MagicMind-Mobile Application to reduce **Non-Verbal Learning Disability (NVLD)**

Project Id :24-25J-150

Project Proposal Report

Harshana W.C.

BSc (Hons) in Information Technology Specializing in Information Technology

Sri Lanka Institute of Information Technology
Sri Lanka

June 2024

MagicMind-Mobile Application to reduce **Non-Verbal Learning Disability (NVLD)**

Project Id :24-25J-150

Project Proposal Report

Harshana W.C.

Submitted to:

Supervisor: Mrs. Lokesha Weerasinghe
Co-Supervisor: Ms. Malithi Nawarathne

BSc (Hons) in Information Technology Specializing in Information Technology

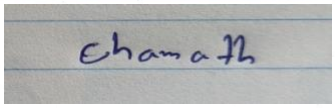
Department of Information Technology

Sri Lanka Institute of Information Technology
Sri Lanka

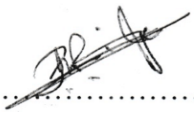
June 2024

Declaration

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

Name	Student ID	Signature
Harshana W.C.	IT21175466	

The above candidates are carrying out research for the undergraduate Dissertation under my supervision.



.....

Signature of the supervisor

22/08/2024

.....

Date

.....

Signature of the Co-supervisor

.....

Date

ABSTRACT

Children with Nonverbal Learning Disabilities (NVLD) face significant challenges in developing visual-spatial skills and recognizing patterns, which are crucial for daily learning and cognitive growth. Traditional educational tools often fall short in addressing these unique needs. This research focuses on developing an interactive mobile application that enhances cognitive skills specifically tailored for children with NVLD. The application leverages artificial intelligence (AI) to generate and divide images into segments with missing elements, enabling children to engage in drag-and-drop tasks to complete the images. The system is designed to dynamically adjust the complexity of the patterns based on the child's performance, providing a personalized and adaptive learning experience. Additionally, the application includes a feature that allows children to signal difficulty, which prompts the system to reduce the complexity, ensuring a supportive and engaging environment for cognitive development.

***Keyword*: Nonverbal Learning Disability (NVLD), Machine Learning (ML), Reinforcement Learning (RL)**

TABLE OF CONTENTS

1. INTRODUCTION

Nonverbal Learning Disabilities (NVLD) represent a complex neurological condition that predominantly affects the right hemisphere of the brain, which is responsible for processing visual and spatial information. Children with NVLD typically exhibit a stark discrepancy between their verbal skills, which are often strengths, and their nonverbal skills, which are areas of difficulty. This condition is characterized by several core challenges:

- **Visual-Spatial Processing:** Children with NVLD have difficulty interpreting visual information. This can manifest as challenges in understanding maps, graphs, and diagrams, or difficulties in navigating physical spaces.
- **Pattern Recognition:** Difficulty in recognizing and predicting patterns affects learning in mathematics and reading, where pattern recognition is crucial.
- **Fine Motor Skills:** Many children with NVLD struggle with tasks that require motor coordination, such as tying shoes, handwriting, or using scissors.
- **Social Skills:** Since nonverbal cues such as facial expressions, body language, and tone of voice are hard to interpret, social interaction can be particularly challenging. This often leads to social isolation and anxiety.

These challenges have profound implications for academic performance and social interactions, which can lead to long-term educational and psychological consequences if not addressed appropriately.

Limitations of Traditional Educational Tools

Traditional educational tools and environments typically cater to a broad student population, often overlooking the unique needs of children with specific learning disabilities like NVLD. These conventional tools rarely offer the flexibility or the specific types of visual-spatial and pattern recognition exercises that can benefit children with NVLD. Moreover, traditional methods often fail to provide immediate feedback or adapt to a child's individual learning pace, further exacerbating their frustration and disengagement.

Purpose of the Study

The principal aim of this study is to design, develop, and evaluate an interactive mobile application specifically tailored to the learning profiles of children with Nonverbal Learning Disabilities. This application is not merely a digital tool but a pedagogical system designed to enhance cognitive abilities crucial for academic and social success.

- **Improvement of Cognitive Skills:** The app focuses on enhancing skills where children with NVLD are typically challenged, such as visual-spatial reasoning and pattern recognition. By turning these areas into interactive exercises, the app helps transform weaknesses into strengths.
- **Dynamic Difficulty Adjustment:** One of the innovative features of the application is its ability to dynamically adjust the difficulty of tasks in real-time. This adjustment is based on the child's immediate performance metrics, ensuring that each child remains neither under-challenged nor overwhelmed.

