Web Application for Students with Dyslexia

Submitted in partial fulfilment of the requirements of the degree

BACHELOR OF ENGINEERING IN **COMPUTER ENGINEERING**

By

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CERTIFICATE

This is to certify that the Mini Project entitled **" Web Application for Students with Dyslexia"** is a bonafide work of **Juhi Birare (D12A/11), Samruddhi Jatkar (D12B/20), Aiman Dabir (D12A/72)** submitted to the University of Mumbai in partial fulfillment of the requirement for the award of the degree of **"Bachelor of Engineering"** in **"Computer Engineering" .**

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Mini Project Approval

This Mini Project entitled "**Web Application for Students with Dyslexia"** by **Juhi Birare (D12A/11), Samruddhi Jatkar (D12B/20), Aiman Dabir (D12A/72)** is approved for the degree of **Bachelor of Engineering in Computer Engineering.**

Examiners

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Date:

Place:

Contents

Abstract:

This app presents the design and functionality of a web application developed to support individuals with dyslexia by creating a personalized and accessible learning environment, powered by artificial intelligence (AI). The application focuses on addressing the unique learning challenges faced by dyslexic users through adaptive tools and multimedia resources that cater to a variety of learning preferences. At its core, the app features a personalized profile page that tracks each user's progress, customizing learning plans based on individual needs and pace. The use of audio and video lessons accommodates different learning styles, making complex topics more accessible and engaging.

One of the app's key interactive tools is a text-to-speech converter, which transforms written content into spoken words, facilitating reading and improving comprehension. This tool enables dyslexic users to engage with content in a more auditory manner, which can reduce the cognitive load of reading and enhance their learning experience. Additionally, the app incorporates educational games that turn learning into a dynamic, hands-on journey, promoting active participation and reinforcing understanding in an enjoyable way.

A comprehensive progress tracking feature allows both students and educators to continuously monitor learning development, providing detailed insights into areas of strength and opportunities for improvement. By highlighting specific areas that need further attention, the app empowers educators to adapt their teaching strategies effectively. For students, progress tracking fosters a sense of accomplishment by celebrating milestones, encouraging motivation and continued engagement in the learning process. Overall, this web application offers an innovative approach to supporting individuals with dyslexia by delivering a flexible, interactive, and tailored educational experience.

Acknowledgements:

We extend our deepest gratitude to our mentor, whose invaluable guidance and unwavering support were instrumental in the successful completion of this project. Your insights, constructive feedback, and thoughtful advice throughout the development process were crucial in shaping the direction and elevating the quality of the web application.

We would also like to express our sincere appreciation to the development team, whose hard work, dedication, and collaboration brought this project to life. Your expertise in design, coding, and testing played a pivotal role in making the web app both functional and user-friendly, ensuring it met the highest standards of accessibility and usability.

List of abbreviations :

1. UI – User Interface

2. UX – User Experience

4. HTML – HyperText Markup Language

5. CSS – Cascading Style Sheets

6. JS – JavaScript

7. ML – Machine Learning

8. AI – Artificial Intelligence

12. TTS – Text-to-Speech

These abbreviations frequently appear in documentation and technical specifications for web development, especially in the context of educational and personalized learning platforms. They are essential for understanding various aspects of the technology stack, user experience, and content delivery strategies used in building such applications.

1. Introduction

1.1 Introduction

Dyslexia, a prevalent learning disability marked by difficulties in accurate and fluent word recognition, spelling, and decoding, creates significant barriers in traditional education settings. These challenges necessitate the development of innovative educational approaches to better support dyslexic learners. Addressing this need, the web application leverages artificial intelligence to transform how educational content is delivered, making it more accessible and effective for individuals with dyslexia.

The progress data allows the app to adjust the learning experience in real-time, ensuring that educational content is tailored to the unique needs of each user. The system not only identifies areas of improvement but also celebrates milestones, motivating students as they advance.

The application goes beyond conventional teaching methods by offering customized learning plans that accommodate different learning preferences. These plans include a variety of multimedia resources, such as audio and video lessons, which make learning more engaging and help students grasp complex concepts by presenting information in diverse formats. By catering to auditory, visual, and kinaesthetic learning styles, the app ensures that content is accessible to a wider range of students.

A built-in text-to-speech tool aids comprehension by converting written text into spoken words, allowing users to listen to and understand material more effectively. This feature is particularly beneficial for dyslexic learners, who may find it difficult to process written information at the same pace as their peers.

Overall, this web application not only supports dyslexic learners but also advocates for a more inclusive approach to education. By incorporating personalized, interactive, and AI-driven solutions, it fosters an adaptive learning environment where all students can thrive, regardless of their learning differences.

1.2 Motivation

The motivation behind this project arises from a commitment to making education more inclusive and accessible for students with dyslexia. Dyslexic learners often encounter significant challenges in traditional educational environments, where learning materials are predominantly text-based and standardized approaches fail to accommodate their unique needs. This web app seeks to bridge that gap by offering a learning experience that is personalized, adaptive, and supportive.

The application addresses these challenges through the use of multimodal content delivery, combining visual and audio elements to present information in ways that are more accessible to dyslexic learners. This tailored approach allows students to engage with material according to their preferred learning style, whether they benefit more from auditory explanations, visual aids, or interactive activities.

Key features such as progress tracking and individualized learning pathways enable the app to adapt dynamically to each student's development, allowing them to learn at their own pace. By providing feedback on areas of improvement and recognizing accomplishments, the app helps boost students' confidence and supports their academic success.

The ultimate goal of the project is to create an educational platform that goes beyond traditional methods to offer tools and resources specifically designed to meet the needs of dyslexic students. By making education more adaptive and responsive to individual learning differences, the app aims to foster an environment where all learners can thrive, ensuring that dyslexic students have equal opportunities to achieve their full potential.

1.3 Problem Statement and Objectives

Problem Statement:

Dyslexia is a common learning difficulty characterized by challenges in processing written and spoken language, which can lead to difficulties in reading, writing, and spelling. These struggles often extend beyond academics, affecting a student's self-esteem and overall confidence. Traditional educational resources and teaching methods are typically text-heavy and do not accommodate the unique needs of dyslexic learners, resulting in ineffective and frustrating learning experiences.

