



Presented By:
24-25J-261

PulseMind: AI-Driven Behavioural Assessment and Intervention for ADHD



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



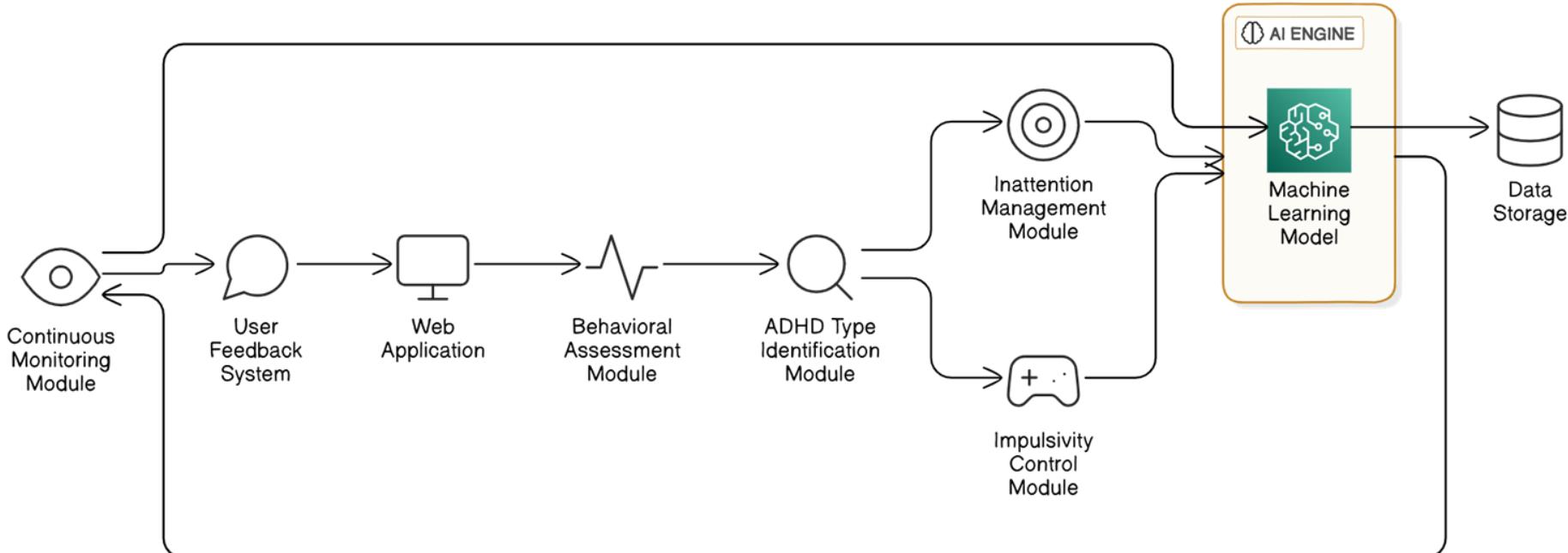
Enhancing Impulse Control



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

RISK MITIGATION

Risk	Severity	Mitigation Measure
Privacy and ethical concerns when collecting and storing sensitive data about children	High	Completed the ethical clearance form, obtained permission from the education division and ensured anonymization of data to protect privacy
Some parents hesitated to give consent for their children to participate	Medium	Implement robust data anonymization and encryption protocols
Target users (parents, teachers, children) find the interface or activities difficult to use or unengaging	Medium	Conduct user testing with parents, teachers, and children during development
The system does not adequately address the cultural or linguistic context of Sri Lankan users.	High	Involve local psychologists, educators, and linguists in system design and content development.

DATA COLLECTION



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



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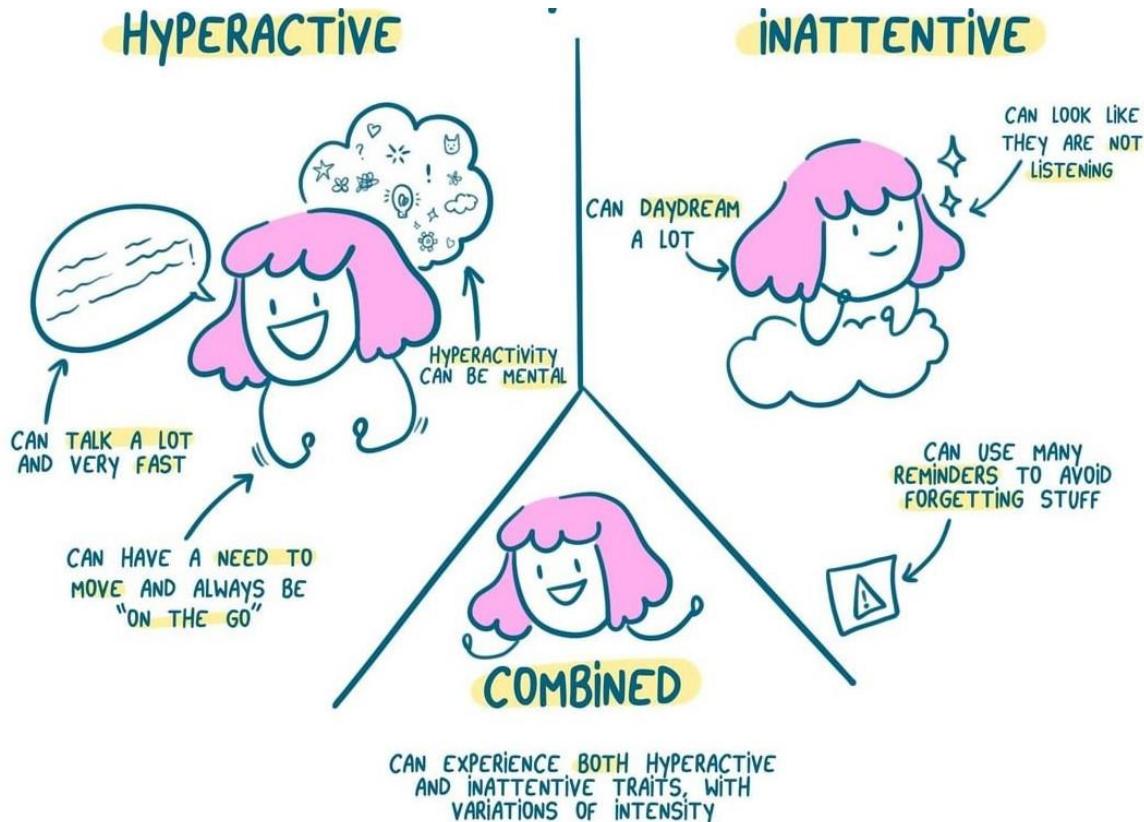
INTRODUCTION

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	✗	✗	✗	✗	✓
Automated model training	✗	✗	✗	✗	✓
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.