- **Personalization:** Beyond adjusting difficulty, the app personalizes the learning experience by adapting the types of tasks presented based on the child's progress and specific areas of need. This personalized approach aims to maximize learning efficiency and engagement.

2. BACKGROUND & LITERATURE SURVEY

The intersection of technology and education has seen significant advancements in recent years, particularly concerning the use of digital tools to support children with learning disabilities. A growing body of research underscores the potential of these technologies to enhance learning outcomes, foster engagement, and provide personalized educational experiences.

One of the key areas of focus within this research has been the application of **Dynamic Difficulty Adjustment (DDA)** in educational settings. DDA refers to systems that automatically adjust the difficulty level of tasks based on the user's real-time performance, ensuring that the user remains adequately challenged without becoming overwhelmed. **Brown et al.** [1] conducted a seminal study in this area, exploring how DDA could be implemented in educational games. Their research demonstrated that when games adjusted their difficulty based on the user's abilities, engagement increased significantly, and learning outcomes improved. This is particularly relevant for educational tools aimed at children with learning disabilities, who often require more tailored and responsive learning environments to succeed.

In a related vein, **Lee et al.** [2] investigated the importance of age-appropriate user interface (UI) design in educational tools for children. Their research emphasized that children's cognitive and motor abilities vary widely depending on their age, and as such, educational software must be designed with these differences in mind. Age-specific design not only makes the tools more accessible but also enhances the learning experience by making the interface intuitive and engaging for children. Lee et al.'s work has laid important groundwork for understanding how UI design can impact learning, particularly in young users.

Furthermore, **Williams et al.** [3]focused on the broader field of user experience (UX) design for children with learning disabilities. Their research highlighted the need for adaptive interfaces that can respond to the diverse and often complex needs of these children. Williams et al. argued that educational tools must go beyond static designs and incorporate elements that adjust to the user's individual needs in real-time. Their findings are particularly pertinent for children with learning disabilities, who may have difficulty using standard interfaces due to cognitive, motor, or sensory challenges.

In addition to DDA and UI/UX design, the role of **adaptive learning technologies** in personalized education has also been extensively studied. **Garrison et al.** [4] provided a comprehensive review of these technologies, noting that their effectiveness lies in the ability to tailor content delivery based on real-time data about the user's performance. Adaptive learning systems are designed to respond to the learner's progress, providing more challenging tasks as proficiency increases or offering additional support when difficulties arise. Garrison et al.'s review highlighted the growing importance of personalization in educational technology, suggesting that these approaches could be particularly beneficial for children with learning disabilities who require more individualized learning paths.

3. GAPS IN EXISTING RESEARCH

Lack of Focus on Nonverbal Learning Disabilities (NVLD)

Despite the progress made in the fields of DDA, UI/UX design, and adaptive learning technologies, there remains a critical gap in the literature regarding tools specifically designed for children with Nonverbal Learning Disabilities (NVLD). NVLD is a condition characterized by difficulties in visual-spatial processing, pattern recognition, and fine motor skills, which significantly impact a child's ability to learn and interact socially. Current research has not adequately addressed the unique needs of children with NVLD, particularly in the context of educational tools that are designed to enhance these specific cognitive skills.

Limited Integration of Dynamic Difficulty Adjustments and Age-Specific Design

Another notable gap in the literature is the limited exploration of how dynamic difficulty adjustments (DDA) and age-specific design can be integrated into a single, cohesive educational tool. While Brown et al. (2018) and Garrison et al. (2020) have demonstrated the effectiveness of DDA and adaptive learning systems, these technologies have primarily been applied in broader educational contexts without a specific focus on NVLD. Similarly, while Lee et al. (2019) and Williams et al. (2021) have underscored the importance of age-appropriate and adaptive interfaces, there has been little exploration of how these design principles can be combined with DDA to create tools that are both engaging and effective for children with NVLD.

Underexplored Potential of Real-Time Performance Data in Visual-Spatial Tasks

A particularly significant gap is the underexplored potential of using real-time performance data to dynamically adjust the complexity of visual-spatial tasks. Children with NVLD often struggle with tasks that require spatial reasoning and pattern recognition, yet there is a lack of research on educational tools that can adjust the difficulty of these tasks in real-time based on the child’s performance. Such an approach could provide immediate feedback and tailored support, helping to bridge the gap between the child's current abilities and the skills they need to develop.