A significant barrier to effective support is the lack of awareness and understanding among educators, parents, and even students themselves about dyslexia. This gap in knowledge often leads to misidentification of the condition or a failure to implement appropriate teaching strategies. As a result, many dyslexic students do not receive the targeted support they need, which hinders their academic progress and exacerbates feelings of inadequacy.

Moreover, dyslexic students frequently struggle to find accessible learning resources that are specifically designed to accommodate their challenges. There is also limited access to assistive technologies, such as text-to-speech tools or specialized reading software, which could significantly aid their learning. Addressing these gaps is crucial for creating supportive learning environments where dyslexic students can thrive and reach their full potential.

Objectives:

1.Develop a Web Application with Personalized, Adaptive Learning Solutions: Design a web application specifically tailored for dyslexic students, focusing on personalized and adaptive learning paths. The app will assess each student's strengths, weaknesses, and learning preferences, providing customized content to accommodate their individual needs. The goal is to create an accessible, user-friendly platform that adapts dynamically to students' progress, ensuring that the learning experience remains relevant and effective.

2. Create an Interactive and Engaging Learning Environment: Incorporate features such as video lessons, interactive quizzes, and educational games to make learning enjoyable and engaging. These elements will cater to different learning styles, utilizing visual and auditory content to help students better understand and retain information. The interactive nature of the app will encourage active participation and make learning a more stimulating and rewarding experience.

3. Provide Immediate Feedback, Performance Analysis, and Progress Tracking: Implement tools for tracking students' progress and performance over time. The app will offer immediate feedback on quizzes and activities, helping students identify areas for improvement and build on their strengths. Detailed performance analysis and visual progress reports will be available to both students and educators, allowing for targeted support and goal setting.

4. Increase Awareness Among Educators and Parents: Include resources and training materials to help educators and parents better understand dyslexia and the specific needs of dyslexic students. The platform will offer guidance on effective teaching strategies, assistive technologies, and ways to create a supportive learning environment. By raising awareness, the app aims to equip adults with the tools to provide better support and advocate for dyslexic learners.

5. Foster a Supportive Community Through Shared Resources and Interaction: Develop a community hub within the app where students, families, and educators can share resources, experiences, and advice. This space will encourage interaction and collaboration, helping to build a supportive network where users can connect, ask questions, and learn from one another. The shared community will also offer peer support, making the learning journey less isolating for students.

1.4. Organization of the Report:

The report is organized into several key sections. It begins with the Literature Survey, which reviews existing research and systems, identifying their methodologies, limitations, and the research gaps the mini-project aims to address. This is followed by the Proposed System, detailing the process design, architectural framework, algorithms, and methodologies applied. It also covers the hardware and software specifications, and result analysis. Finally, the Conclusion and Future Work section summarizes the project's outcomes and suggests potential improvements and future research directions to enhance the system’s effectiveness and scalability.

2. Literature Survey

2.1 Survey of Existing System

A literature survey is a comprehensive review of existing research, studies, tools, and educational programs related to a particular topic or field. It aims to identify, analyze, and synthesize the current state of knowledge, highlighting gaps, trends, and advancements. In the context of this project, the literature survey will examine the current landscape of dyslexia support, focusing on traditional and modern approaches, and evaluating their effectiveness in assisting dyslexic learners.

The current landscape of dyslexia support includes various tools and educational programs designed to assist learners with dyslexia. These systems range from traditional methods to modern technology-based approaches:

- **Traditional Educational Resources**:
    - Schools and educators often rely on conventional teaching methods such as textbooks, workbooks, and lectures. While effective for some students, these approaches may not meet the unique needs of dyslexic learners who struggle with reading, spelling, and comprehension.
    - These resources lack personalization and fail to provide the multi-sensory learning experiences that dyslexic students need to grasp concepts effectively.
- **Text-to-Speech Software**:
    - Tools like Kurzweil 3000, Read&Write, and Natural Reader are commonly used by students with dyslexia to convert written text into spoken words, facilitating better understanding of the content. These tools help bridge the gap between written language and comprehension.
    - However, these programs are often limited to reading assistance and do not offer a comprehensive learning plan, nor do they incorporate interactive elements such as quizzes, video lessons, or educational games.
- **Dyslexia-Specific Learning Apps**:
    - Nessy Learning, Lexia, and MindPlay offer educational games, phonics-based exercises, and literacy support tailored for dyslexic learners. These programs are designed to improve reading skills through game-based learning.

- Despite their benefits, these apps often focus on specific areas, such as phonics or reading, without providing a holistic approach that includes progress tracking, multi-sensory learning, or community involvement. They may also lack detailed customization for individual learning styles and progress monitoring.

- **Assistive Technology Integration in Schools**:
  - Some educational institutions implement assistive technologies like audiobooks, speech-to-text programs, and visual organizers to support dyslexic students. For instance, Dragon NaturallySpeaking helps students dictate their writing, bypassing spelling difficulties.
  - These technologies are helpful but typically address only a particular aspect of the learning process. They do not offer a full-spectrum solution that encompasses audio/visual learning, engagement, progress analysis, and direct community support.
- **Awareness and Training Programs for Educators**:
  - There are initiatives to educate teachers and parents about dyslexia, providing strategies for supporting dyslexic students. Organizations like the International Dyslexia Association (IDA) offer workshops, certifications, and informational materials to raise awareness.
  - However, these programs are not universally available and do not always equip educators with hands-on tools for direct implementation in the classroom.

2.2 Limitation Existing system or Research gap

While there are many useful resources for dyslexia support, existing systems exhibit notable limitations and gaps in service:

- **Limited Personalization and Adaptation**:
  - Most current systems offer one-size-fits-all solutions that do not consider individual learning styles, needs, and progress. Dyslexic learners often require customized content that adapts in real-time based on their strengths, weaknesses, and improvements.
  - Adaptive learning algorithms that adjust lesson difficulty, content presentation, and pacing are generally absent from these systems.

