Mobile and Simulation-based Approach to Reduce Dyslexia in Children with Learning Disabilities

24-25J-133

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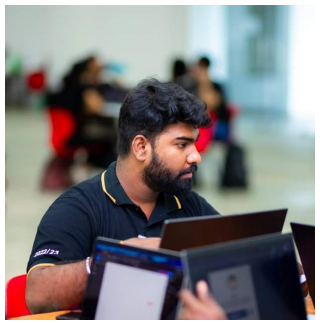

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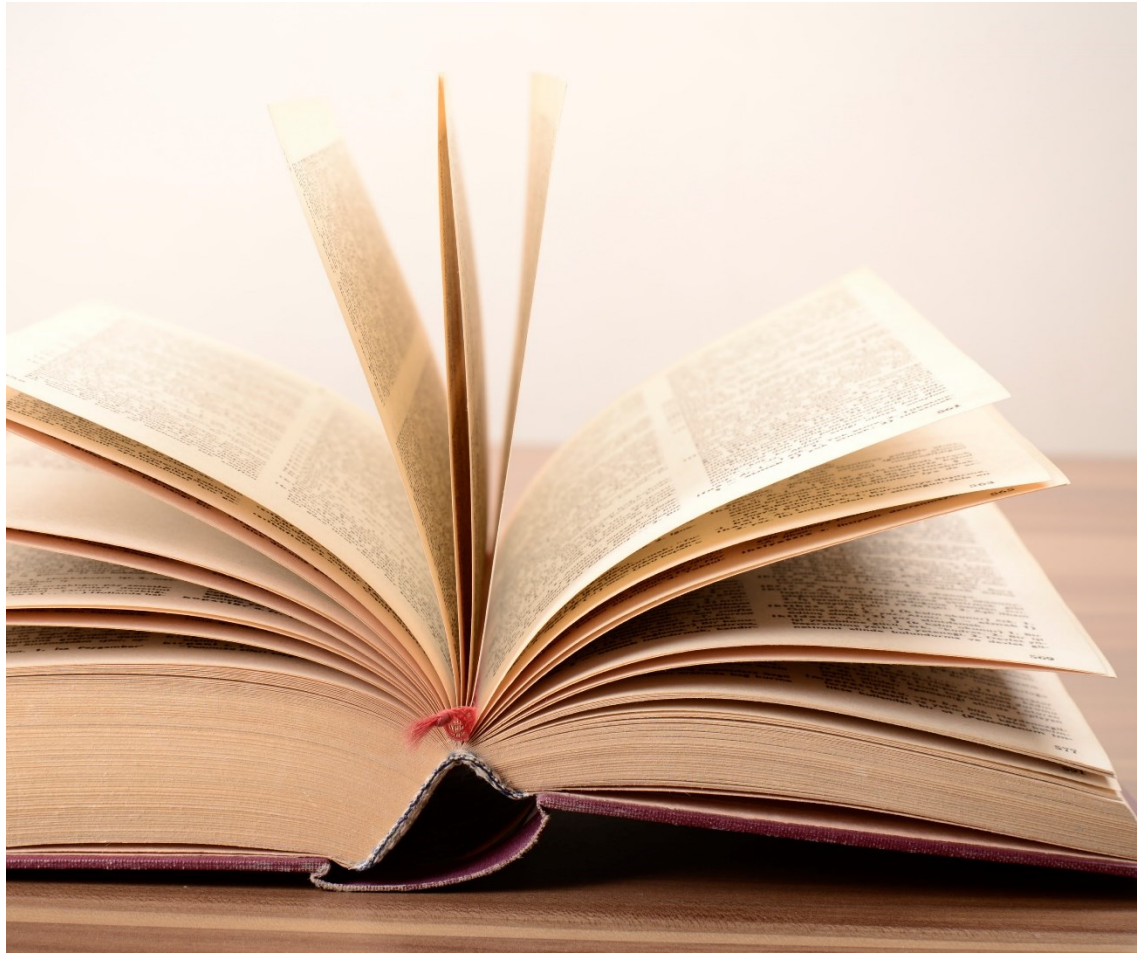
Introduction to the overall project