The Need for Integrated, Holistic Solutions

The existing literature tends to focus on individual components—such as DDA, adaptive interfaces, or age-specific design—rather than on integrated solutions that address multiple aspects of learning disabilities in a holistic manner. For children with NVLD, an effective educational tool would need to combine these elements to provide a comprehensive learning experience that adapts to their unique challenges. The lack of such integrated tools represents a significant research gap that this study aims to address.

3.1 Research Gap

The table below summarizes the identified research gaps and how the proposed solution aims to address them:

Research Gap	Research 1	Research 2	Research 3	Proposed Solution
Dynamic performance-based adjustments in images splitting.	✗	✗	✗	✓
Interfaces designed for children and how age-specific design impacts engagement and learning.	✓	✗	✓	✓
Focus on educational applications and the effectiveness of real-time adjustments in image tasks.	✗	✗	✓	✓
Focus on strategies designed to attract and sustain interest in cognitive exercises for children.	✗	✓	✗	✓

3.2 Explanation of Research Gap

3.2.1 Identifying the Knowledge Gap:

The analysis of existing research (as summarized in the table) highlights several critical areas where current studies fall short, particularly concerning the educational needs of children with Nonverbal Learning Disorder (NVLD). The table reveals that despite advancements in adaptive learning and user interface design, there is a notable absence of research that holistically addresses the unique requirements of this demographic.

Dynamic Performance-Based Adjustments in Image Splitting:

- Research Gap: None of the reviewed studies (Research 1, 2, and 3) adequately explore how dynamic adjustments to image splitting based on real-time performance can enhance learning outcomes. This gap is significant because children with NVLD often struggle with visual-spatial tasks, and adaptive difficulty could play a crucial role in improving their cognitive skills.
- Proposed Solution: Our solution addresses this gap by incorporating a system that adjusts the complexity of image splitting in real-time, based on the child's ongoing

performance. This approach ensures that the difficulty level remains appropriate, neither too challenging nor too simple, thereby fostering effective learning.

Age-Specific Interface Design:

- Research Gap: Although Research 1 acknowledges the importance of designing interfaces that cater to children's cognitive levels, it does not focus specifically on age-specific designs or their impact on engagement and learning. Research 2 and Research 3 do not address this aspect at all.
- Proposed Solution: The proposed solution will incorporate age-appropriate design elements, ensuring that the interface is not only accessible but also engaging for children within different age groups. This is particularly crucial for maintaining the interest and motivation of children with NVLD, who may be easily discouraged by poorly designed interfaces.

Educational Applications and Real-Time Adjustments:

- Research Gap: There is a conspicuous absence of research focused on the effectiveness of real-time adjustments in educational applications, particularly in tasks that involve image manipulation or pattern recognition. This is a critical oversight, as children with NVLD could benefit significantly from immediate feedback and adjustments that help them better understand and complete tasks.
- Proposed Solution: By integrating real-time feedback mechanisms that adapt to the child's responses during image-splitting tasks, the proposed application aims to enhance the educational value of the exercises. This real-time adaptability is key to supporting the learning process, particularly in a demographic that may struggle with fixed or static challenges.

Sustaining Interest in Cognitive Exercises:

- Research Gap: While Research 3 touches on strategies for engaging children in cognitive exercises, it does not offer comprehensive methods to sustain interest over time, particularly in a way that adapts to the child's evolving capabilities and challenges.
- Proposed Solution: The proposed solution includes strategies specifically designed to attract and maintain the child’s interest through dynamic challenges and interactive elements. This ensures that children remain engaged with the cognitive exercises, making learning both enjoyable and effective.

3.2.2 Justification for Novelty and Creativity:

The proposed application is novel because it uniquely combines several elements that, while explored independently in existing research, have not been integrated into a single tool tailored for children with NVLD. By addressing the identified gaps—dynamic difficulty adjustments, age-specific interface design, real-time educational feedback, and sustained engagement strategies—this project not only fills a crucial gap in the literature but also offers a creative and innovative solution that has the potential to significantly improve educational outcomes for children with NVLD.

- Novelty: The integration of these features into a cohesive tool represents a significant advancement over existing applications, which tend to focus on one or two elements in isolation.

- Creativity: The approach of dynamically adjusting tasks based on real-time performance, combined with a carefully designed, age-appropriate interface, demonstrates a creative solution that is finely tuned to the needs of its users.

By clearly identifying these research gaps and proposing a well-justified, innovative solution, this project contributes new knowledge and tools to the field of educational technology, particularly for children with NVLD.

