamically adjust learning activities to reduce stress and enhance engagement. By focusing on the unique emotional profiles of these students, this approach aims to create a more effective and supportive learning environment that addresses both cognitive and emotional factors. Additionally, personalized feedback for guardians and detailed progress analyses will further enhance the support system for these students.

1.2 Research Gap

There is lack of researches focused on providing personalized feedback for guardians about the emotional state of dyslexic student while engaging with learning activities. Also, many of the related systems do not pay attention to the process of changing the level of difficulty of learning activities by detecting emotions, which is the requirement for an effective teaching-learning process for students with learning disability. This gap in the research highlights the need for specialized emotion detection systems that can provide tailored responses to the emotional needs of dyslexic and dyscalculic students.

However, the target audience of this study was also lacking research work on the feedback to be offered to guardians regarding the emotional status of students with learning disabilities. While many studies have explored emotion detection, few have examined how to use this data to provide detailed feedback to guardians, comparing students' past and present emotional engagements with learning activities. [11] This aspect is important for monitoring some results and making sure that appropriate interventions are making the required impact to the emotional and the cognitive development of the student.

Below table 1.1 shows a tabularized format of the above explanation about the comparison of research and our proposed system.

Table 1.1 : Existing Research Comparison

	A	B	C	D	E	LexAyudha
Rehabilitation Activity	✓	✓	✓	✓	✓	✓
Report Generation	✓	✗	✗	✗	✗	✓
Detect User's emotion	✗	✗	✗	✗	✗	✓
Provide Personalized feedback to guardian	✗	✗	✗	✗	✗	✓
Focus on Student's stress level	✗	✗	✗	✗	✗	✓
Keep track of progress	✓	✓	✓	✗	✗	✓

Personalized Rehabilitation

Research A – A Mobile-Based Screening and Refinement System to Identify the Risk of Dyscalculia and Dysgraphia Learning Disabilities in Primary School Students. (Research and a mobile app). [12]

Research B – ALEXZA: A Mobile Application For Dyslexics Utilizing Artificial Intelligence And Machine Learning Concepts. (Research and a mobile app). [13]

Research C - Walipilla: Mobile Based Screening and Refinement System to Identify the Risk of Reading Weaknesses Due to Dyslexia. (Research and a mobile app). [14]

D - Developing two game-based interventions for dyslexia therapeutic interventions using gamification and serious games approaches entertainment computing journal. [15]

E - Effectiveness of digital game-based trainings in children with neurodevelopmental disorders. [16]

Our project aims at filling these gaps through the design of a facial expression-based emotion detection for the students with dyslexia and dyscalculia. The system will classify emotions into frustration, distraction, and engagement, and dynamically adjust the difficulty level of learning activities in real-time based on these classifications. Additionally, the system will generate personalized feedback reports for guardians, providing insights into the emotional states of students during activities and comparing their progress over time. This approach aims to bridge the gap between emotion detection technology and the specific needs of students with learning disabilities, offering a more comprehensive and tailored solution for their education

1.3 Research Problem

In today's educational landscape, students with learning disabilities such as dyslexia and dyscalculia often struggle to maintain engagement and manage the cognitive load during learning activities. Traditional methods of instruction fail to account for the dynamic emotional states of these students, leading to frustration, distraction, and decreased motivation.

How can we enhance the learning experience for dyslexic and dyscalculic students by developing a system that detects their real-time emotional states using facial expressions and dynamically adjusts the difficulty level of learning activities?

Difficulties with the management of the learners with dyslexia and dyscalculia in the context of the constant change in the process make it crucial to develop new approaches that address the specifics of the learning disabilities with the help of the technology. The proposed research problem involves improving learning approaches, this will be done by proposing an intelligent system that can assess students' emotional state (for example frustration, distraction, engagement). This system will dynamically adjust the difficulty level of learning activities in real-time based on the detected emotional state.

To address this research problem and create a solution that fosters engagement and progress, the following key features and strategies will be implemented:

Emotion Detection and Analysis

In this part the system will use AI algorithms to analyze learners' facial key emotions (happiness, sadness, anger, surprise and neutral) and define their emotion class such as frustration, distraction and engagement.

Dynamic Adjustment of Learning Activities

Using signal from the emotion detection analysis the system will automatically adjust the difficulty level of learning activities to match the student's current emotional state, helping to maintain engagement and reduce frustration.

Personalized Feedback for Guardians

The system will provide guardians with an individual report that presents the affective experience of the student as well as give a comparison of past activities to determine the progression of the student.

With those features integrated, the proposed solution is closely meant to ensure a supportive and adaptive learning environment for dyslexic and dyscalculic students, improve their educational results due to emotional feedback in real time, and personalized feedback.

