

# AI-Driven Behavioral Assessment and Intervention for ADHD

Group ID: 24-25J-261



# SUPERVISOR DETAILS



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# INTRODUCTION

ADHD (Attention-Deficit / Hyperactivity Disorder) is a neuro developmental disorder.[1]

Characterized by symptoms of  
**Inattention**  
**Hyperactivity**  
**Impulsivity**



ADHD can affect children's academic performance, social skills, and emotional well-being. It may lead to long-term challenges in adulthood, such as low self-esteem and career difficulties[2]

# OBJECTIVES

**ADHD diagnosis and provides personalized intervention strategies for managing ADHD symptoms in children**



Assessing ADHD Symptoms



Enhance focus and organizational skills



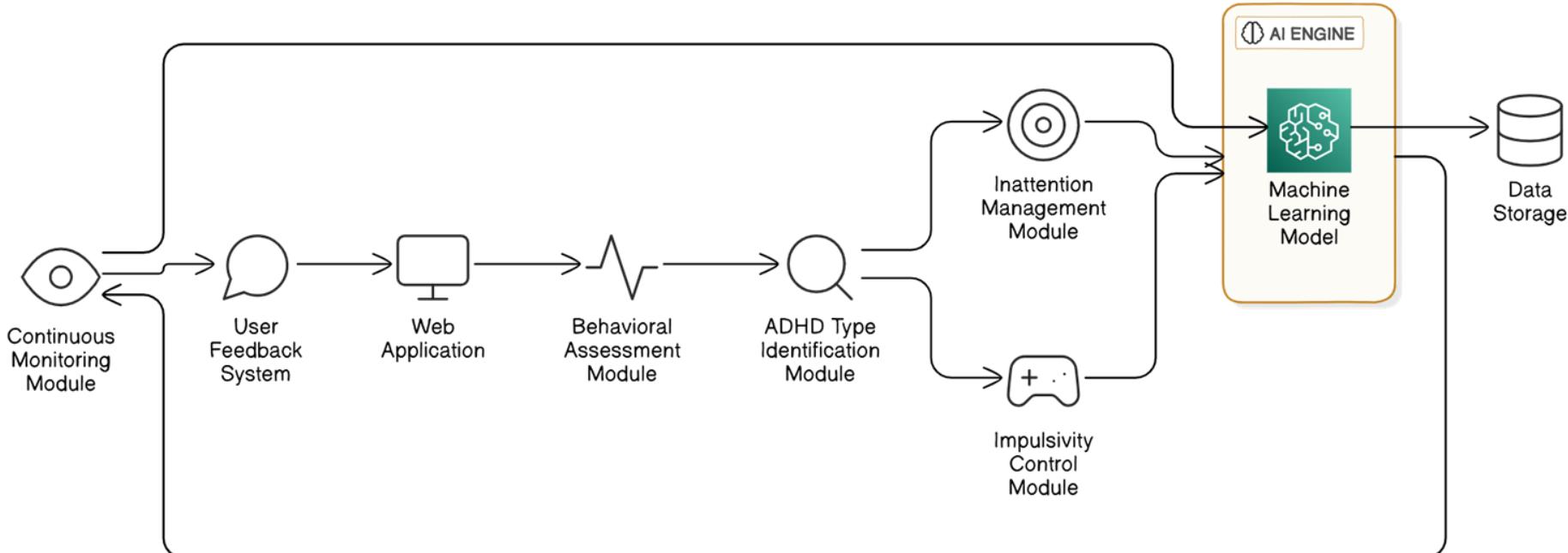
Enhancing Impulse Control



Create Adaptive Learning with Predictions

# OVERALL SYSTEM DIAGRAM

ADHD Management Web Application Architecture



# COMMERCIALIZATION PLAN

## Basic Plan

Free

- ✓ ADHD symptom assessment through interactive questionnaires
- ✓ Basic inattention and hyperactivity tracking
- ✓ Limited progress reports available within the app

Suitable for individual users (parents or teachers) who need a basic assessment tool

## Premium Plan

\$10 /month

- ✓ Full ADHD assessment with symptom identification and subtype classification
- ✓ AI-driven personalized interventions and cognitive training exercises
- ✓ Advanced progress tracking with weekly and monthly reports
- ✓ 24/7 customer support

Ideal for families and schools seeking a comprehensive ADHD support tool

## Group Plan

\$150 /month

- ✓ All features from the Premium Plan
- ✓ Multi-user access for up to 25 students
- ✓ Ability to manage and monitor multiple classrooms or groups within a single dashboard

Best suited for schools, clinics needing to support multiple children

# REFERENCES

- [1] J. J. S. Kooij, "ADHD: a Neurodevelopmental Disorder," *European Psychiatry*, vol. 30, Suppl. 1, p. 45, 2015, doi: 10.1016/S0924-9338(15)30036-5.
- [2] T. E. Wilens and T. J. Spencer, "Understanding attention-deficit/hyperactivity disorder from childhood to adulthood," *Postgrad. Med.*, vol. 122, no. 5, pp. 97-109, Sep. 2010, doi: 10.3810/pgm.2010.09.2206.

# AI-Driven Gamified ADHD Symptom Assessment for Children Aligned with DSM-5



**IT21288326 | Dharmasena U.D.S.V.**  
**Specialization: Information technology**

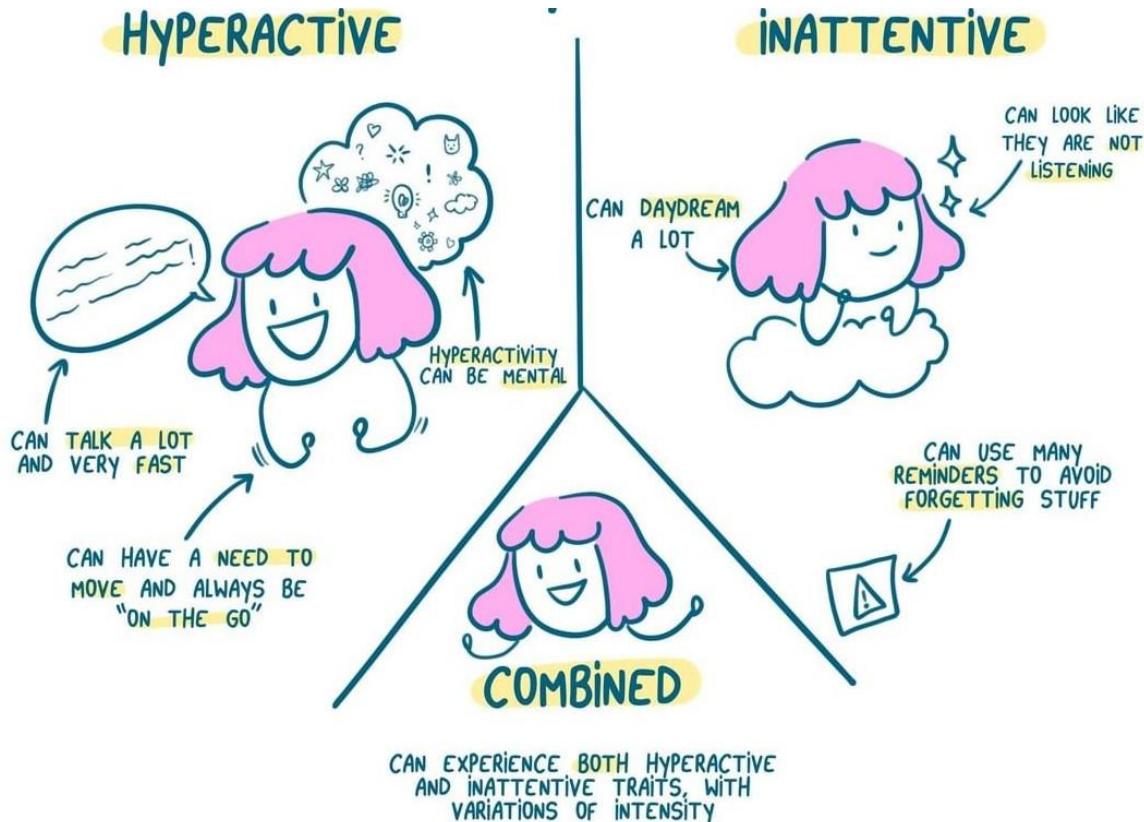
# INTRODUCTION

Early diagnosis helps children with ADHD learn coping skills and get the right support, which can improve their success their overall quality of life.

## ADHD subtypes

- Predominantly inattentive ADHD
- Hyperactive-impulsive ADHD
- Combined ADHD





## Tools for assessing ADHD symptoms.

- Vanderbilt ADHD Diagnostic Parent Rating Scale
- Conners Rating Scale
- ADHD Self-Report Scale(for Adults)

# RESEARCH GAP

Component	[3]	[4]	[5]	[6]	Proposed System
Use of digital tools for ADHD assessment	✓	✓	✗	✓	✓
Personalized real-time adaptive questioner	✗	✗	✗	✗	✓
Multimodal Data Integration	✗	✗	✗	✗	✓
Tailored interventions for ADHD symptoms	✓	✗	✓	✓	✓
Accessibility and affordability of interventions	✗	✗	✓	✗	✓
Symptom assessment based on DSM-5	✓	✓	✓	✓	✓

[3] Jan. 2018, "Evaluating Digital ADHD Assessment Tools for Children."

[4] Apr. 2019, "Understanding Cultural Factors in ADHD Diagnosis: A Global Perspective"

[5] Jul. 2020, "Evaluating Accessibility of ADHD Intervention Programs for Diverse Populations"

[6] May. 2021, "Interactive Applications for DSM-5 Based ADHD Symptom Assessment"

# RESEARCH PROBLEM

How can we Assess ADHD  
Symptoms in Children age 5-10,  
through an AI-Driven Gamified  
Focus & Impulse Control  
Module Aligned with DSM-5  
Criteria ?



# OBJECTIVES

Assess ADHD  
Symptoms in Children  
Through an AI-Driven  
Gamified Focus &  
Impulse Control  
Module Aligned with  
DSM-5 Criteria



Assess cognitive functions through interactive activities.