4. RESEARCH PROBLEM

Core Challenges

The primary research problem revolves around the development of a system capable of accurately identifying and splitting images generated by children with NVLD, while dynamically adjusting the difficulty of these tasks based on the child's performance. Additionally, the challenge includes optimizing the user interface to be engaging, friendly, and suitable for different age groups, ensuring that the application is both accessible and effective for the target users.

Specific Challenges

- Image Splitting and Pattern Recognition: Developing an AI model that can split images into parts with missing elements, ensuring that these segments are neither too simple nor too complex for the child.

- Adaptive Difficulty Adjustment: Implementing a machine learning algorithm that can analyze the child's performance and adjust the complexity of future tasks in real-time.

- User Interface Optimization: Designing an interface that is intuitive, visually appealing, and appropriate for children aged 10 to 13, while also being flexible enough to cater to varying levels of cognitive ability.

5. OBJECTIVES

5.1 Main Objective

The proposed AI-powered mobile application for children with Nonverbal Learning Disorder (NVLD) aims to enhance their pattern recognition and visual-spatial skills through a personalized, dynamically adjusting learning environment. This system's design reflects a well-thought-out approach to addressing the unique needs of children with NVLD, ensuring that the learning process is both effective and engaging.

5.2 Specific Objectives

1. Design an Intuitive Interface

   The application’s user interface is meticulously crafted to be intuitive and user-friendly. Recognizing the challenges faced by children with NVLD, the design focuses on simplicity and ease of use. The drag-and-drop functionality for completing images to this interface, allowing children to interact with the tasks in a straightforward manner without overwhelming them with complex controls. This design choice ensures that children can focus on learning rather than struggling with the app's usability, which is crucial for maintaining their engagement and promoting a positive learning experience.

2. Integrate Machine Learning

   At the heart of this application is a reinforcement learning agent that continuously adapts to the child’s performance. The agent's role is to analyze how well the child is completing the tasks and adjust the difficulty accordingly. This dynamic adjustment is key to personalizing the learning experience. For example, if a child excels in a particular task, the agent may introduce more complex patterns in the next task to challenge them further. Conversely, if a child struggles, the agent simplifies future tasks to prevent frustration and encourage progress. This ensures that the learning curve is tailored to each child's abilities, promoting sustained engagement and effective skill development.

3. Implement a Feedback Mechanism

   Recognizing the importance of user feedback, the application incorporates a feedback mechanism that empowers children to express their difficulties. The "I cannot do that" button is a simple yet powerful tool that allows children to signal when a task is too challenging. Upon receiving this feedback, the system immediately adjusts the difficulty level, making the tasks more manageable. This feature not only enhances the personalization of the learning experience but also ensures that the child remains motivated and does not feel overwhelmed by tasks that are beyond their current abilities.

6. METHODOLOGY

6.1 Overall System Description

The system is designed to be both comprehensive and user-centered, providing an engaging learning experience that is responsive to the needs of children with NVLD. The methodology involves several key components that work together to create a seamless educational experience:

1. Image Generation and Splitting

The application uses AI to generate images that are then split into segments with missing elements. This task requires the child to ccomplete the image by dragging and dropping the image pieces into place. The process not only engages the child in a visually stimulating activity but also challenges their pattern recognition and visual-spatial skills, which are critical areas of development for children with NVLD.

2. Adaptive Learning Model

   The reinforcement learning agent is a critical component of the system. It continuously monitors the child's performance and adjusts the complexity of tasks in real-time. This adaptability ensures that the learning process remains challenging yet achievable, preventing both boredom and frustration. For example, if a child finds a task particularly difficult, the agent might reduce the number of segments in future tasks or simplify the patterns to make them easier to complete.

3. User Feedback and Difficulty Adjustment

   The system's feedback mechanism is designed to respond to the child's immediate needs. By pressing the "I cannot do that" button, children can communicate their struggles directly to the system. The system then responds by lowering the difficulty of subsequent tasks, ensuring that the child does not lose confidence or interest. This feature is crucial for maintaining a positive and encouraging learning environment, where children feel supported and capable.

4. Data Storage and Analysis

   All user interactions, including performance data and feedback, are stored in a database. This data is invaluable for continuously refining the machine learning model, enabling it to provide increasingly personalized learning experiences over time. By analyzing this data, the system can identify patterns in the child's learning process, making more informed adjustments to the task difficulty and further enhancing the effectiveness of the application.