2. OBJECTIVES

2.1 Main Objective

“Emotion Recognition to provide real-time adaptive feedback and adjust activity difficulty level” component is develop an adaptive learning system that enhances the educational experience for dyslexic and dyscalculic students by utilizing real-time facial expression analysis to detect emotional states, dynamically adjusting the difficulty level of learning activities, and providing personalized feedback to guardians.

2.2 Specific Objectives

There are four specific objectives that must be reached to achieve the overall objective described above.

1. Develop A Real-Time Emotion Detection System

This component aims to develop an emotion detection system which is capable of accurately identifying and categorize five key facial expressions happiness, sadness, anger, surprise and neutral in to three emotional states frustration, distraction and engagement. This system will use new and improved advanced machine learning models with the available data sets in the target accuracy of at least 70% within six months. By targeting precisely those emotions that are related to processes of education, the work on the project will be more efficient, and it will be ensured that the designed system will have the maximal possibility to function effectively in the specified timeframe.

2. Implement Dynamic Learning Activity Adjustment

To improve the students’ involvement the project will incorporate and implement an adaptive mechanism that adjusts the level of difficulty of the learning tasks to the

current emotional status of the student as identified by the system. It aims to raise engagement scores by at least 20% within three months of experimenting with a group of identified students. The implementation will take place using generally adaptable learning technologies and learning theories, for a limited number of activities to be added into the system at first, then spreading as the presence of the system proves to be effective. The goal is to have this feature fully operational and tested within three months following the completion of the emotion detection system.

3. Develop and Deliver Personalized Feedback Reports

The component will also involve in developing a feedback mechanism that will generates detailed, personalized reports for guardians which will include analyses of the student's emotional states and track their progress over time. The system is expected to deliver 90% of these reports accurately and promptly, with positive feedback from at least 80% of guardians within the first two months of implementation. By utilizing automated reporting tools and integrating with existing communication platforms, the project will ensure that the feedback provided is both meaningful and actionable, supporting the ongoing development of the student’s learning journey.

4. Track and Analyze Student Progress Over Time

Finally, the component will establish a framework for collecting and analyzing data on students' emotional responses and learning progress. This framework will aim to gather and analyze data from 100 student interactions within the first four months, with the goal of identifying patterns that can inform further refinements to the system. By focusing on key performance indicators such as emotional stability and learning outcomes, the project will provide insights that contribute to the continuous improvement of the adaptive learning environment. The analysis and reporting of these findings will be completed within four months of the system’s full implementation.

3. METHODOLOGY

The proposed system, Lexayudha is aimed at delivering a personalized learning experience to dyslexic adolescents. To fulfill the desired objectives, Lexayudha utilizes cutting edge technologies such as deep learning techniques in combination with advanced methodologies to deliver the best performance while having the least performance bottleneck. This ensures a seamless user experience for the users of this proposed system.