1. What is dyslexia, and how does it affect children?

2. Why is there a need for a mobile application to support children with dyslexia?

Research Questions

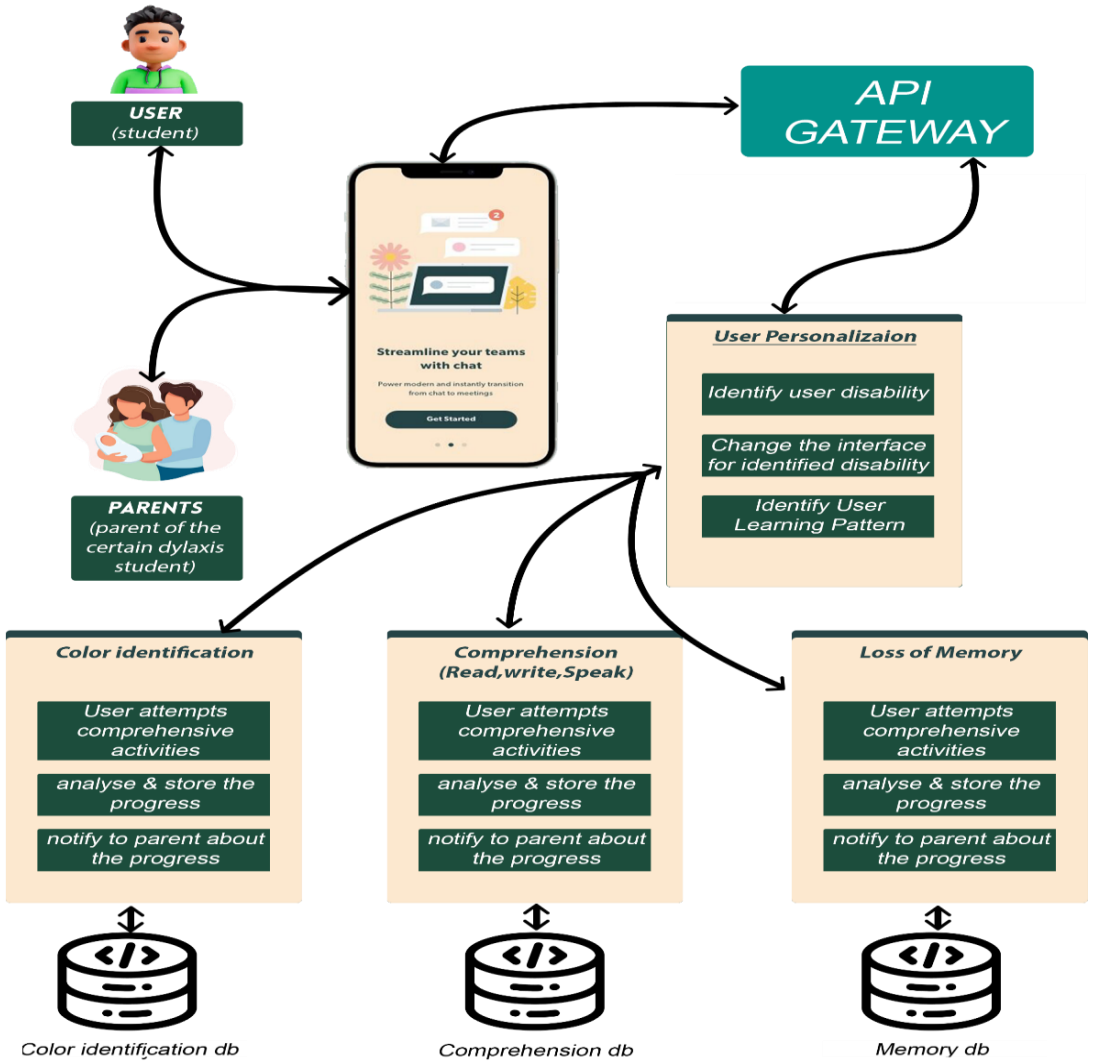
How can a mobile application utilizing innovative solutions, such as Natural Language Processing (NLP) and machine learning, support children with dyslexia in improving their reading, processing, and memory skills?

Research Objectives

- Main Objective

  To design and develop a mobile application that utilizes innovative solutions to support children with dyslexia in improving their reading, processing, and memory skills.

Overall solution as a system diagram



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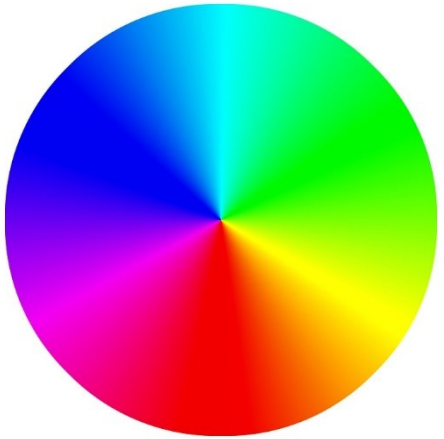
SOFTWARE ENGINEERING

Component 01

Visual Processing Module

Introduction



Background

- This Module is designed to support children with dyslexia who often struggle with visual perception and discrimination.
- Research suggests that individuals with dyslexia may have underlying visual processing issues that impact their ability to learn.
- Visual discrimination difficulties can impact students' performance in reading, writing, and mathematics.
- By addressing these core visual processing challenges, the Visual Processing Improvement Module aims to enhance overall learning outcomes for children with dyslexia.