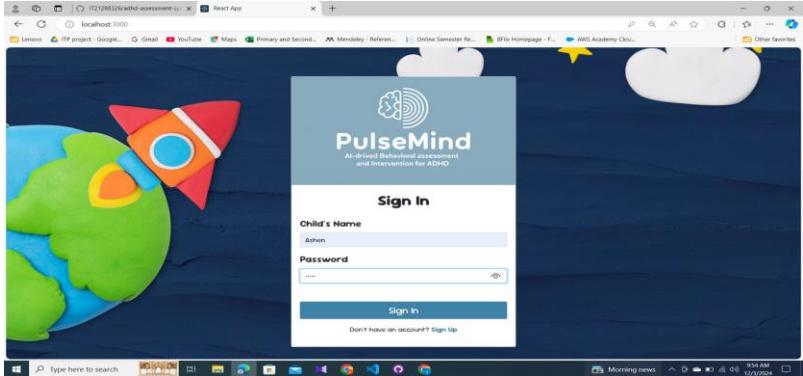
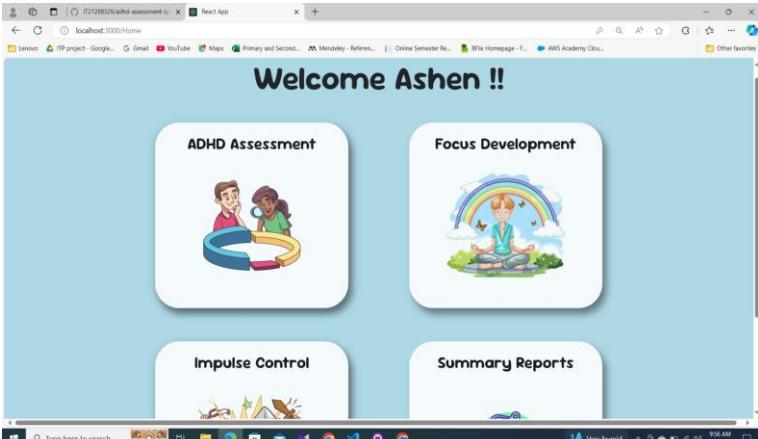
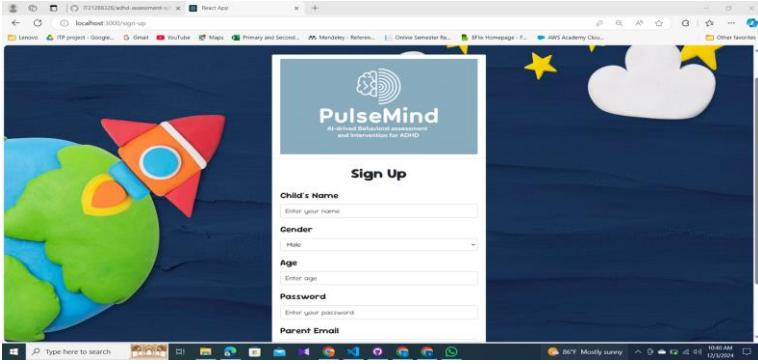


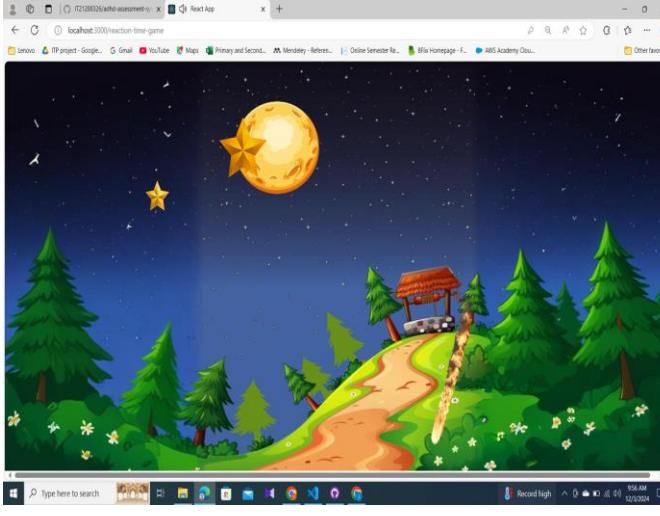
Collect DSM-5 symptoms based on gamified behavioral performance.



Integrate behavioral and questionnaire data to classify ADHD symptoms.

PROOF OF COMPLETION





Disclaimer: ADHD Questionnaire for Parents

Important Notice:
This questionnaire is designed to help identify potential signs of Attention Deficit Hyperactivity Disorder (ADHD) in children. The questions aim to assess behaviors commonly associated with ADHD, which may be exhibited by children in varying degrees.

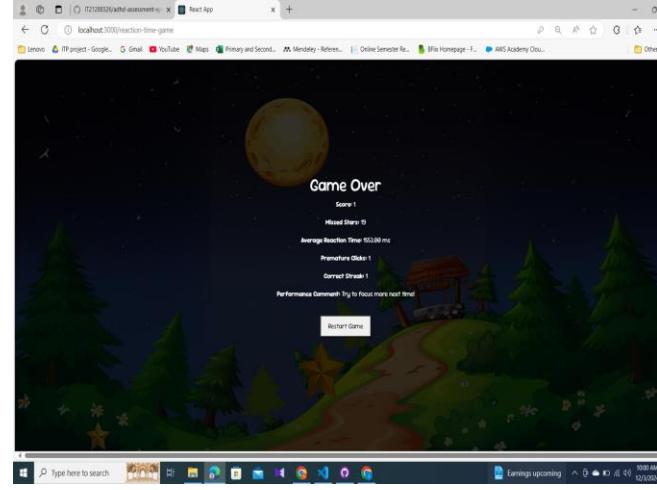
Confidentiality:
All responses provided are confidential and will only be used for the purpose of evaluating ADHD-related behaviors.

Instructions:
Please read each question carefully and respond based on your observations of your child's behavior over the past six months.

By proceeding with this questionnaire, you acknowledge that you understand the purpose, confidentiality, and limitations of the screening process.

Thank you for your participation!