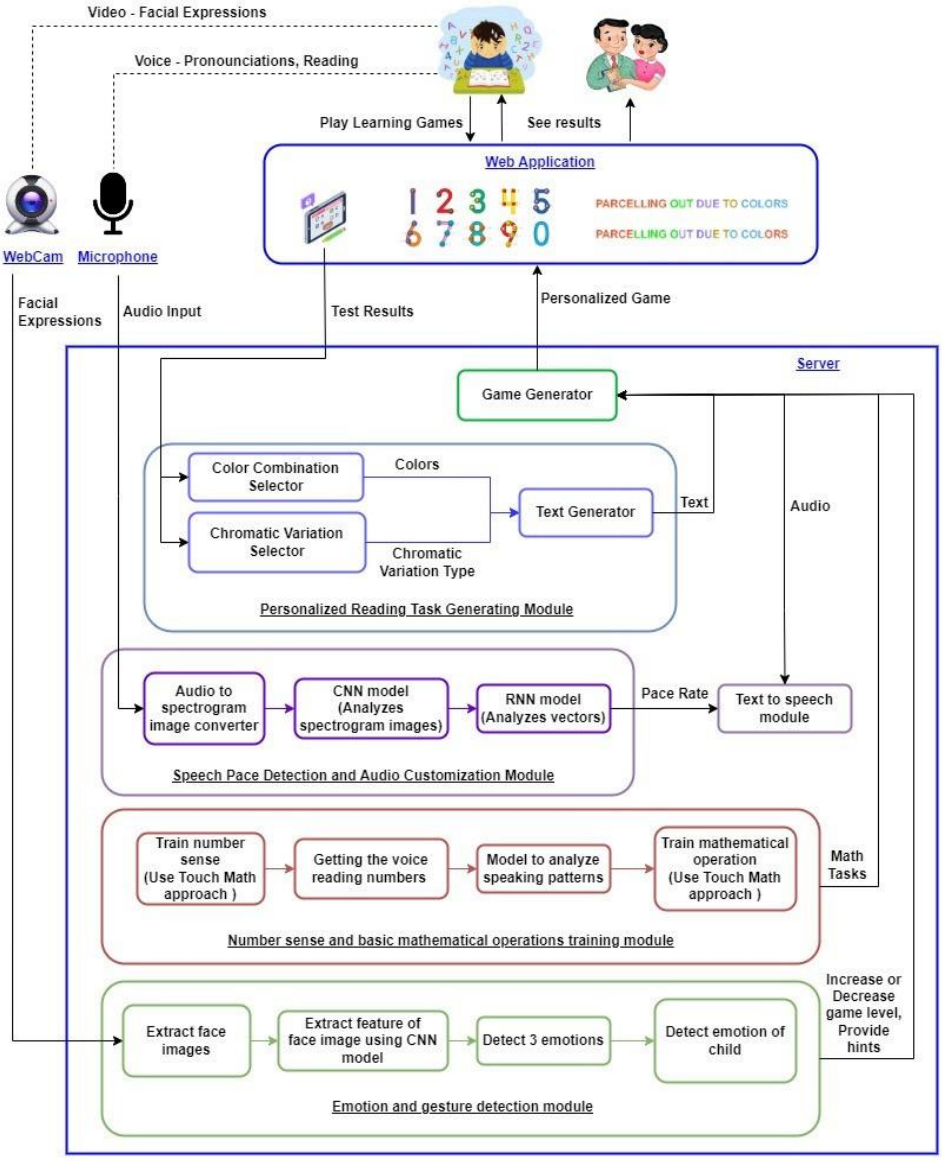

Figure 3.1: Overall System Diagram

Figure 3.1, it is technically proposed to be developed using a microservice architecture. This approach enhances load balancing, security, and fault tolerance, preventing single points of failure and facilitating the integration of various technologies within the system. For data management, the proposed system will utilize MongoDB Atlas, a cost-effective and reliable cloud-based solution, which eliminates the need for maintaining a dedicated database infrastructure. The server of the system is intended to be hosted on Render, leveraging Docker for containerization and Kubernetes as the orchestration platform. The front-end web application of this purposed system is intended to be hosted on Vercel hosting platform. This setup ensures efficient management, scalability, and ease of deployment. System will use Agile Methodology as in Appendix A.

Apart from the common system overview, each component can also be further broken down into smaller sub-units with distinct technological layers. In this study, emotion recognition to provide real-time adaptive feedback and adjust game difficulty level will be explaining.