Research Problem

How can machine learning, Image processing algorithms be leveraged to dynamically adjust visual processing activities and games, improving visual skills of children with dyslexia?

Specific and Sub Objectives

Main Objective:

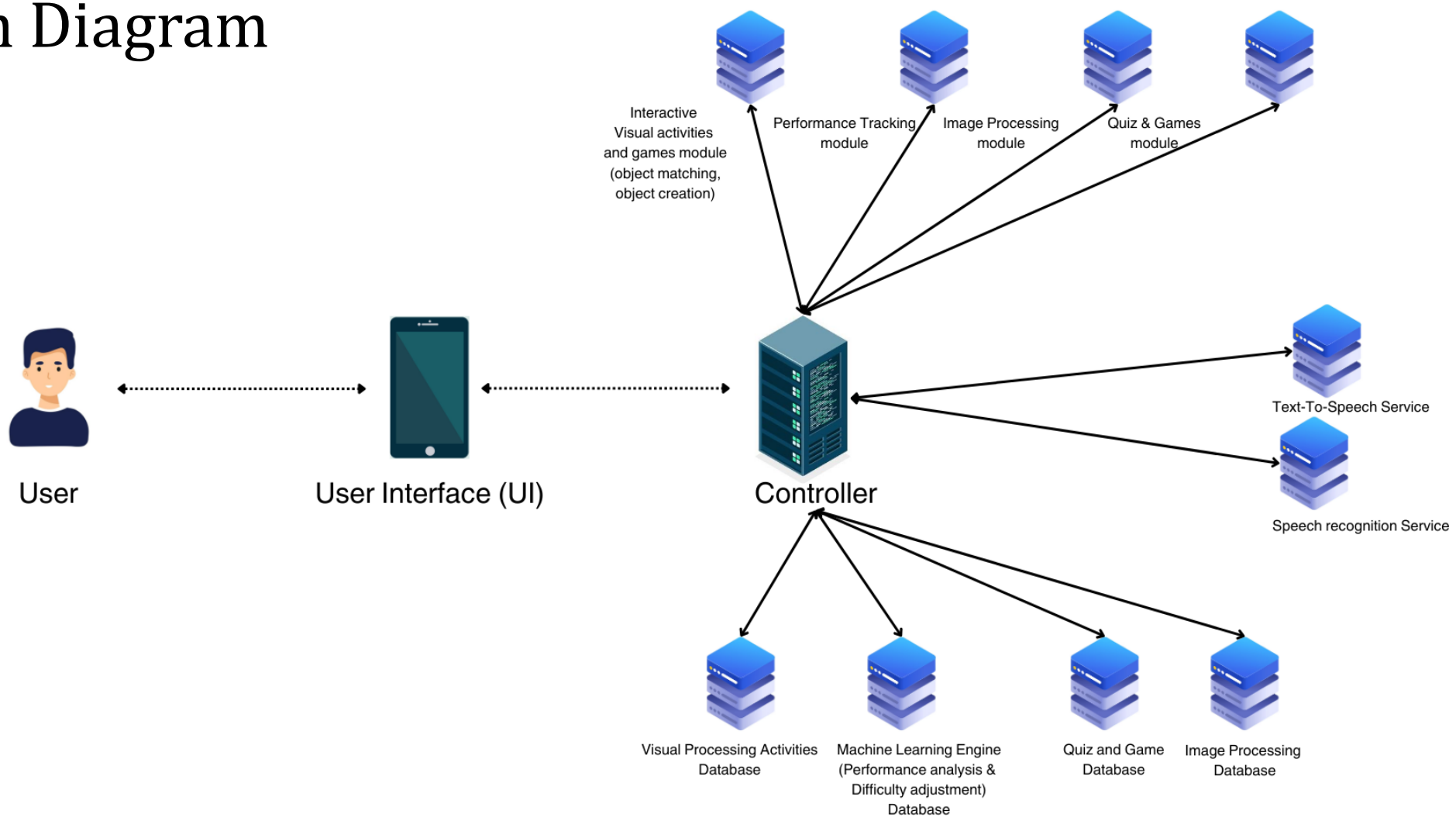
- To design and develop a Visual Processing Module that improves the visualizing abilities of students with visual processing difficulties, including those with dyslexia.