- **Lack of Multi-Sensory Integration**:
    - Multi-sensory learning techniques, which involve using visual, auditory, and kinesthetic activities to reinforce learning, are underutilized in existing tools. Dyslexic students benefit significantly from engaging multiple senses simultaneously to improve information retention and understanding.
    - While some apps may include audio or visual aids, they often fail to combine these into a cohesive, multi-sensory learning experience that reinforces skills through multiple modalities.
- **Inadequate Progress Tracking and Feedback**:
    - Monitoring a student's progress is essential for adapting educational strategies and providing timely interventions.
    - Detailed performance analysis, real-time feedback, and individualized recommendations are not always available, limiting the ability to optimize learning outcomes.
- **Insufficient Awareness Programs**:
    - Educators and parents frequently lack access to comprehensive training on recognizing and supporting dyslexia. Although some resources exist, they do not always reach a broad audience or provide practical, actionable strategies for everyday use in educational settings.
    - Awareness programs often miss the opportunity to incorporate technology-based tools and approaches, focusing primarily on theoretical knowledge rather than practical applications.
- **Lack of Community Support and Shared Learning**:
    - Many tools do not offer features that foster community interaction among students, parents, and educators. A supportive network can significantly enhance learning experiences, allowing users to share resources, advice, and encouragement.
    - The absence of shared learning spaces and community-driven resources limits the social and emotional support that can be crucial for students with dyslexia.

2.3 Mini Project Contribution

The proposed web application aims to address the limitations of existing systems and bridge the gaps by incorporating a variety of innovative features:

- **Personalized Learning Plans**: The web application will use artificial intelligence to create adaptive learning algorithms that will adjust the content's difficulty and type, ensuring students are consistently challenged without feeling overwhelmed. Learning preferences will also be considered, offering multimodal content such as text-to-speech, interactive videos, and visual aids tailored to each student's specific needs.
- **Multi-Sensory Content**: The application will provide a multi-sensory learning experience through a combination of audio/visual lessons, interactive quizzes, and educational games that engage multiple senses simultaneously. Tools like text-to-speech will convert written text into spoken words to aid comprehension, while video lessons with animations and voiceovers will explain concepts.
- **Progress Tracking and Feedback**: The app will track individual progress performance analysis tools will monitor key metrics such as reading speed, comprehension, and spelling accuracy. Real-time feedback will be provided on exercises, with personalized recommendations for supplementary materials based on the user's performance. Educators and parents will also have access to these progress reports, enabling them to better support the learner.
- **Awareness Programs and Training Resources**: A dedicated section of the web app will focus on educating parents and educators about dyslexia, offering practical resources, training videos, and best practices for supporting dyslexic learners.
- **Comprehensive Report Generation**: The app will generate comprehensive reports summarizing each student's progress, highlighting performance trends, mastered skills, and areas needing improvement. These reports will serve as valuable tools for setting learning goals, tracking advancements, and planning future educational strategies. Additionally, they will facilitate communication between educators and parents, ensuring all stakeholders are aligned in supporting the learner’s ongoing development.
- **Community Support and Shared Learning**: The application will foster a supportive online community where students, families, and educators can interact, share experiences, and collaborate.

3. Proposed System

3.1 Introduction

The proposed web application aims to offer a comprehensive, adaptive, and user-centered solution to address the learning challenges faced by individuals with dyslexia. This system is specifically designed to create a supportive educational environment that accommodates different learning preferences, empowers dyslexic students, and provides resources for educators and parents. By leveraging the latest advancements in artificial intelligence, multi-sensory learning techniques, and adaptive content delivery, the web app seeks to transform traditional educational methods and provide a more inclusive learning experience.

The application will integrate various features such as personalized learning plans, multi-sensory content delivery, progress tracking, and community support to ensure that students with dyslexia can access educational resources tailored to their specific needs. Additionally, the system aims to increase awareness and understanding of dyslexia among educators and parents by providing training materials and practical tools for supporting learners effectively.

Key components of the proposed system include:

1. **Personalized Learning Paths:**
    - The system will use AI-driven algorithms to create adaptive, individualized learning plans for each user. By analyzing data from quizzes, games, and progress reports, the app will adjust content difficulty, pacing, and type to ensure that learning remains engaging and effective.
    - Personalized recommendations will guide users toward appropriate learning materials, including video lessons, audio resources, and interactive exercises that suit their learning style.
2. **Multi-Sensory Learning Techniques:**
    - The application will incorporate multi-sensory learning methods by providing audio/visual lessons, educational games, and text-to-speech tools. These techniques will help students engage multiple senses (hearing, sight, touch) to reinforce learning and improve retention.

- Lessons will be designed to use a combination of text, speech, visual aids, and animations to accommodate different learning preferences and facilitate better comprehension of reading and spelling concepts.

3. **Progress Tracking and Feedback:**
   - The app will include comprehensive tracking tools that monitor student performance across various metrics, such as reading fluency, comprehension, and spelling accuracy. These metrics will be used to generate detailed reports that show growth trends and highlight areas that require further support.
   - Users will receive immediate feedback on quizzes, exercises, and games, with suggestions for further practice and targeted activities to strengthen weak areas. Educators and parents can access these progress reports to stay informed and participate actively in the learning process.
4. **Awareness Programs and Training Resources:**
   - To support the dyslexic community and increase awareness, the application will feature educational resources which will include informational articles, training videos, and best practices for assisting students with dyslexia.
   - The app will offer practical strategies for classroom adaptation, such as modifying assignments, using assistive technology, and creating supportive learning environments.
5. **Community Support and Shared Learning:**
   - A built-in community feature will allow students, families, and educators to connect, share experiences, and collaborate on overcoming challenges. Users can participate in discussion forums, share educational resources, and engage in group activities.
   - The community will serve as a space for exchanging advice, offering encouragement, and celebrating milestones, fostering a sense of belonging and collective growth.
6. **Comprehensive Report Generation:**
   - The system will automatically generate detailed reports summarizing each student's progress, performance in specific skills, and learning patterns.
   - Educators and parents can use these reports during meetings and consultations to discuss a student's development and plan future learning strategies.