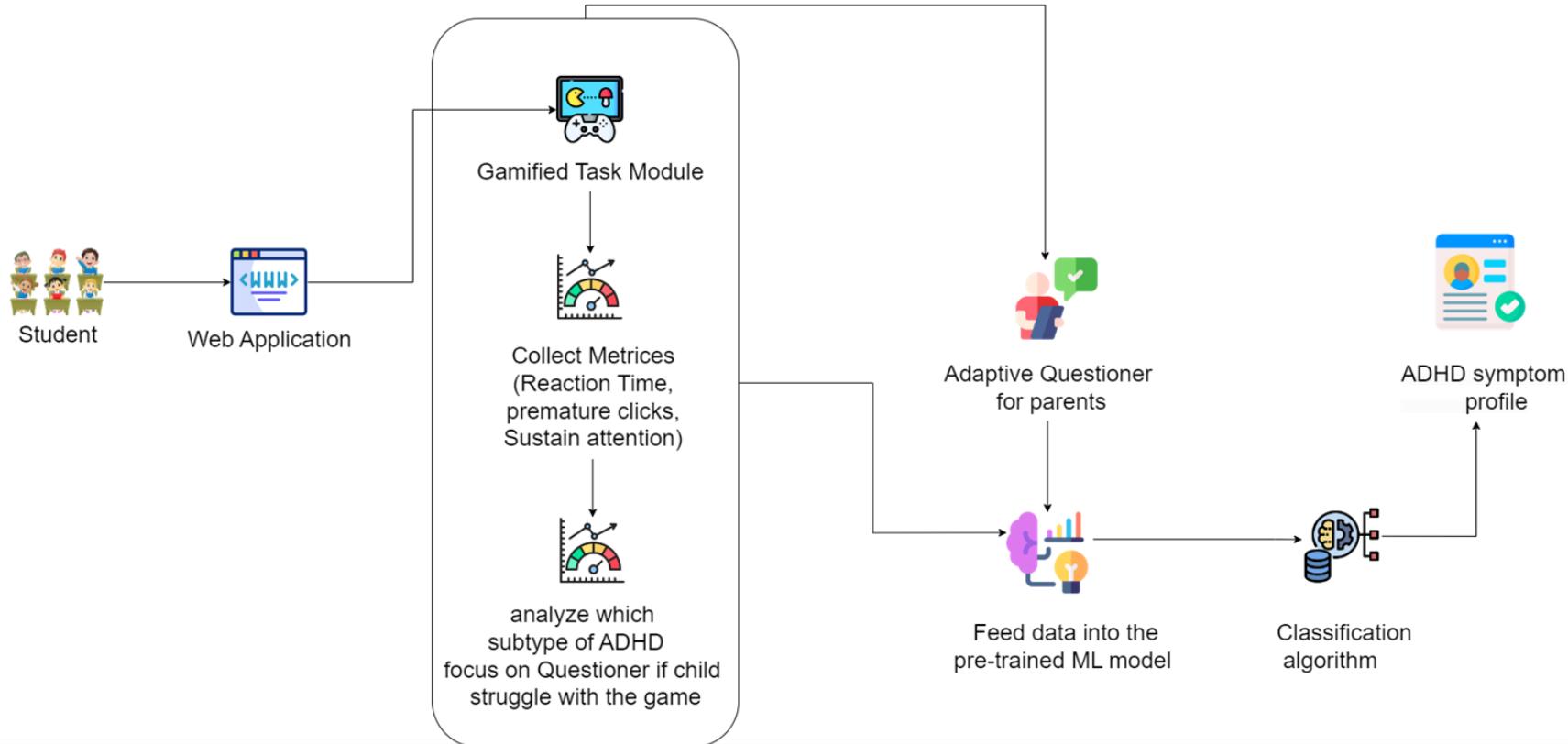


Collect DSM-5 symptoms based on gamified behavioral performance.



Integrate behavioral and questionnaire data to classify ADHD symptoms.