Sub-Objectives:

- Improve Visual Comprehension.
- Enhance the capacity to distinguish between subtle differences in visual stimuli.
- Enhance the ability to perceive complete forms from incomplete information.
- Enhance the ability to understand the position of objects in relation to each other.
- Develop handwriting fluency and accuracy.

Methodology

System Diagram



Tools & Technologies

Technologies

- Machine learning, Image Processing

Languages

- Python, Flutter

Storage

- MongoDB (pymongo)

Requirements

Functional

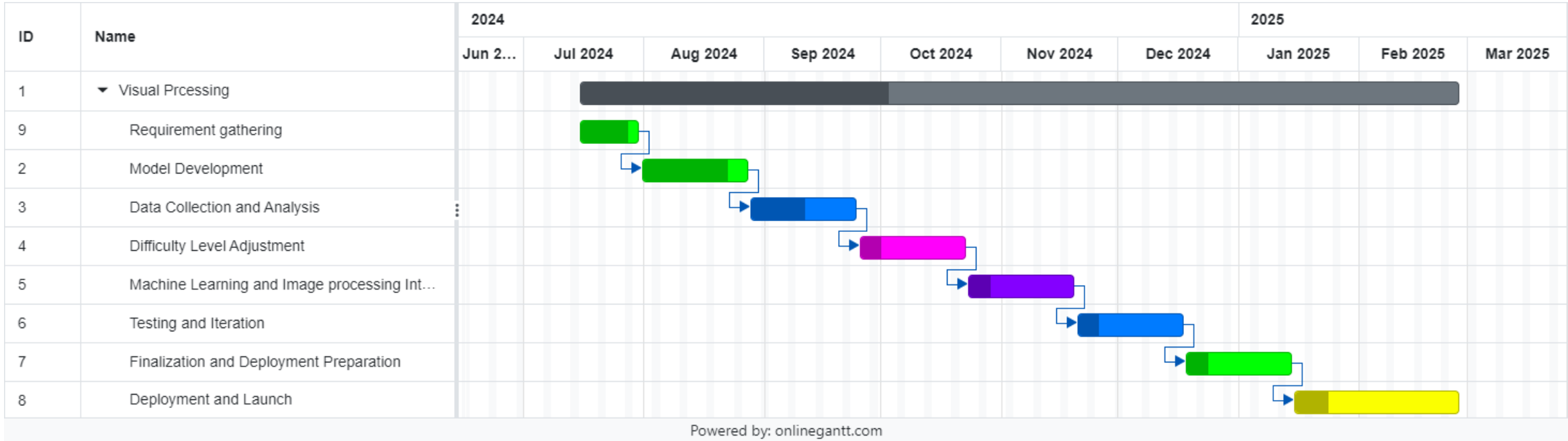
- Visual Identification Activities
- Visual Differentiation of objects
- Dynamic Difficulty Adjustment

Non-Functional

- Reliability
- Accessibility
- Engagement

Work Breakdown Structure

Gannt Chart



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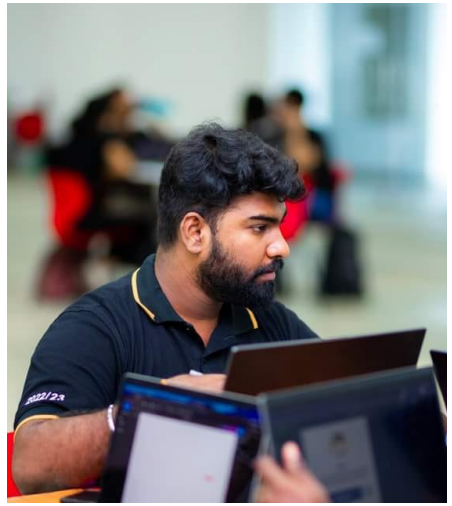

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SOFTWARE ENGINEERING

Component 01

Reading Skills Enhancement Module

Introduction

Background

- Dyslexia is a common learning disorder affecting 15-20% of the population, making it challenging for individuals to read, write, and spell.
- Children with dyslexia often struggle with phonemic awareness, phonics, fluency, and comprehension, which are essential reading skills.
- Traditional teaching methods that focus on rote memorization and repetition can be ineffective for children with dyslexia.
- Research-based approaches that incorporate multisensory instruction, technology, and individualized learning have shown promise in improving reading outcomes for children with dyslexia.