3.2 Architectural Framework / Conceptual Design

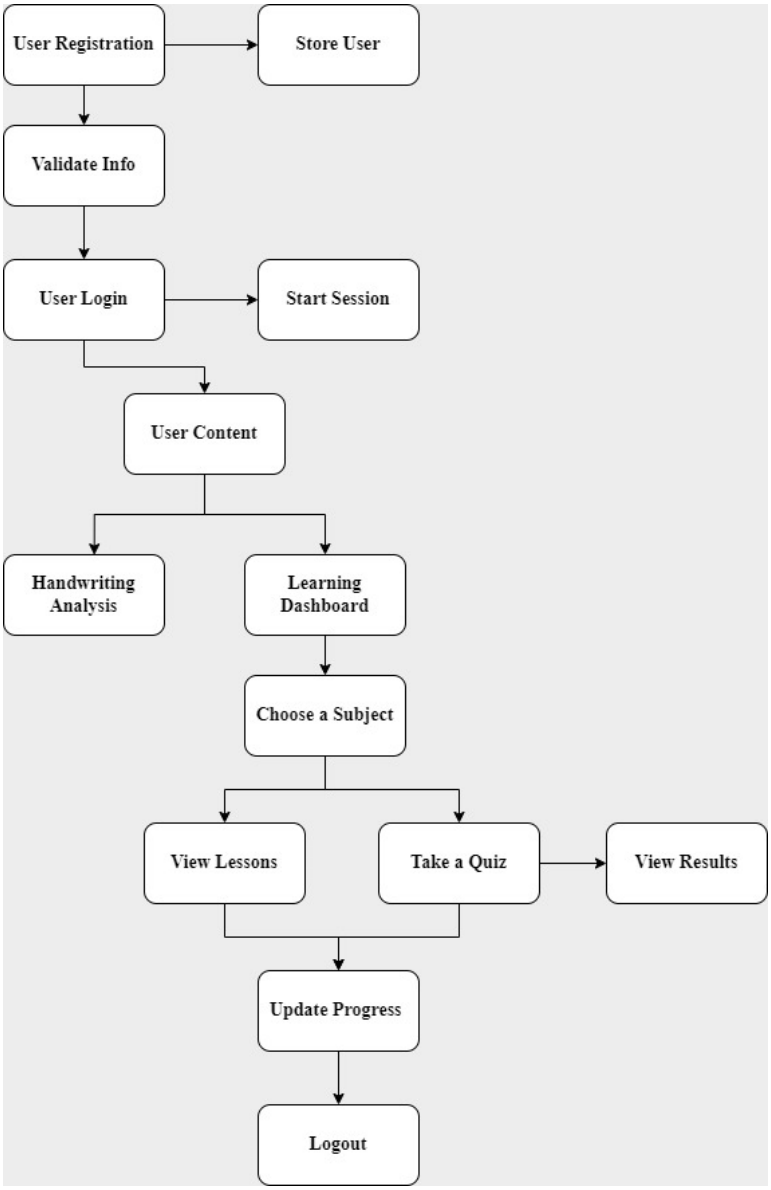


Fig 3.2.1 Architectural Diagram

1. Frontend (User Interface Layer)

- Responsive Design: The UI should be adaptive to various devices like mobiles, tablets, and desktops.
- Accessible Design: Use large, readable fonts, contrast, and voiceover/speech support for dyslexic users.
- Intuitive Navigation: Easy-to-navigate layout with clear labels and helpful tooltips.

- Awareness Program Module (About Dyslexia): Informational pages explaining dyslexia. Links to external resources and support communities.
- Personalized Learning and Assessment Module: User sign-in page with individual dashboards. A content library offering dyslexia-friendly learning materials (custom fonts, speech-to-text, visual aids). Adaptive quizzes/tests based on learning history.
- Progress Tracking Module: Detailed reports on assessments (strengths, areas to improve).

2. Backend (Server Layer):

- User Management: Authentication (sign-up/login), roles (student, teacher, parent), and profile management.
- Content Management System (CMS): Admin interface to manage learning content, assessments, and progress tracking.
- Database: Stores user profiles, learning materials, assessment results, and progress data.

3. Database Layer: This layer holds all the critical data for users, content, and progress.

- User Data: Personal details, role (student, teacher), learning history, preferences.
- Content Storage: Text-based resources, video/audio files, interactive learning modules.
- Assessment Data: Quiz results, assessment scores, personalized recommendations.
- Progress Tracking: Historical performance metrics, reports, and trends.

4. APIs and External Services :

- Speech-to-Text APIs: Allow students to speak instead of typing.
- Text-to-Speech APIs: Provide reading assistance for text-heavy materials.
- Progress Analytics Tools: Integrate with analytical services to visualize and analyze user progress.
- External Learning Resources: Pull resources or videos from dyslexia organizations or online platforms.

3.3 Algorithm and Process Design

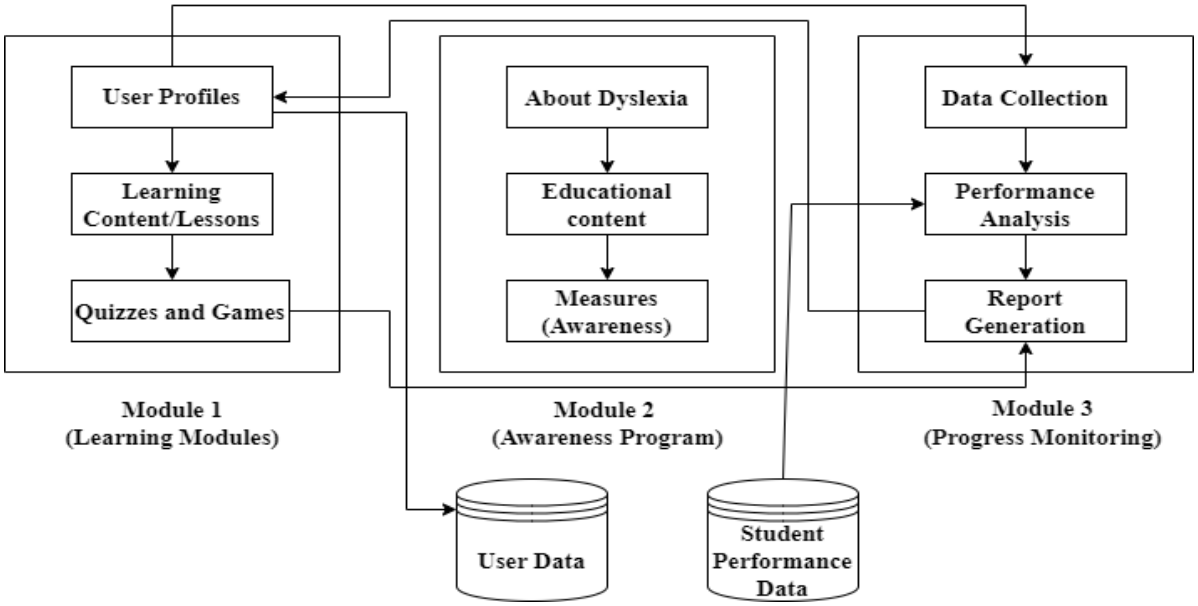


Fig 3.3.1 Modular Diagram

1. Awareness Program :

1. User Access: User selects the Awareness Program module.
2. Content Retrieval: Fetch and display multimedia content (text, videos) based on user role (student, parent, teacher).
3. Interactive Quiz: Optional quiz for learning verification, with instant feedback.