# SYSTEM DIAGRAM



# TECHNOLOGIES

Python



TensorFlow



SQLite



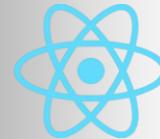
JWT



Phaser



React



Pandas



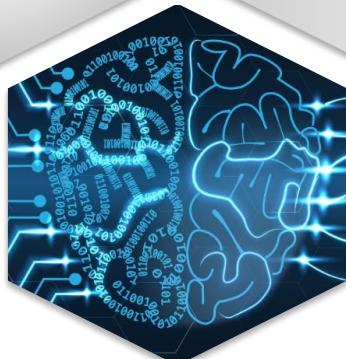
# KEY PILLARS

UI/UX

Machine  
learning

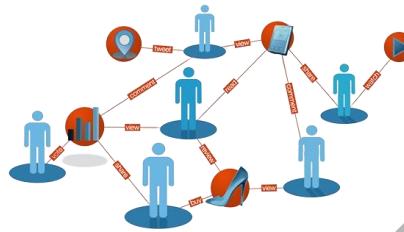
Game  
Development

Data  
Collection and  
Management



# COMPONENT SPECIFIC REQUIREMENTS

## Functional Requirement



Data Collection and Processing



Gamified Behavioral Task

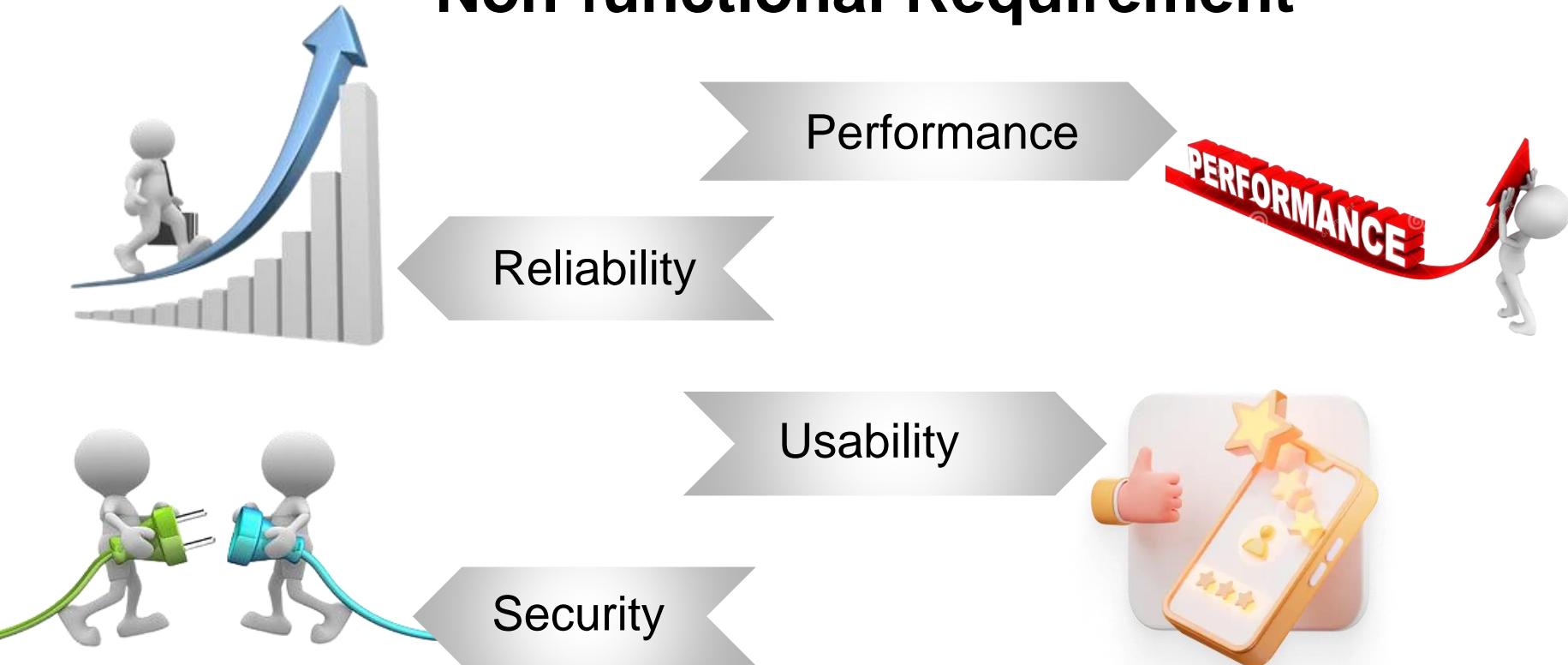


Adaptive Questionnaire

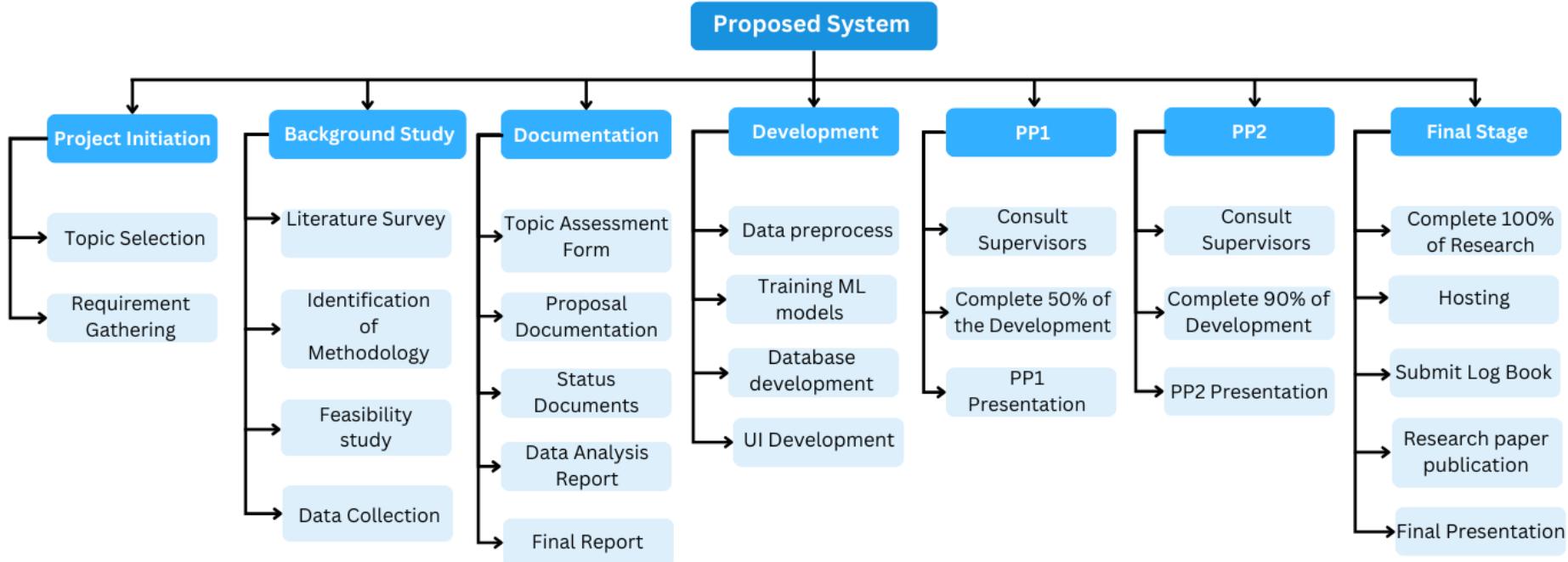
User Interface

# COMPONENT SPECIFIC REQUIREMENTS

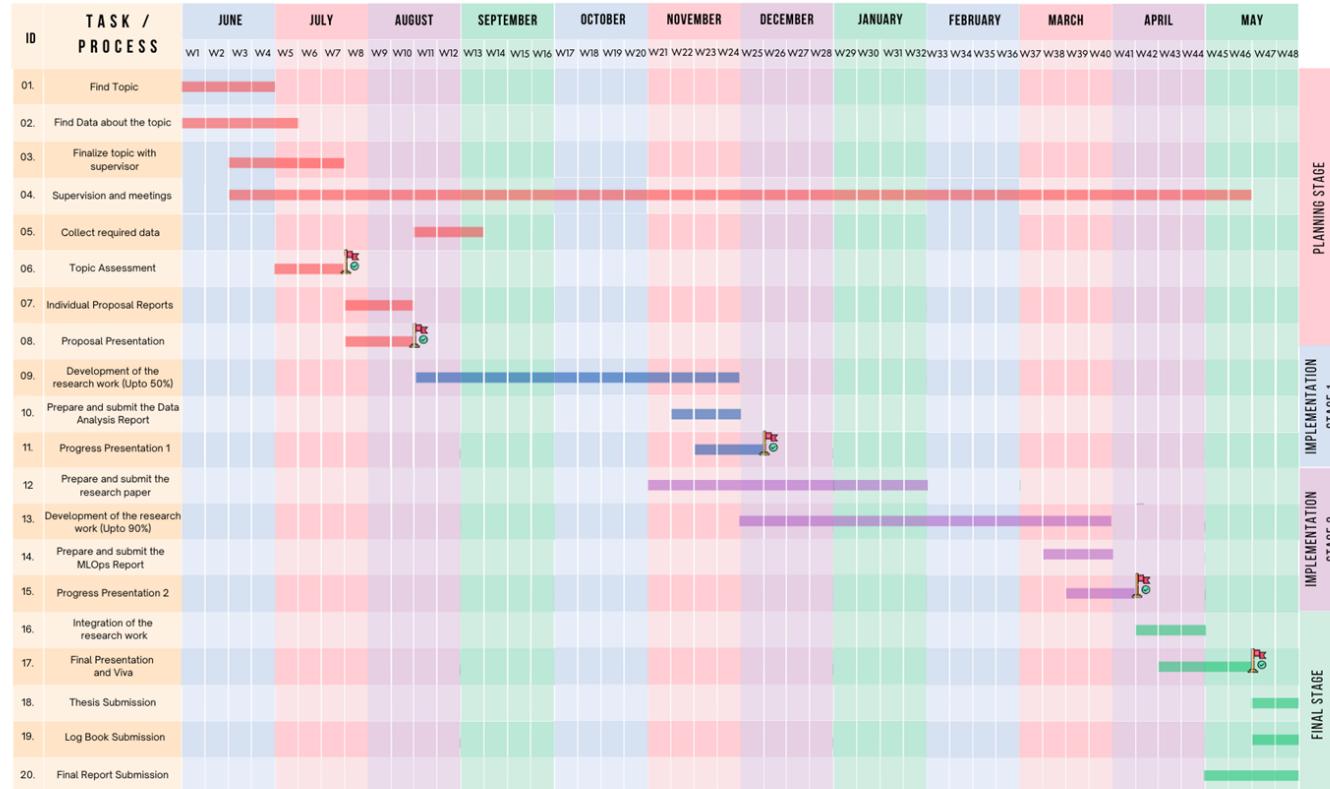
## Non-functional Requirement



# WORK BREAKDOWN CHART



# GANNT CHART



# REFERENCES

- [3]A. Smith, B. Johnson, and C. Lee, "Evaluating Digital ADHD Assessment Tools for Children: A Review," *IEEE Access*, vol. 6, pp. 12345-12353, Jan. 2018. doi: 10.1109/ACCESS.2018.2812345.
- [4]K. Chen and M. Patel, "Understanding Cultural Factors in ADHD Diagnosis: A Global Perspective," *IEEE Transactions on Psychology*, vol. 12, no. 2, pp. 345-356, Apr. 2019. doi: 10.1109/TP.2019.1234567.
- [5]L. Kumar and R. Thompson, "Evaluating Accessibility of ADHD Intervention Programs for Diverse Populations," *IEEE Journal of Public Health*, vol. 17, no. 4, pp. 567-579, Jul. 2020. doi: 10.1109/JPH.2020.2345678.
- [6]M. Rogers, S. Chang, and D. Patel, "Interactive Applications for DSM-5 Based ADHD Symptom Assessment," *IEEE Software*, vol. 22, no. 3, pp. 78-85, May 2021. doi: 10.1109/IS.2021.1234567.

Creates specific tools and activities to help children with predominantly inattentive ADHD improve focus and stay organized.



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# INTRODUCTION

Inattention is a core characteristic of ADHD that manifests as difficulty sustaining focus, organizing tasks, and following through on instructions.

Individuals may struggle with maintaining attention in both academic and social settings.



# How to Identify ?

- Difficulty paying attention to details, leading to careless mistakes
- Frequent forgetfulness in daily activities
- Challenges in organizing tasks and activities
- Avoidance of tasks requiring sustained mental effort
- Easily distracted by extraneous stimuli



# Solution

- Games to Help Improve Focus
- Emotion-Based Game Adjustment
- Personalized Game Flow
- Task Organization Tools
- Progress Tracking and Rewards
- Adaptive Learning Environment

Helping Children  
Grow Step by  
Step Towards  
Overcoming Their  
Challenges

# RESEARCH GAP

Component	[7]	[8]	[9]	[10]	Proposed System
Gamified Learning Approaches	✓	✗	✗	✗	✓
Emotional and Behavioral Analysis Tools	✗	✗	✗	✗	✓
Adaptive Task Management Tools	✓	✗	✓	✗	✓
Tailored Activities for Focus Enhancement	✓	✓	✓	✓	✓
Support for Self-Regulation Skills	✗	✗	✓	✗	✓
Personalized Game Flow	✗	✗	✗	✗	✓

[7] April 2022, " Mobile Application: A Serious Game Based in Gamification for Learning Mathematics in High School Students."

[8] May 2024, " Decreased impulsiveness and MEG normalization after AI-digital therapy in ADHD children: a RCT"

[9]December 2021, "Information and Communication Technologies Learning Methodologies for Children with ADHD"

[10]October 2024, "Provision of digital health interventions for young people with ADHD in primary care: findings from a survey and scoping review"

# RESEARCH PROBLEM

How can we use machine learning and real-time emotion detection to improve focus and organization in children with predominantly inattentive ADHD, enhancing their learning and reducing behavioral issues?



# OBJECTIVES

To create tools and activities that enhance focus, organizational skills, and attention span in children with predominantly inattentive ADHD, using adaptive learning and technology-assisted methods.



Create engaging and **personalized activities** that cater to the unique needs of children with ADHD, focusing on improving their attention and concentration.

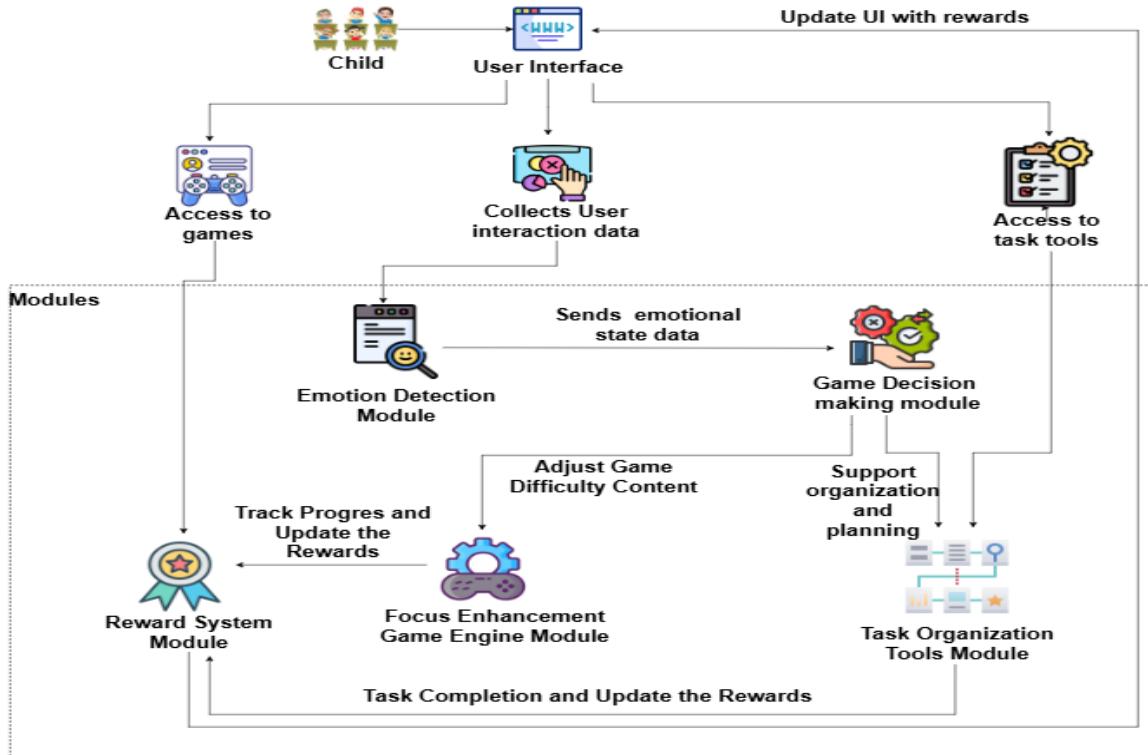


Implement **gamified elements** into learning methodologies to enhance motivation and engagement among children with ADHD.