Agree and next



1. Does not pay attention to details or makes careless mistakes (e.g., homework).

Never Occasionally Often Very Often

2. Has difficulty sustaining attention in tasks or play activities.

Never Occasionally Often Very Often

3. Does not seem to listen when spoken to directly.

Never Occasionally Often Very Often

4. Does not follow through on instructions and fails to finish tasks (e.g., homework).

Never Occasionally Often Very Often

5. Has difficulty organizing tasks and activities.

```
File Edit Selection View Go Run Terminal Help <-- / adhd-assessment-system
| Profiler | Signatures | Signatures | QuestionnaireForm.jsx | ReactiontimeGame.jsx | SignIn.jsx | QuestionnaireForm.cs | Profile.css | Home.jsx | App.jsx
Frontend > component > i17288326 > QuestionnaireForm.jsx | QuestionnaireForm.jsx

1 import React, { useState, useEffect } from "react";
2 import axios from "axios";
3 import { useStateContext } from "react-router-dom";
4 import { useStateValue } from "react";
5 import { useState } from "react";
6 import { useStateValue } from "react";
7 import { useState } from "react";
8 import { useState } from "react";
9 const QuestionnaireForm = () => {
10   const location = useState();
11   const [questions, setQuestions] = useState([]);
12   const [responses, setResponses] = useState([]);
13   const [childId, setChildId] = useState(location.state.childId || null);
14   const [message, setMessage] = useState("");
15   const [isSubmitting, setIsSubmitting] = useState(false);
16   const [isDisclaimerToggled, setIsDisclaimerToggled] = useState(true);
17   const navigate = useNavigate(); // Initialize navigate function
18
19   const handlePageChange = () => {
20     navigate(-1); // Navigate to the previous page
21   };
22
23   // Fetch questions from the backend
24   useEffect(() => {
25     const fetchQuestions = async () => {
26       try {
27         const response = await axios.get(`http://localhost:5000/api/questionnaire/questions`, {
28           withCredentials: true, // Ensure requests include credentials
29         });
30         setQuestions(response.data);
31       } catch (error) {
32         console.error(error);
33       }
34     };
35     fetchQuestions();
36   }, []);
37
38   // Handle user responses
39   const handleResponse = (questionIndex, answer) => {
40     const updatedResponses = [...responses];
41     updatedResponses[questionIndex] = answer;
42     setResponses(updatedResponses);
43   };
44
45   // Handle form submission
46   const handleSubmit = (e) => {
47     e.preventDefault();
48     if (!isDisclaimerToggled) {
49       setMessage("Please accept the disclaimer before submitting.");
50       return;
51     }
52     setIsSubmitting(true);
53     const data = {
54       responses,
55       childId,
56     };
57     axios
58       .post(`http://localhost:5000/api/questionnaire/submit`, data)
59       .then((response) => {
60         setMessage(`Your responses have been submitted successfully!`);
61         setIsSubmitting(false);
62         navigate("/reactiontime-game");
63       })
64       .catch((error) => {
65         console.error(error);
66       });
67   };
68
69   // Toggling between disclaimer and questionnaire
70   const toggleDisclaimer = () => {
71     setIsDisclaimerToggled(!isDisclaimerToggled);
72   };
73
74   return (
75     <div>
76       <h1>Reaction Time Game</h1>
77       <p>Please answer the following questions to help us assess your reaction time.</p>
78       <div>
79         <div>
80           <h3>Questionnaire</h3>
81           <ul>
82             <li>Question 1</li>
83             <li>Question 2</li>
84             <li>Question 3</li>
85             <li>Question 4</li>
86             <li>Question 5</li>
87           </ul>
88           <div>
89             <input type="text" value={responses[0]} />
90             <input type="text" value={responses[1]} />
91             <input type="text" value={responses[2]} />
92             <input type="text" value={responses[3]} />
93             <input type="text" value={responses[4]} />
94           </div>
95         </div>
96         <div>
97           <h3>Reaction Time Game</h3>
98           <ul>
99             <li>Reaction 1</li>
100            <li>Reaction 2</li>
101            <li>Reaction 3</li>
102            <li>Reaction 4</li>
103            <li>Reaction 5</li>
104          </ul>
105          <div>
106            <input type="text" value={responses[0]} />
107            <input type="text" value={responses[1]} />
108            <input type="text" value={responses[2]} />
109            <input type="text" value={responses[3]} />
110            <input type="text" value={responses[4]} />
111          </div>
112        </div>
113      </div>
114      <div>
115        <button onClick={handlePageChange}>Previous</button>
116        <button onClick={handleSubmit}>Submit</button>
117        <button onClick={toggleDisclaimer}>Toggle Disclaimer</button>
118      </div>
119    </div>
120  );
121}
122
```

The screenshot shows the MongoDB Compass interface. The left sidebar has sections for Project, Data Services, Overview, Clusters, Services (Atlas, Stream Processing, Triggers, Migration, Data Federation), Security (Backup, Database Access, Network Access, Advanced), and Goto (System Status, All Good). The main area is titled 'Data Services' with a search bar for 'Search Namespaces'. A dropdown menu shows 'test' selected, with 'children' and 'gometrics' listed under it. Below the search bar are tabs for Find, Indexes, Schema Anti-Patterns, Aggregation, and Search Indexes. A button for 'INSERT DOCUMENT' is on the right. The 'Find' tab is active, showing a query builder with 'Type a query: { Field: "value" }'. The results pane displays a document with the following fields:

```
_id: ObjectId("676d3f7232db05274602c856e")
title: "Gometrics"
reactionTime: Array(22)
averageReactionTime: 4547.277272727272
count: 1000
preReactionTicks: 38
missedStars: 15
score: 1000
createdAt: 2024-12-01T09:01:23.127+00:00
...V: 0
```

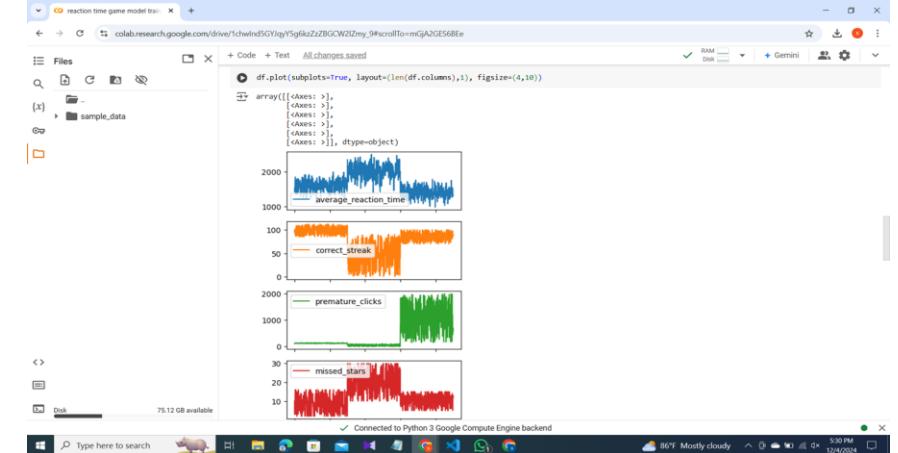
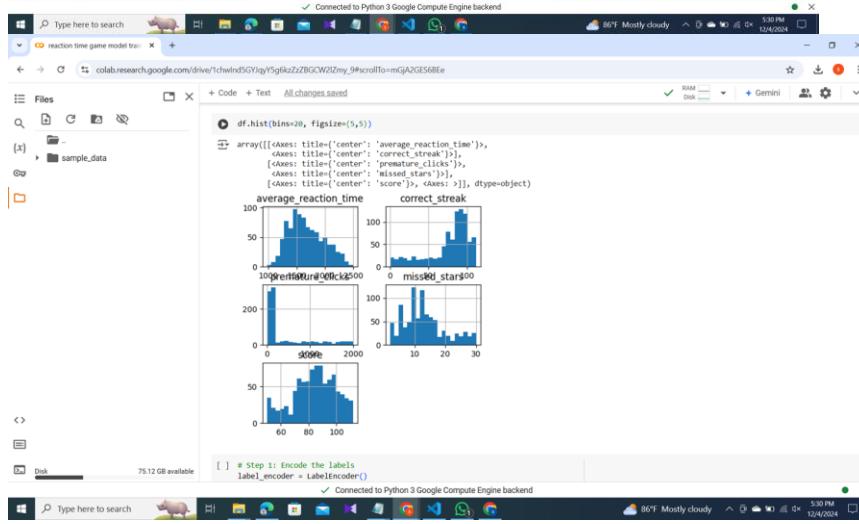
Below the results are navigation buttons for PREVIOUS, NEXT, and a page number indicator '1-20 of many results'.

```
[ ] import pandas as pd
import numpy as np
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import LabelEncoder
from sklearn.svm import SVC
from sklearn.metrics import accuracy_score, classification_report
import joblib

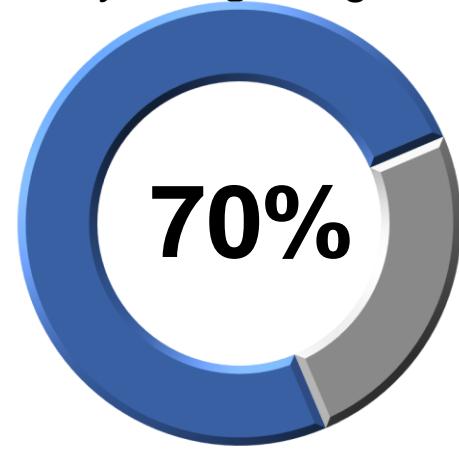
[ ] # load the dataset
data_path = "/content/adhd_dataset.csv"
df = pd.read_csv(data_path)

df.head(10)
```