Reading Component

- Phenomics awareness
  - sounds the word made up of
- Phonic
  - Letters / arrangement of the letter, that produces certain sound
  - Key , Ki can make the same sound.
- Fluency
  - Rate of effort to read a word

Research Problem

How can interactive learning modules, combined with natural language processing (NLP) techniques, be effectively utilized to enhance the reading skills of children with dyslexia?

Traditional Enhancement Approaches

Salt Tray

Rhyme Games

Repeated Read

Gaps Identified and Novelties

- App existing that serves only targeted scope in Reading Skills
  - App serves the entire solution and help to reach the ultimate goal of reading - Comprehension
- Personalized learning
  - Usage of ML and NLP helps to provide us a personalized user experience (Tracking, real time feedbacks)
  - ML for make prediction in on-boarding identification of user Phonic level &
  - Identify Learning pattern to recommend adjust the difficulty level for progress.
- Missing integration of proven techniques
  - Incorporating proven techniques like Repeated reading, salt tray in a modern aspect
- Early intervention focus

Specific and Sub Objectives

Main Objective:

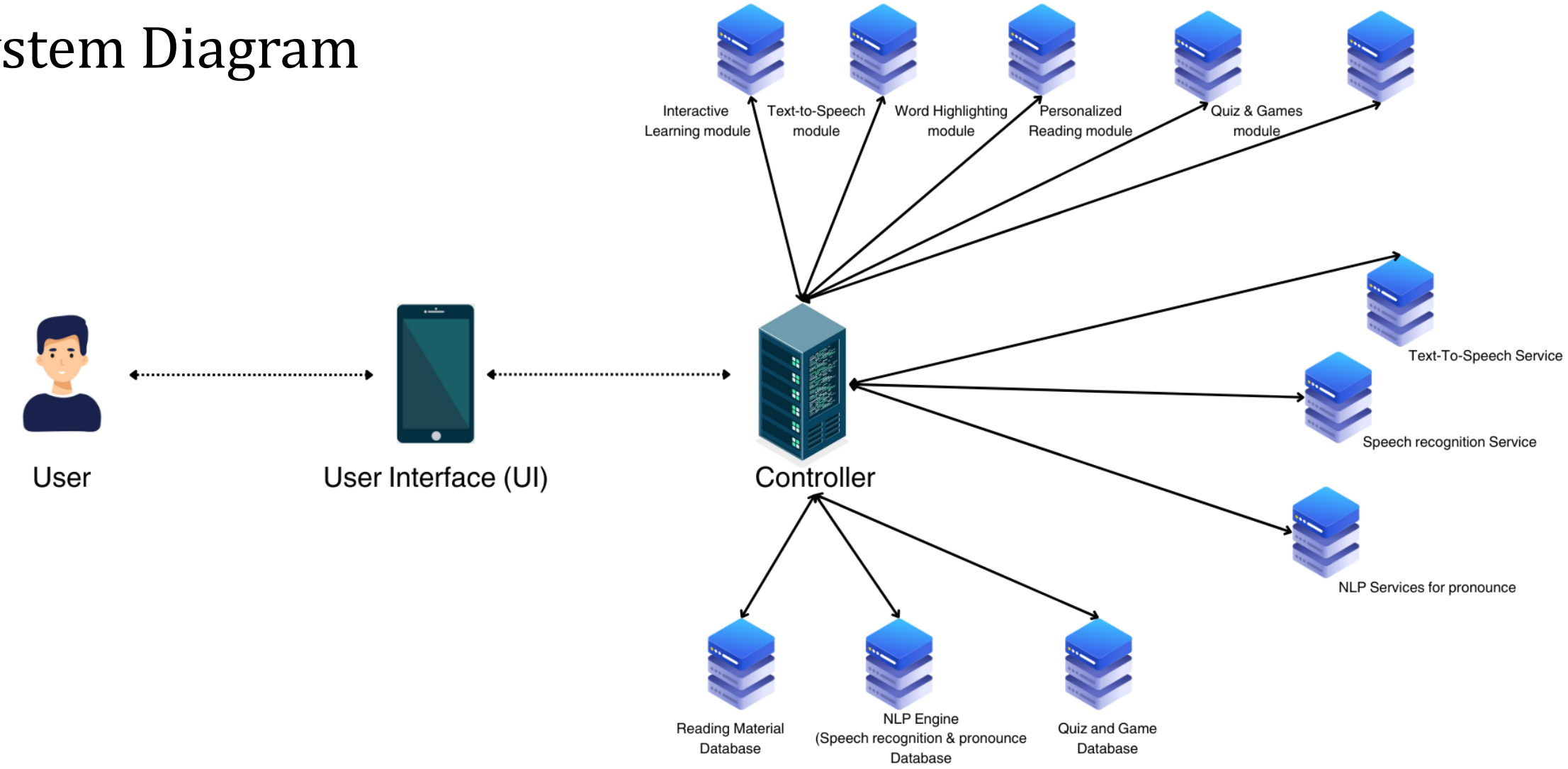
- To design and develop a Reading Skills Enhancement Module that improves the reading abilities of children with dyslexia.