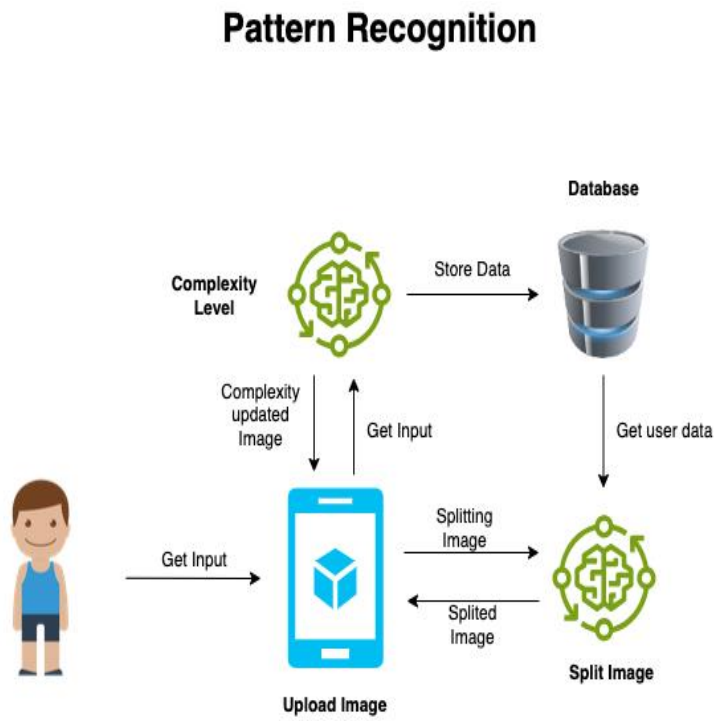
6.2 Logical Discussion of the System's Features

The system's features are logically integrated to support the overall goal of enhancing pattern recognition and visual-spatial skills in children with NVLD. Each feature addresses a specific need, from the design of the user interface to the adaptive learning model and feedback mechanism. The logical flow from task presentation to difficulty adjustment, guided by real-time performance data, ensures that the system is responsive and tailored to the individual child's needs.

This approach not only provides an engaging learning experience but also ensures that the tasks remain within the child's zone of proximal development—challenging enough to promote growth, yet achievable enough to prevent discouragement. The continuous feedback loop, where user data informs the machine learning model, creates a dynamic and evolving learning environment that adapts as the child's skills develop.

Overall, this proposal demonstrates a clear and thoughtful understanding of the needs of children with NVLD, integrating advanced technology with educational best practices to create a supportive and effective learning tool.

The system diagram below illustrates the flow of data and interactions within the application:



6.3. Project Technology Stack

Frontend	Flutter, Language: Dart
Backend	Python, Firebase ML Kit
AI and Machine Learning	TensorFlow Lite, Open CV, Reinforcement Learning
APIs and Services	Image generation API
IDE	VS Code
Collaboration Tools	GitHub, Trello
Deployment	Google Play Store/Apple App Store

7. PROJECT REQUIREMENTS

7.1 Functional Requirements

- Image Generation: The app must allow children to generate AI images using a "Generate Image" button.
- Image Splitting: The app must split images into segments with missing elements, creating a drag-and-drop puzzle for the child.
- Drag-and-Drop Interface: The app must provide a drag-and-drop interface where children can place missing elements back into the image.
- Adaptive Difficulty: The app must adjust the difficulty of tasks based on real-time analysis of the child's performance.
- Feedback Mechanism: The app must include a button for children to indicate if a task is too difficult, triggering an automatic difficulty adjustment.

7.2 Non-Functional Requirements

- Usability: The interface must be intuitive and engaging, designed specifically for children aged 10 to 13, ensuring that the application is accessible and enjoyable to use.
- Performance: The system should respond quickly to user actions, ensuring smooth interaction and preventing any lag that could disrupt the learning process.
- Reliability: The app must be reliable, with no crashes or bugs that could hinder the child's learning experience. It should also securely handle user data, ensuring privacy and confidentiality.
- Scalability: The system should be able to handle multiple users simultaneously without performance degradation, particularly.

7.3 Test Cases

To ensure the system meets all functional and non-functional requirements, the following test cases will be conducted:

- **Usability Testing:** Evaluate the ease of use of the interface by children within the target age group. This will involve observing children as they interact with the app and gathering feedback on their experience.
- **Performance Testing:** Assess the system's response time during key operations, such as image generation, splitting, and interaction, ensuring that all tasks are performed smoothly and efficiently.