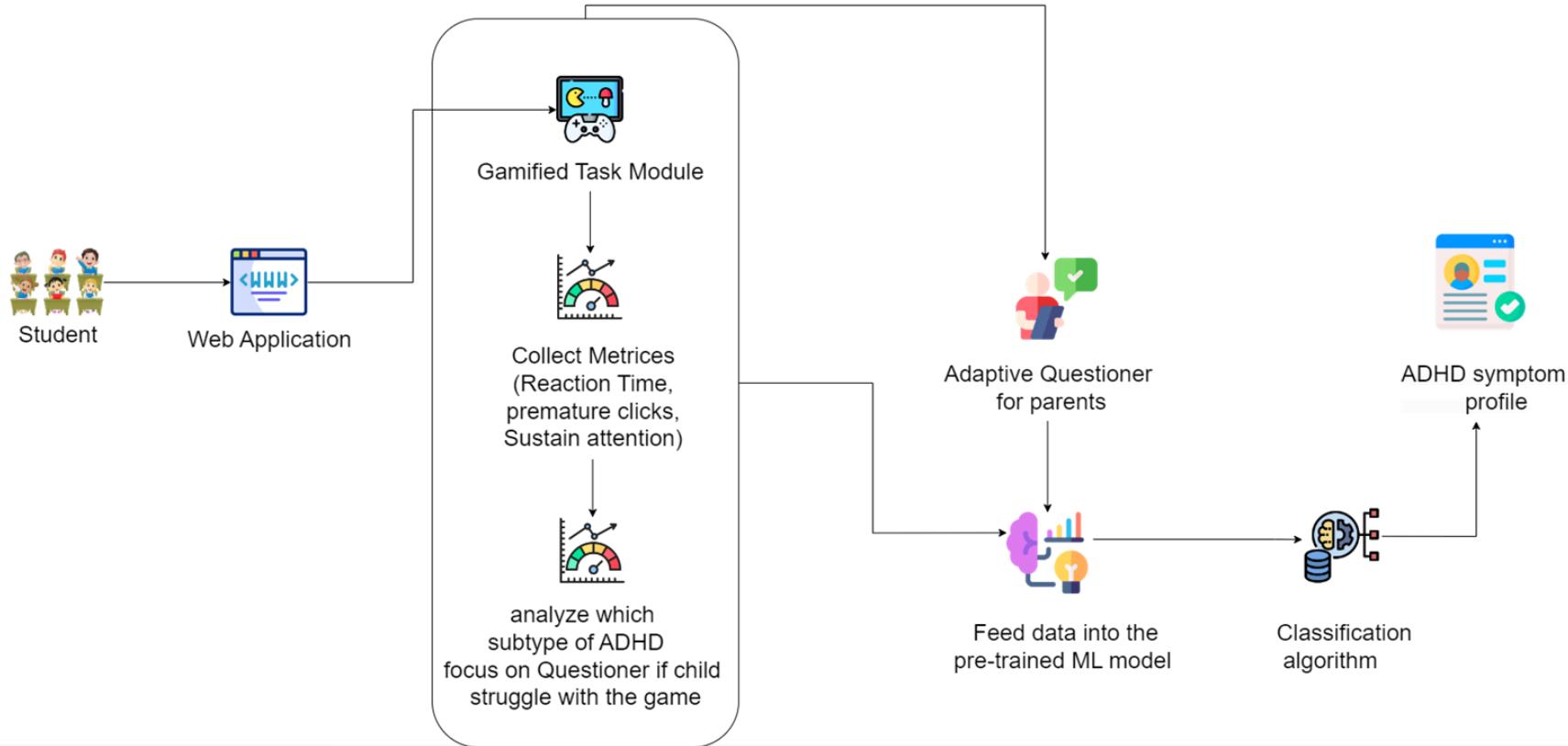
	average_reaction_time	correct_streak	premature_clicks	missed_stars	score	label
0	1628.573381	95	113	10	91	Normal
1	1502.739612	100	116	3	99	Normal
2	1417.351373	101	112	3	103	Normal
3	1794.103257	93	129	12	104	Normal
4	1866.537748	89	126	16	97	Normal
5	1715.479049	97	123	3	92	Normal
6	1346.972819	97	137	5	87	Normal
7	1635.932410	86	140	16	87	Normal
8	1616.580324	94	121	8	93	Normal
9	1350.794768	107	114	15	90	Normal



- Implement SignIn and SignUp pages
- Collect data and generate dataset
- Create a falling star game
- Train a model to identify which ADHD type child has by using the game data
- Create parental questioner
- Apply DSM5 to calculate sub type
- Automated Model Training
- Real-Time ADHD Type Prediction



