A Project Report

on

READEASE : EMPOWERING DYSLEXIA LEARNING

Submitted in partial fulfillment of the requirements

for the award of degree of

BACHELOR OF TECHNOLOGY

in

Information Technology

by

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(NAAC 'A' Grade & NBA Accredited- ECE, EEE, CSE & IT)

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DECLARATION

We hereby declare that the work presented in this project entitled **"ReadEase: Empowering Dyslexia"** submitted towards completion of in IV year I sem of B.Tech IT at "BVRIT HYDERABAD College of Engineering for Women", Hyderabad is an authentic record of our original work carried out under the esteemed guidance of **Dr. J. Kavitha, Associate Professor**, Department of Information Technology.

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CERTIFICATE

This is to certify that the Project report on **" ReadEase : Empowering Dyslexia "** is a bonafide work carried out by **G. Ravi Sri Chandana (20WH1A1215), V. Jaswitha (20WH1A1224), M. Sandhya (20WH1A1243)** and **P. Sai Varshitha (21WH5A1204)** in the partial fulfillment for the award of B.Tech degree in **Information Technology , BVRIT HYDERABAD College of Engineering for Women, Bachupally, Hyderabad** affiliated to Jawaharlal Nehru Technological University, Hyderabad under my guidance and supervision. The results embodied in the project work have not been submitted to any other university or institute for the award of any degree or diploma.

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ABSTRACT

Dyslexia is a learning disability that affects an individual's ability to read, write, and spell. It is characterized by difficulties in phonological processing, which is the ability to recognize and manipulate sounds in words. While children with dyslexia typically have normal intelligence and vision, they may encounter the challenges when it comes to reading, writing and spelling. The core objective of the project is to build an accessible and supportive platform for dyslexics. This project involves implementing dyslexia-friendly fonts, an image-to-text-to-speech converter along with reading and spelling exercises. These enhancements aim to improve the learning experience for the dyslexic users. The design's efficacy is assessed by considering the user-friendliness, performance tracking and user satisfaction feedback. This endeavor contributes to a more inclusive society by empowering dyslexic learners to improve their literacy skills and gain a sense of achievement.

Keywords: learning disability, reading, writing, spelling, phonological processing, Image-to-text-to-speech converter

LIST OF FIGURES

LIST OF ABBREVATIONS

Abbrevation	Meaning
MARS	Mobile App Rating Scale
ICT	Information and Communications Technology
CVCe	Consonant-Vowel-Consonant-Silent E
RD	Reading Difficulties
REST	Representational State Transfer
OCR	Optical Character Recognition
gTTS	Google Text-to-Speech
EFs	Executive Functions

CONTENTS

1. INTRODUCTION

Dyslexia, encompassing language difficulties in reading, writing, spelling, and speaking, poses substantial challenges for youngsters, potentially exposing them to social biases when not identified early. Repercussions extend beyond academic realms, engendering a decline in self-esteem, emotional distress, aggression, and delinquency. A prevalent learning disorder globally, affecting 5 to 10 percent of individuals, dyslexia doesn't correlate with intelligence but significantly impacts daily functioning. Its historical narrative reflects a persistent dichotomy between the disorder's specificity and its intricate relationship with other learning disabilities. From early descriptions of Word Blindness Centre case files to contemporary neuropsychological studies, dyslexia's portrayal as a specific problem in reading and spelling, necessitating specialized intervention, has been central. Yet, there's an ongoing debate questioning its definition, potential subtypes, and its existence. It contends that broadening dyslexia's criteria leads to the wider classification of an individuals, while recognizing its co-occurrence with other disorders sheds light on the diversity of its manifestations. Former research presumed dyslexia as the specific learning difficulty, where the discrepancies between expected and actual reading abilities were central to diagnosis. The lack of the distinct reading differences between dyslexic children and those with the broader learning issues undermined this discrepancy-based definition's credibility, prompting a shift in it's perspective. Understanding implications of departing from a definition necessitates reviewing operationalization and evidence challenging its validity. This evolving understanding encourages a more nuanced approach in both identifying and supporting individuals with dyslexia, emphasizing the tailored interventions that address the multifaceted nature of this condition.

1.1. Objective

The main objective of this platform is dedicated to creating the dyslexiafriendly space, empowering users to strengthen their reading and spelling skills through engaging exercises. By incorporating tools like Image-to-text-to-speech converter and dyslexia-friendly font converter, we enable

easy access and comprehension of text, making reading experience more accessible and tailored to individual needs. The core focus lies in its interactive reading and spelling exercises, where users record themselves reading stories and practice spelling words they see.Feedback is provided, encouraging improvement on the specific words and enhancing the pronunciation skills. To make learning enjoyable, AI-generated story illustrations and charming illustrations are rewarded upon completion, fostering the sense of achievement and progress. Aim is to offer the learning environment that supports dyslexic users, utilizing technology and interactive exercises while promoting an enjoyable and rewarding learning journey.

1.2. Problem Definition

The current landscape for dyslexic learners presents significant challenges in accessing tailored resources to enhance their reading and spelling skills. Existing platforms often lack the comprehensive tools specifically designed for dyslexia, hindering effective learning experiences. Limited accessibility to dyslexia-friendly fonts and a lack of interactive exercises personalized to individual needs limit the efficacy of available solutions. Moreover, the absence of platforms offering a seamless transition from image-to-text-to-speech conversion adds to the barriers faced by dyslexic individuals in comprehending textual content. The prevalent gap lies in the scarcity of engaging learning platforms equipped with features like AI-generated story illustrations, interactive spelling exercises with immediate feedback, and tools that allow users to practice specific words while receiving targeted support.

Addressing these challenges requires a comprehensive platform that tailored explicitly for dyslexic learners, offering a holistic set of the tools and exercises to enhance reading and spelling skills effectively. There is a need for the integrated solution that seamlessly combines the dyslexiafriendly font converters with the interactive reading and spelling exercises. Bridging this gap will empower dyslexic users by providing easy access to the dyslexia friendly formats, personalized learning experiences, and engaging exercises that support their unique learning needs. Creating such a platform

would significantly contribute to the advancement of dyslexia education, providing a user-friendly, inclusive, and effective learning environment for individuals grappling with dyslexia-related challenges.

1.3. Modules

1) Image-to-text-to-speech conversion

2) Reading Exercises

3) Spelling Exercises

2. LITERATURE SURVEY

Gokul Yenduri, Rajesh Kaluri, Dharmendra Singh Rajput, Kuruva Lakshmanna, Thippa Reddy Gadekallu, Mufti Mahmud and David J. Brown.[1] The project provides a comprehensive approach of the learning difficulties and the pressing need for inclusive education to support students facing these challenges. This delves into multifaceted causes of learning difficulties, environmental exposures and familial risks. Emphasizing the transformative shift toward inclusive education, review elucidates how integrating students with the learning difficulties into regular classrooms fosters more equitable and beneficial learning environment. It underlines the pivotal role of assistive technologies in higher education, stressing their significance in leveling the educational landscape for students with learning difficulties. The discourse extends to various types of assistive technologies, encompassing hardware, software, and peripherals tailored to aid these students in overcoming barriers to learning. This extends to the role of technologies such as AI, IoT, and digital twins in facilitating the learning and addressing the needs of students with learning difficulties. It touches on ongoing projects and initiatives dedicated to inclusive education, showcasing the potential impact of technology in this domain. Furthermore, it acknowledges challenges in implementing assistive technologies and proposes potential solutions. Lastly, it underscores the need for further research and exploration to enhance technology's role in supporting the educational needs of students with learning difficulties in higher education.

Andres Larco, Jorge Carrillo, Nelson Chicaiza, Cesar Yanez and Sergio Luján-Mora.[2] This study referenced as outlines, development of the web and mobile application targeted at aiding dyslexic children by facilitating diagnosis and treatment. Through the integration of user experience techniques and prototyping, the app underwent evaluations using the Mobile App Rating Scale (MARS), assessing key aspects such as engagement, functionality, aesthetics, and information. Its testing at a school in Ecuador revealed promising potential within the education system, particularly in rural communities where dyslexia often goes unnoticed. The paper delves into the detailed process of prototyping iterations, the interfaces tailored for teachers and students, and pre-diagnostic assessments

incorporated within the app's design. Notably, evaluation results from both teachers and children reflect positive perceptions regarding app's quality and usability. The study concludes by emphasizing the app's significance in supporting dyslexic students and suggests future expansions to cater to other learning difficulties, such as dyscalculia.

Erika Zapata-Cifuentes, Carolina Sarmiento-González, William Nieto-León.[3] The review delves into the intersection of dyslexia education, ICT, inclusive, bilingual learning, and educational management practices. It emphasizes the need for an integrated approach to enhance learning processes for individuals with dyslexia by leveraging ICT tools. Various dyslexia types and their distinctive characteristics are highlighted, shedding light on how ICT can assist in diagnosis, intervention, and improvement of reading and writing skills for affected individuals. The review underscores the evolving role of ICT in education, particularly in addressing learning difficulties, and the potential of management strategies to align educational institutions with emerging requirements. However, it also notes the existing gaps in understanding and applying these concepts, particularly in bridging dyslexia, ICT, and foreign languages. Overall, the review emphasizes the significance of inclusion as a fundamental aspect in achieving quality education and advocates for a holistic approach that integrates dyslexia, ICT, bilingualism, and management practices to create more effective learning environments.

Tinglei Liu1, Feroz De Costa1, Megat Al Imran Yasin.[4] The project aims to explore the impact of online learning effectiveness, categorizing findings into three main areas: analysis of impact, dyslexia's effects on online learning, and interventions. 37 articles met the inclusion criteria, highlighting that dyslexic learners face challenges with online learning, leading to reduced self-confidence, academic performance, and self-efficacy. Internal and external factors like dyslexia types, psychological traits, teaching strategies, and online educational environments influence dyslexic learners. While interventions, such as customized online learning systems and telerehabilitation, exist, there's a lack of strategies addressing dyslexic learners' internal psychology and external support systems. Future research is recommended to delve into the differential impact of dyslexia on online learning and

to understand factors producing this impact, guiding the development of instructional strategies and adapting online learning for dyslexics. The review method utilized the PICOS approach, focusing on populations with developmental dyslexia, excluding studies involving organic dyslexia, and highlighting harmful effects on online learning as dependent variables. However, future studies should broaden the scope to include psychological resources in intervention strategies for dyslexia and explore the evolving landscape of online education to effectively support dyslexic individuals.