Process Design:

1. User logs in (optional) and navigates content.
2. Multimedia content is displayed interactively.
3. User takes quizzes (optional) and receives feedback.

2. Personalized Learning & Assessment :

1. User Profile: Retrieve user profile and learning history.
2. Personalization: Recommend content based on diagnostic or past performance.
3. Assessment: Trigger assessments, adjust difficulty based on progress.
4. Post-Assessment: Update user profile and recommend new content.

Process Design:

1. User logs in and takes diagnostic tests (if new).
2. Personalized content is shown.
3. Periodic assessments adjust difficulty based on performance.

4. Update learning path based on results.

3. Progress Tracking :

1. Data Collection: Gather assessment results and time spent on content.
2. Analysis: Track progress and detect trends (improvement, areas of struggle).
3. Visualization: Display progress through graphs, reports, and alerts for underperformance.

Process Design:

1. Collect data from assessments and learning sessions.
2. Analyze and present data visually (graphs, progress bars).
3. Periodic reports sent to parents/teachers, with alerts if needed.

3.4 Methodology Applied

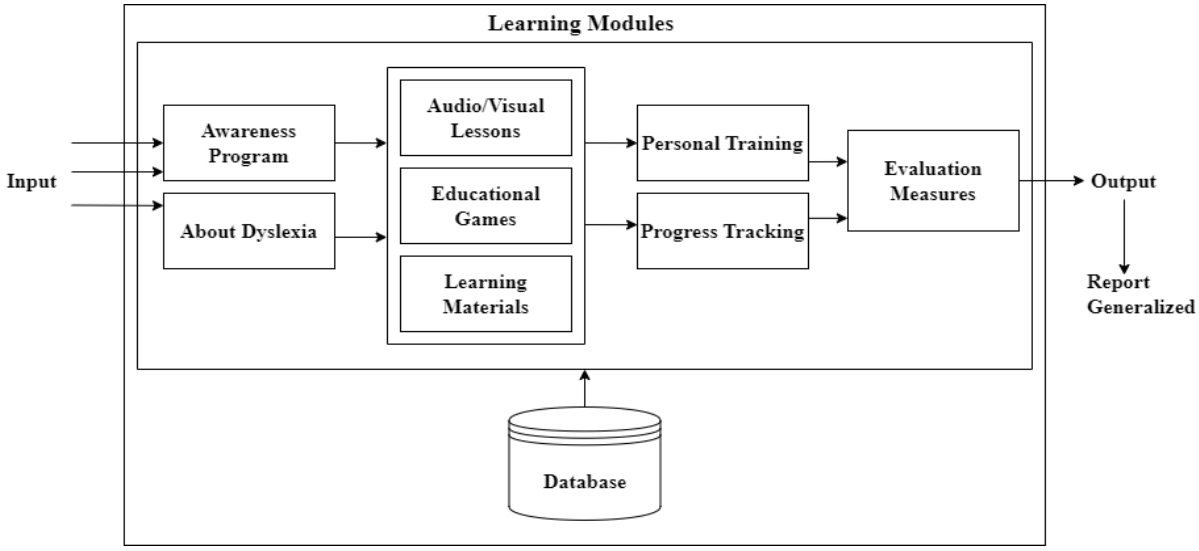


Fig 3.4.1 Block Diagram

Methodology - Agile Model :

- Plan: Prioritize creating personalized learning paths and adaptive modules to address specific user needs.
- Develop: Build features in agile sprints, testing quickly to incorporate feedback and ensure rapid iteration.
- Test: Collect feedback from dyslexic users to refine features for better usability and learning outcomes.
- Review: Regularly check that features align with project goals and desired user impact.
- Improve: Update the backlog and enhance functionality based on user feedback and performance improvements.
- Support: Maintain the platform with updates, bug fixes, and ongoing enhancements to ensure smooth operation.

3.5 Hardware & Software Specifications:

Hardware :

- Mobile phone : (Android or IOS)
- Computer: Ensure that the hardware is compatible with the latest software requirements.

Software :

- Operating System:
- Windows Server: Windows Server 2022 (latest stable release).
- Web Server: Apache HTTP Server: 2.4.58 (latest stable version).

Languages :

- HTML5, CSS3 for structure and design
- JavaScript: ECMAScript 2023 (latest version of ECMAScript).
- PHP

AI/ML Tools:

- Scikit-learn: 1.3.0 (latest stable version).
- NLTK: 3.8.1 (latest stable version).
- SpaCy: 3.5.1 (latest stable version).
- Keras: 2.15.0 (latest stable version).

Plugins and Extensions:

- Browser Extensions:
- Screen Readers: NVDA 2024.1 (latest version), JAWS 2024 (latest version).
- Speech-to-Text and Text-to-Speech Plugins: Google Chrome's built-in speech-to-text, Microsoft Azure Speech Services, Google Cloud Text-to-Speech (ensure using the latest API versions).