SYSTEM DIAGRAM



TECHNOLOGIES

Python



TensorFlow



mongoDB



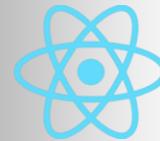
JWT



Phaser



React



Pandas



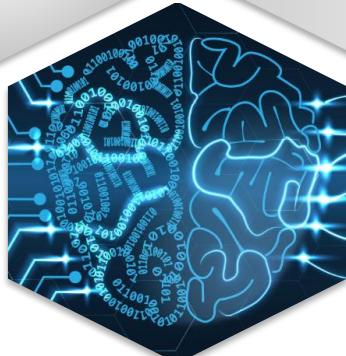
KEY PILLARS

UI/UX

Machine
learning

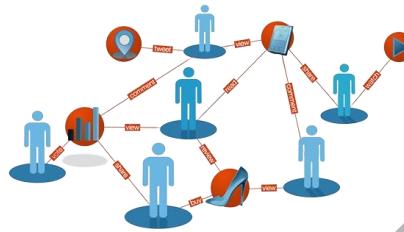
Game
Development

Data
Collection and
Management



COMPONENT SPECIFIC REQUIREMENTS

Functional Requirement



Data Collection and Processing



Gamified Behavioral Task

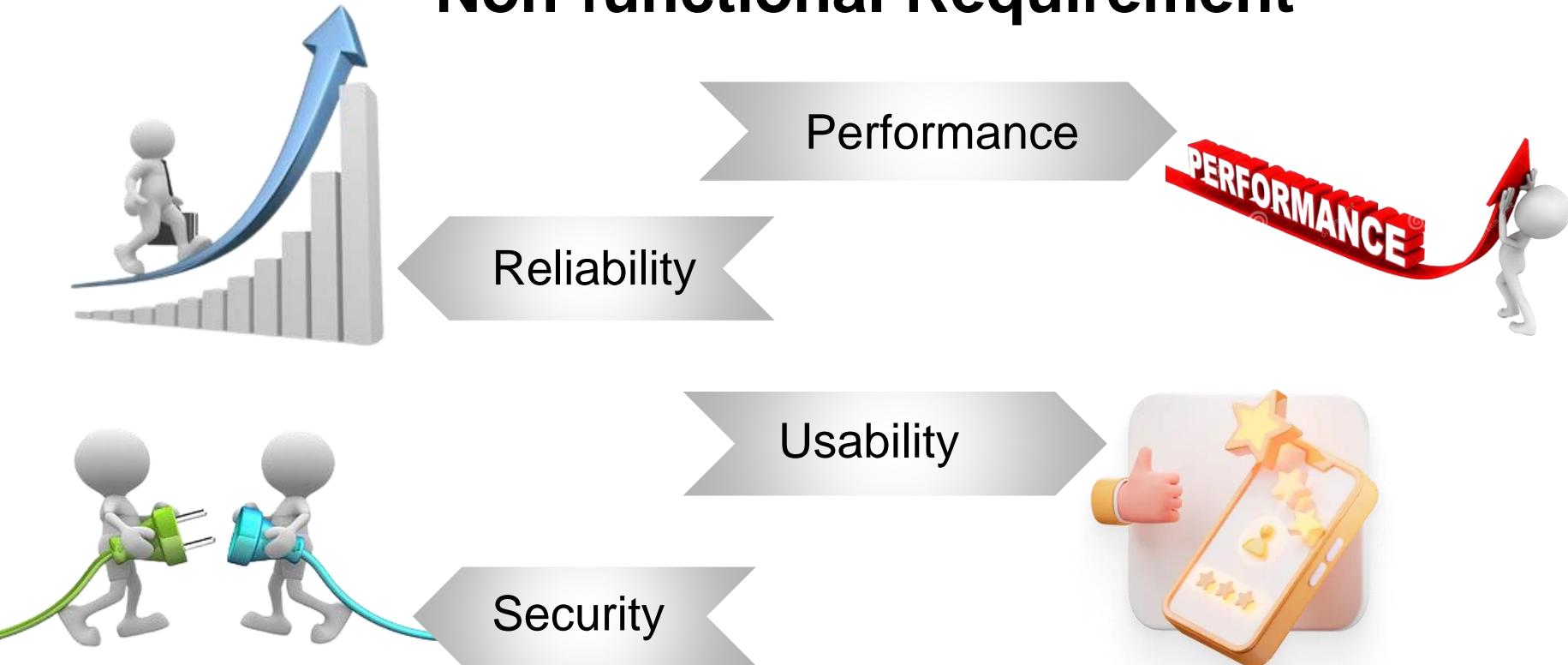


Adaptive Questionnaire

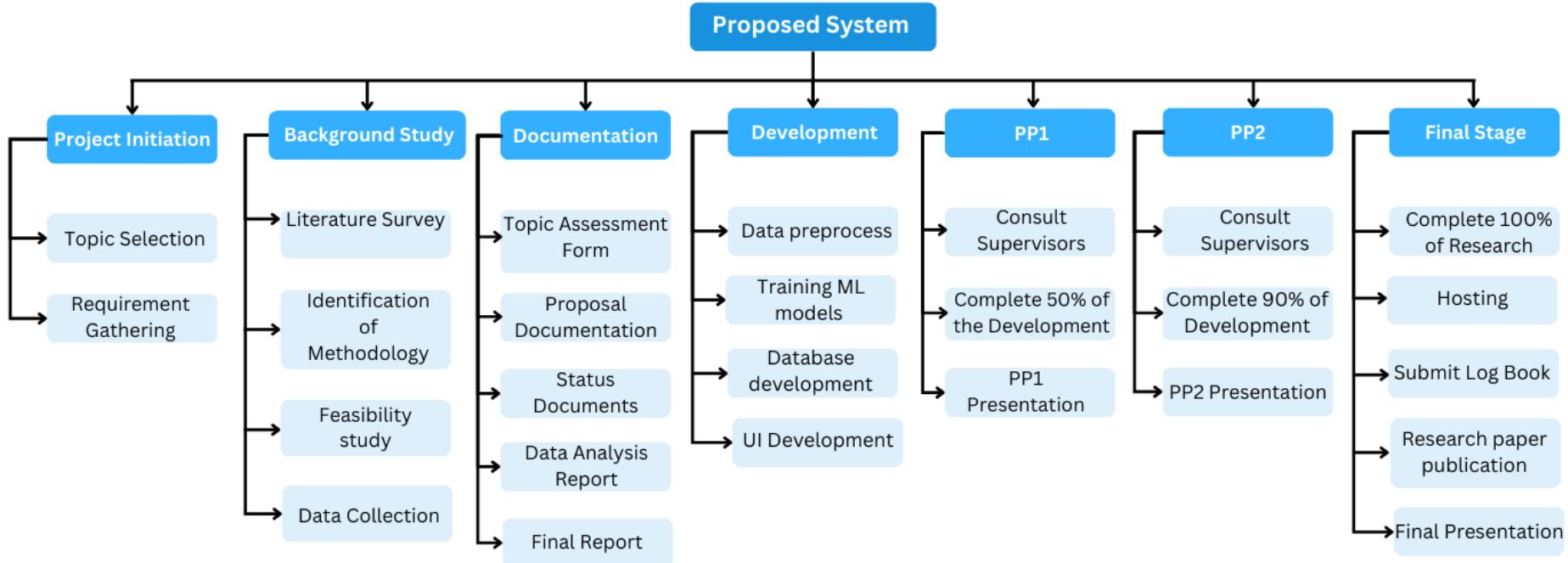
User Interface

COMPONENT SPECIFIC REQUIREMENTS

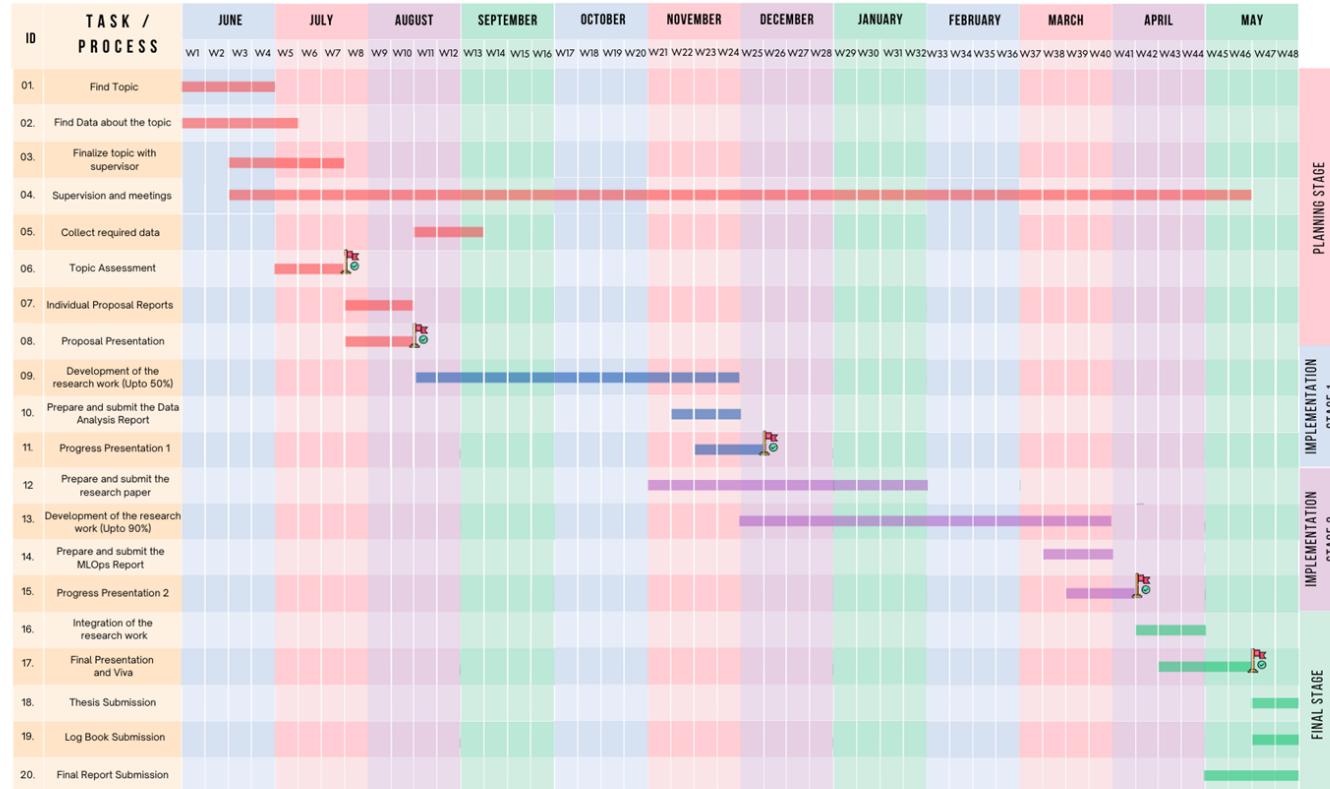
Non-functional Requirement



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.