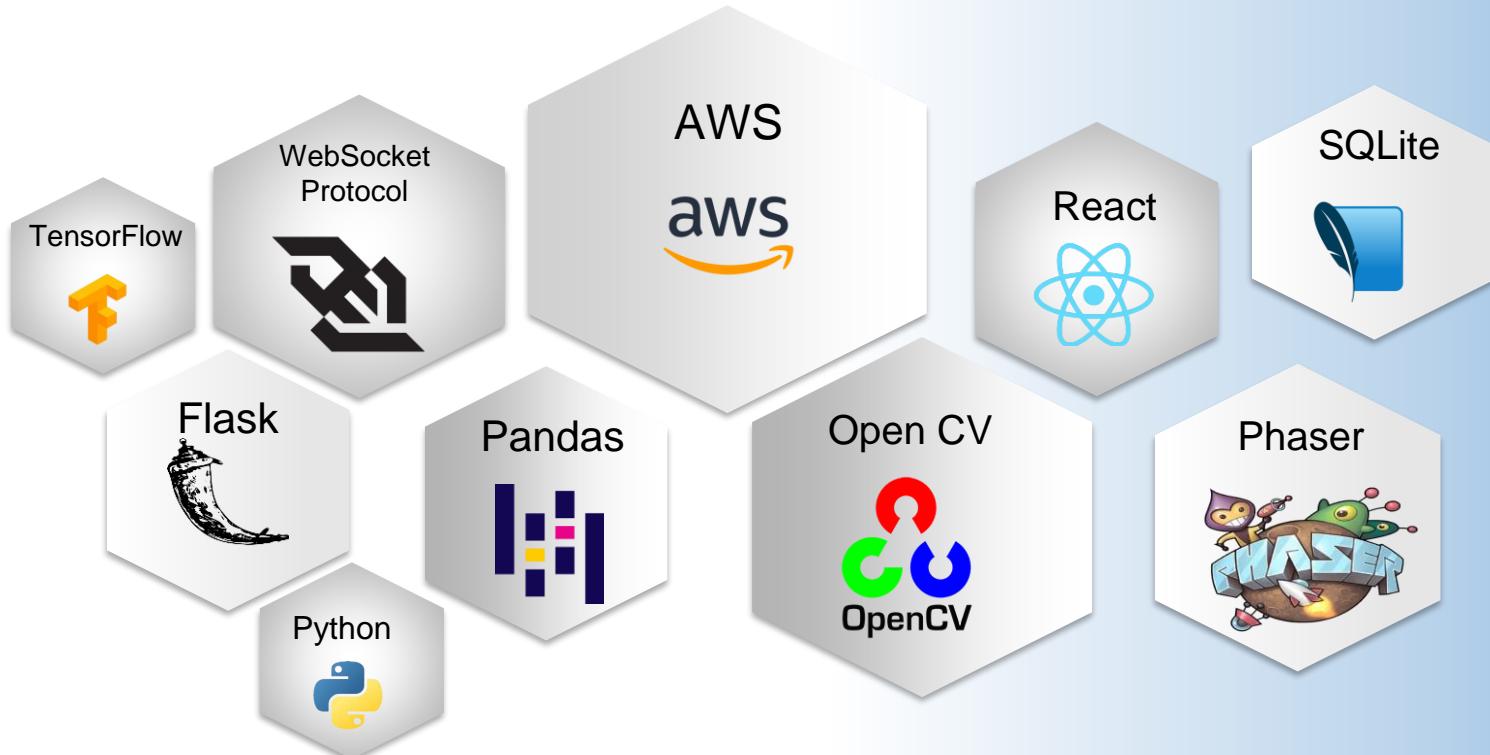


Utilize technology to analyze **emotional and behavioral responses**, enabling personalized interventions that adapt to the child's emotional state.

# SYSTEM DIAGRAM



# TECHNOLOGIES



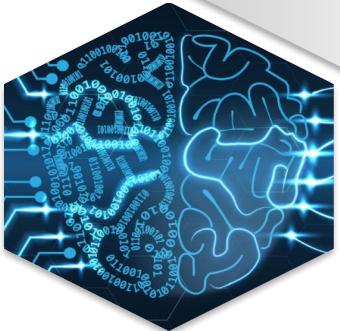
# KEY PILLARS

Machine  
learning



Games  
Developmen  
t

Image  
Processing



# COMPONENT SPECIFIC REQUIREMENTS

## Functional Requirement



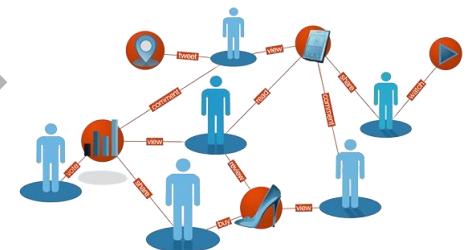
Identifying a child's behaviors through facial expressions