Rosemarie T. Bigueras, Maria Charmy A. Arispe, Jocelyn O. Torio, Daniel E. Maligat.[5] The paper proposes a specialized mobile game, called LaroLexia, tailored to aid dyslexic children in improving their reading abilities in the Filipino language. Twelve dyslexic children aged 8 to 12, their parents, and five teachers from Daet Elementary School's Special Education Department were involved in the study. Employing a descriptive research approach and focused sampling, the study identified essential game elements vital for engaging dyslexic learners, such as storytelling, points/rewards, clear objectives, levels, feedback mechanisms, and an achievement system. These elements were integrated into LaroLexia to heighten interest and engagement among dyslexic users. LaroLexia comprises two core sections: Titik and Salita. Titik aims to familiarize dyslexic children with Filipino consonants, vowels, and syllable reading, starting with basic letter recognition and employing sight words to aid initial reading efforts. Salita focuses on enhancing word comprehension through syllable-based reading. Pre-test and post-test assessments conducted during the research demonstrated a significant improvement in the reading performance of dyslexic children following LaroLexia usage. This outcome suggests the potential effectiveness of LaroLexia as a tool specifically designed to assist dyslexic children in overcoming reading difficulties associated with the fundamentals of the Filipino language.

Ruth Görgen, Sini Huemer, Gerd Schulte-Körne, Kristina Moll.[6] The project provides valuable insights into the effectiveness of a novel digital game-based reading training program for children with reading disorders. The findings suggest significant improvements in word reading skills, both for trained and untrained words, indicating potential transfer effects. The focus on phonological awareness,

grapheme-phoneme mapping, and morphological instruction, combined with repeated word reading activities, aligns with established principles of effective reading interventions. Additionally, the integration of motivational elements, such as adaptivity, immediate feedback, and rewarding, enhances the overall flow experience for the children. The feasibility of implementing this digital game-based training in a home environment is highlighted, emphasizing its potential to reach children who may not have access to traditional reading support. The study contributes to the growing body of research on technology-based interventions for reading disorders, emphasizing the importance of individualized and adaptive approaches. Overall, the findings underscore the promising role of digital game-based learning in supporting children with reading difficulties and enhancing their overall attitude towards reading.

Attracta Brennan, Tara McDonagh, Mary Dempsey, John McAvoy.[7] The project focuses on leveraging game-based learning strategies to create an educational toolkit named Cosmic Sounds, designed to enhance phonological awareness skills in children aged 9 to 12 diagnosed with dyslexia. A distinctive aspect of this research was the active involvement of the children and their teacher as codesigners, ensuring their perspectives and insights were integral to the game development process. The toolkit, informed by both existing literature and the expertise of a dyslexia pedagogical specialist, targeted essential phonological components such as consonant and vowel digraphs, syllabication, and CV-Ce words. The outcomes of the study demonstrated positive impacts on the children's phonological awareness skills, with significant improvements observed in specific areas, including consonant and vowel digraphs, syllabication, and CVCe words. The participatory approach in designing the games not only fostered a sense of ownership among the children but also heightened their motivation to engage with the games for learning purposes. This pilot study offers insights into the potential efficacy of game-based interventions, co-created with the intended users, as effective tools for supporting the development of phonological awareness skills in children grappling with dyslexia, thereby contributing to advancements in their literacy abilities.

Anna Fiveash, Enikő Ladányi, Julie Camici, Karen Chidiac, Catherine T. Bush, Laure-Hélène Canette, Nathalie Bedoin, Reyna L. Gordon and Barbara Tillmann.[8] The project aims to investigate visuo-spatial attention in children encountering reading difficulties (RD) by utilizing a paper-and-pencil labyrinth task to assess attentional abilities. Results revealed significant differences in visuo-spatial attention between children with RD and those without reading issues. Those experiencing RD displayed deficiencies in both focused and distributed visuo-spatial attention, critical skills involved in processing letter strings and associating graphemes with phonemes during reading. These attentional deficits appeared distinct from challenges related to motor coordination or procedural learning skills. The study emphasizes the importance of evaluating visuo-spatial attention in children struggling with reading difficulties. It highlights how children with RD encounter specific challenges in visually concentrating, impacting their capacity to effectively process letter strings while reading. By distinguishing these attentional deficits from other skill domains, such as motor coordination and procedural learning, the research underscores the necessity of interventions addressing both auditory-phonological and visuo-attentional abilities. Integrating such interventions could potentially improve the effectiveness of tailored reading remediation programs for children experiencing reading difficulties.

Zeno Menestrina, Angela Pasqualotto, Adriano,Paola Venuti, Antonella De Angeli.[9] The project explores player-centered methodologies for serious games, specifically targeting children, an area lacking substantial insights. It unfolds through two studies that inspired the development of 'Skies of Manawak' (SoM), aiming to address developmental dyslexia. The initial study involved ideation workshops with 60 children aged 8 to 13, shaping the game's story and aesthetics. The subsequent study engaged 258 children aged 8 to 11, comparing the game demo with a commercial cognitive training system. Results emphasized the importance and intricacy of involving children early in the design process. Despite children's appreciation for the demo, the story they shaped veered in critical dimensions, addressing gender stereotypes and violence conflicting with the game's intended objectives. This highlighted a clash between designers' and children's values, underscoring the necessity

for effective mediation to align with the game's goals. In the realm of human-computer interaction and game research, involving children in serious game design poses persistent challenges. While some advocate for children as inspirations without direct co-design involvement, others aim to develop children's game-design literacy, yet facing hurdles due to limited creativity and misalignment of content. This research leans more toward viewing children as inspirations for designers, recognizing the complexity of integrating direct co-design due to educational goals and intricate game mechanics. The study's focus on cognitive training for dyslexia with 'Skies of Manawak' reflects a shift in remediation approach, targeting executive functions (EFs) rather than traditional symptom treatment. By leveraging EFs' improvement potential linked to dyslexia, the game aims to enhance engagement by integrating motivational elements and effective feedback, drawing insights from successful language learning and action video game approaches. Utilizing video game design frameworks and an ethically approved inclusive approach engaging children as informants in workshops, the study navigated the intricate design space. The workshops facilitated a child-friendly environment for ideating game design elements, uncovering children's inclination toward complex narratives with fantasy elements, violence, and gender stereotypes. This highlighted the challenge of aligning their creative ideas with the game's functional requirements and values.

Michael J. Lee and Joseph Chiou.[10] The paper aims to improve self-directed learners' engagement and task completion rates in an online educational programming game by implementing visually-oriented hint systems. The study involved modifying an existing educational game called Gidget, incorporating three hint versions: static image hints displaying entire solutions, carousel hints allowing step-by-step scrolling, and animated video hints enabling play, pause, and seeking through hint sequences. 150 participants were randomly assigned to these hint versions, with findings indicating a strong preference and improved performance in the group utilizing animated hints. These users completed more game levels, suggesting increased engagement. The study highlights the potential impact of interactive, visually segmented hints in enhancing user understanding of programming task goals within educational games. Potential applications of these findings are suggested for researchers, edu-

cators, and designers of online learning systems, encouraging further exploration in diverse online resources to ascertain similarities and differences in educational contexts.

Dr. Milena Georgieva.[11] The paper investigates the perspectives of six literacy teaching professionals regarding the incorporation of phonics and reading comprehension in English instruction for dyslexic pupils. It highlights reservations about the overreliance on synthetic phonics as a comprehensive solution and suggests a shift towards larger sublexical units in teaching. While reading comprehension's importance is acknowledged, some respondents underestimate its significance despite it not typically being compromised in dyslexic pupils. Criticism is directed at the excessive use of phonetic-based books, seen as detracting from natural language engagement. Conducted in a Greater London area, the study, involving semi-structured interviews, uncovered varying opinions among professionals, emphasizing the necessity of integrating both synthetic and analytical phonics alongside sight word reading. However, it exposed divergent perspectives on the importance of comprehension development, urging a reconsideration of its role in teaching dyslexic learners within a syntactic and contextual framework.

3. SYSTEM DESIGN

The system encompasses a user-centric digital platform, tailored to enhance literacy and foster inclusivity for individuals facing dyslexia-related challenges. This platform aims to provide an array of tools and features, including an Image-to-text-to-speech converter, dyslexia-friendly font converter, spelling and reading exercises. Users can easily convert images to text and access dyslexia-friendly fonts, facilitating comprehension and accessibility. The interactive spelling and reading exercises allow users to record themselves reading stories, receive feedback, and practice specific words they struggle with. Additionally, the platform's intuitive design allows users to click on individual words to listen, thereby promoting engagement and personalized learning experiences. By incorporating technology with tailored exercises, it strives to empower dyslexic learners, making learning more accessible, engaging, and effective. Furthermore, the platform implements a user-friendly interface that prioritizes ease of navigation and accessibility. Users can seamlessly navigate between various functionalities and exercises, ensuring a smooth and intuitive learning experience. These gamified features aim to motivate users, creating a supportive and encouraging environment that fosters continuous improvement in language skills.

3.1 Architecture

The architectural overview of the system is aimed at assisting individuals, particularly those with dyslexia, in reading and spelling tasks. The User Interface component includes features like an image-to-text-to-speech converter, a dyslexia-friendly font converter, reading and spelling exercises, and progress tracking. The back-end component consists of an image processing module, a text-to-speech module, a spelling checker, and a progress tracker. These components are integrated through APIs, allowing the User Interface and back-end to communicate and work together seamlessly, enabling the system to provide a comprehensive solution for improving reading and spelling skills.

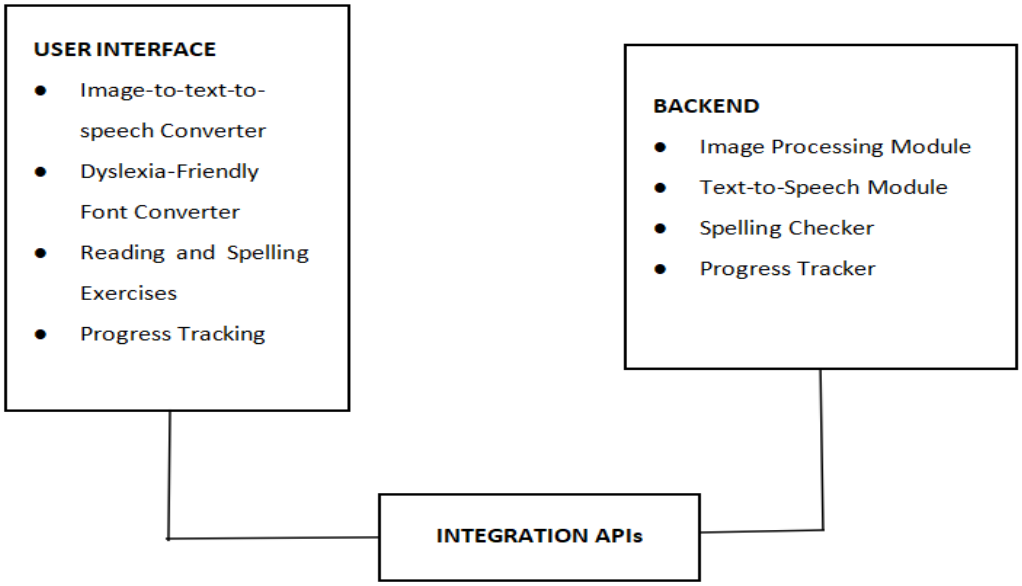

Figure 3.1.1: Architecture

3.1.1 User Interface

The User Interface component of the system aims to provide a user-friendly and accessible experience for individuals, particularly those with dyslexia. It includes an image-to-text-to-speech converter that allows users to convert text from images into spoken words, enabling them to comprehend written material more effectively. Additionally, it features a dyslexia-friendly font converter that transforms text into fonts specifically designed to enhance readability for those with dyslexia. The User Interface also incorporates reading and spelling exercises tailored to help users improve their skills in these areas. Furthermore, it offers a progress tracking feature that allows users to monitor their improvement over time, providing motivation and a sense of accomplishment.