Sub-Objectives:

- Phonological Awareness
- Decoding and Fluency
- Reading Comprehension
- Reading Difficulties Reduction
- Engagement and Motivation

Methodology

System Diagram



Tools & Technologies

Technologies

- Natural Language Processing (NLP), Machine Learning

Languages

- Python, Flutter

Storage

- MongoDB (pymongo)

Flutter

Requirements

Functional

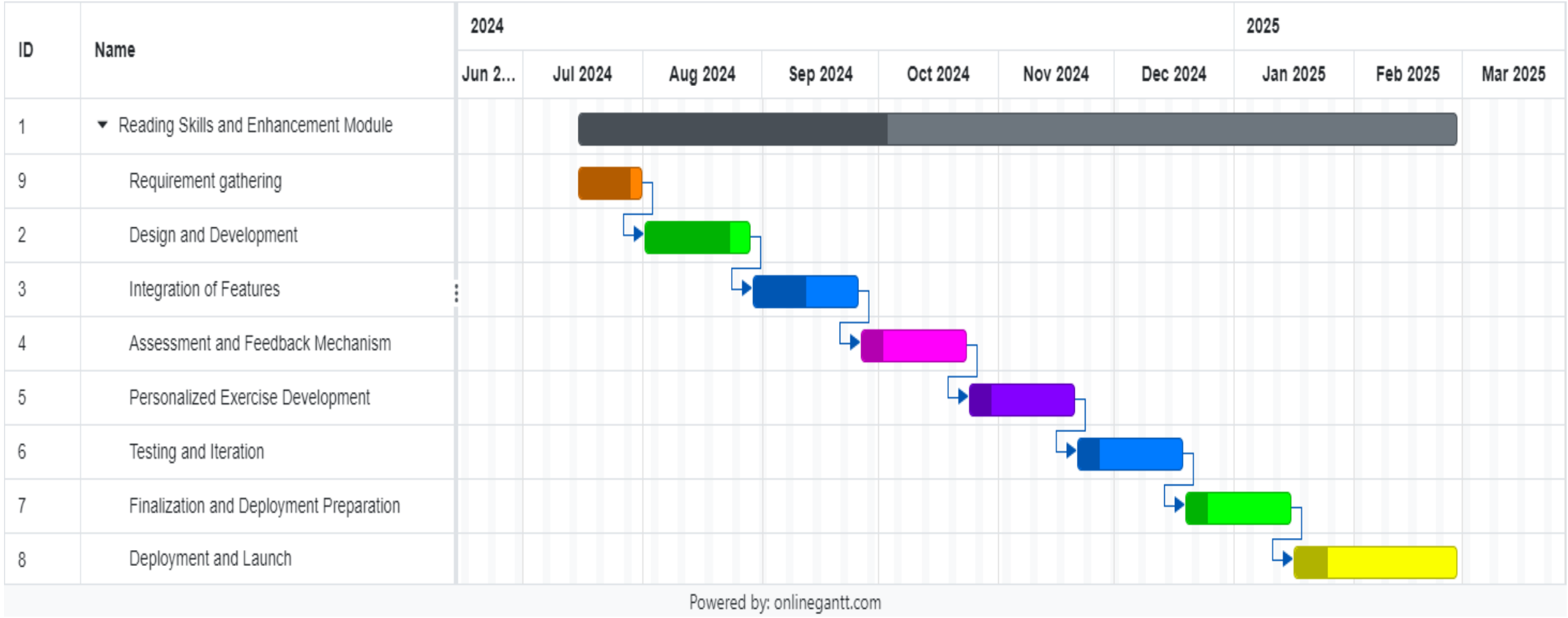
- Interactive Learning Modules
- Text-to-Speech and Word Highlighting
- Personalized Reading Materials

Non-Functional

- Performance
- Scalability
- Usability

Work Breakdown Structure

Gannt Chart



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SOFTWARE ENGINEERING

Component 03

Short-term Memory Enhancement Module

Introduction

Background

- Short-term memory plays a crucial role in learning and academic achievement, yet many individuals struggle with retaining information in their working memory.
- Research has shown that short-term memory deficits can significantly impact academic performance, particularly in subjects like mathematics and reading.
- Current interventions often focus on compensatory strategies, but there is a need for a more comprehensive approach that targets the underlying cognitive processes.
- The Short-term Memory Enhancement Module is designed to address this need by providing personalized training and exercises to improve short-term memory capacity.