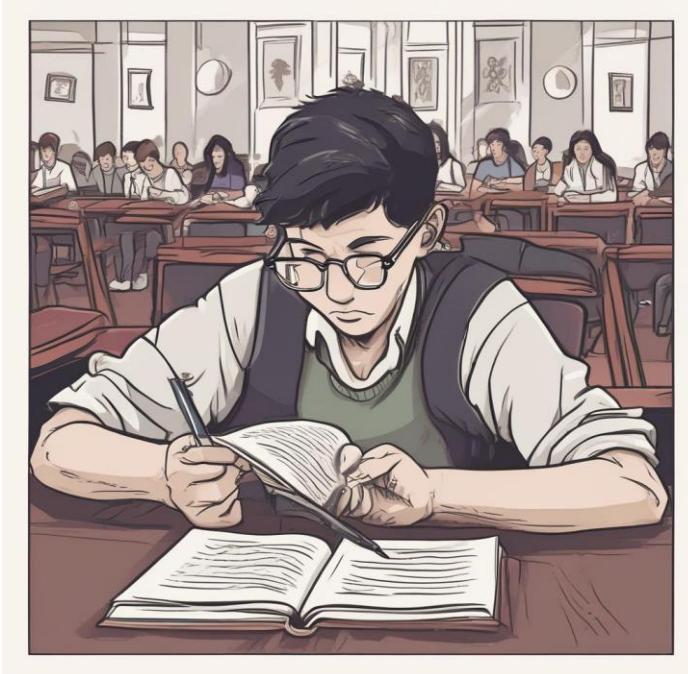


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Specialization: Information technology

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.

PROOF OF COMPLETION

```
[19]: from google.colab import drive
drive.mount('/content/drive')

# Drive already mounted at /content/drive; to attempt to forcibly remount, call drive.mount("/content/drive", force_remount=True).

[x]
  ✓ import matplotlib.pyplot as plt
  import numpy as np
  import os
  import PIL
  import tensorflow as tf
  from tensorflow import keras
  from tensorflow.keras import layers
  from tensorflow.python.keras.layers import Dense, Flatten
  from tensorflow.keras.models import Sequential
  from tensorflow.keras.optimizers import Adam

[13]: from pathlib import Path
data_dir = Path('/content/drive/MyDrive/emotion project_adhd/test')

[14]: img_height, img_width=224,224
batch_size=32
train_ds = tf.keras.preprocessing.image_dataset_from_directory(
    data_dir,
    validation_split=0.2,
    subset="training",
    seed=123,
    image_size=(img_height, img_width),
    batch_size=batch_size)
```

```
[ ] class_names = train_ds.class_names
print(class_names)

['disgust', 'fear', 'happy', 'neutral', 'sad', 'surprise']

[ ] # Create the sequential model
resnet_model = Sequential()

# Load pretrained Resnet50 model
pretrained_model = tf.keras.applications.ResNet50(include_top=False,
    input_shape=(224, 224, 3),
    pooling='avg',
    weights='imagenet')

# Freeze the pretrained layers
for layer in pretrained_model.layers:
    layer.trainable = False

# Add layers to the sequential model
resnet_model.add(pretrained_model)
resnet_model.add(tf.keras.layers.Flatten())
resnet_model.add(tf.keras.layers.Dense(32, activation='relu'))
resnet_model.add(tf.keras.layers.Dense(26, activation='relu'))
resnet_model.add(tf.keras.layers.Dense(len(class_names), activation='softmax'))
```