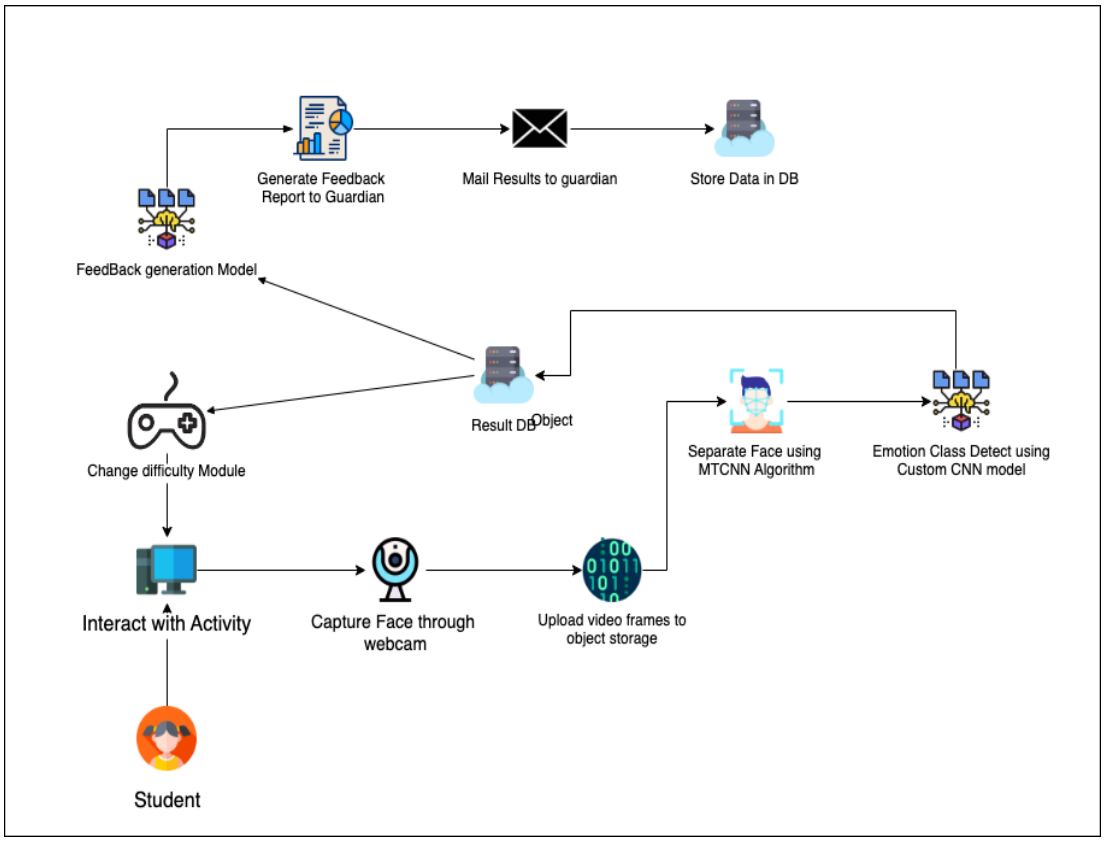

Figure 3.2: System Diagram for emotion detection and provide personalized feedback component

Figure 3.2, The system diagram provides a clear outline of how the project components work together to achieve the main research objective using real time emotion detection for development of personalized and stress-free learning atmosphere for students with dyslexia and dyscalculia. The first part of this component is identifying the learner's emotions using facial recognition technology and adjusting the difficulty of learning activities based on the detected emotional state. Additionally, personalized feedback reports are generated and shared with the student's guardians.

The component will have the following major activities and sub activities. The first step is to connect a webcam to the system which capture the real-time video of the student facial expressions during learning activities. The captured video frames are then uploaded to Object storage for processing. The next task is facial detection, where the Multi-task Cascaded Convolutional Networks (MTCNN) algorithm is used to separate the student's face from the background in each video frame. This facial data is then processed by a custom-built Convolutional Neural Network (CNN) model to classify the student's emotions into predefined classes: frustration, distraction, or engagement.

After the identification of the emotional state, there are two parallel processes to follow them. The first one is the real-time adjustment of the learning activity's difficulty level. For example, if the system detects frustration, it will provide the predefined hints to the student to simplify their task during the learning activity likewise. On the other hand, if engagement is detected, the system may raise the complexity of the task by challenge the student. The second process is creating detailed feedback report. These reports compile the student emotional information then checks it with earlier session to determine the student improvement over time. The reports are sent to the student's guardians via email and stored in a database for future reference and analysis

The data for this component is collected continuously during the student engagement process. The primary data consists of facial expressions, which are captured by the webcam and analyzed to classify emotional states. No surveys or interviews are required for the primary data collection, as the system relies on automatic facial recognition and machine learning techniques.

This component will be carried out in phases. Each phase will have its own task and subtasks. The initial phase is to set up the system including webcam and configuring

object storage. In the second phase will be responsible to developing and training the facial recognition and emotion determination model. The third phase involves implementing the adaptive learning algorithms, followed by the creation of the feedback generation and reporting system. The entire project is expected to follow a detailed Gantt chart, which outlines the timeline and milestones for each task.

Additionally, during this phase, the technical architecture of the platform will also be established. The platform will be built using a robust and scalable technology stack that includes:

Technologies

- Facial emotion Recognition – Tensorflow, Keras, Pytorch
- Computer vision – OpenCV, Dlib
- Backend Technologies – Flask, NodeJs
- Frontend Technologies – React, AntDesign, ChartJs

Algorithms

- Multi-task Cascaded Convolutional Networks (MTCNN) Algorithm
- Facial Landmark Detection Algorithm

Other

- Version Management – Github
- Containerization – Docker, Kubernetes

4. PROJECT REQUIREMENTS

The project will commence with a comprehensive planning and requirements gathering phase. This initial phase involves collaboration with stakeholders, including educators, dyslexia specialists, and technology experts, to define the specific needs of dyslexic students and the desired outcomes of the platform. Based on the gathered requirements from the stakeholders, user requirements, system requirements and non-functional requirements are as follows.

Functional Requirements

- Realtime Emotion Detection - For the system to work, it needs to use the webcam, identify the student's emotions as they are expressed through facial expressions such as happy, sad, anger, surprise, and take them through the emotion states such as frustration, distraction, engagement.
- Dynamically change difficulty - The system should be able to change the difficulty of learning tasks depending on the detected emotional state.
- Feedback Report generation - The system must generate detailed feedback reports based on the student's emotional state during activities. These reports should include historical comparisons to track the student's emotional and learning progress over time.
- Data Storage - All information such as Video frames, Emotion classification and feedback reports must be stored in a cloud-based data warehouse for future analysis.