Adapting game difficulty based on performance



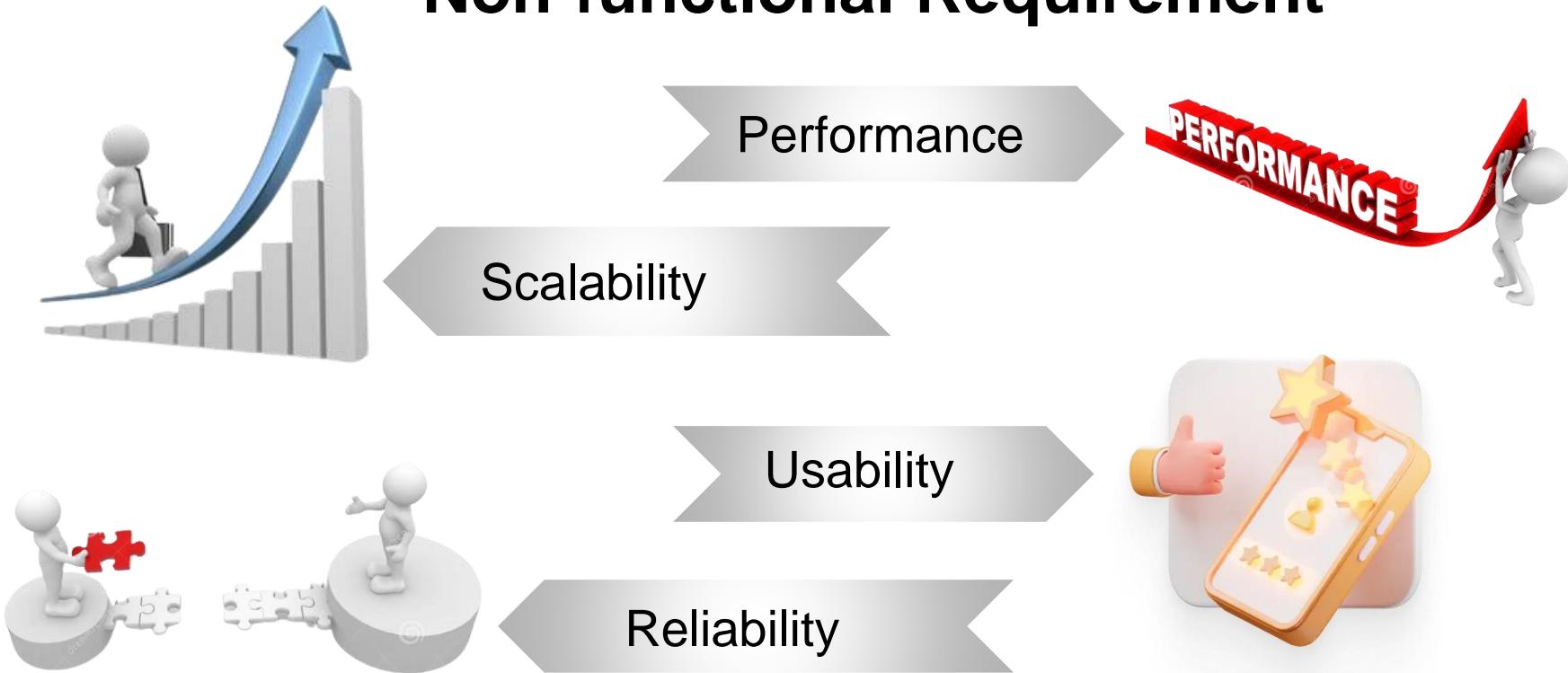
Image Preprocessing



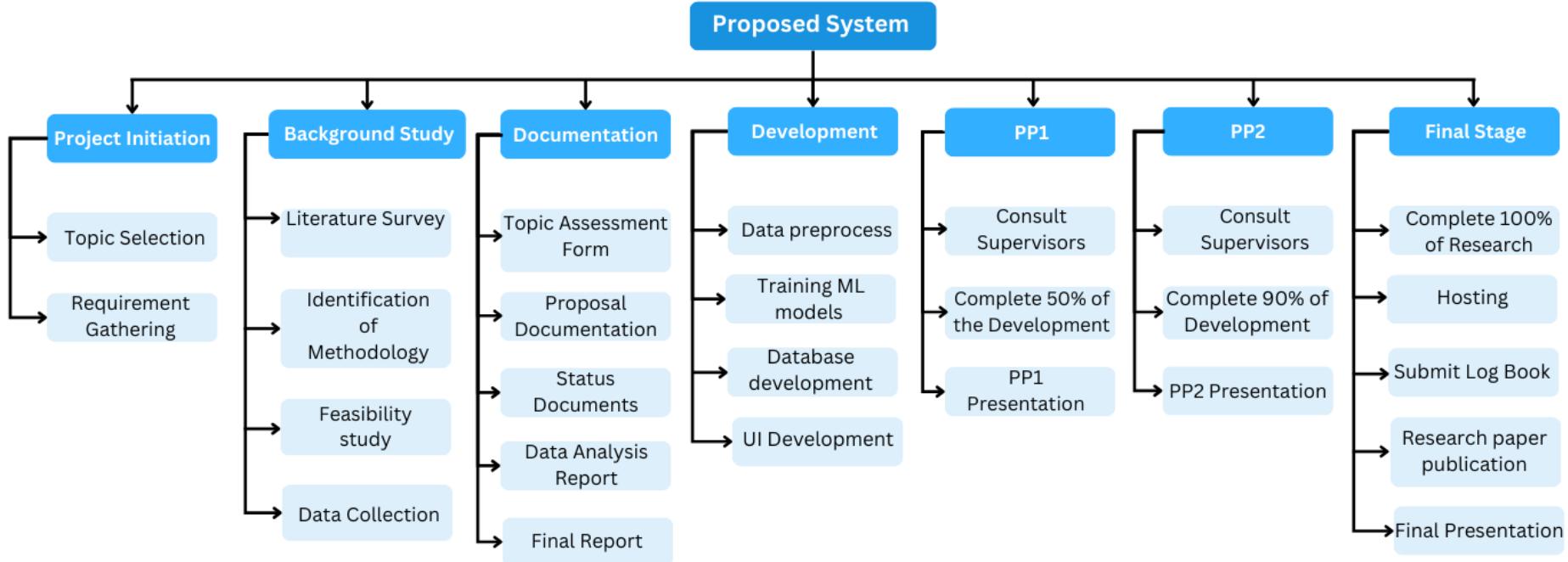
Personalized reward system

# COMPONENT SPECIFIC REQUIREMENTS

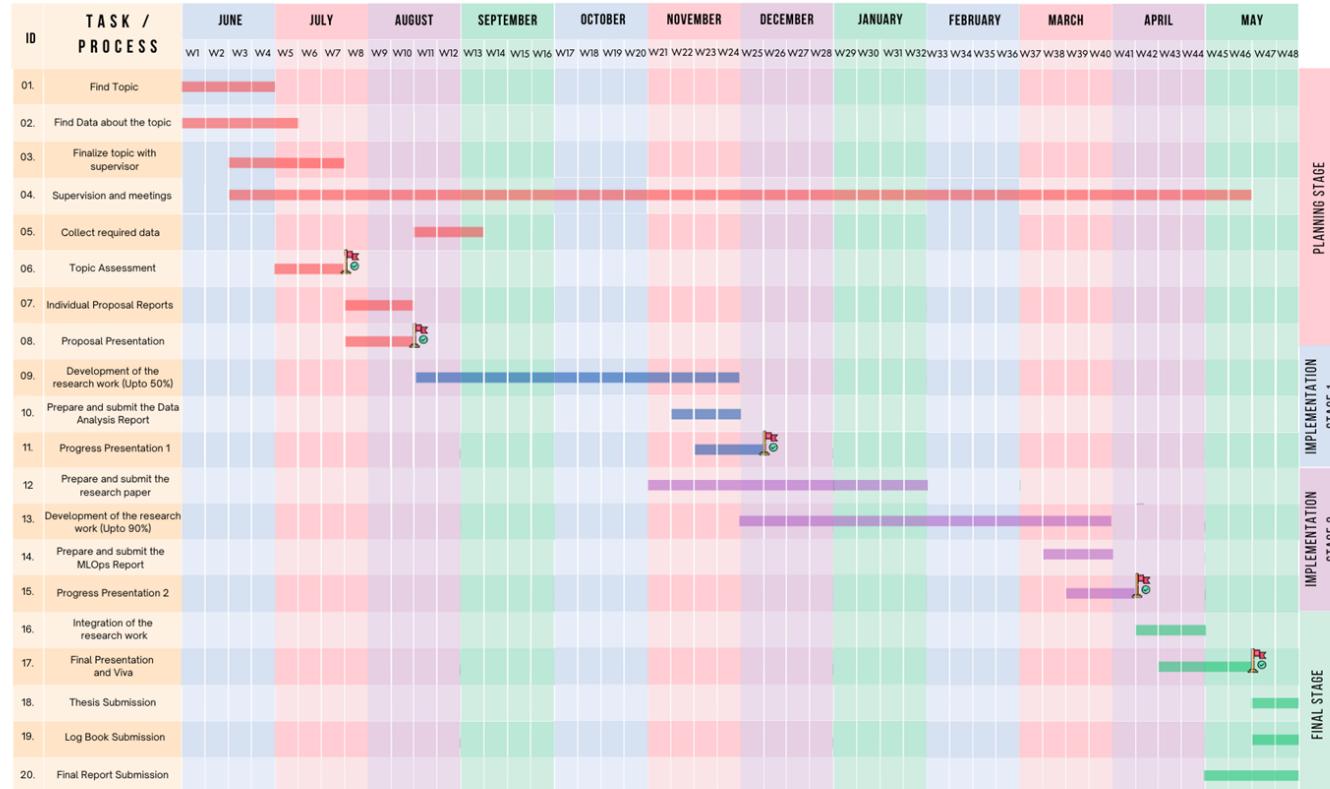
## Non-functional Requirement



# WORK BREAKDOWN CHART



# GANNT CHART



# REFERENCES

- [7]W. Ortiz, D. Castillo and L. Wong, "Mobile Application: A Serious Game Based in Gamification for Learning Mathematics in High School Students," 2022 31st Conference of Open Innovations Association (FRUCT), Helsinki, Finland, 2022, pp. 220-228, doi: 10.23919/FRUCT54823.2022.9770917. keywords: {Technological innovation;Avatars;User experience;Mobile handsets;Mathematics;Serious games;Mobile applications},
- [8]Danylyna Shpakivska Bilan, Irene Alice Chicchi Giglioli, Pablo Cuesta et al. Decreased impulsiveness and MEG normalization after AI- digital therapy in ADHD children: a RCT, 02 May 2024, PREPRINT (Version 1) available at Research Square [<https://doi.org/10.21203/rs.3.rs-4329802/v1>]
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- [10]Gudka, R., Becker, K., Newlove-Delgado, T. et al. Provision of digital health interventions for young people with ADHD in primary care: findings from a survey and scoping review. *BMC Digit Health* **2**, 71 (2024). <https://doi.org/10.1186/s44247-024-00129-1>

# **Enhancing Impulse Control in ADHD Students Through Structured Timetables**



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**Specialization: Information technology**

# INTRODUCTION

Design for children with hyperactive-impulsive ADHD, it offers personalized, structured daily timetables to help manage symptoms and improve impulse control.