Downloading data from https://storage.googleapis.com/tensorflow-keras-applications/resnet/resnet50_weights_tf_dim_ordering_tf_kernels_notop.h5
94765736/94765736 55 MB/step

```
[14]: img_height,img_width=224,224
batch_size=32
train_ds = tf.keras.preprocessing.image_dataset_from_directory(
    data_dir,
    validation_split=0.2,
    subset="training",
    seed=123,
    image_size=(img_height, img_width),
    batch_size=batch_size)

Found 7178 files belonging to 6 classes.
Using 5743 files for training.

[ ] val_ds = tf.keras.preprocessing.image_dataset_from_directory(
    data_dir,
    validation_split=0.2,
    subset="validation",
    seed=123,
    image_size=(img_height, img_width),
    batch_size=batch_size)

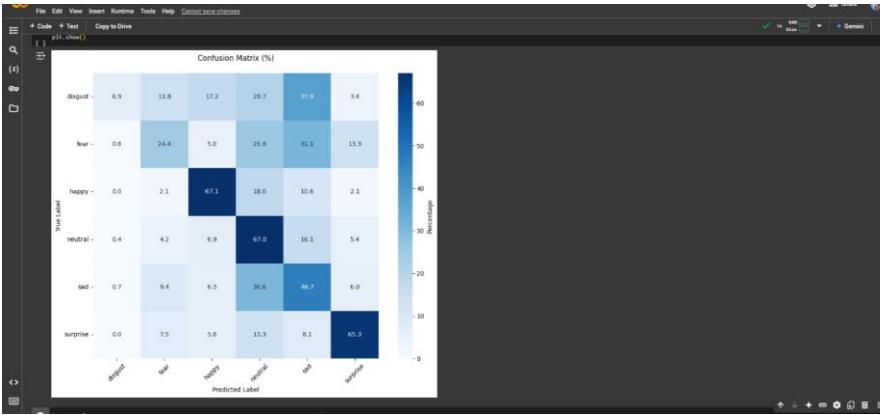
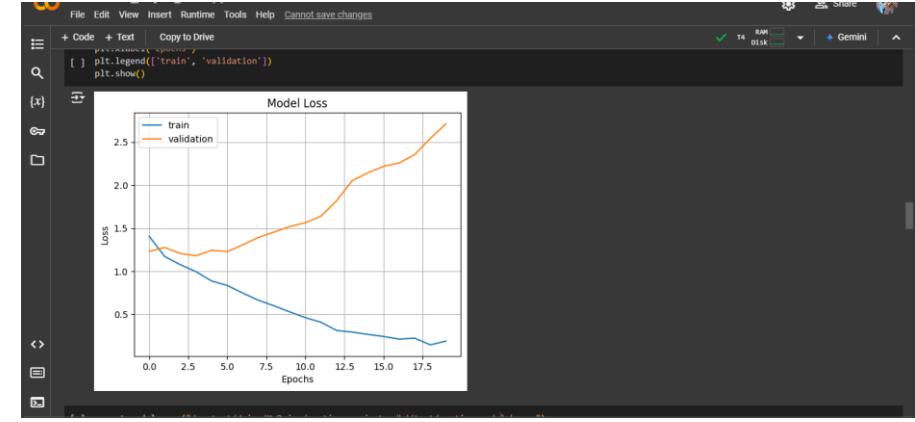
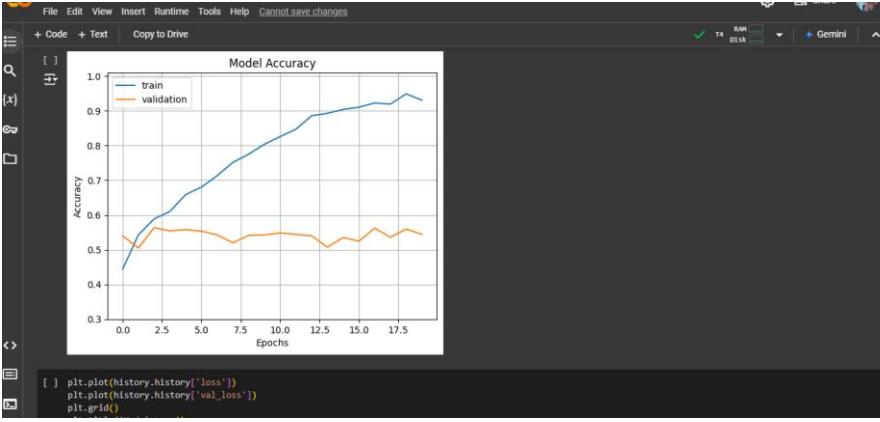
Found 7178 files belonging to 6 classes.
Using 1435 files for validation.

[ ] class_names = train_ds.class_names
print(class_names)
```

```
[ ] resnet_model.compile(optimizer='Adam(learning_rate=0.001)', loss='sparse_categorical_crossentropy', metrics=['accuracy'])

[ ] epochs=20
history = resnet_model.fit(
    train_ds,
    validation_data=val_ds,
    epochs=epochs
)

Epoch 1/20
180/180 [00:00 <0s/step] - accuracy: 0.3905 - loss: 1.5975 - val_accuracy: 0.5394 - val_loss: 1.2703
Epoch 2/20
180/180 [00:00 <0s/step] - accuracy: 0.5318 - loss: 1.1766 - val_accuracy: 0.5092 - val_loss: 1.2752
Epoch 3/20
180/180 [00:00 <0s/step] - accuracy: 0.5886 - loss: 1.0845 - val_accuracy: 0.5638 - val_loss: 1.2854
Epoch 4/20
180/180 [00:00 <0s/step] - accuracy: 0.6142 - loss: 1.0004 - val_accuracy: 0.5540 - val_loss: 1.1791
Epoch 5/20
180/180 [00:00 <0s/step] - accuracy: 0.6542 - loss: 0.9802 - val_accuracy: 0.5582 - val_loss: 1.2436
Epoch 6/20
180/180 [00:00 <0s/step] - accuracy: 0.6707 - loss: 0.8559 - val_accuracy: 0.5533 - val_loss: 1.2225
Epoch 7/20
180/180 [00:00 <0s/step] - accuracy: 0.7105 - loss: 0.7522 - val_accuracy: 0.5429 - val_loss: 1.3066
Epoch 8/20
180/180 [00:00 <0s/step] - accuracy: 0.7478 - loss: 0.6828 - val_accuracy: 0.5199 - val_loss: 1.3925
Epoch 9/20
180/180 [00:00 <0s/step] - accuracy: 0.7775 - loss: 0.6112 - val_accuracy: 0.5415 - val_loss: 1.4547
Epoch 10/20
180/180 [00:00 <0s/step] - accuracy: 0.8011 - loss: 0.5325 - val_accuracy: 0.5429 - val_loss: 1.5181
```



Predicted Label

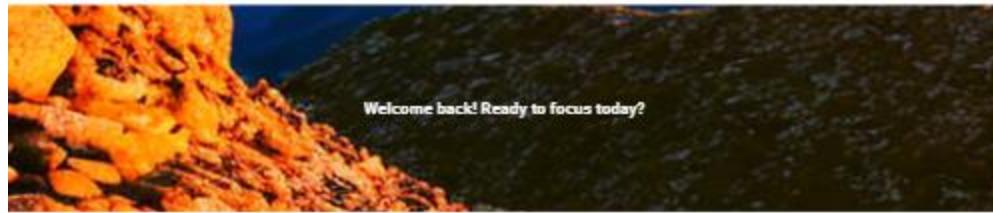
```
[ ] import cv2

def process_image(image_path):
    image=cv2.imread(image_path)
    img_height,img_width= 224,224
    image_resized=cv2.resize(image, (img_height,img_width))
    image=np.expand_dims(image_resized, axis=0)

    pred=model.predict(image)
    class_names = ['disgust', 'fear', 'happy', 'neutral', 'sad', 'surprise']
    output_class=class_names[np.argmax(pred)]
    probability =float(str(round(max(pred[0]),6)))
    return {"class":output_class , "probability":probability}

print(process_image(r"/content/drive/MyDrive/Dataset/archive (2)/test/sad/PrivateTest_10658656.jpg"))

1/1    0s 23ms/step
{'class': 'sad', 'probability': 0.997832}
```



Welcome back! Ready to focus today?

 **Ongoing Tasks**
Check your current tasks and keep track of your progress.

 **Games**
Engage with fun activities to boost your motivation.

 **Earned Rewards**
View your achievements and rewards.

 Pulse

Navigation
Dashboard
Games
Progress
Tasks
Rewards

Welcome to Pulse Mind

Puzzle Game

Enhance your problem-solving skills with puzzles.

Memory-Matching Game

Boost your memory with exciting matching challenges.

Progress Tracker

Visualize your progress and achievements over time.

Your Rewards

Achievements

 Completed 10 Tasks 

Redeem Your Rewards

10% Discount Coupon

[Redeem](#)

Free Ebook

[Redeem](#)



Pulse Mind

Welcome to Pulse Mind

Add New Task

Quick Access

- Dashboard Overview
- Student Profile
- Activity Logs

Games

- Puzzle Game
- Memory Match

Children's Games

- Puzzle Game
- Engage with mind-bending puzzles that adapt to your mood.
- Memory Match
- Boost your memory with matching challenges.

Progress Reports

Monitor your child's progress and achievements in real-time.

Suggested Activities

- Outdoor Play
- Encourage physical activity with outdoor games.
- Creative Arts
- Boost creativity with painting and crafts.
- Reading Time
- Enhance knowledge with interesting books.

Your Rewards

Achievements

Completed 10 Tasks

Redeem Your Rewards

10% Discount Coupon

Free Ebook

[Redeem](#)

[Redeem](#)

Your Rewards

Achievements

Completed 10 Tasks

Redeem Your Rewards

10% Discount Coupon

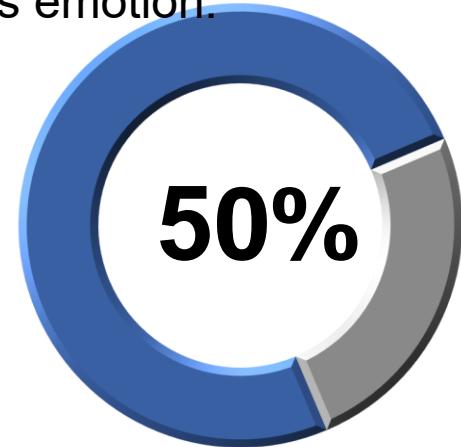
Free Ebook

[Redeem](#)