Non-Functional Requirements

- Performance - The system must process and classify emotions in real-time to ensure immediate responses during learning activities.
- Scalability - The system must scale to support a growing number of students and activities, utilizing cloud infrastructure for seamless expansion.

- Security - Sensitive data, including video frames, emotional classifications, and reports, must be securely stored and transmitted, ensuring compliance with privacy regulations.
- Reliability - The system must be reliable, with high availability and minimal downtime, especially during real-time learning sessions.
- Usability - The system must be user-friendly, with an intuitive interface for both students and guardians, ensuring smooth interaction.

System Requirements

- A webcam for video capture
- Computer with web browser for student to interact with learning activities
- Stable internet connection

User Requirements

- The system should provide an engaging and stress-free learning environment, with activities that adjust based on their emotional state in real-time.
- Guardians should receive personalized feedback reports that detail the student's emotional state and progress, allowing them to understand the student's learning experience better.
- Guardians should have access to the stored data and reports, enabling them to track student progress and adjust learning activities accordingly.

The design process will focus on creating a clean, intuitive interface that supports real-time interaction. Special attention will be given to the chromatic variation system, ensuring that color adjustments are easy to manage and visually effective.
Prototypes will be developed using React.js, allowing for rapid iteration and testing. These prototypes will be shared with stakeholders for feedback, ensuring that the design aligns with the educational goals and user needs. This feedback loop is critical in Agile, allowing the team to make adjustments early in the development process and avoid costly changes later on.

5. PERSONAL AND FACILITIES

The emotion detection to provide stress free learning environment and generate personalized reports for guardian component will be planned, implemented and delivered as per the below task management plan and per the allocated timeline (Figure 5.1,5.2).

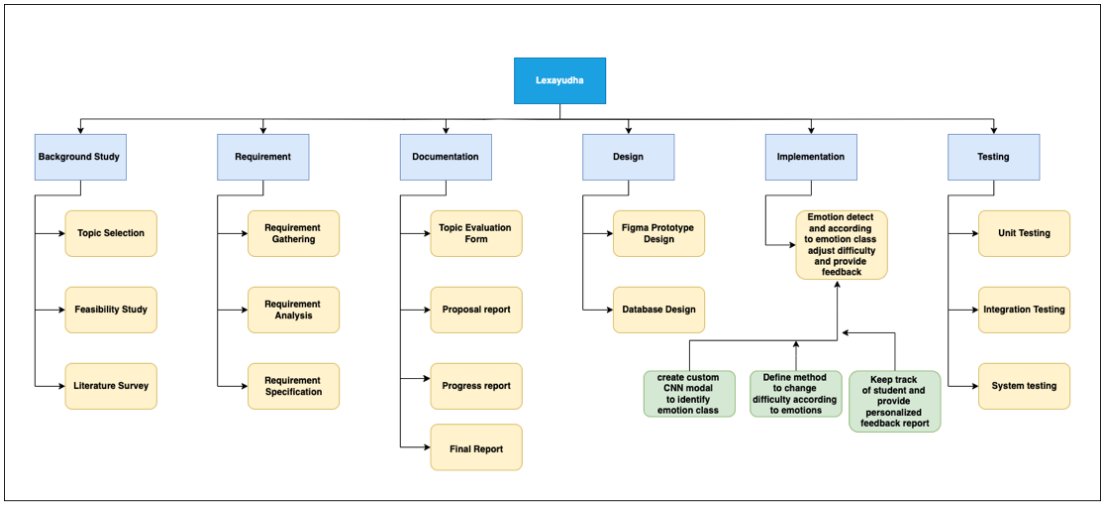

Figure 5.1: Work Breakdown Structure

Task name	Progress	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Project Initiation																	
Study about research gaps	100%																
Deciding appropriate research area	100%																
Going through research papers	100%																
Finalizing a topic	100%																
Requirements Gathering & Analysis																	
Identifying functional requirements	100%																
Identifying non- functional requirements	100%																
Identifying data requirements	100%																
Identifying knowledge requirements	100%																
Design																	
Creating the figma prototype	100%																
Development																	
Model training	0%																
Backend Development	0%																
Frontend Development	0%																
Testing																	
Unit and API testing	0%																
Integration Testing	0%																
Load Testing	0%																
User Acceptance Testing	0%																
Deployment	0%																

Figure 5.2: Gannt chart

6. BUDGET AND BUDGET JUSTIFICATION

The proposed system was planned on a budget in a way that the cost can be reduced and hence could provide a feature rich application to the end users for an affordable price for them. Below is the planned budget for the proposed system and the budget justification. Please note that the budget allocation and the selection of the vendors can be slightly change with future findings and requirements.