3.1.2 Backend

The Backend component of the system plays a crucial role in providing the necessary functionality and processing power. The Image Processing Module handles the conversion of text within images into a format suitable for further analysis and processing, enabling the seamless integration of the image-to-text-to-speech feature. The Text-to-Speech Module is responsible for converting the extracted text into audible speech, allowing users to listen to the content with ease. The Spelling Checker Module ensures accurate spelling by identifying and correcting errors, enhancing the overall quality of the reading and spelling exercises. Additionally, the Progress Tracker Module meticulously monitors and records the user's performance, enabling them to track their progress over time and providing valuable insights for improvement.

3.1.3 Integration APIs

The Integration APIs serve as the bridge that facilitates seamless communication and data exchange between the User Interface and Backend components. These APIs act as intermediaries, enabling the two components to interact and share information effectively. By exposing well-defined interfaces, the Integration APIs allow the User Interface to request services from the Backend, such as image processing, text-to-speech conversion, spelling checking, and progress tracking. Conversely, the Backend can leverage these APIs to provide the necessary data and functionality to the User Interface, ensuring a cohesive and integrated experience for the end-users. The Integration APIs play a crucial role in abstracting away the complexities of the underlying systems, promoting modular design, and enabling the flexible integration of new features or components in the future.

3.2 Technologies

3.2.1 Python with Flask

This project leverages Python with Flask as its primary technology stack to create a user-centric digital platform dedicated to enhancing literacy for individuals facing dyslexia-related challenges. Using Python, Flask framework offers a robust backend infrastructure, facilitating seamless communication between various modules and ensuring efficient handling of server-side functionalities. This choice of technology enables the development team to create interactive spelling and reading exercises, implement an image-to-text-to-speech converter, and integrate dyslexia-friendly font conversion tools. Python's versatility combined with Flask's flexibility empowers the platform to deliver engaging and personalized learning experiences, enabling dyslexic learners to access, comprehend, and engage with information more effectively. Through this technology, the project aims to foster inclusivity and empower dyslexic individuals by providing tailored tools and exercises to enhance their language skills and overall learning experience.

3.2.2 RESTful APIs

Utilizing RESTful APIs, the integration of the Cohere API within our platform enhances its functionality by providing advanced capabilities for generating stories, illustrations, or content tailored to the unique needs of dyslexic learners. Leveraging RESTful principles allows seamless communication and interaction between our system and the Cohere API, facilitating data exchange and content generation. This integration empowers our platform to offer personalized and engaging learning materials, creating a supportive environment for dyslexic individuals to improve their reading and comprehension skills. The Cohere API integration aligns with our commitment to inclusivity and education, enabling us to deliver dynamic, AI-driven content that caters to diverse learning preferences, ultimately contributing to an enriched learning experience for our users.

3.2.3 OCR - Optical Character Recognition

Optical Character Recognition (OCR) involves the utilization of libraries or APIs like pytesseract or Tesseract to convert images containing text into machine-readable text formats. These tools offer powerful image processing capabilities, enabling the extraction of textual information from images, scanned documents, or photographs. pytesseract, a Python wrapper for Tesseract OCR engine, stands out for its efficiency in deciphering text from various image formats with high accuracy. Tesseract, an open-source OCR engine, supports multiple languages and performs adeptly in recognizing and converting text from images into editable formats. Leveraging these OCR technologies, developers can implement robust image-to-text conversion functionalities within applications, facilitating accessibility and comprehension of textual content for users, especially individuals with specific needs such as dyslexia or those seeking easier text extraction from images.

3.2.4 Text-to-Speech Conversion

Utilizing text-to-speech conversion services like Google Cloud Text-to-Speech API or Amazon Polly, the platform implements a robust feature to convert textual content into audible speech. This integration allows users to seamlessly listen to the converted text, enhancing accessibility and comprehension for individuals facing challenges related to reading or dyslexia. By leveraging these services, the platform ensures high-quality speech synthesis, offering users an immersive experience where written content is transformed into clear, natural-sounding speech. This functionality significantly contributes to breaking down barriers in accessing information, providing an inclusive environment where users can engage with textual content more effectively through auditory means.

3.3 UML Diagram

UML is an acronym that stands for Unified Modeling Language, It is a modern approach to modeling and documenting software. In fact, it's one of the most popular business process modelling techniques. It is based on diagrammatic representations of software components. A UML diagram with the purpose of visually representing a system along with its main actors, roles, actions, artifacts or classes, in order to better understand, alter, maintain, or document information about the system.

3.3.1. Sequence Diagram

A sequential diagram is a visual representation that illustrates the sequential flow of actions, interactions, or processes within a system or software application. It outlines the step-by-step sequence of events or activities, depicting how different components or modules of the system interact with each other and the order in which these interactions occur. This diagram typically uses symbols, blocks, or objects connected by arrows or lines to demonstrate the flow of control, data, or information between various elements within the system, offering a clear and structured overview of the system's behavior in a chronological manner.

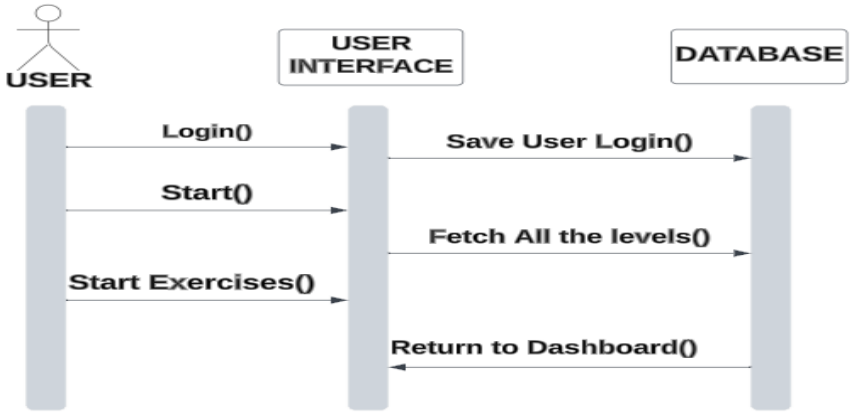

Figure 3.3.1.1: Sequence Diagram

3.3.2. Use Case Diagram

A use case diagram is a graphical representation in Unified Modeling Language (UML) that illustrates how users interact with a system with various use cases and their relationships. It presents a high-level view of the system's functionalities from a user's perspective, showcasing different actions or tasks users can perform and how these actions relate to the system's components.

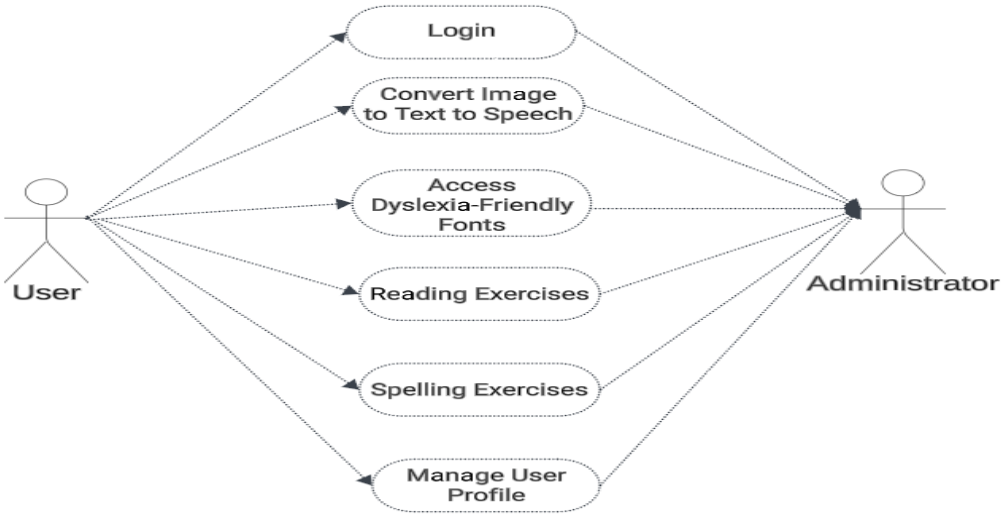

Figure 3.3.2.1: Use Case Diagram

3.4 Software and Hardware Requirements

Software

i) Python

ii) HTML

iii) cohere

Hardware

i) Operating System : Windows 11

ii) Processor - Intel Core i5

iii) Memory(RAM) - 8 GB

4. METHODOLOGY

4.1 Image-to-Text-to-Speech Converter

The Image-to-Text-to-Speech Conversion Module within this project is a critical component designed to facilitate seamless access to textual content from uploaded images. This module employs specialized algorithms to extract and convert text embedded within images into machine-readable text formats. Once the text is extracted, the Text-to-Speech functionality is activated, enabling users to listen to the converted textual content in an auditory format. This process aids individuals affected by dyslexia by providing an alternative means to comprehend textual information, promoting accessibility and enhancing the overall learning experience. The module's functionality focuses on breaking down barriers associated with traditional text-based content, offering users a more inclusive method of accessing and comprehending information through auditory cues.

4.2 Dyslexia-Friendly Font Converter

The Dyslexia-Friendly Font Converter Module is a pivotal component within this platform, designed specifically to facilitate the transformation of standard text into dyslexia-friendly fonts. This module aims to enhance readability for individuals affected by dyslexia by converting uploaded text files into fonts optimized for easier comprehension. By offering this functionality, users can upload various text formats, such as PDFs or documents, and the module converts the text into dyslexia-friendly fonts, ensuring that the content maintains its original format while being presented in fonts specifically tailored to improve readability for those with dyslexia. This feature aligns with the platform's overarching goal of fostering inclusivity and accessibility, providing users with an environment conducive to their learning needs and preferences.