## Levels of Impulsivity

- High impulsivity
- Moderate impulsivity
- Low impulsivity



# RESEARCH GAP

Component	[11]	[12]	[13]	Proposed System
Current Approaches	✓	✗	✗	✓
Limited Integration of Activities	✓	✗	✗	✓
Lack of Personalization	✗	✓	✓	✓
Engagement and Enjoyment	✓	✓	✗	✓
Need for Structured Timetables	✗	✗	✗	✓

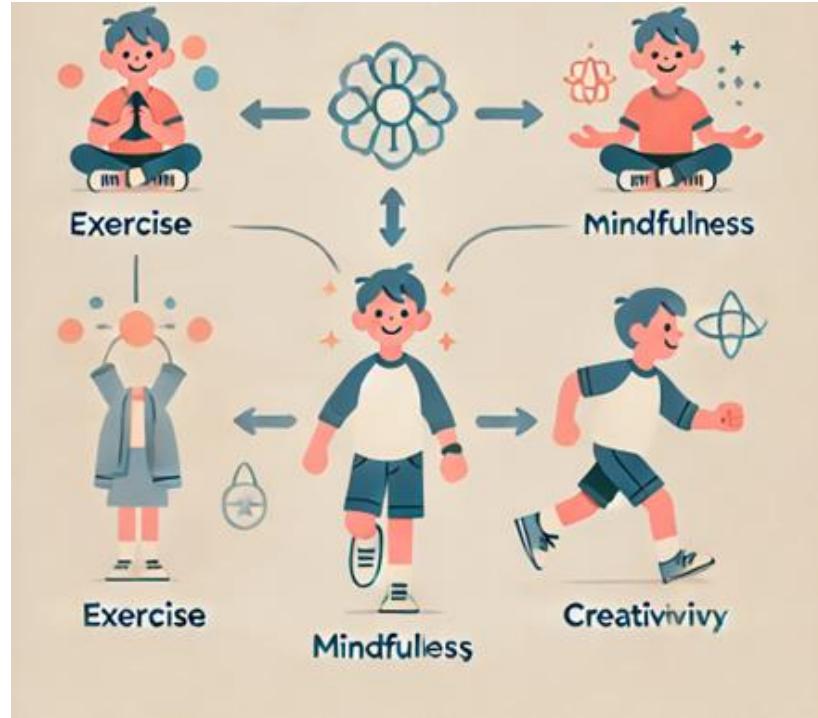
[11] August 2024-The effectiveness of parent training programs for children with ADHD aged 6-11 years: A systematic

[12] August 2021-Characterizing neuroanatomic heterogeneity in people with and without ADHD based on subcortical brain volumes

[13] June 2019:Development and Standardization of an Impulse Control Scale for Adolescents

# RESEARCH PROBLEM

How can personalized, structured activities help children with hyperactive-impulsive ADHD improve impulse control and manage their energy effectively?



# OBJECTIVES

The project aims to create a personalized app that aids children with ADHD by offering structured activities like physical exercises and mindfulness techniques.



Develop five pre-designed schedules with activities to address different impulsive behaviors in children with ADHD.

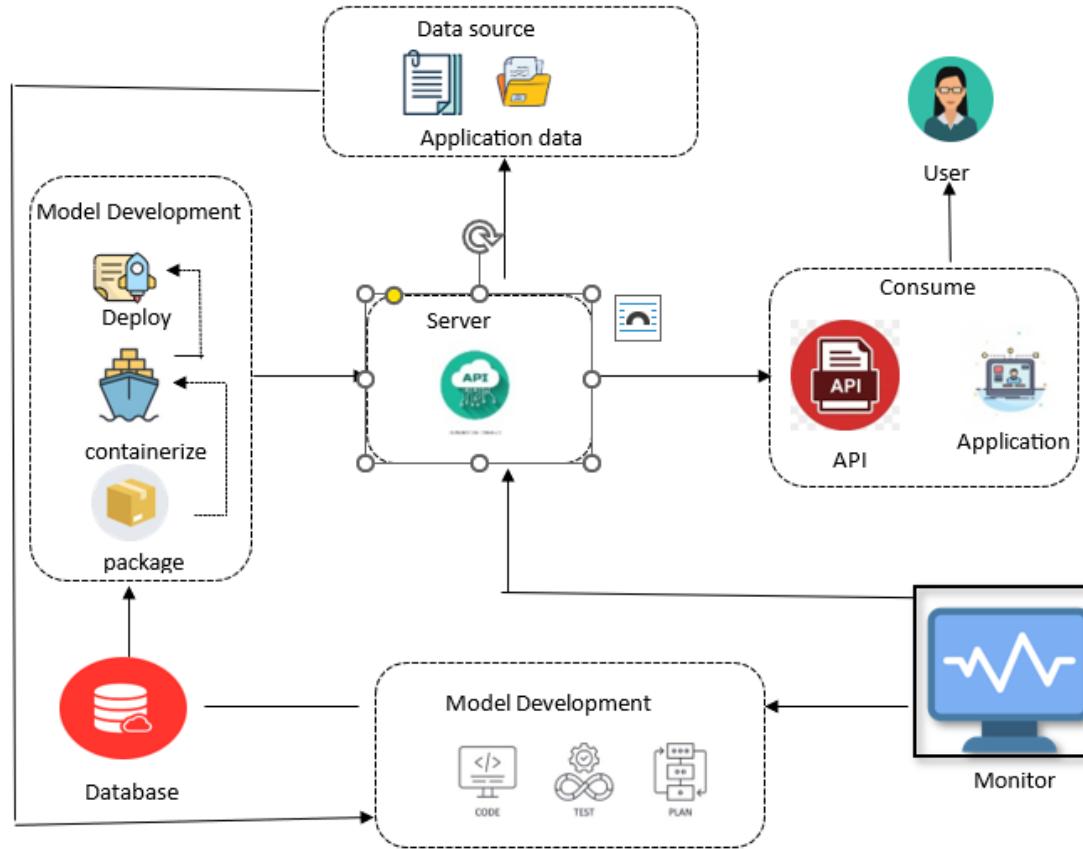


Allow teachers/caregivers to customize and modify timetables, ensuring the activities are engaging and fit the specific needs of each child.

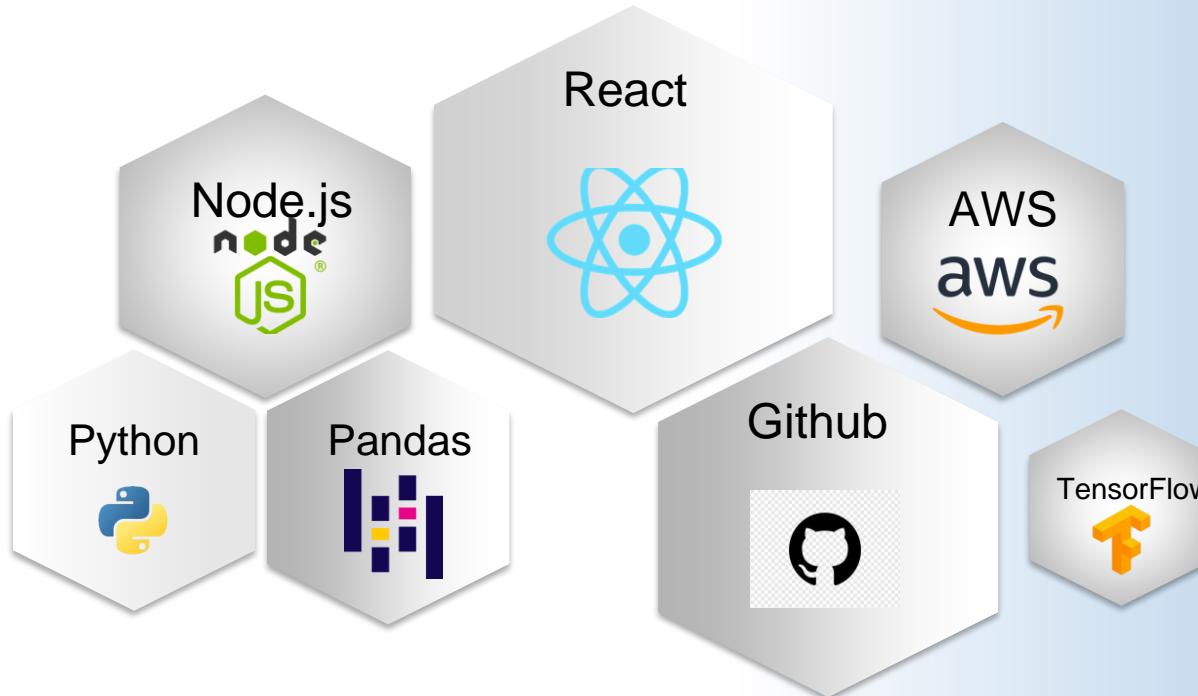


This will provide a personalized, structured routine for each child, helping them manage their energy, improve impulse control, and develop self-regulation through engaging, enjoyable activities.