Proposed Budget and allocation

Table 6.1: Overall Budget for System

Description	Cost
Azure Blob Storage	$ 0.018 per GB (first 5GB free)
Azure Cosmos DB	Free tier (50 GB free for year)
AWS SageMaker	$ 0.10/hour (16 GB RAM)
Azure Virtual Machines	Free tier (750h)
Azure Speech to Text	$ 1 /hour (5 hours free per month)
AWS SES	Free (3000 emails per month)
Vercel – Frontend Deployment	Free tier
Render – Backend Deployment	Free tier

Budget justification

Azure Blob storage: Azure blob storage was chosen for it competitive pricing and the free tier. It provides $ 0.018 per GB after the free first 5GB. Blob storage has one of the lowest storage prices compared to AWS S3 bucket $ 0.023 per GB and google clouds $ 0.026 per GB. Blob Storage is well-suited due to its ease of integration, flexibility, and ability to handle unstructured data and also Azure provides a more affordable entry point while still maintaining high performance and scalability.

Azure Cosmos DB: Azure cosmos DB was selected as No SQL Database for its cost effective and extensive free tier offering 50GB of free storage per month for the first year. This makes it's the most suitable option compared to the AWS dynamodb (25 GB per month for a year) and google firestore (1 GB per month for a year). Cosmos DB also provides globally distributed, low-latency access to data, which is ideal for a real-time application like Lexayudha, where performance is critical for storing and retrieving results and feedback. Additionally, Cosmos DB supports multiple NoSQL APIs, making it flexible.

AWS SageMaker: AWS SageMaker can select as the best choice to address the machine learning parts due to its robust platform and flexible pricing options. At $0. 10/hour for an ml. t3. medium instance, SageMaker also presents a a highly cost-effective solution to running machine learning computations. It also easily interconnects with other AWS services, so this is advantageous if you decide to upscale system's AI models.

Azure Speech to Text: Azure Speech to Text was chosen for its low cost ($1/hour) and a free monthly allowance of 5 hours, which is beneficial for projects with moderate usage. Also compared to AWS and Google speech to text prices which is $1.44/hour and free 60 minutes for month, Azure speech to Text is more suitable for the system. The service's high accuracy in transcribing audio to text, along with its integration capabilities within the Azure ecosystem, makes it ideal for project's potential need for speech processing

Commercialization Aspects of the Product

It is in fact a business opportunity for the proposed AI-driven adaptive web-based platform, as it uniquely fills the gap in the education sector empowered by personalization in adaptive learning experiences for students with dyslexia. The potential number of people with dyslexia is fairly large, and interest in effective and scalable educational solutions has been quite pervasive and growing at a very fast rate. By providing a solution using artificial intelligence, chromatic variations, and natural

language processing, the platform will be positioned as part of the best in class for this EdTech marketplace.

Target Market

The two target markets for this solution will primarily be schools and other educational facilities, as well as parents of dyslexic students. Key Target Audiences for these target markets include:

- Primary and Secondary Schools: Public and private schools that afford special education programs have a great opportunity. These will most frequently be looking out for a package that can help teach such children with learning disabilities, and what the platform will offer in terms of personalized and adaptive learning will effectively meet this demand.
- Parents: Parents of dyslexic children make another crucial segment of the market. In general, parents are more than glad to pay for materials or services which would enable their children to climb up the ladder educationally, especially if the regular learning methodologies have failed.

Educational technology companies: Suitable educational technology companies can also become collaborative to scale the reach of this platform. Many of these companies work to expand their product lines with creative solutions; in this light, the inclusion of this platform in their existing suites will be beneficial for both parties.

Dyslexia Advocacy Groups: It can form alliances with independent, non-profit making dyslexia advocacy groups dedicated to making lives with dyslexia better and echo this platform for more visibility and credibility in general.

Pricing models

This would be a flexible pricing strategy that caters to the needs and budgets of the target market in order to be successful financially. For the purpose of pricing, it may use any one of the following models:

- Subscription based model: The plan will apply a tiered subscription model at a fee charged, plus the features required. With the next tier of features being the advanced tiers, which include advance analytics and an extended library of

content with further customization options, the example of one basic tier including the core features, such as individual learning paths and chromatic adjustments. Therefore, depending on the level of service needed, the price will range from $5 and above monthly.