Database :

- MySQL: 8.0.33 (latest stable version).
- MongoDB (optional)

3.6 Experiment and Results for Validation and Verification:

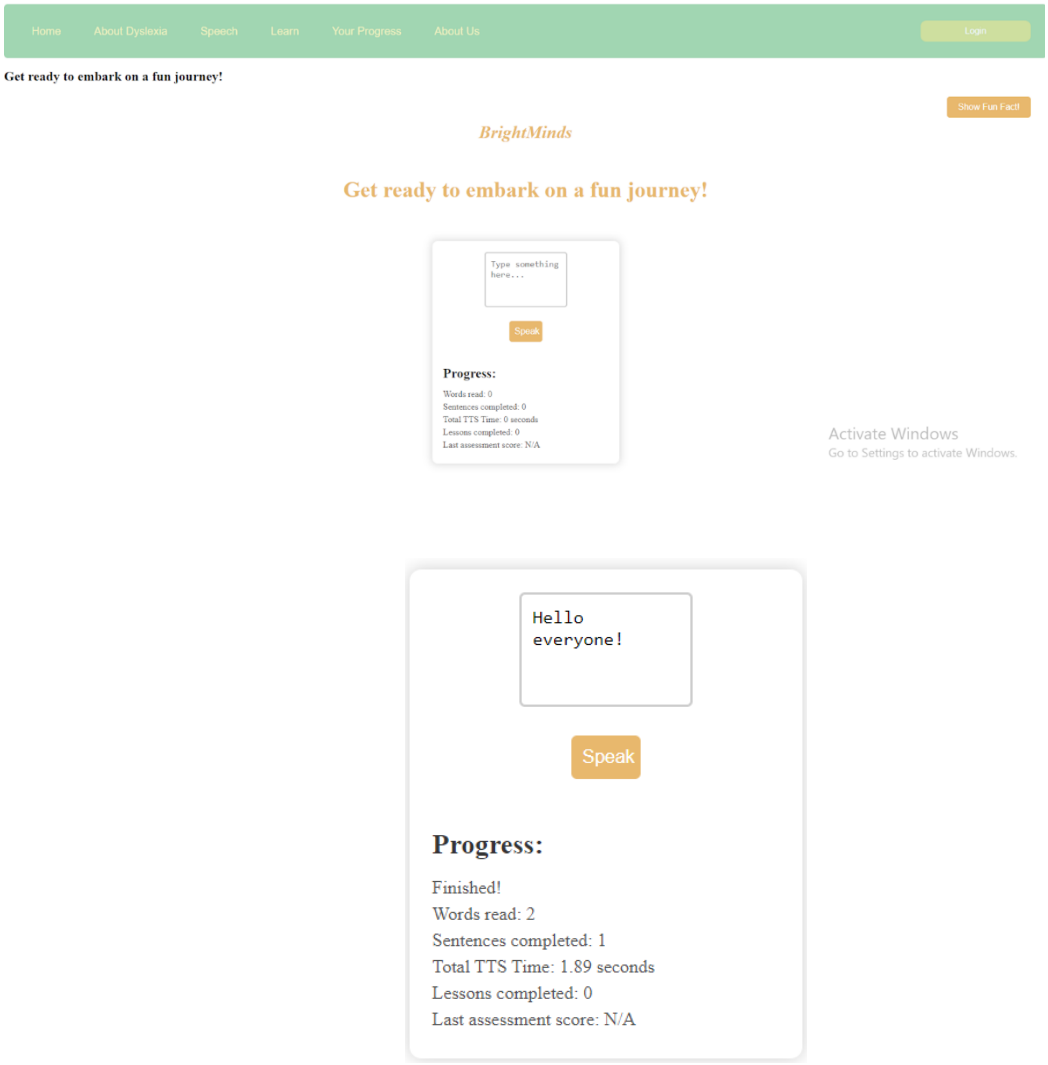