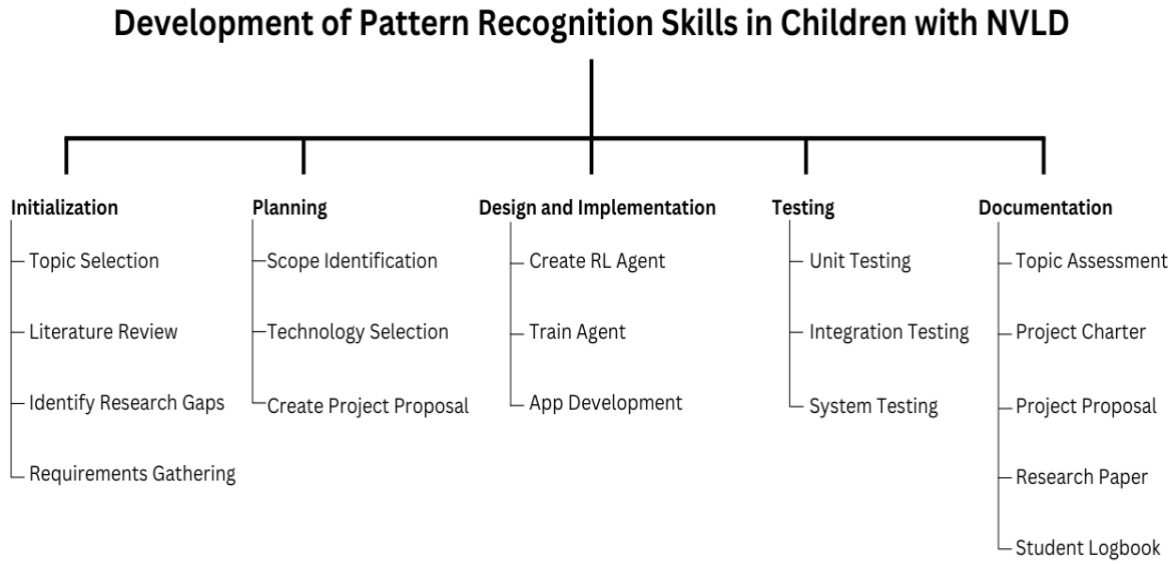
- **Effectiveness Testing:** Measure how effectively the app adjusts the difficulty of tasks to match the child's skill level. This will involve monitoring the child's performance over time and ensuring that the difficulty adjustments are appropriate and beneficial.
- **Security Testing:** Ensure that the system securely handles and stores user data, preventing unauthorized access and ensuring the privacy of sensitive information.

7.4 Expected Test Cases Table

Test Case ID	Test Case Description	Steps	Expected Result
TC_01	Verify that the user can successfully generate an image to the app.	1. Launch the app. 2. Navigate to the image generate section. 3. Click button and generate image.	The image is successfully uploaded, and a confirmation message is displayed.
TC_02	Verify that the app correctly splits the uploaded image into parts.	1. Wait for the app to process the image. 2. View the split image parts.	The image is accurately split into the correct number of parts, and they are displayed in the designated section of the screen.
TC_03	Verify that the user can drag and drop image parts to reassemble the original image.	1. View the split image parts. 2. Drag and drop the parts to the main section to reassemble the image.	The user can successfully drag and drop parts to reassemble the image. The reassembled image is displayed correctly in the main section.
TC_04	Verify that the app dynamically adjusts the difficulty of the task based on user performance.	1. Complete an initial task. 2. Observe the app's response to performance (speed, accuracy). 3. Proceed to the next task.	The app adjusts the difficulty (e.g., more parts, fewer hints) based on the user's performance in the initial task.

TC_05	Verify that the system saves the user's progress and learning level in the database.	1. Complete an image assembly task. 2. Close the app. 3. Reopen the app and log in. 4. Navigate to the user profile or progress section.	The user’s progress and learning level are saved and correctly displayed upon re-login. The app resumes from the last completed task or shows the updated learning level.
TC_06	Verify that the app provides feedback based on the user’s task performance.	1. Complete an image assembly task. 2. Submit the task. 3. View the feedback provided by the app.	The app provides immediate feedback (e.g., “Well done!” or suggestions for improvement), and the feedback is relevant to the task performance.
TC_07	Verify that the user can choose to reduce the task's difficulty if they find it too challenging.	1. Begin a difficult task. 2. Click on the “I cannot do this” button. 3. Observe the changes in the task.	The app reduces the task difficulty (e.g., fewer parts, added hints) and allows the user to continue with the easier version.