# SYSTEM DIAGRAM



# TECHNOLOGIES



# KEY PILLARS

Machine  
learning

Cloud  
computing



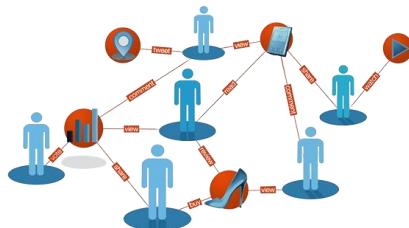
# COMPONENT SPECIFIC REQUIREMENTS

## Functional Requirement

Customizable Timetables



Activity Integration

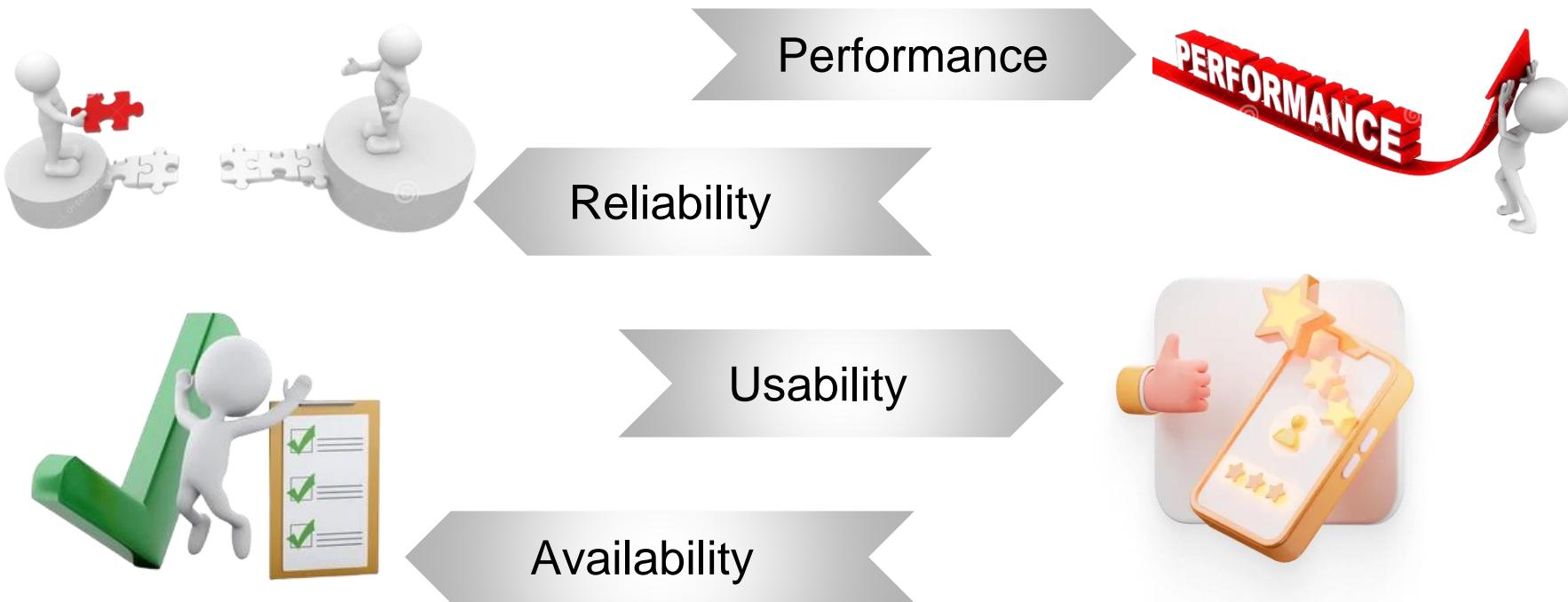


Tracking and Feedback

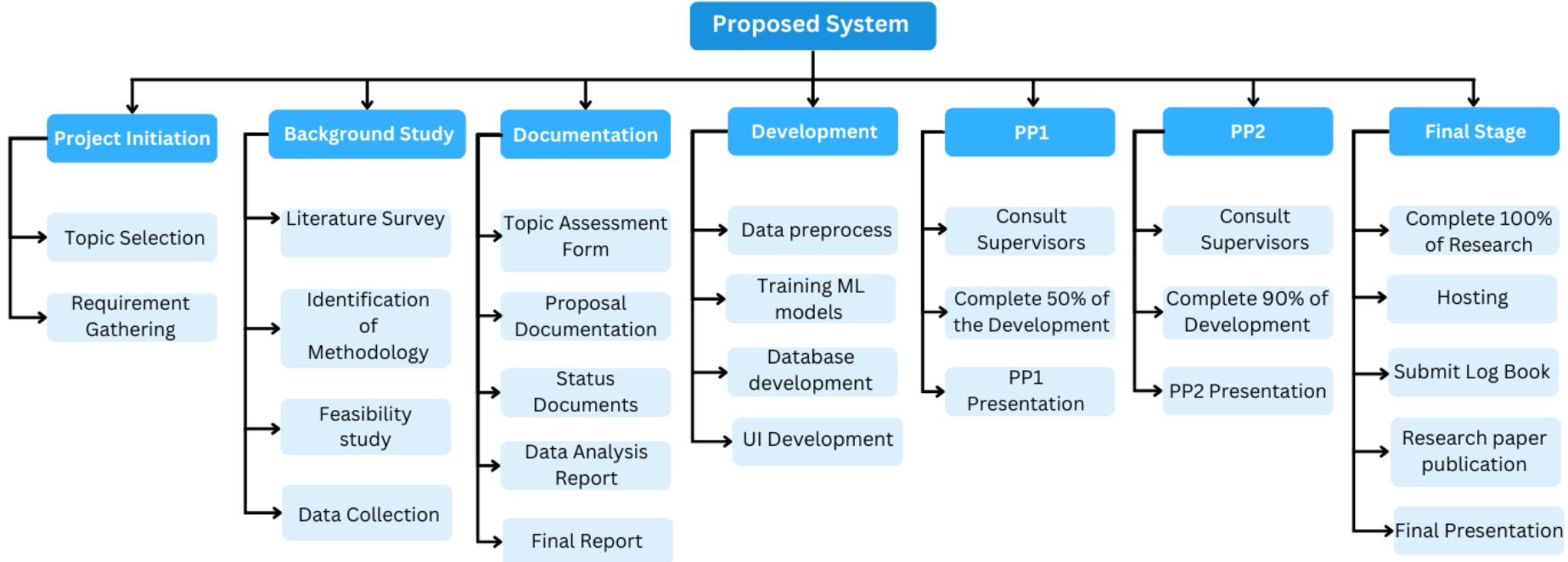
Notifications and Reminders

# COMPONENT SPECIFIC REQUIREMENTS

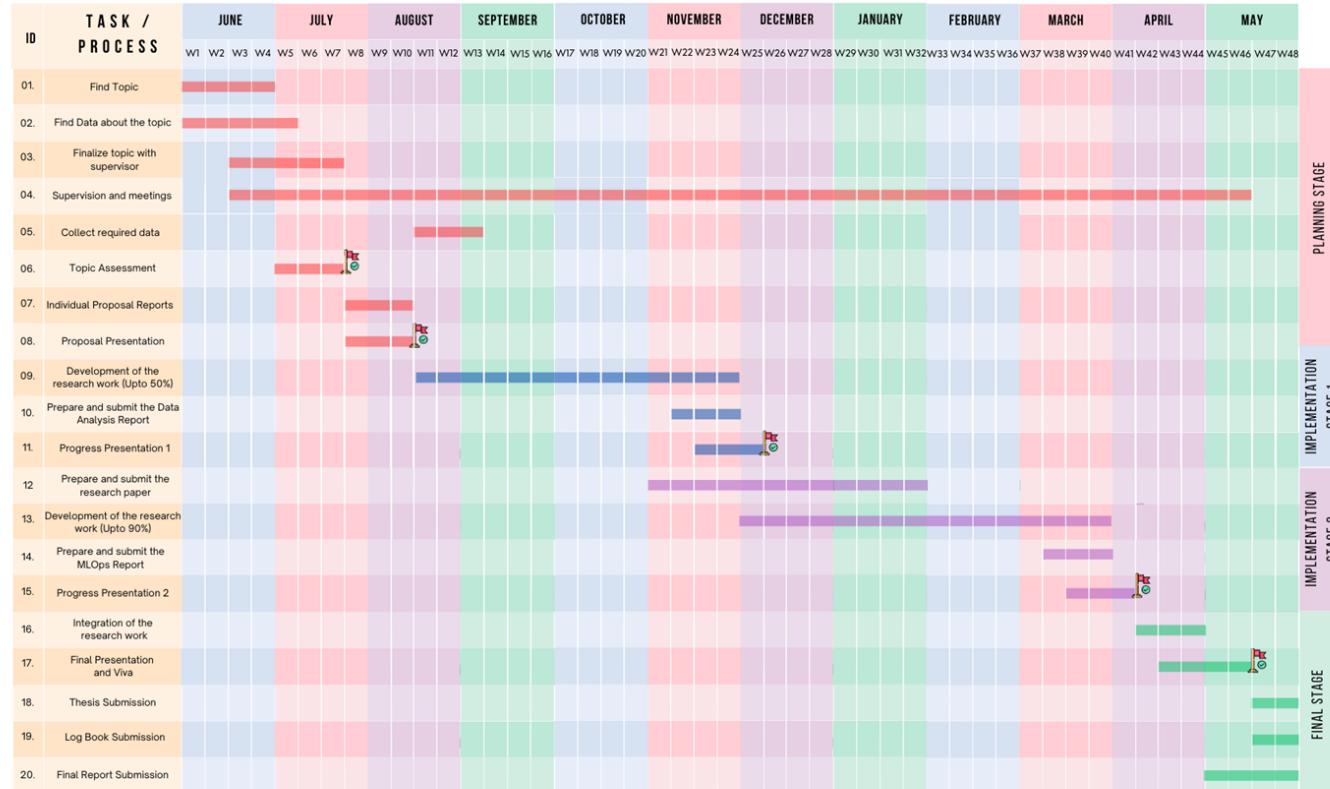
## Non-functional Requirement



# WORK BREAKDOWN CHART



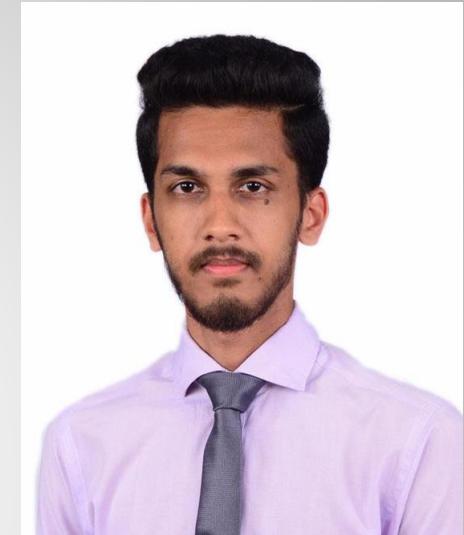
# GANNT CHART



# REFERENCES

- [11]S. McGrath, "Research Review - The Effectiveness of Parent Training Programs for Children with ADHD Aged 6-11 Years: A Systematic Review," *ResearchGate*, Oct. 2024. [Online]. Available: <https://www.researchgate.net/publication/382875375>. [Accessed: 16-Oct-2024].
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# AI-Driven Adaptive Learning and Intervention System with future predictions for Personalized ADHD Management in Children



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**Specialization: Information technology**

# INTRODUCTION

- Research aims to develop an intelligent system for data analysis, pattern recognition, and future challenge prediction to ensure interventions stay relevant and effective over time.
- Provide personalized support by dynamically adapting intervention strategies based on a child's interactions.



# RESEARCH GAP

Component	[14]	[15]	[16]	Proposed System
Monitoring Child's interactions	✓	✓	✓	✓
Personalized Feedbacks	✗	✓	✓	✓
User Dashboard	✓	✗	✓	✓
Future Predictive Insights	✗	✗	✗	✓
AI-Driven Recommendations	✗	✗	✗	✓
Alert and Notifications	✓	✓	✗	✓

[14] January 2022 - An Overview of Predicting the Prevalence of ADHD

[15] June 2023 - Diagnosing attention-deficit hyperactivity disorder (ADHD) using artificial intelligence: a clinical study in the UK

[16] April 2020 - Machine-Learning prediction of comorbid substance use disorders in ADHD youth using Swedish registry data

# RESEARCH PROBLEM

Current ADHD management methods are unable to adapt to individual needs, leading to inconsistent outcomes. An AI-driven system is needed to provide dynamic, personalized strategies and proactive solutions for better ADHD management.



# OBJECTIVES

Monitor the child's interactions with the application and Collect data on key indicators such as response times, completion rates, attention span, and behavioral trends to assess the child's progress.



Develop a user-friendly interface for educators and children to easily track progress, view key achievements, and identify areas that need further attention.

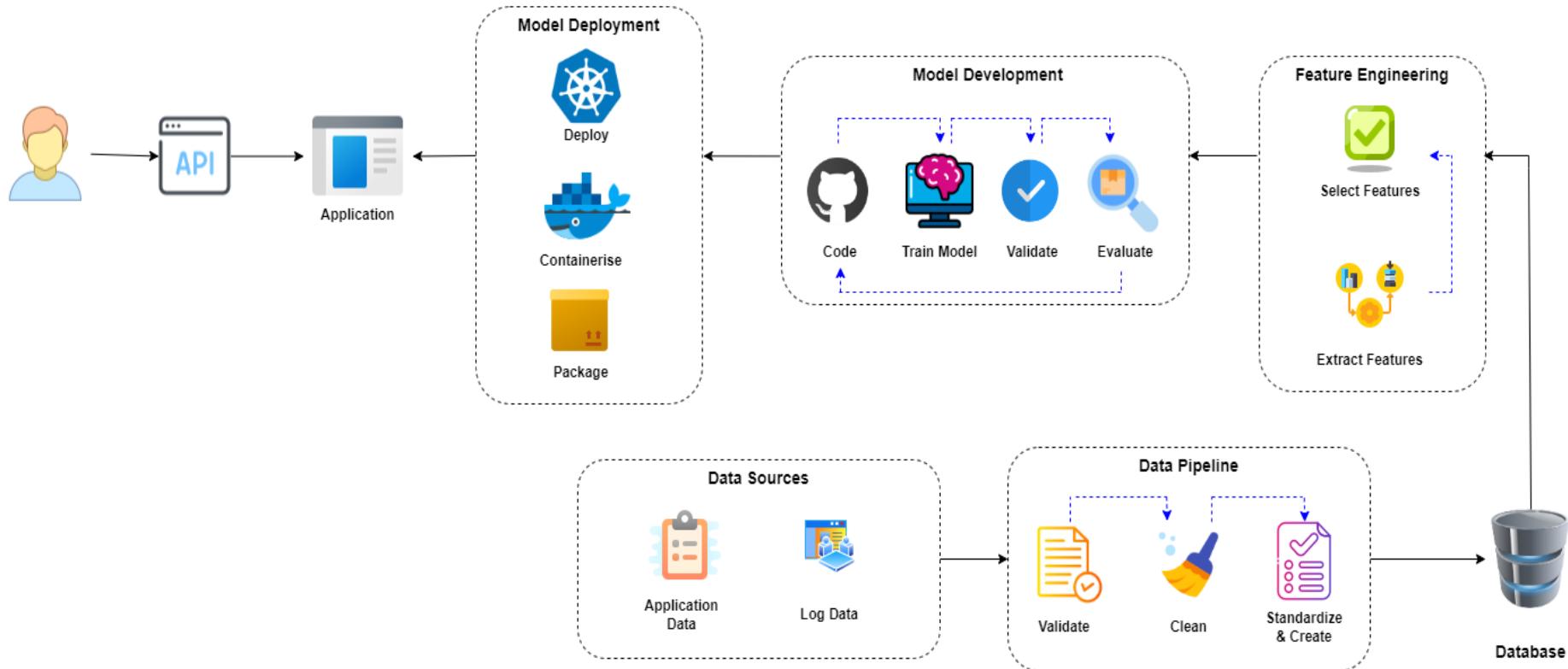


Leverage AI to predict potential challenges the child may face in the future based on current and historical performance data.

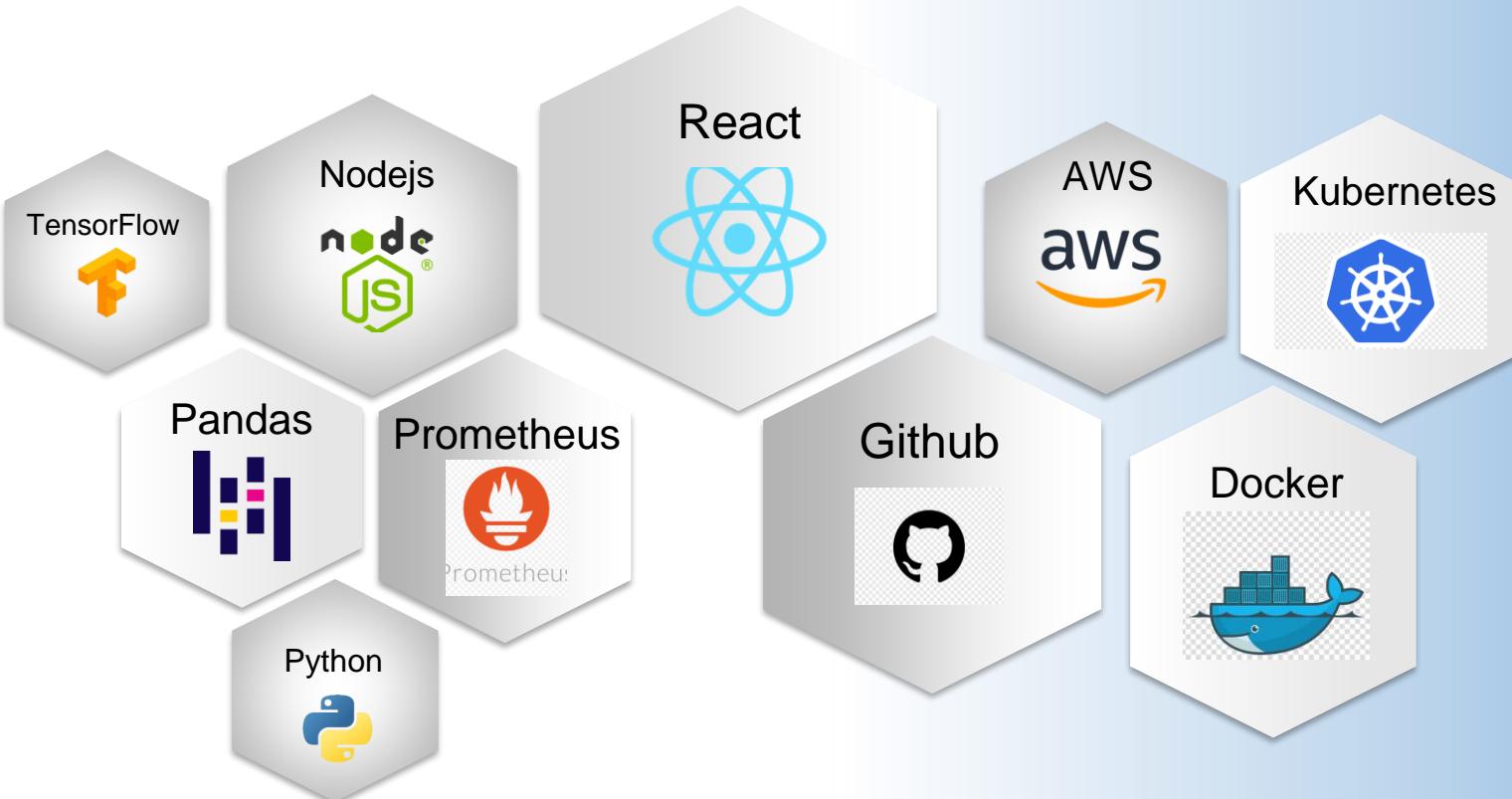


Deliver tailored feedback to both the child and caregivers, offering insights into strengths, areas for improvement, and specific intervention strategies.