- Freemium Model: That is why, for instance, on this platform, a freemium model could be used where all the basic functionalities would be free of charge. Therefore, users would have experience of the platform and subsequently transfer to the paid version. By subscription, premium feature advanced AI-driven content customization, detailed progress reports, and more support options could be unlock.

Market Strategy

A market strategy will be put in place to commercialize the platform successfully .

- Marketing and Outreach: Participating in educational technology related meetings and visiting places offering education for dyslexics and dyscalculics can be of importance, which will enable the creation of brand awareness. This helps to network potential clients and other stakeholders. Impressions on the potentials of the platform for benefiting students with dyslexia and dyscalculia can be achieved through the demos or presentations made at these events.
- Online marketing will be conducted through digital campaigns that place ads on social media, educational forums, and search engines for both school and parent buyers. Thought leadership on this subject will be built using content marketing for those in education for whom dyslexia is a concern. Collaboration with schools and special education programs will facilitate early testing for the platform.
- Dyslexia advocacy groups can boost the believability as well as exposure in the community. Support for the platform as well as ongoing development can be provided through these groups based on input.

Sales Channels

- Direct Sales: Working on a face-to-face basis with schools, colleges, and school districts to make aware the platform and close contracts.
- Online Sales Portal: The channel will also be purchasable and subscribed to through online sales portals, thus being easily accessible to individual customers and smaller institutions.

Only high customer support will help in the retention of the user base and, thus, ensure word-of-mouth publicity. The support services will consist of onboarding assistance, training sessions for educators, and continuous technical support.

Regular updates and improvements, based on user feedback, will maintain the relevance and effectiveness of the platform and thereby secure customer satisfaction in the long term.

Global Expansion

In future, after the platform is developed for the English-speaking markets, the company will get further development of the platform, which will provide an opportunity to cover many languages and educational systems across the globe. The content and the user interface of the platform will be localized based on the specific needs of the international markets.

Revenue Projections and Long-Term Vision

This is so because, if well priced and marketed, large potential can be realized in terms of revenue generation on this platform. Most of the revenues in the first few years will come from subscription sale. Further with the growth, when the user base has increased, more ways can be figured out to better monetize the platform, such as data analytics services provided to institutions or premium content and features.