8. WORK BREAKDOWN STRUCTURE



9. COMMERCIALIZATION POTENTIAL

The development of an interactive mobile application tailored to the needs of children with Nonverbal Learning Disabilities (NVLD) represents a significant advancement in the field of educational technology. Beyond its academic and research implications, this project holds substantial potential for commercialization and entrepreneurial development. The growing demand for specialized educational tools that cater to the unique needs of children with learning disabilities, coupled with the increasing reliance on digital learning platforms, provides a fertile ground for the successful commercialization of this application.

Market Demand and Opportunity

- Growing Market for Educational Technology

The global educational technology market has been experiencing rapid growth, driven by advancements in digital learning tools, increased adoption of mobile devices, and a shift toward personalized learning. According to market research, the EdTech market is expected to reach over $400 billion by 2025, with significant investments in adaptive learning technologies and educational applications. Within this broader market, there is a specific and growing demand for tools that address the needs of children with learning disabilities, such as NVLD, ADHD, and dyslexia.

- Addressing an Underserved Segment

Currently, the market for educational tools designed specifically for children with NVLD is relatively underdeveloped. While there are numerous apps and tools for children with other learning disabilities, there is a noticeable gap in products that specifically address the visual-spatial and pattern recognition challenges faced by children with NVLD. This gap represents a significant market opportunity. By targeting this underserved segment, the proposed application can differentiate itself from existing products and capture a niche but crucial market share.

- Personalized Learning Experience

One of the most compelling features of the proposed application is its ability to provide a personalized learning experience that adjusts in real time to the user's performance. This feature not only enhances the app's educational value but also increases its appeal to parents, educators, and institutions looking for effective tools to support children with NVLD. Personalization is a key trend in EdTech, and products that offer tailored learning experiences are more likely to succeed in the market.

- Scalability and Expansion

The application is designed with scalability in mind, allowing for easy expansion to include additional features or to be adapted for other learning disabilities. This scalability is crucial for commercialization, enabling the product to grow and evolve with market demands. For instance, the underlying technology could be adapted to create similar tools for children with dyslexia or ADHD, thereby expanding the potential customer base and increasing revenue opportunities.

- Subscription-Based Earning Model

The monetization strategy of this mobile app is the subscription-based model. In this approach, users pay a recurring fee (monthly or annually) to access the full suite of features. This model can provide a steady revenue stream and encourage continued use of the app, as users are more likely to renew their subscriptions if they see consistent benefits. The subscription could include access to regular updates, new content, and ongoing support.

10.DESCRIPTION OF PERSONAL AND FACILITIES

Registration No	Name	Task Description
IT21175466	W.C. Harshana	• The mobile app will display a button called "Generate Image". • Using the button children can generate AI images. • Then the app will divide the image to series of images with missing elements. • Then children can drag and drop the elements to the main image, and he/she can complete the image using given missing elements. • The Reinforcement learning model can also personalize the difficulty by analyzing the child's performance and adjusting the complexity of the patterns presented. • If child cannot do this or these splitting parts are very difficult to child. They can touch the button "I cannot do that". Then RL Model will reduce the difficulty of the splitting pattern.

11.BUDGET AND BUDGET JUSTIFICATION

Item	**Budget**	**Justification**
Image Generation API	LKR 5,000	Facilitates the core functionality of the application, enabling children to engage with image-based tasks.
Cloud Hosting Services	LKR 10,000	Necessary for hosting the application with scalability, reliability, and availability in mind.
App Store Deployment	LKR 30,000	Apple Developer registration fee, along with app listing costs.
Play Store Deployment	LKR 8,000	Google Play Developer registration fee, along with app listing costs.
Total	**LKR 53,000**	