Fig 3.6.1 Home Page

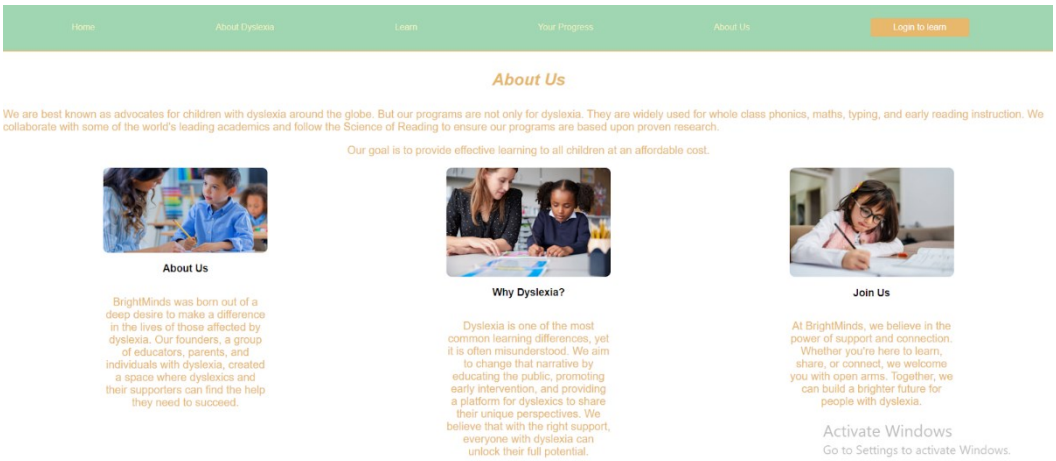


Fig 3.6.2 About Us

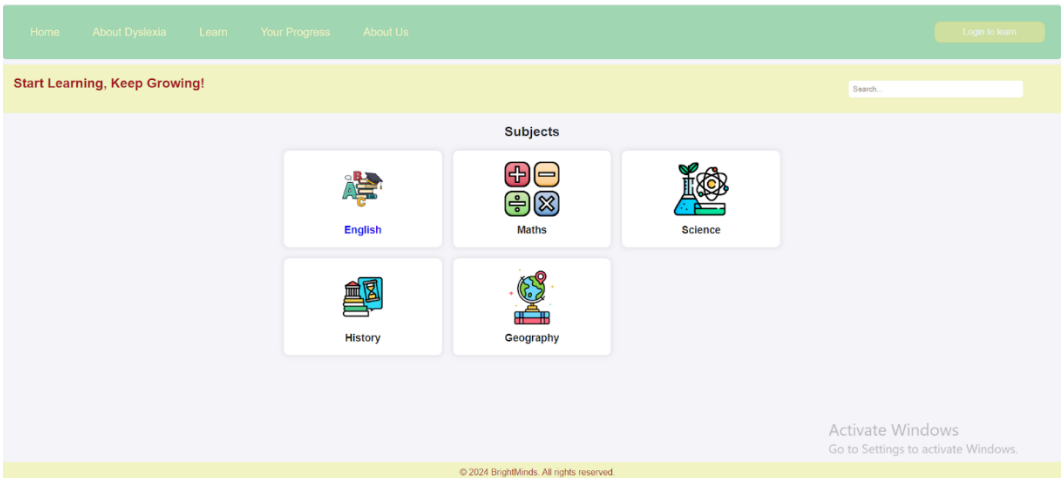
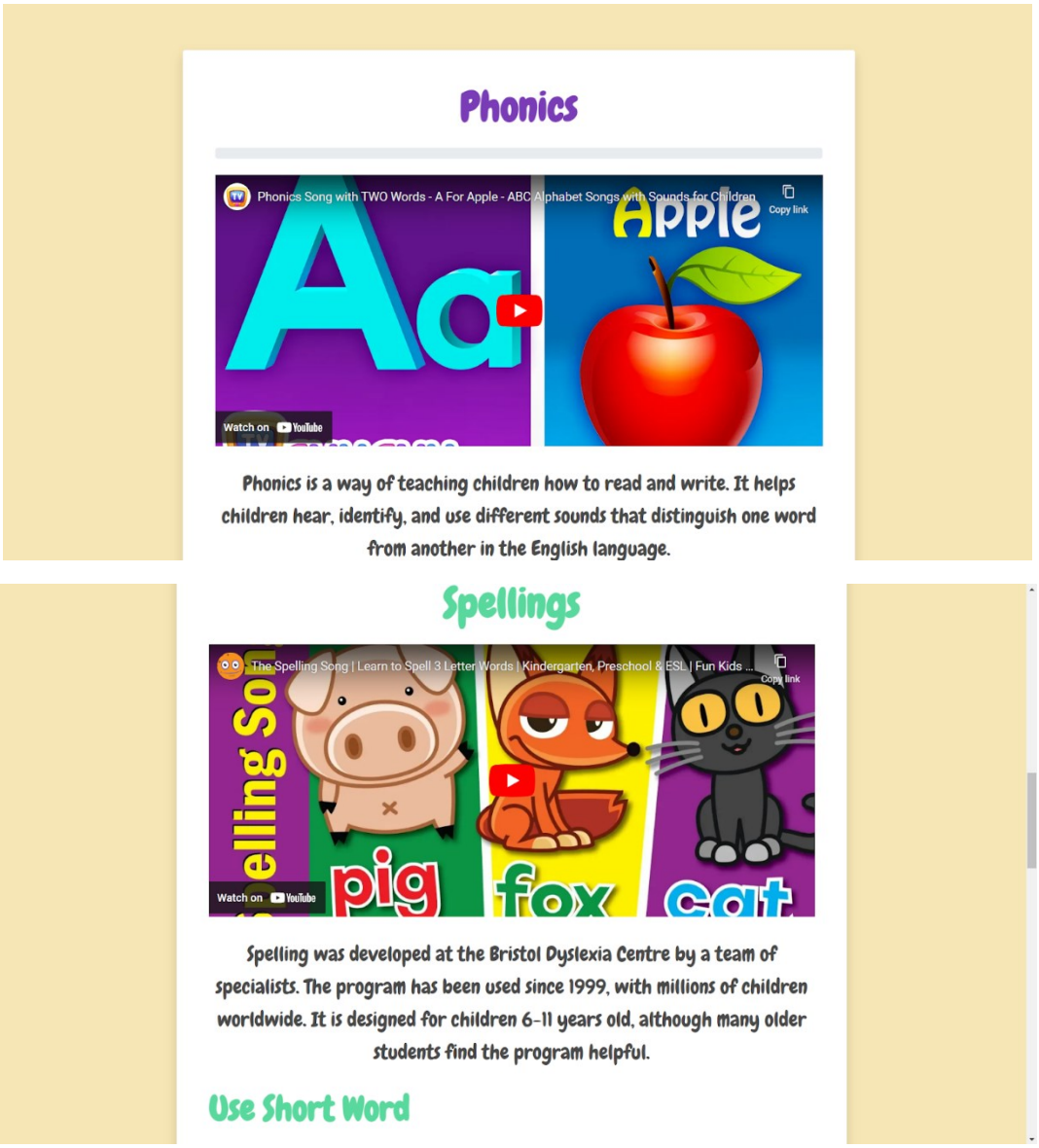