4.3 Reading Exercises

This module enhances the user's reading skills through interactive activities. It allows individuals, especially those affected by dyslexia, to engage in exercises focused on reading stories, receiving feedback, and practicing specific words. Users can record themselves while reading the provided stories, enabling them to assess their pronunciation and comprehension. The module's feedback mechanism assists users by highlighting specific words or sections where they may encounter difficulties, enabling targeted practice for improvement. This feature aims to create a supportive environment where users can focus on enhancing their reading abilities at their own pace, promoting confidence and proficiency in reading comprehension. Moreover, it offers a personalized learning experience tailored to each user's needs, further optimizing their progress and enjoyment in the learning process.

4.4 Spelling Exercises

The Spelling Exercises Module is designed to aid users in improving their spelling skills through interactive and user-friendly exercises. This module allows individuals facing dyslexia-related challenges to practice spelling words by replicating them as seen, helping enhance their word recognition and writing abilities. Users can engage in exercises where they attempt to write words displayed on the interface, and upon completion, the system evaluates the accuracy of their spelling. In case of errors, the module highlights the incorrect parts of the word, offering users the opportunity to correct and learn from their mistakes. Additionally, users can listen to the word by clicking on it, further reinforcing their auditory association with the correct spelling, thereby fostering a comprehensive learning experience aimed at improving spelling proficiency. The Spelling Exercises Module also provides personalized feedback and progress reports, enabling users to track their improvement over time and identify areas for further practice.

4.5 User Interface

The User Interface (UI) module in this project serves as the interactive platform that users directly engage with. It focuses on designing and implementing the visual elements, layout, and functionalities of the web-based application to ensure an intuitive and accessible experience. The UI module encompasses the frontend development, utilizing HTML, CSS, and JavaScript technologies to create a user-friendly interface. It prioritizes ease of navigation, readability, and accessibility, especially catering to users with dyslexia-related challenges by incorporating dyslexia-friendly fonts, clear visuals, and intuitive controls. The UI module's primary goal is to provide a seamless and engaging environment where users can comfortably access features like image-to-text conversion, reading and spelling exercises, and AI-generated content while promoting an inclusive learning experience.

4.6 API Integration

The API Integration Module in this platform plays a crucial role in connecting the platform's internal functionalities with external services, enabling seamless interactions and enhancing the user experience. It acts as a bridge, facilitating communication between ReadEase's modules and external APIs, including OCR (Optical Character Recognition), text-to-speech conversion, dyslexia-friendly font conversion, and potentially other third-party services. By leveraging these APIs, the platform empowers users with capabilities like converting images to text for improved accessibility, transforming text into speech to aid comprehension, and providing dyslexia-friendly fonts to enhance readability. This integration module ensures smooth data exchange, enabling users to access diverse tools and features that contribute to a more inclusive and supportive learning environment for individuals with dyslexia-related challenges.

5. IMPLEMENTATION

The implementation phase of the project is where the detailed design is actually transformed into working code. Aim of the phase is to develop a digital platform that supports individuals with dyslexia in improving their literacy skills through tailored tools and features.

5.1 Code

app.py

```
from flask import Flask, render_template, request, redirect, url_for
from PIL import Image
import pytesseract
import cv2
import secrets
import os
import cohere
import config
import speech_recognition as sr
import pyaudio
import wave
import random
from diffusers import StableDiffusionPipeline, EulerDiscreteScheduler
import torch
from generated import generated_data
import warnings
words = generated_data.challenging_words.copy()
sentences = generated_data.stories.copy()
```

```
app = Flask(__name__)
warnings.filterwarnings("ignore", message=
 "torch.utils._pytree._register_pytree_node is deprecated")
@app.route('/')
def home():
  return render_template("home.html")
@app.route('/upload', methods=['POST', 'GET'])
def upload():
  if request.method == 'POST':
    file = request.files.get('file')
    filename, extension = file.filename.split(".")
    generated_filename = secrets.token_hex(10) + f".{extension}"
    raw_file_location = os.path.join(os.getcwd(), "static",
     "saved_img" , generated_filename)
    file.save(raw_file_location)
    pytesseract.pytesseract.tesseract_cmd =
     r'C:\Program Files\Tesseract-OCR\tesseract.exe'
    img = cv2.imread(raw_file_location)
    raw = pytesseract.image_to_string(img)
    converted_text = raw.split()
    img_shape = img.shape
    d = pytesseract.image_to_data(img, output_type=pytesseract.Output.DICT)
    print(d.keys())
    for i in range(len(d["conf"])):
      print([d[key][i] for key in d])
      data_size = len(d["text"])
      cur_level = [(0, 0, 0, 0, 0), (0, 0), (0, 0)]
```

```
      text_size = 0
      for i in range(data_size):
        if int(d['conf'][i] >= 60):
          text_size += d['height'][i]
          if (d['level'][i] ,d['page_num'][i], d['block_num'][i],
           d['par_num'][i], d['line_num'][i]) == cur_level[0]:
            d['top'][i], d['height'][i] = cur_level[1]
            d['left'][i] = cur_level[2][0] + cur_level[2][1] + 20
            cur_level[2] = (d['left'][i], d['width'][i])
          else:
            cur_level[0] = (d['level'][i] ,d['page_num'][i],
             d['block_num'][i], d['par_num'][i], d['line_num'][i])
             cur_level[1] = (d['top'][i], d['height'][i])
             cur_level[2] = (d['left'][i], d['width'][i])
      text_size /= data_size
      for i in range(len(d["conf"])):
        print([d[key][i] for key in d])
      img_src = url_for('static', filename=f'saved_img/
       {generated_filename}')
      print(generated_filename)
      return render_template('upload.html', img_src=img_src,
       img_shape=img_shape, d=d, font_size=text_size,
       data_size=data_size, converted_text=converted_text,
       img_url=raw_file_location, filename=generated_filename)
    else:
        return render_template('upload.html')
@app.route('/about')
```

```
def about():
    return render_template('about.html')
@app.route('/features')
def converted():
    return render_template('features.html')
global words_idx
words_idx = random.randint(0, 4)
global word
word = words[words_idx]
score = 0
@app.route('/learn',  methods=['POST', 'GET'])
def learn():
    global words_idx
    global score
    global word
    message=""
    if request.method == 'POST':
        text = request.form['text']
        if text == word:
            message = "Well done!"
            old_word = word
            words_idx = random.randint(0, 4)
            word = words[words_idx]
            score += 1
            return render_template("correct.html", message=message,
            words_idx=words_idx, word=old_word, written=text, score=score)
        else:
```

```
            message = "Try again"
            return render_template("learn.html", words_idx=words_idx,
            message=message, word=word, written=text, len_written=len(text),
            len_word=len(word))

    return render_template("learn.html", message=message, word=word,
    words_idx=str(words_idx))
speechs = ["i love kimberly so much", "kimberly is my girlfriend",
           "my name is kimberly", "my name is john",
           "my name is kevin", "my name is adam",
           "my name is tommy", "my name is ben",
           'ben', 'john', 'tommy', 'alpha'] * 100
global speech
co = cohere.Client(config.api_key)
global speech_idx
speech_idx = random.randint(0, 4)
speech=sentences[speech_idx]
@app.route('/finished', methods=['POST', 'GET'])
def done_learn():
    global score
    user_score = score
    score = 0
    return render_template("finish.html", score=user_score)
@app.route('/audio', methods=['POST', 'GET'])
def audio():
    global speech
    return render_template('recording.html', speech=speech)
```

```
global false_words
false_words = []
@app.route('/record', methods=['POST', 'GET'])
def record():
    global speech
    global false_words
    speech_words = speech.replace('.', '').replace(',',
    '').replace(':','').replace("'","").lower().split()
    print(speech_words)
    print('start')
    r = sr.Recognizer()
    with sr.Microphone() as source:
        r.adjust_for_ambient_noise(source)
        print('Please say something')
        audio = r.listen(source ,timeout=10)
        print('Recognizing...')
        try:
          text = r.recognize_google(audio)
        except:
          text = "Sorry, We couldn't hear you"
    text_words = text.lower().split()
    print(text_words)
    correct = 0
    total = len(speech_words)
    incorrect_words = []
    for word in speech_words:
        if word in text_words:
```

```
            correct+=1
        else:
            incorrect_words.append(word)
    false_words = incorrect_words
    if len(false_words) == 0:
        global speech_idx
        return redirect('/first_try')
    else:
        first_try = "no"
    old_speech = speech
    global speech_idx
    speech_idx = random.randint(0, 4)
    speech=sentences[speech_idx]
    return render_template("recording.html", speech=old_speech, text=text,
    score=round(correct/total*100), incorrect=incorrect_words,
    first_try=first_try)
@app.route('/first_try')
def first_try():
    global speech_idx
    old_idx = speech_idx
    speech_idx = random.randint(0, 4)
    return render_template("first_try.html",
    filename=f'generated_image/story_{old_idx}.jpg')
cur_word = ''
@app.route('/speech', methods=['POST', 'GET'])
def read_display():
    global cur_word
```

```
    global false_words
    cur_word = false_words.pop()
    return render_template("speech.html", word=cur_word)
@app.route('/speech-start', methods=['POST', 'GET'])
def read_start():
    global speech
    global cur_word
    global false_words
    speech_word = cur_word
    print('start')
    r = sr.Recognizer()
    with sr.Microphone() as source:
        r.adjust_for_ambient_noise(source)
        print('Please say something')
        audio = r.listen(source ,timeout=10)
        print('Recognizing...')
        try:
            text = r.recognize_google(audio)
        except:
            text = "Sorry, We couldn't hear you"
    with open('static/recorded_sound/recorder.wav', "wb") as f:
            f.write(audio.get_wav_data())
    print('false_words before detected')
    print(false_words)
    text_words = text.lower().split()
    correct = 0
    if speech_word.lower() in text_words:
```

```
        correct="true"
        print('true')
    else:
        correct="false"
        print('appending')
        if speech_word not in false_words:
            false_words.append(speech_word)
    if len(false_words) == 0:
        return redirect("/finish-read")
    return render_template("speech.html", speech=speech, word=speech_word,
    text=text, correct=correct, single_word="true")
@app.route("/finish-read")
def finish_read():
    global speech_idx
    global words
    old_idx = speech_idx
    speech_idx = random.randint(0, 4)
    return render_template("finishread.html",
    filename=f'generated_image/story_{old_idx}.jpg', caption=sentences[old_idx])
if __name__ == "__main__":
    app.run(debug=True)
```