12. REFERENCESS

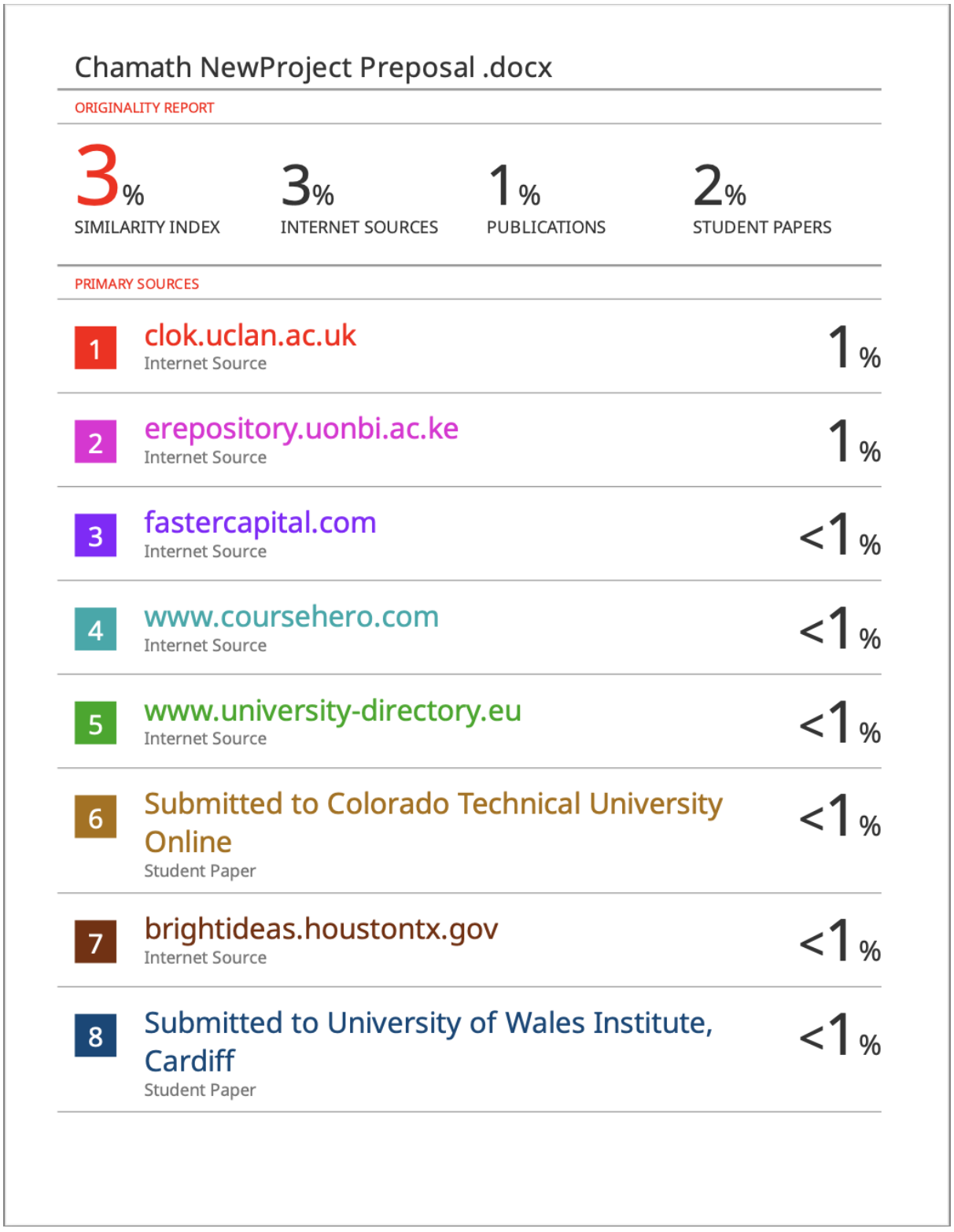
[1] A. B. e. a. Brown, " Dynamic Difficulty Adjustment in Educational Games.," Journal of Educational Technology., (2018).. [Online].

[2] J. P. e. a. Lee, " Designing User Interfaces for Children: A Review.," Journal of Interface Design., (2019). [Online].

[3] L. R. e. a. Williams, "User Experience Design for Children with Learning Disabilities. Learning Disabilities Quarterly.," (2021). [Online].

[4] K. S. e. a. Garrison, " Adaptive Learning Technologies: A Review. Educational Technology Review.," (2020). . [Online].

13.APPENDICES



Chamath NewProject Preposal .docx

ORIGINALITY REPORT

3%	3%	1%	2%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	clok.uclan.ac.uk Internet Source	1%
2	erepository.uonbi.ac.ke Internet Source	1%
3	fastercapital.com Internet Source	<1%
4	www.coursehero.com Internet Source	<1%
5	www.university-directory.eu Internet Source	<1%
6	Submitted to Colorado Technical University Online Student Paper	<1%
7	brightideas.houstontx.gov Internet Source	<1%
8	Submitted to University of Wales Institute, Cardiff Student Paper	<1%