Research problem

How can machine learning techniques be employed to develop adaptive memory training exercises that effectively enhance the short-term memory of children with dyslexia?

Specific and Sub Objectives

Main Objective:

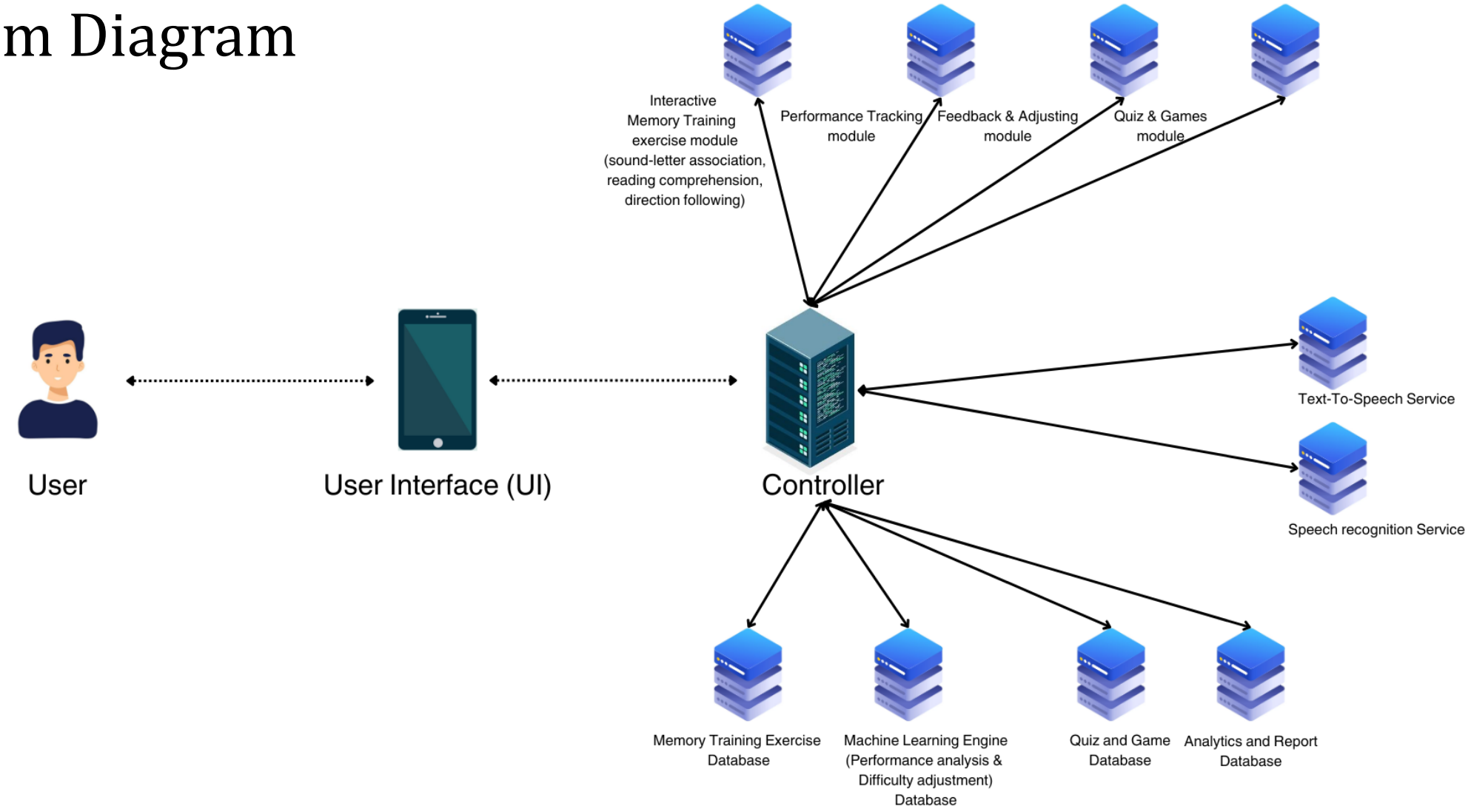
- To design and develop a Short-term Memory Enhancement Module that improves the short-term memory skills of children with dyslexia.