home.html

```
{% extends 'layout.html' %}
{% block content %}
<nav>
 <input type="checkbox" id="check">
 <label for="check" class="checkbtn">
```

```
  <i class="fa fa-bars"></i>
 </label>
 <label class="logo">ReadEase</label>
 <ul class='navbar'>
  <li id='aa'><a href="/" class='active' >Home</a></li>
  <li id='bb'><a href="/about">About Us</a></li>
  <li id='cc'><a href="/features">Features</a></li>
 </ul>
</nav>
<section class="function">
 <img src="{{ url_for('static', filename='img/reading.png') }}">
</section><br><br><br>
<section class="homepagetxt">
 <h1 onclick="toSound(this)" style="cursor:pointer">
  Welcome to Our Dyslexia Support Website!</h1><br>
 <h4 onclick="toSound(this)" style="cursor:pointer">
  We get it - words can sometimes feel like tricky puzzles,
  <br>but we've got your back! We've created a platform that<br>
  tailored specifically to help dyslexic individuals thrive.</h4><br>
 <h4 onclick="toSound(this)" style="cursor:pointer">
  Let us introduce you to our world of features.</h4><br>
</section>
<a href="/features">
 <button class="getstartedbutton">Get Started</button>
</a><br>
<a href="/about">
 <button> Learn More</button>
```

```
</a>
{% endblock %}
```

about.html

```
{% extends "layout.html" %}
{% block content %}
<nav>
 <input type="checkbox" id="check">
 <label for="check" class="checkbtn">
  <i class="fa fa-bars"></i>
 </label>
 <label class="logo">ReadEase</label>
 <ul class='navbar'>
  <li id='aa'><a href="/"  >Home</a></li>
  <li id='bb'><a href="/about" class='active'>About Us</a></li>
  <li id='cc'><a href="/features" >Features</a></li>
 </ul>
</nav>
<div id="offers">
 <img class="leftfloat" src="{{ url_for('static',
  filename='img/inclusion.png') }}"/>
 <h1 onclick="toSound(this)" style="cursor:pointer"
  class="inlinetext"><br>OUR MISSION</h1>
 <img class ="rightfloat" src="{{
  url_for('static', filename='img/question.png') }}"/>
 <h1 onclick="toSound(this)" style="cursor:pointer"
  class="inlinetext" ><br>Why Us?</h1>
 <img class ="rightrightfloat" src="{{
```

```
  url_for('static', filename='img/team.png') }}"/>
 <h1 onclick="toSound(this)" style="cursor:pointer"
  class="inlinetext"><br>OUR TEAM</h1>
</div>
<h4 onclick="toSound(this)" style="cursor:pointer"
 class="abouttext">We are dedicated to creating a
 <br>digital platform that embraces<br> diversity, breaks down
 barriers,<br> and empowers individuals of all <br>backgrounds
 and abilities to <br>access, understand, and engage<br>with
 information seamlessly. We<br> believe that education is a <br>
 powerful tool for empowerment. <br>Through our features like
 <br> spelling and reading exercises, <br>we strive to enhance
 language<br> skills for dyslexic learners.</h4>
<h4 onclick="toSound(this)" style="cursor:pointer"
 class="abouttextmid">When you choose our platform,<br> you are
 choosing the platform<br> that understands the unique<br>
 challenges of dyslexic learners. <br> We recognize the transformative
 <br> power of technology in overcoming<br> challenges.
 We offer technology<br> solutions that aid reading<br> and
 improve spelling skills.<br> These tools enhance learning<br>
 while boosting the confidence<br>  and independence
 of learners.</h4>
<h4 onclick="toSound(this)" style="cursor:pointer"
 class="abouttxt" >Behind ReadEase stands<br>two passionate
 individuals<br> committed to creating a<br> platform that embraces<br>
 inclusivity and diversity. <br><br>Please don't hesitate<br> to contact
 us if you have<br> any questions, concerns, or<br> would like
```

```
 more information.<br>Always here for you!<br>
</h4>
{% endblock %}
```

features.html

```
{% extends "layout.html" %}
{% block content %}
<nav>
 <input type="checkbox" id="check">
 <label for="check" class="checkbtn">
  <i class="fa fa-bars"></i>
 </label>
 <label class="logo">ReadEase</label>
 <ul class='navbar'>
  <li id='aa'><a href="/"  >Home</a></li>
  <li id='bb'><a href="/about">About Us</a></li>
  <li id='cc'><a href="/features" class="active">Features</a></li>
  </ul>
 </nav>
 <img id="bongo" src="{{ url_for('static', filename='img/bongocat.png') }}"/>
 <img id="bongo" src="{{ url_for('static', filename='img/bongocat.png') }}"/>
 <img id="bongo" src="{{ url_for('static', filename='img/bongocat.png') }}"/>
 <img id="bongo" src="{{ url_for('static', filename='img/bongocat.png') }}"/>
 <br><br><br><br><br><br>
 <div class="belowbongo">
  <h2 onclick="toSound(this)" style="cursor:pointer">WE OFFER YOU...</h2>
  <div id="offers">
   <section class="rounded">
```

```
    <h3 onclick="toSound(this)" style="cursor:pointer">
     Dyslexia-Friendly Font Conversion & Text-to-Speech Conversion</h3>
    <i class="fas fa-images"></i>
    <i class="fas fa-headphones"></i><br>
    <a href="/upload">
     <button>Convert Here</button>
    </a>
   </section>
   <section class="rounded">
    <h3 onclick="toSound(this)" style="cursor:pointer">
     Reading Exercises</h3>
    <i class="fas fa-book-reader"></i>
    <i class="fas fa-microphone"></i><br>
    <a href="/audio">
     <button>Start Reading</button>
    </a>
   </section>
   <section class="rounded">
    <h3 onclick="toSound(this)" style="cursor:pointer">
     Spelling Exercises</h3>
    <i class="fas fa-keyboard"></i>
    <i class="fas fa-spell-check"></i><br>
    <a href="/learn">
     <button>Start Typing</button>
    </a>
   </section>
  </div>
```

```
  </div>
{% endblock %}
```

upload.html

```
{% extends 'layout.html' %}
{% block content %}
<nav>
 <input type="checkbox" id="check">
 <label for="check" class="checkbtn">
  <i class="fa fa-bars"></i>
 </label>
 <label class="logo">ReadEase</label>
  <ul class='navbar'>
    <li id='aa'><a href="/"  >Home</a></li>
    <li id='bb'><a href="/about">About Us</a></li>
    <li id='cc'><a href="/features" class="active">Features</a></li>
  </ul>
 </nav>
 {% if not converted_text %}
  <img id="waitingspongebob" src="{{
   url_for('static', filename='img/waiting.png')}}"/>
  <br><br><br><br><br>
  <form method="POST" enctype="multipart/form-data">
   <i class="fas fa-upload"></i>
   <input class = 'border' type = "file" name="file"
    method = 'post' id = "uploadedfile" required/>
   <button>submit</button>
  </form>
```

```
 {% else %}
  {% for i in range(data_size) %}
   {% if d["conf"][i] >= 60 %}
    <button class="word-button" onclick="toSound(this)"
     style="cursor:pointer;position:absolute;top:{{ d['top'][i] }}px;
     left:{{  d['left'][i] }}px;width:{{ d['width'][i] }}px;height:
     {{ d['height'][i] }}px;font-size:{{ font_size }}px">{{
     d['text'][i] }}</button>
   {% endif %}
  {% endfor %}
  <img id="orig-text" src="{{ img_src }}">
  <a href="/upload">
  <button class="upload-new border">Upload a New File</button>
  </a>
 {% endif %}
{% endblock %}
```

speech.html

```
{% extends "layout.html" %}
{% block content %}
<nav>
 <input type="checkbox" id="check">
 <label for="check" class="checkbtn">
  <i class="fa fa-bars"></i>
 </label>
 <label class="logo">ReadEase</label>
 <ul class='navbar'>
  <li id='aa'><a href="/"  >Home</a></li>
```

```
  <li id='bb'><a href="/about">About Us</a></li>
  <li id='cc'><a href="/features" class="active">Features</a></li>
 </ul>
</nav></br>
{% if not correct or correct=="false" and single_word %}
 <h3><ul class="ulinsreading">
  <li onclick="toSound(this)" style="cursor:pointer">
   Look at the word carefully and read it out. </li>
  <li onclick="toSound(this)" style="cursor:pointer">
   If you are unsure about the word's don't worry!</li>
  <li onclick="toSound(this)" style="cursor:pointer">You have the
   option to listen to the word by clicking on the word itself.</li>
 </ul></h3><br><br>
 <a href="/speech-start"><button id="single-word-button"
  class="learn" style="cursor:pointer;margin-left:42%">
  <img id="micimg" src="{{ url_for('static',
   filename='img/mic.png') }}"></button></a>
 <button onclick="toSound(this)" class="learn" id="single-word">
  {{ word }}</button></br></br><br>
{% endif %}
{% if not single_word %}
 {% if text %}
  <p>{{ text }}</p>
  <p>You got {{ score }} score </p>
  <p>Wrong words {{ ', '.join(incorrect) }}</p>
  <a href="/speech-start"><button class="learn"
   style="cursor:pointer">Next Word</button></a>
```

```
 {% endif %}
 {% else %}
 {% if correct=="true" %}
   <br><br><br><br>
   <p class="learn" style="margin-left:40%;">Correct!</p><br>
   <a href="/speech"><button class="learn"
    style="cursor:pointer;margin-left:40%;">Next Word</button></a>
 {% else %}
  <p class="learn" id="correct-speech" style="margin-left:20%;">
   Sorry, still incorrect. Here is what you said : </p><br>
  <div class="audios">
   <audio controls>
    <source src='static/recorded_sound/recorder.wav' type="audio/mpeg">
     Your browser does not support the audio element.
   </audio></div>
  <p class="learn" style="margin-left:30%;">It sounded like
   "{{ text }}"</p><br>
  <a href="/speech"><button class="learn"
   style="cursor:pointer;margin-left:42%">Try Again</button></a>
  {% endif %}
 {% endif %}
{% endblock %}
```

