Dyslexia Learning Companion: An AI-Powered Support System

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Abstract

This paper explores a comprehensive solution aimed at enhancing the quality of life for individuals with Dyslexia and Autism Spectrum Disorder (ASD). The proposed system integrates assistive technologies such as Text-to-Speech (TTS), predictive text support, emotion recognition, and memory aids into a unified platform. A thorough literature survey identifies current gaps in assistive technologies and forms the foundation of this solution. The paper details the project's methodology, expected outcomes, and potential for scalability and customization.

1. Introduction

Dyslexia and Autism Spectrum Disorder (ASD) affect millions worldwide, posing challenges in communication, emotional regulation, and learning. Assistive technologies have evolved to address specific aspects of these conditions, such as TTS systems for reading or emotion recognition tools for social interaction. However, these solutions often lack integration and personalization. This paper introduces a novel Quality of Life Assistant, a user-centric platform integrating multiple modules tailored for individuals with dyslexia and ASD.

Dyslexia is a neurological condition characterized by difficulties in reading, spelling, and writing, despite average or above-average intelligence. It affects approximately 15-20% of the population globally, with symptoms such as letter reversals, difficulty in word recognition, and spelling inconsistencies. While dyslexia cannot be cured, assistive technologies offer significant support in improving reading comprehension and confidence.

2. Literature Survey

- **Assistive Technologies for Dyslexia**

Text-to-Speech Systems: Tools like Kurzweil 3000 have shown to enhance reading comprehension by converting text into audio. A study by Smith and Taylor (2020) highlights improvements in reading fluency through auditory reinforcement.Writing Support Tools: Co:Writer provides spelling correction and predictive text for dyslexic users.

Research by Jones et al. (2019) emphasizes the need for simplified interfaces for better usability.

Dyslexia-Friendly Fonts: Fonts like Open Dyslexic reduce reading strain and improve visual clarity. Studies by Lee et al. (2018) show a significant increase in reading speed using these fonts.

- **Assistive Technologies for ASD**

Emotion Recognition Systems: AI-powered emotion recognition tools aid ASD individuals in interpreting facial expressions. Patel et al. (2021) demonstrated a 40% improvement in social engagement through interactive training.

Sensory Management Tools: Devices providing auditory and visual cues reduce overstimulation. Johnson and Davis (2020) noted these tools' effectiveness in educational settings.

- **Challenges**

Lack of integrated solutions addressing both dyslexia and ASD.

Limited emotional and social support features for dyslexia.

Low customizability in existing tools.

3. Existing system

4. Motivating Factors

The global prevalence of dyslexia (15-20%) and ASD (1 in 44 children).

Limited availability of holistic solutions combining cognitive, emotional, and social functionalities.

Potential for AI-driven assistive tools to improve accessibility and inclusivity.

Limitations of Traditional Learning Methods for Dyslexic Students

Increasing Need for Specialized, Technology-Driven Educational Tools

AI as an Emerging Solution in Personalized Learning for Special Needs Education.

5. Problem Statement

Despite advancements in assistive technologies for dyslexia and ASD, existing solutions are fragmented, lacking integration and personalization. This project aims to bridge these gaps by developing a unified platform addressing the cognitive, emotional, and social needs of affected individuals.

6. Objectives

The Quality of Life Assistant for Dyslexia and ASD addresses these gaps through the following modules:

Reading Support Module: Includes TTS with customizable speech rates and dyslexia-friendly fonts.

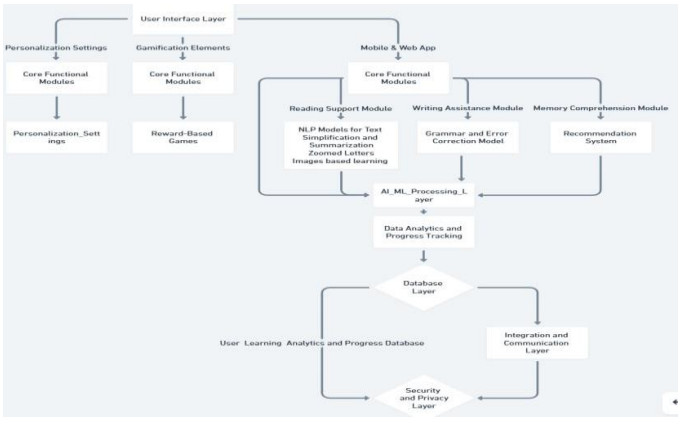
Writing Assistance: Predictive text, grammar simplification, and context-sensitive spelling correction.

Emotion and Social Support: AI-based emotion recognition with guided feedback and social training.

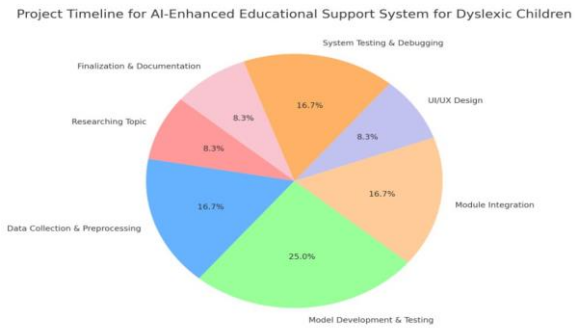
Memory Aids: Tools for task organization and recall tailored to user preferences.

Parental Dashboard: Enables caregivers to track progress and customize settings.

7. Proposed Architecture



8. Timeline



9. Conclusion

This paper presents a novel, integrated assistive technology solution for dyslexia and ASD. By combining TTS, writing assistance, and emotion recognition, the Quality of Life Assistant addresses key gaps in current solutions. Future work will explore advanced AI integrations and further customization to enhance user experience