Sub-Objectives:

- **Enhance Short-term Memory**
- **Improve Working Memory**
- **Increase Memory Capacity**

Methodology

System Diagram



Tools & Technologies

Technologies

- Machine learning

Languages

- Python, Flutter

Storage

- MongoDB (pymongo)

Requirements

Functional

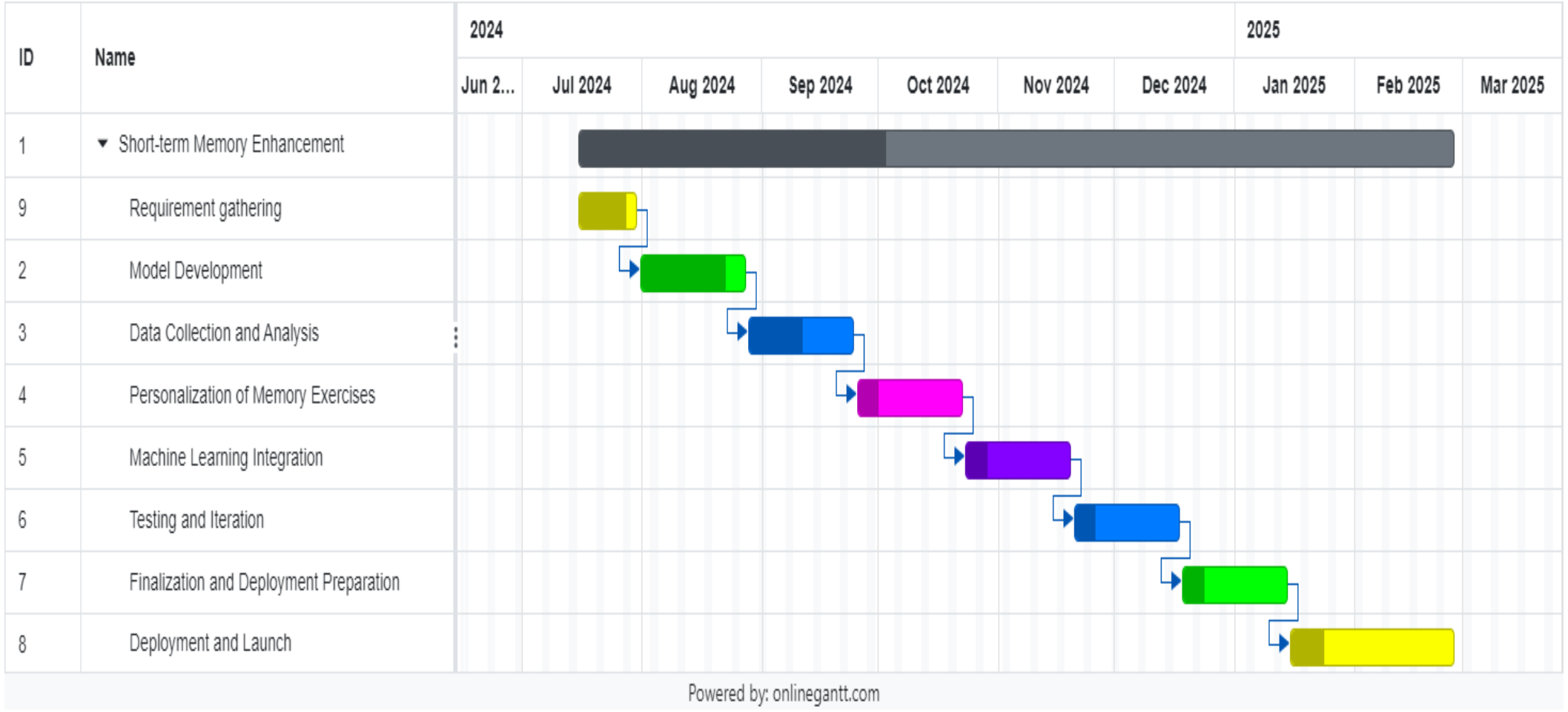
- Memory Training Exercises
- Performance Data Analysis
- Personalized Memory Exercises

Non-Functional

- Efficiency
- Security
- Adaptability

Work Breakdown Structure

Gannt Chart



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Q&A

THANK YOU