# SYSTEM DIAGRAM



# TECHNOLOGIES



# KEY PILLARS

Cloud  
Computing



Adaptive  
Monitoring

Machine  
Learning

# COMPONENT SPECIFIC REQUIREMENTS

## Functional Requirement



Data collection and feature engineering

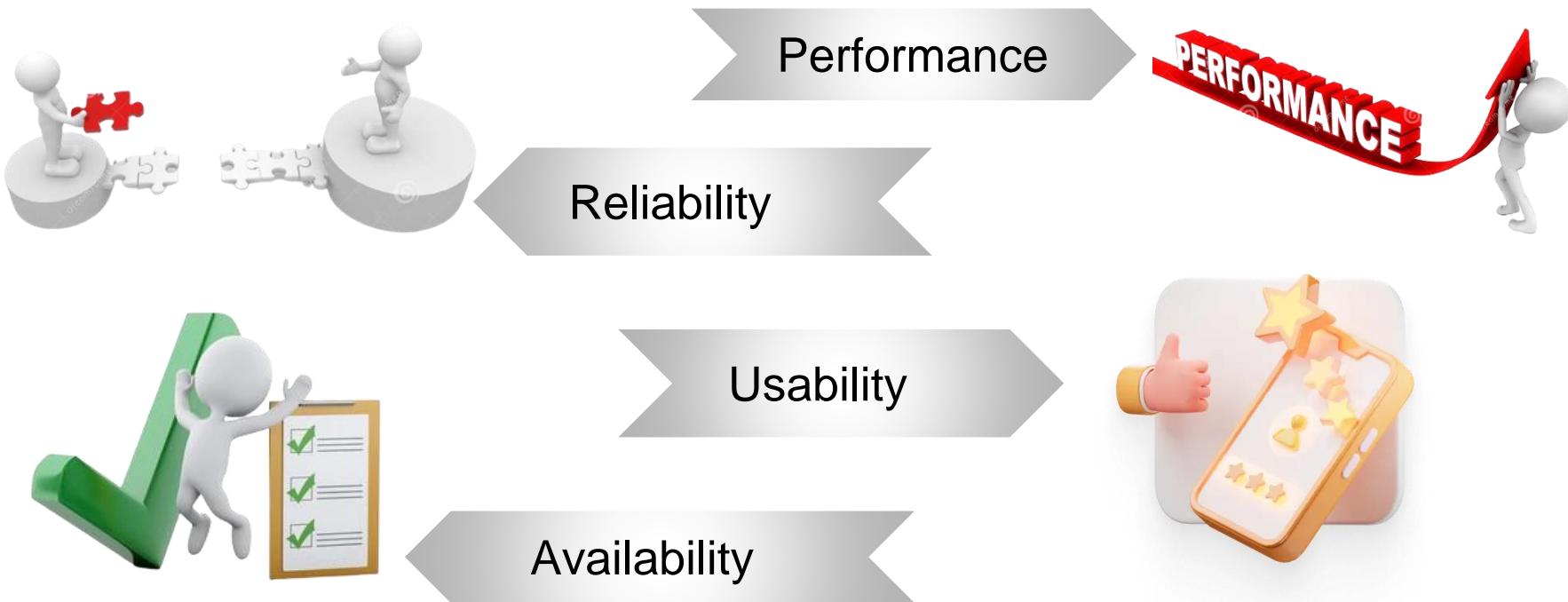
User Dashboard

Future Predictions and Risk Identification

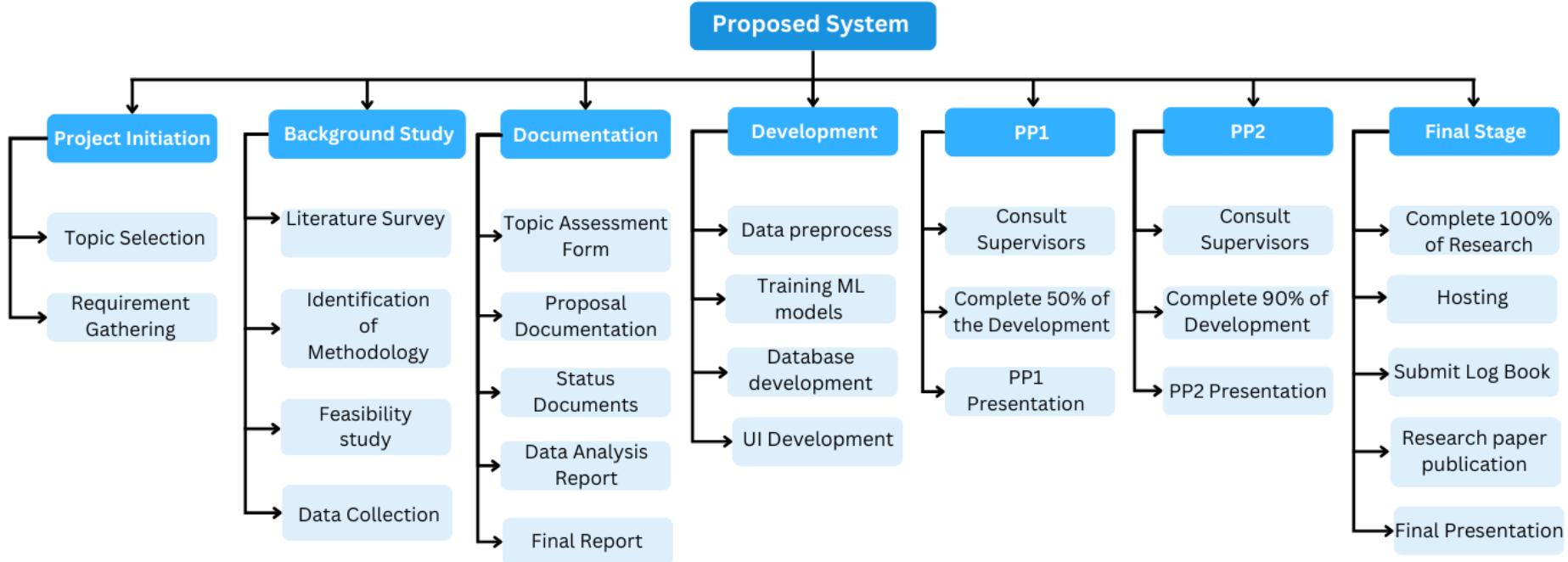
Personalized Feedback and Alerts

# COMPONENT SPECIFIC REQUIREMENTS

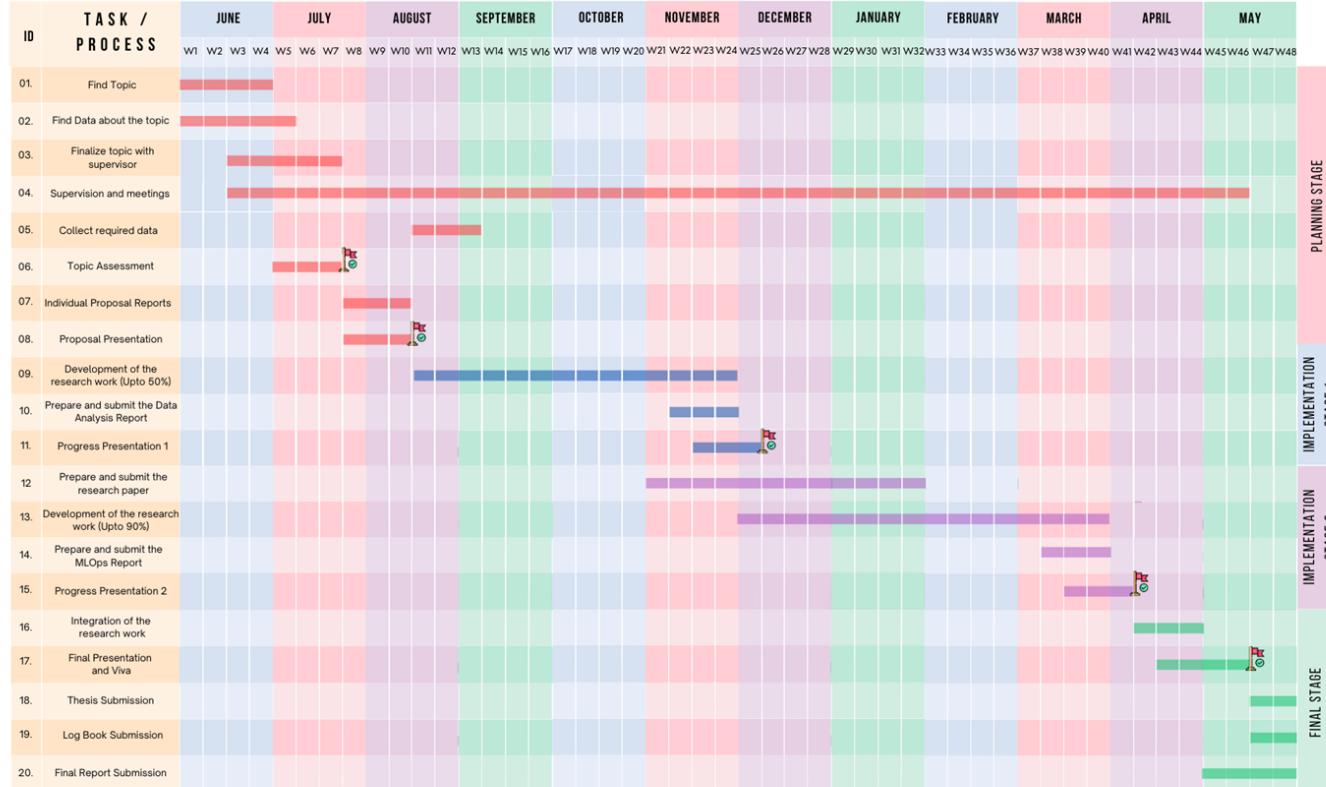
## Non-functional Requirement



# WORK BREAKDOWN CHART



# GANNT CHART



# REFERENCES

- [14] H. W. Loh, C. P. Ooi, P. D. Barua, E. E. Palmer, F. Molinari, and U. R. Acharya, "Automated detection of ADHD: Current trends and future perspective," *Computers in Biology and Medicine*, vol. 146, p. 105525, Jul. 2022, doi: <https://doi.org/10.1016/j.combiomed.2022.105525>.
- [15] T. Chen, I. Tachmazidis, S. Batsakis, M. Adamou, E. Papadakis, and G. Antoniou, "Diagnosing attention-deficit hyperactivity disorder (ADHD) using artificial intelligence: a clinical study in the UK," *Frontiers in Psychiatry*, vol. 14, Jun. 2023, doi: 10.3389/fpsyt.2023.1164433.
- [16] Y. Zhang-James, Q. Chen, R. Kuja-Halkola, P. Lichtenstein, H. Larsson, and S. V. Faraone, "Machine-Learning prediction of comorbid substance use disorders in ADHD youth using Swedish registry data," *Journal of Child Psychology and Psychiatry*, vol. 61, no. 12, pp. 1370–1379, Apr. 2020, doi: <https://doi.org/10.1111/jcpp.13226>.
- [17] J. Downs *et al.*, "Assessing machine learning for fair prediction of ADHD in school pupils using a retrospective cohort study of linked education and healthcare data," *BMJ Open*, vol. 12, no. 12, Dec. 2022, doi: <https://doi.org/10.1136/bmjopen-2021-058058>.
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# THANK YOU

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