Fig 3.6.3 Learning Page



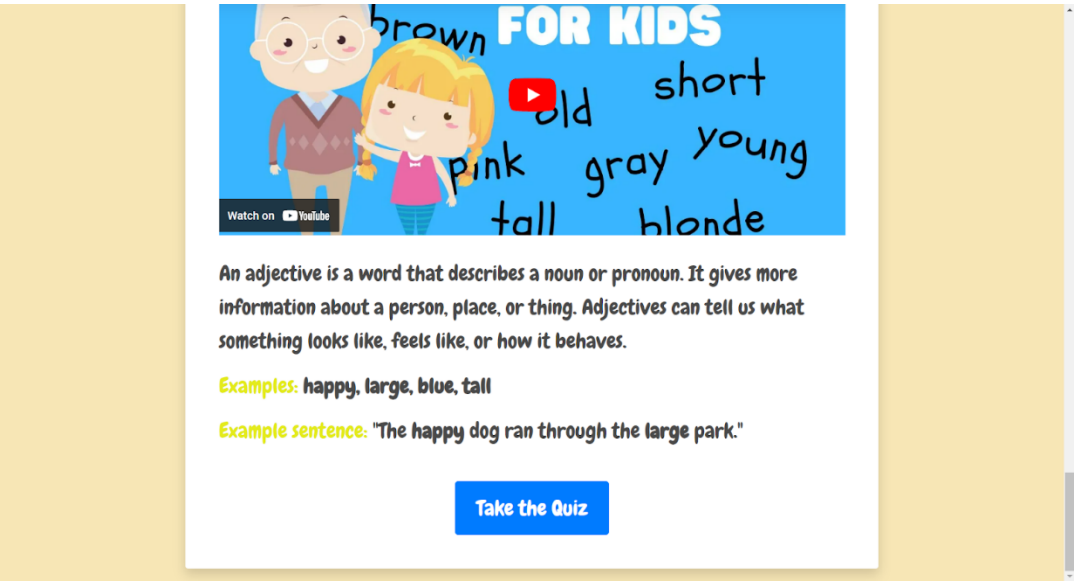


Fig 3.6.4 English Learning Page

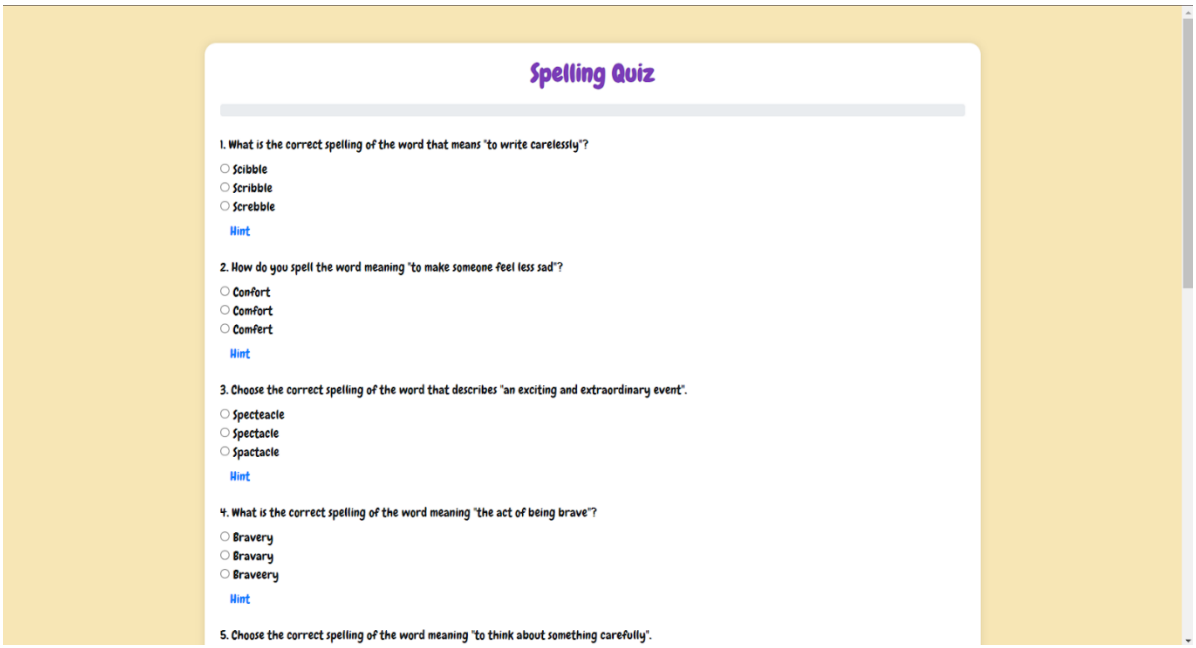


Fig 3.6.5 Quiz Page

3.7 Result Analysis and Discussion :

1. **Overview of Implementation**

In this project, the implementation includes a frontend with pages like Home, Learn, and About Us, along with the integration of Text-to-Speech (TTS) and Speech-to-Text (STT) APIs. These features aim to enhance accessibility and support dyslexic students with reading and communication tasks.

2. **Functionality and Feature Testing**

Frontend Pages :

The Home page offers easy navigation, providing access to key modules.

The Learn page integrates TTS for reading learning materials aloud and STT for interactive voice-based tasks.

The About Us page functions well in delivering static information and contact details.

TTS Feature: TTS effectively reads aloud text displayed on the Learn page, providing clear and natural speech output. It successfully handles different sentence types, with minor challenges in pronunciation of certain special characters.

STT Feature: The STT API accurately converts speech input into text, showing reliable performance in recognizing common phrases. However, slight inaccuracies were observed with accents and fast speech. Background noise also affected performance, though in a minor way.

3. Performance Evaluation

Load Time and Responsiveness: The frontend is quick to load, with responsive transitions between pages. TTS and STT integrations work efficiently, with minimal delays in processing text to speech and vice versa.

API Response Time: TTS responds within 3-4 seconds of text input, providing near-instant feedback to users. STT has an average response time of 2-3 seconds, depending on the length and clarity of speech input.

TTS Errors: Some issues were noted with the pronunciation of uncommon words or special symbols. Overall, the TTS performed well but could benefit from improvements in handling complex text.

STT Errors: Transcription accuracy slightly declined with varying accents and fast speech. Background noise also posed minor challenges, leading to misinterpretations.

Potential Improvements

- Improve the TTS output by integrating more natural-sounding voices and better handling of special characters.
- Enhance STT feature by providing speech fluency and confidence recognition for improving speaking skills of children.
- Update the frontend with more accessibility features, such as customizable font sizes and color themes to accommodate dyslexic users.

3.8 Conclusion and Future work

The development of the web application aimed at supporting dyslexic students has made significant progress, with key components such as the frontend and integration of Text-to-Speech (TTS) and Speech-to-Text (STT) APIs successfully implemented. These features offer valuable tools for improving accessibility, allowing students to listen to content read aloud and convert spoken language into text. Although the project is still in progress, early tests have shown promising results in terms of usability, functionality, and system responsiveness.

While the current version is functional, more work is required to achieve the full scope of the project, including additional features like handwriting error detection and speech confidence prediction. Initial results suggest that the system holds great potential for making learning more accessible for dyslexic students, but further refinement and additional functionality are needed to reach its full impact.

Future Work

- Model Development and Integration: Complete the training and integration of models for handwriting error detection and speech confidence prediction. These models will provide personalized learning assessments and feedback to help students improve their skills.
- Feature Enhancement: Refine the performance of the TTS and STT APIs, ensuring greater accuracy and naturalness in speech synthesis and recognition, especially for diverse accents and speech patterns.
- Progress Tracking and Feedback Mechanism: Develop the progress tracking module, which will allow students to monitor their learning journey over time and receive personalized feedback based on their performance in various tasks.
- Full Implementation of Learning Modules: Expand on the personalized learning content and assessment modules, providing more diverse and tailored exercises that adapt to the specific

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