recording.html

```
{% extends "layout.html" %}
{% block content %}
<nav>
 <input type="checkbox" id="check">
```

```
 <label for="check" class="checkbtn">
  <i class="fa fa-bars"></i>
 </label>
 <label class="logo">ReadEase</label>
 <ul class='navbar'>
  <li id='aa'><a href="/"  >Home</a></li>
  <li id='bb'><a href="/about">About Us</a></li>
  <li id='cc'><a href="/features" class="active">Features</a></li>
 </ul>
</nav>
<br>
<h3><ul class="ulinsreading">
 <li onclick="toSound(this)" style="cursor:pointer">
  Read the short story provided below.</li>
 <li onclick="toSound(this)" style="cursor:pointer">Take your time to
  observe each word visually before clicking the microphone button.</li>
 <li onclick="toSound(this)" style="cursor:pointer">
  Click on the microphone button and start reading the story out loud.</li>
</ul></h3>
<a href="/record"><button id="recordbutton" class="learn"
 style="cursor:pointer">
 <img id="micimg" src="{{ url_for('static', filename='img/mic.png') }}">
</button></a>
<h2 id="story" class='learn'>{{ speech }}</h2>
 {% if not text%}
 {% endif %}
 {% if first_try == "yes" %}
```

```
  <h3 class="readingcongrats">Congratulations! You got it on a first try</h3>
  <img class="woohoo" src="{{url_for('static',filename='img/woohoo.png')}}"/>
  <a href="/audio"><button class="learn" id="startlearn"
    style="cursor:pointer">Learn Again?</button></a>
 {% else %}
  {% if text %}
    <div class="incorrect">
     <p>You got {{ score }}% accuracy </p>
     <p>Wrong words:  {{ ', '.join(incorrect) }}</p>
    </div>
    <img class="sad" src="{{url_for('static',filename='img/sad.png')}}"/>
    <a href="/speech"><button class="learn" id="startlearn2"
     style="cursor:pointer">Start Learning</button></a>
  {% endif %}
 {% endif %}
{% endblock %}
```

learn.html

```
{% extends 'layout.html' %}
{% block content %}
<nav>
 <input type="checkbox" id="check">
 <label for="check" class="checkbtn">
  <i class="fa fa-bars"></i>
 </label>
 <label class="logo">ReadEase</label>
  <ul class='navbar'>
    <li id='aa'><a href="/"  >Home</a></li>
```

```
    <li id='bb'><a href="/about">About Us</a></li>
    <li id='cc'><a href="/features" class="active">Features</a></li>
  </ul>
</nav>
<h3><ul class="ulinsreading">
 <li onclick="toSound(this)" style="cursor:pointer">
  Look at the word carefully and try to spell it correctly. </li>
 <li onclick="toSound(this)" style="cursor:pointer">
  If you are unsure about the word's spelling, don't worry!</li>
 <li onclick="toSound(this)" style="cursor:pointer">
   You have the option to listen to the word by clicking
   on the word itself.</li>
 </ul></h3>
<br><br><br><br>
<button onclick="toSound(this)" class="learn"
 id="buttonofword">{{ word }}</button>
</br> </br>
<form method="POST" enctype="multipart/form-data">
 <input class = 'learn' class="learn" type = "text" name="text">
 </br></br>
 <input class = "learn" id="submit-spelling" type="submit" value="submit">
</form>
{% if written %}
<p class="learn" style="margin-left:33%;">You Wrote</p> <br>
{% if written[0] == word[0] %}
 <p class="correct" style="background-color:#66FF99;
 display:inline;margin-left:33%">{{ written[0] }}</p>
```

```
{% else %}
 <p class="correct" style="background-color:#F75D59;
  display:inline;margin-left:33%">{{ written[0] }}</p>
{% endif %}
{% for i in range(1, len_written) %}
 {% if i < len_word and written[i] == word[i] %}
  <p class="correct" style="background-color:#66FF99;
   display:inline">{{ written[i] }}</p>
 {% else %}
  <p class="correct" style="background-color:#F75D59;
   display:inline">{{ written[i] }}</p>
 {% endif %}
{% endfor %}
{% endif %}
{% if message %}
 <br><br>
 <p class="learn" id="tryagain-spelling" style="margin-left:33%">
  {{ message }}</p>
{% endif %}
{% endblock %}
```

finishread.html

```
{% extends "layout.html" %}
{% block content %}
<nav>
 <input type="checkbox" id="check">
 <label for="check" class="checkbtn">
  <i class="fa fa-bars"></i>
```

```
 </label>
 <label class="logo">ReadEase</label>
  <ul class='navbar'>
    <li id='aa'><a href="/"  >Home</a></li>
    <li id='bb'><a href="/about">About Us</a></li>
    <li id='cc'><a href="/features" class="active">Features</a></li>
  </ul>
</nav>
<br>
<h3 class="learn">Congratulations!</h3>
<h3 class="learn" style="margin-left:28%;">You have finished all words</h3>
<h3 class="learn" style="margin-left:10%">You got this cool AI generated
 picture from previous story!</h3>
<img src={{ url_for('static', filename=filename) }} style="margin-bottom:-10%;
 margin-top:1%;margin-left:35%;width:500px;height:500px;display:block">
<br><br><br><br><br><br><br><br><br><br>
<br><br><br><br><br><br><br><br><br>
<h3 style="float:center;text-align:center;margin-top:0%">{{ caption }}</h3>
<br>
<a href="/audio"><button class="learn" style="cursor:pointer;
 margin-left:40%;padding-top:">Learn Again?</button></a>
{% endblock %}
```

finish.html

```
{% extends "layout.html" %}
{% block content %}
<nav>
 <input type="checkbox" id="check">
```

```
 <label for="check" class="checkbtn">
  <i class="fa fa-bars"></i>
 </label>
 <label class="logo">ReadEase</label>
  <ul class='navbar'>
   <li id='aa'><a href="/"  >Home</a></li>
   <li id='bb'><a href="/about">About Us</a></li>
   <li id='cc'><a href="/features" class="active">Features</a></li>
  </ul>
</nav>
 <h2 class='learn' style='margin-left:30%;'>Congratulations! you got
  {{ score }} star</h2>
 <h2 class='learn' style='margin-left:0%;text-align:center;'>
  You got this cute chibi! Practice more to get another chibi.</h2>
 <div style="width:150%;height:200%;margin-left:30%;margin-top:0%">
  {% if score <= 2 %}
    <img src={{ url_for('static', filename='img/chibi1.png')}}>
  {% elif score <= 4 %}
    <img src={{ url_for('static', filename='img/chibi2.png')}}>
  {% elif score <= 6 %}
    <img src={{ url_for('static', filename='img/chibi3.png')}}>
  {% elif score <= 8 %}
    <img src={{ url_for('static', filename='img/chibi4.png')}}>
  {% elif score <= 10 %}
    <img src={{ url_for('static', filename='img/chibi5.png')}}>
  {% elif score <= 100 %}
    <img src={{ url_for('static', filename='img/chibi6.png')}}>
```

```
  {% else %}
    <img src={{ url_for('static', filename='img/chibi7.png')}}>
  {% endif %}
 </div>
{% endblock %}
```

6. RESULTS & DISCUSSIONS

The assessment and analysis of the dyslexia support platform revolve around its effectiveness in improving literacy skills among dyslexic learners. Evaluation metrics include pre- and post-intervention assessments of reading and spelling abilities, alongside user feedback on platform usability and effectiveness. Positive outcomes, such as enhanced literacy scores and user satisfaction, underscore ReadEase's potential to complement traditional teaching methods and provide personalized learning experiences for dyslexic individuals. These findings highlight the platform's role in empowering dyslexic learners and advancing literacy education, with implications for future iterations and enhancements to ensure continued impact and relevance in addressing learning differences.