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7. REFERENCES

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8. APPENDICES

Appendix A

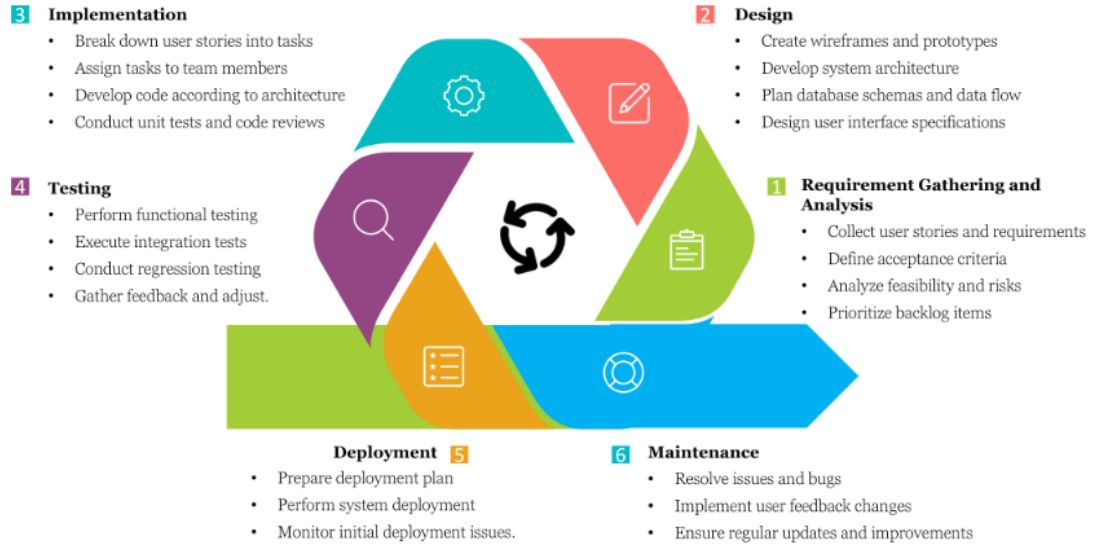

Figure 8.1: Agile Methodology

Appendix B

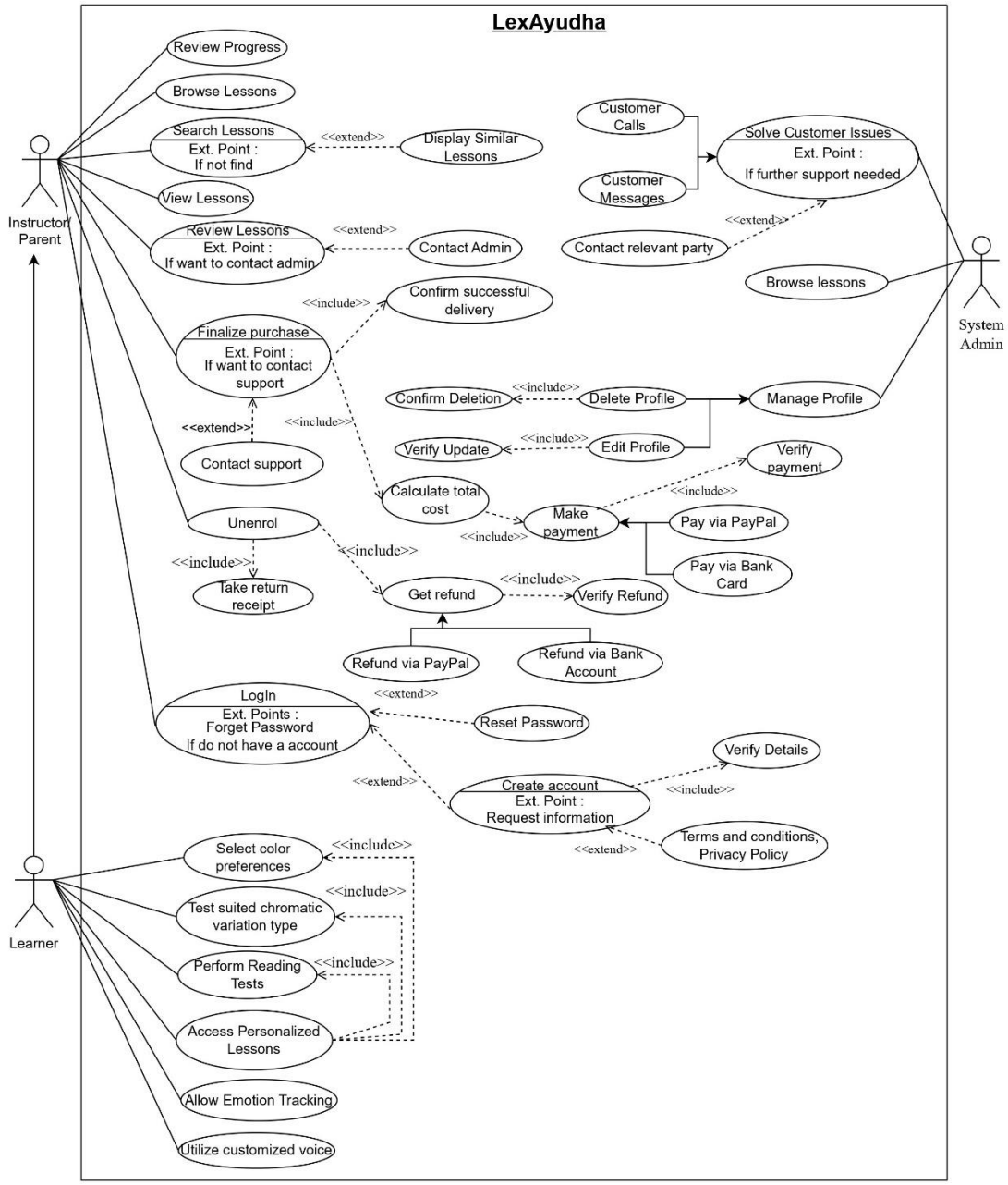

Figure 8.2: UseCase Diagram for system

Appendix C

Table 8.1: Team Contribution

Student Name	Student ID	Research Component
Silva T.U.D	IT21318320	1. Create a sample test to identify the efficient color combinations for the child. 2. Create a sample test to identify the most efficient chromatic variation type for the child. 3. Create a test to check the reading skills of the child to customize the complexity levels of the tasks. 4. Create personalized reading task plans for each child.
Madusanka G.K.I	IT21189944	1. Emotion Recognition Algorithm Development 2. Real-Time Adaptive Feedback Loop

		3. Personalized Emotional Baseline Establishment 4. Integration of Emotion Regulation Strategies and provide feedback to educators and parents
Thalangama T.P	IT21223594	1. Implementing a speech pace detection AI model that outputs the pace as a numerical value. 2. Implementing a pace incorporating text to speech (TTS) model.
Dissanayake M.G.T.W	IT21319174	1. Implement Touchpoints on numerals for tactile learning 2. Providing a memorizing approach to improve mathematical skills. 3. Integrates visual, tactile, auditory, and kinesthetic elements.