6.1 Home Page

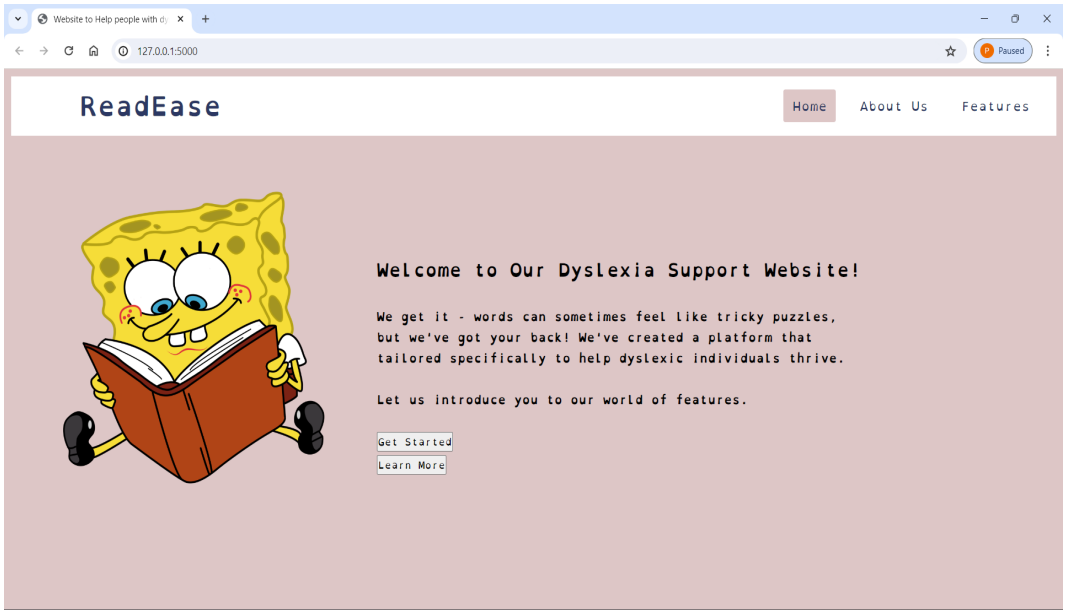

Figure 6.1.1: Home Page

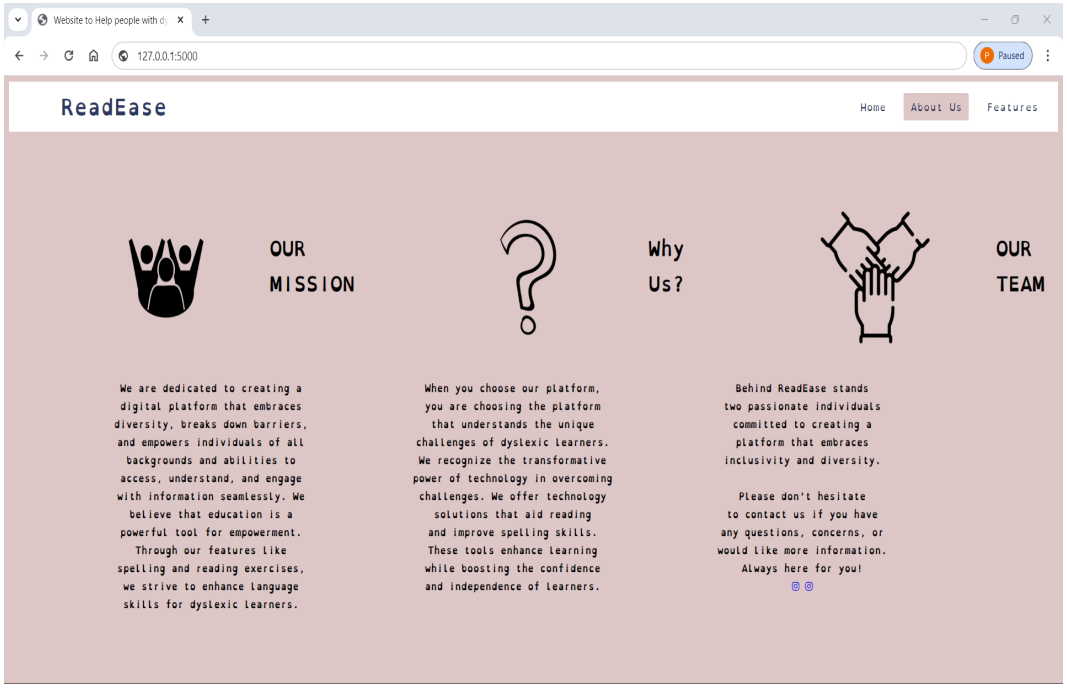

Figure 6.1.2: About Us

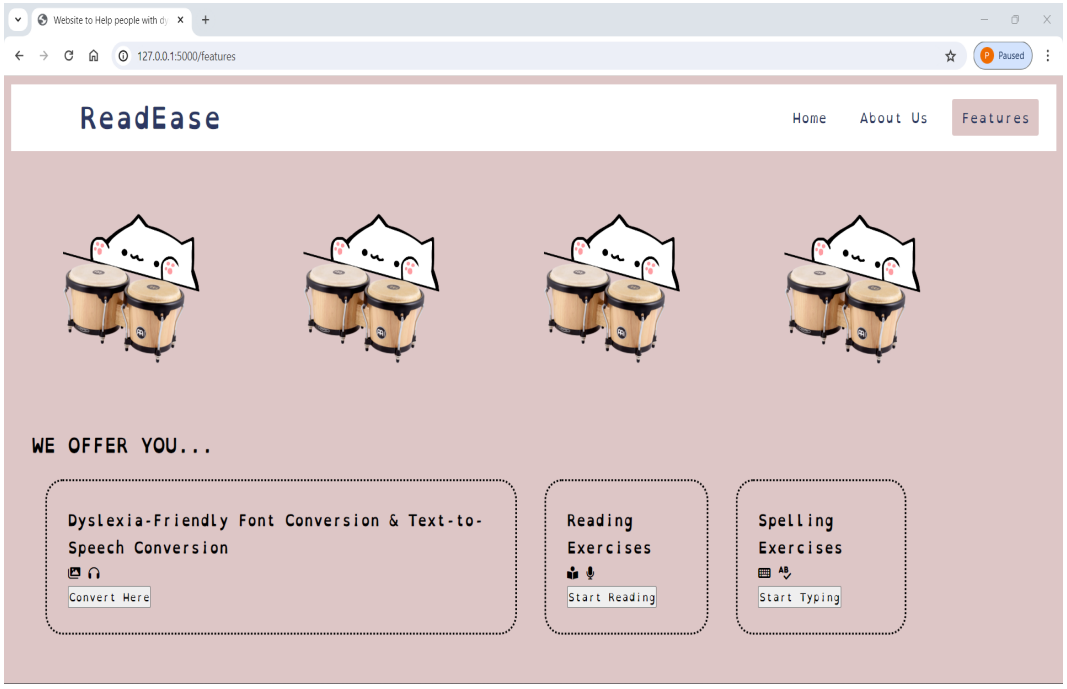

Figure 6.1.3: Features

6.2 Image-to-Text-to-Speech Conversion

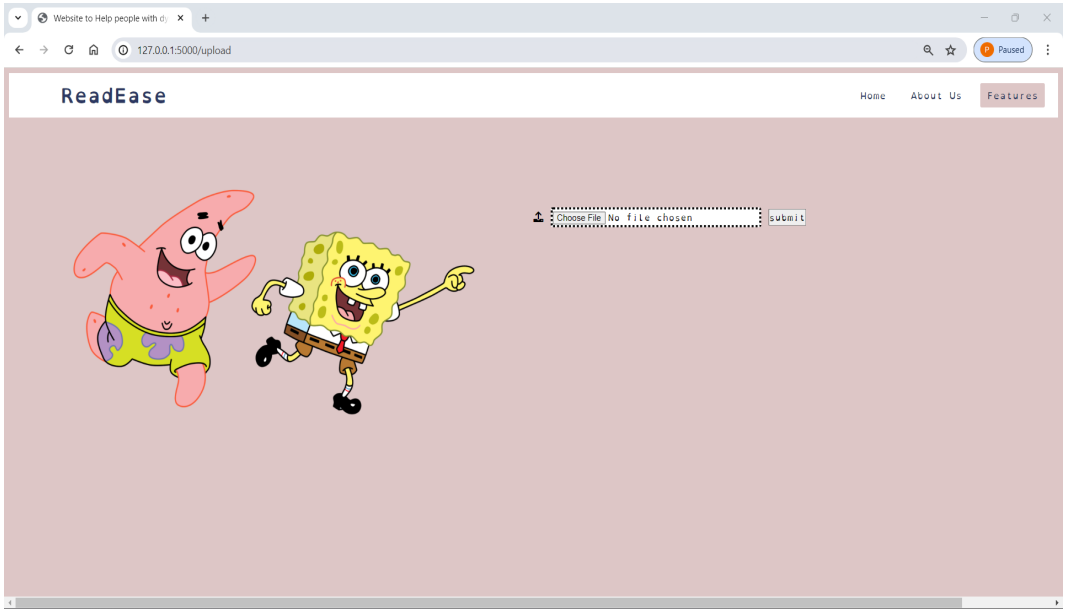

Figure 6.2.1: Before uploading the image

Figure 6.2.2: After uploading the image

6.3 Reading Exercises

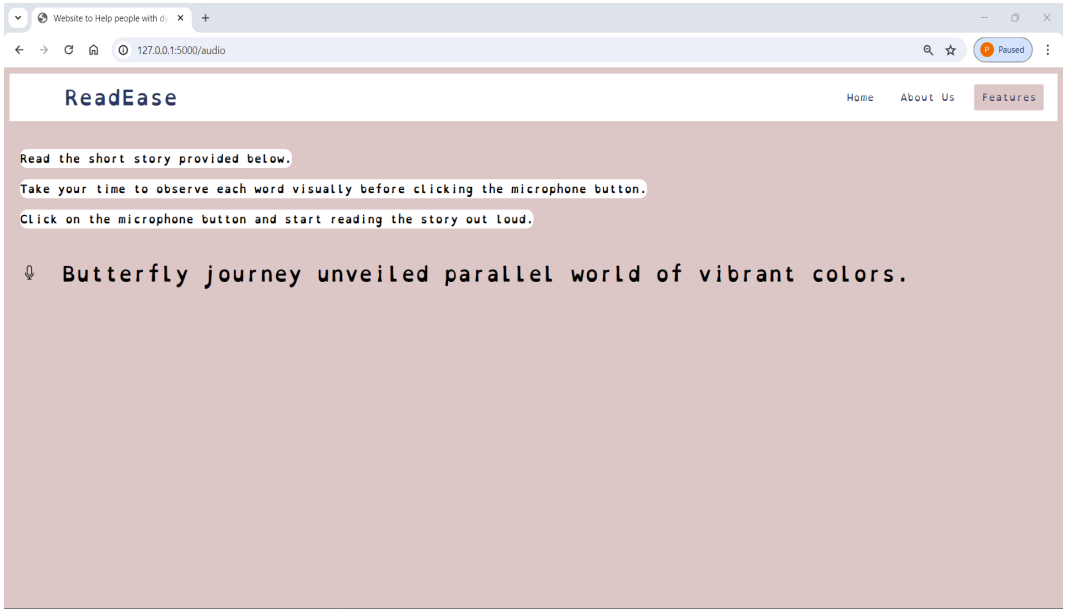

Figure 6.3.1: Listen to the sentence

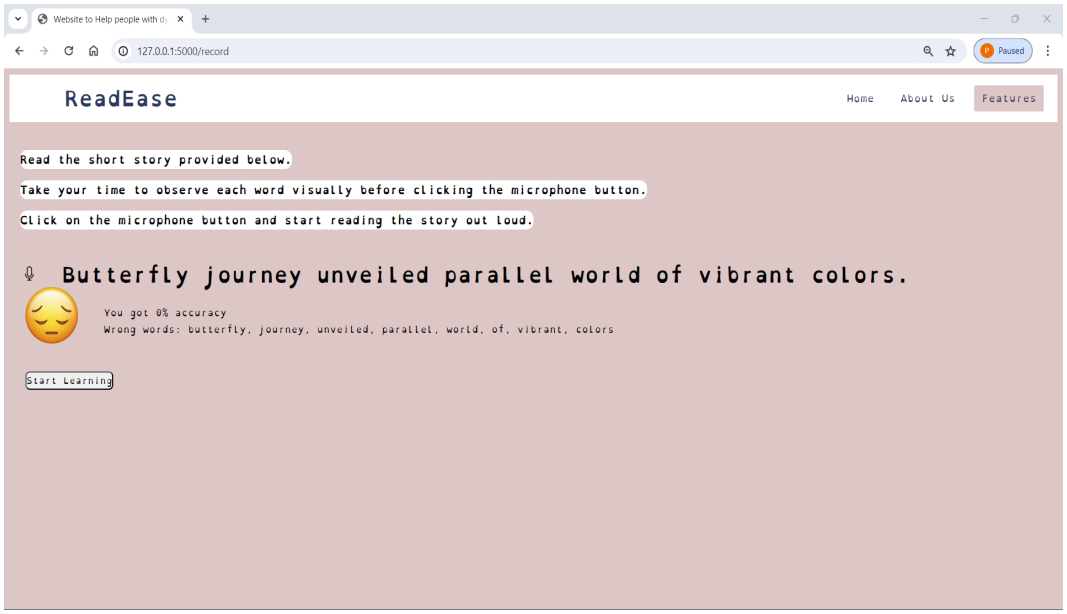

Figure 6.3.2: Incorrect spelling

6.4 Spelling Exercises

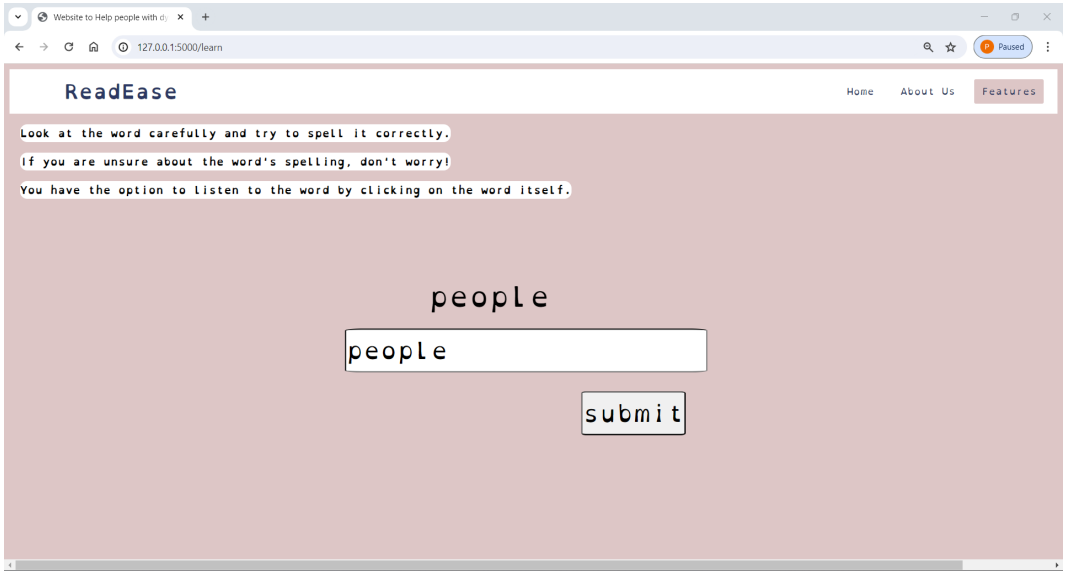

Figure 6.4.1: Correctly typed word

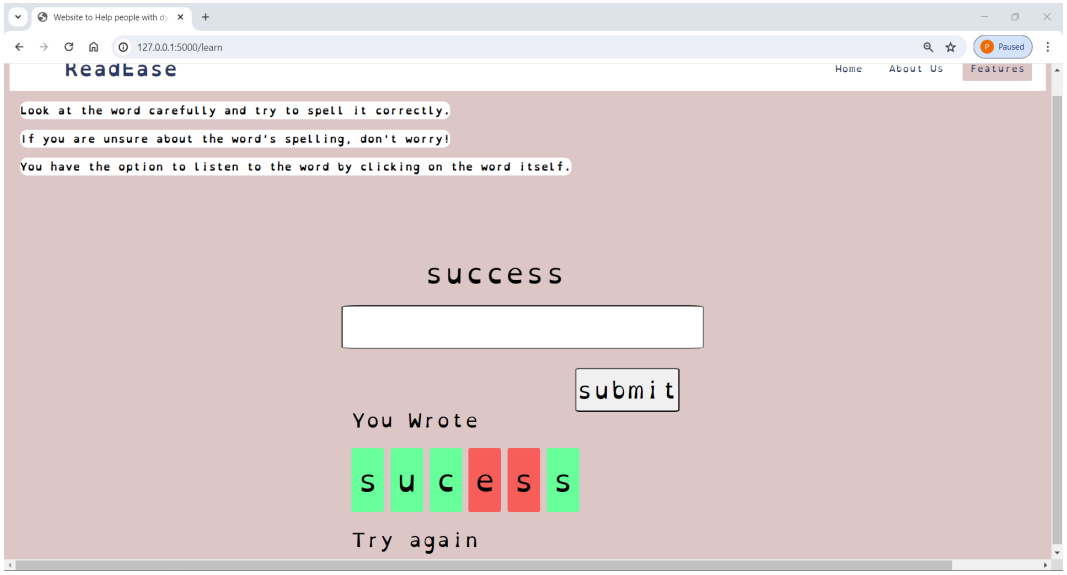

Figure 6.4.2: Incorrectly typed word

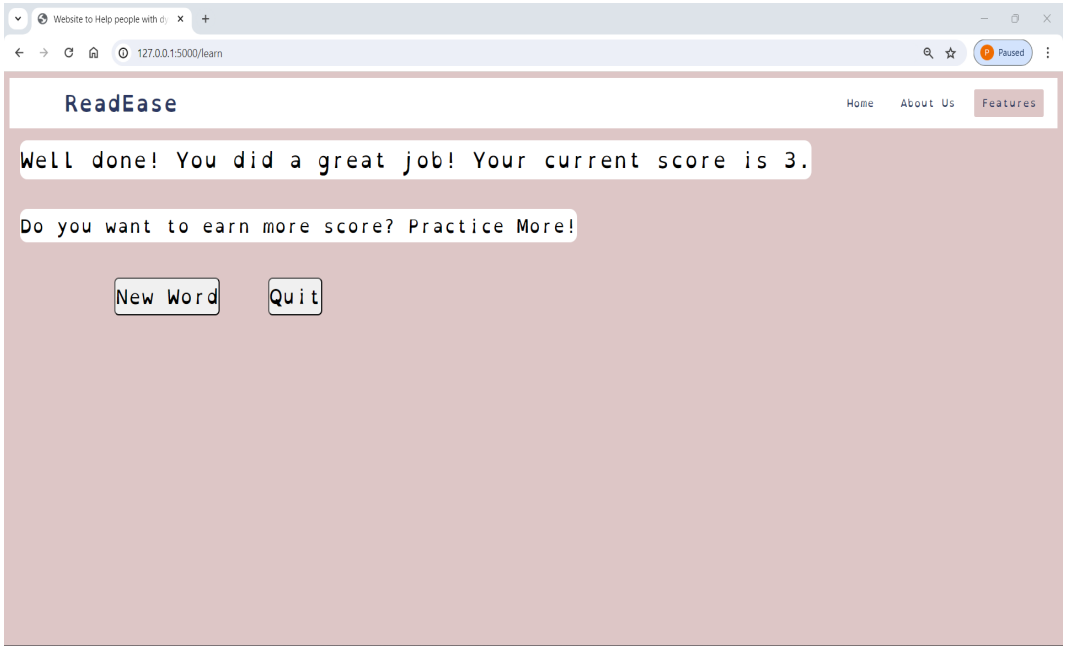

Figure 6.4.3: Scoreboard of spelling exercises

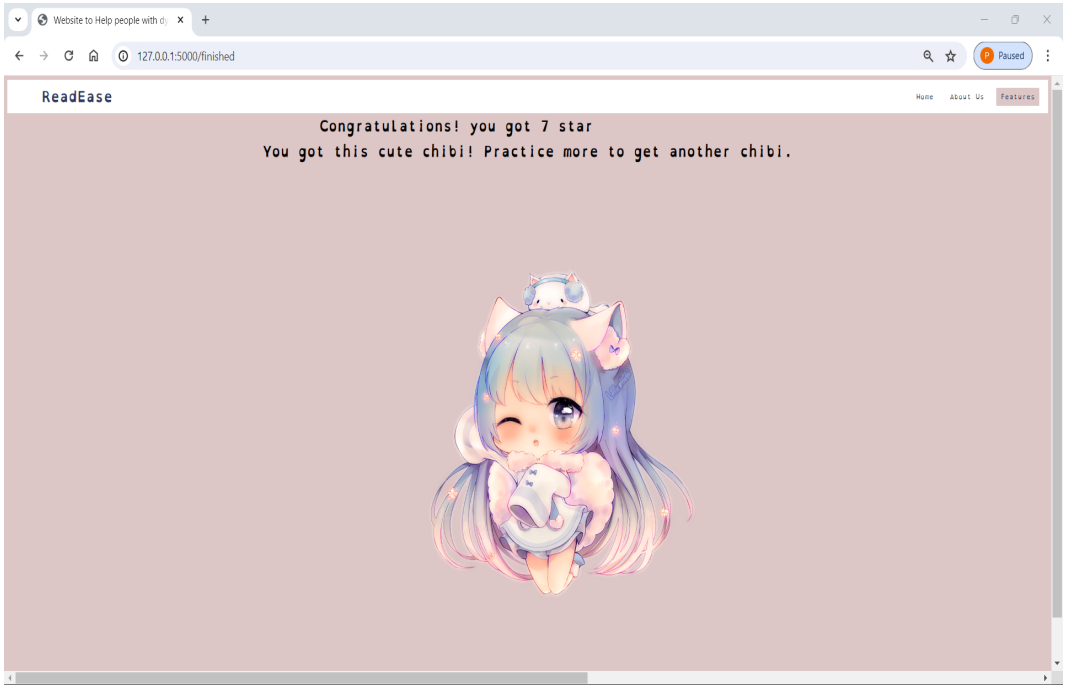

Figure 6.4.4: Final Scoreboard

7. CONCLUSIONS & FUTURE SCOPE

In summary, the project has revealed the promising role that digital platforms like ReadEase can play in supporting dyslexic learners and improving their literacy skills. Through rigorous analysis and user engagement, the project has showcased significant advancements in both reading and spelling proficiencies among users, validating the efficacy of ReadEase's tailored features and personalized learning approaches. The positive outcomes observed underscore the platform's potential to serve as a valuable resource in literacy education for individuals with dyslexia. Looking ahead, the project opens avenues for further development and expansion of ReadEase. Continuous refinement and augmentation of its features will be crucial to meet the evolving needs of dyslexic learners and leverage advancements in technology effectively. Integration of new AI-driven tools and expansion of the platform's content library can enhance its effectiveness and utility, ensuring its relevance in the dynamic landscape of dyslexia intervention.

Moreover, partnerships with educators, researchers, and dyslexia experts will play a pivotal role in shaping ReadEase's future trajectory. Collaborative efforts will facilitate the incorporation of evidence-based practices and ensure the platform remains grounded in research-backed methodologies. By staying abreast of the latest developments in dyslexia intervention, ReadEase can continue to evolve and adapt to the needs of dyslexic individuals effectively. Furthermore, the project underscores the importance of accessibility, usability, and inclusivity in the design and implementation of ReadEase. Prioritizing these aspects will enable the platform to reach a broader audience and accommodate diverse learning styles and preferences. By fostering a user-friendly and inclusive environment, ReadEase can empower dyslexic learners to navigate their literacy journey with confidence and success. Ultimately, the project's findings highlight ReadEase's potential to not only transform the lives of dyslexic individuals but also to contribute to a more equitable and inclusive educational landscape.

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