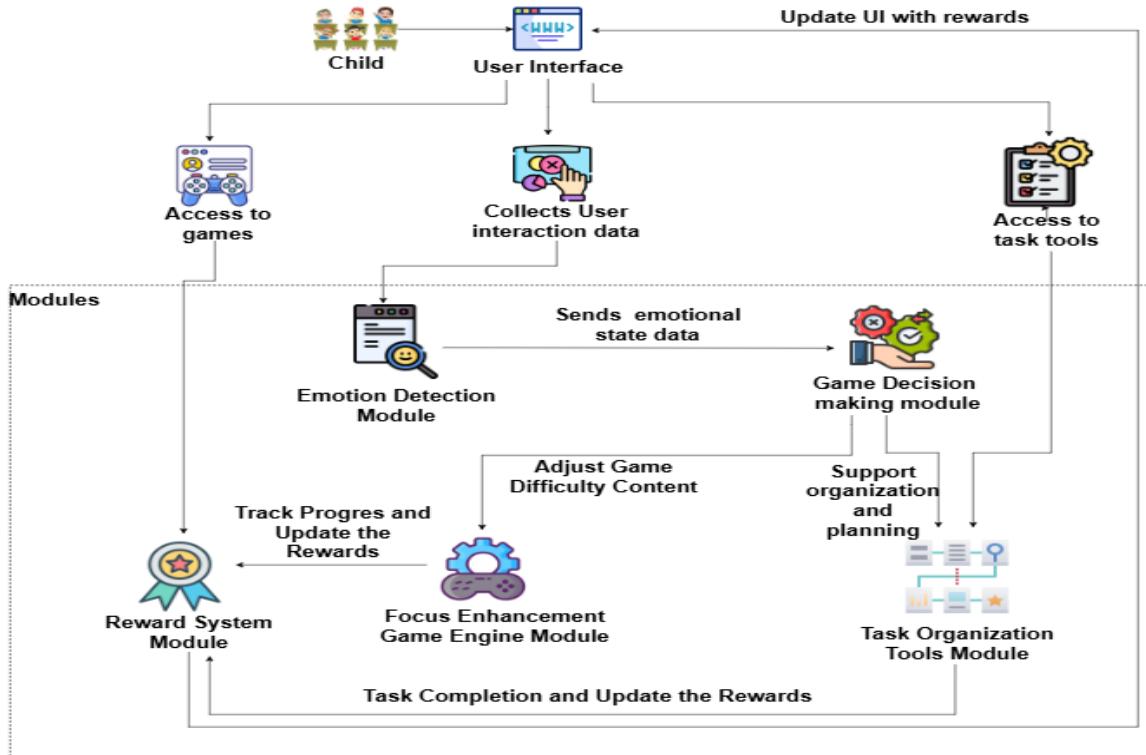
[Redeem](#)



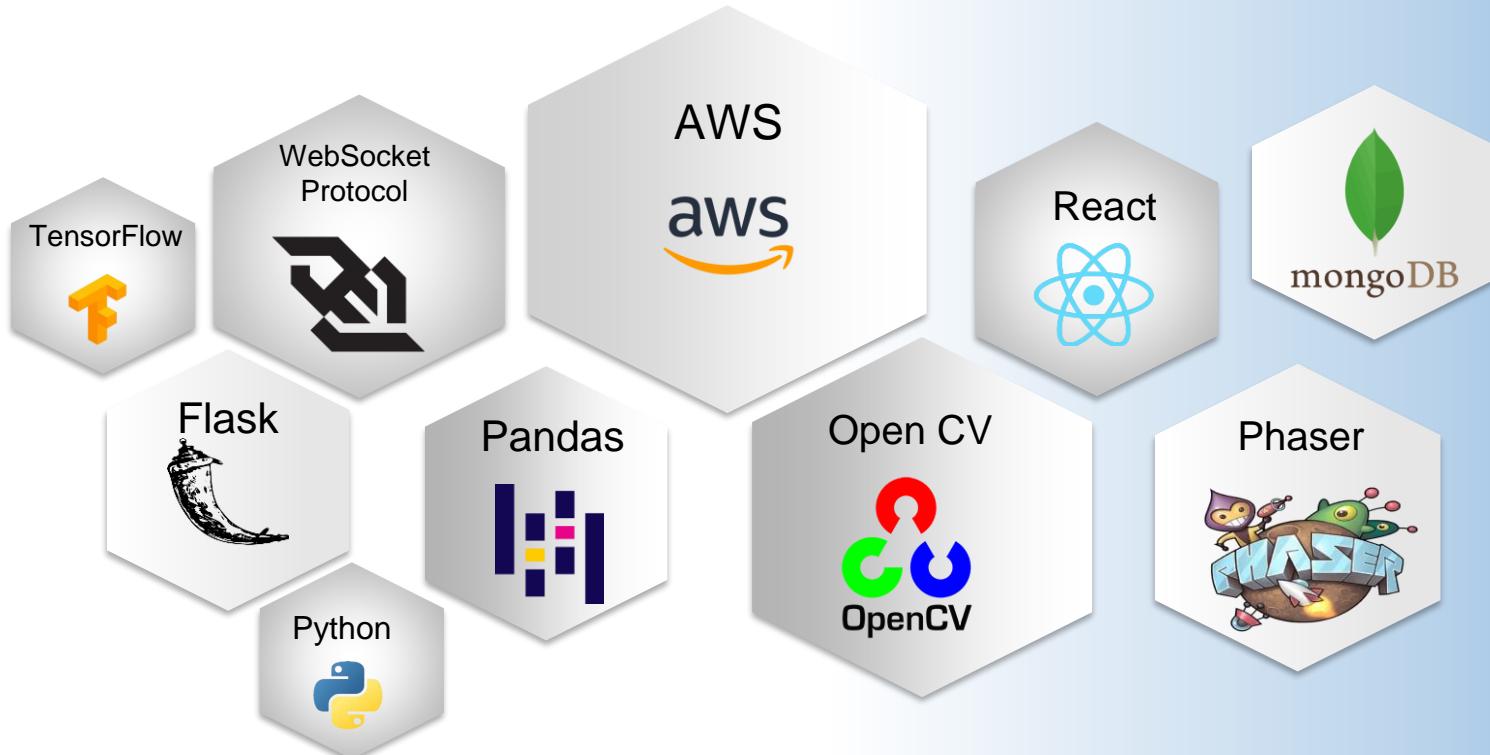
- Collect data and generate a dataset.
- Labeling the data to different emotions (Data preprocessing)
- Train the emotion detection model to identify a child's emotion.
- Design user interfaces.
- Develop user interfaces according to the design.
- Develop focus enhancement games.
- Personalized game flow and reward system
- Suggest activities and to-do lists to develop child attention.



SYSTEM DIAGRAM



TECHNOLOGIES



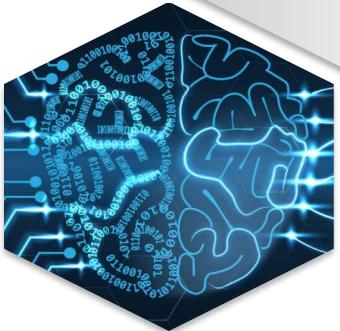
KEY PILLARS

Machine
learning



Games
Developmen
t

Image
Processing



COMPONENT SPECIFIC REQUIREMENTS

Functional Requirement



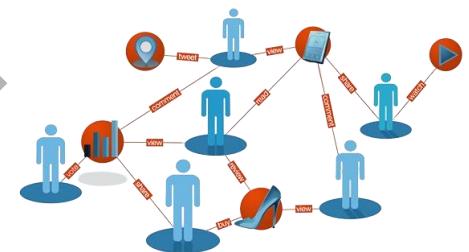
Identifying a child's behaviors through facial expressions



Adapting game difficulty based on performance



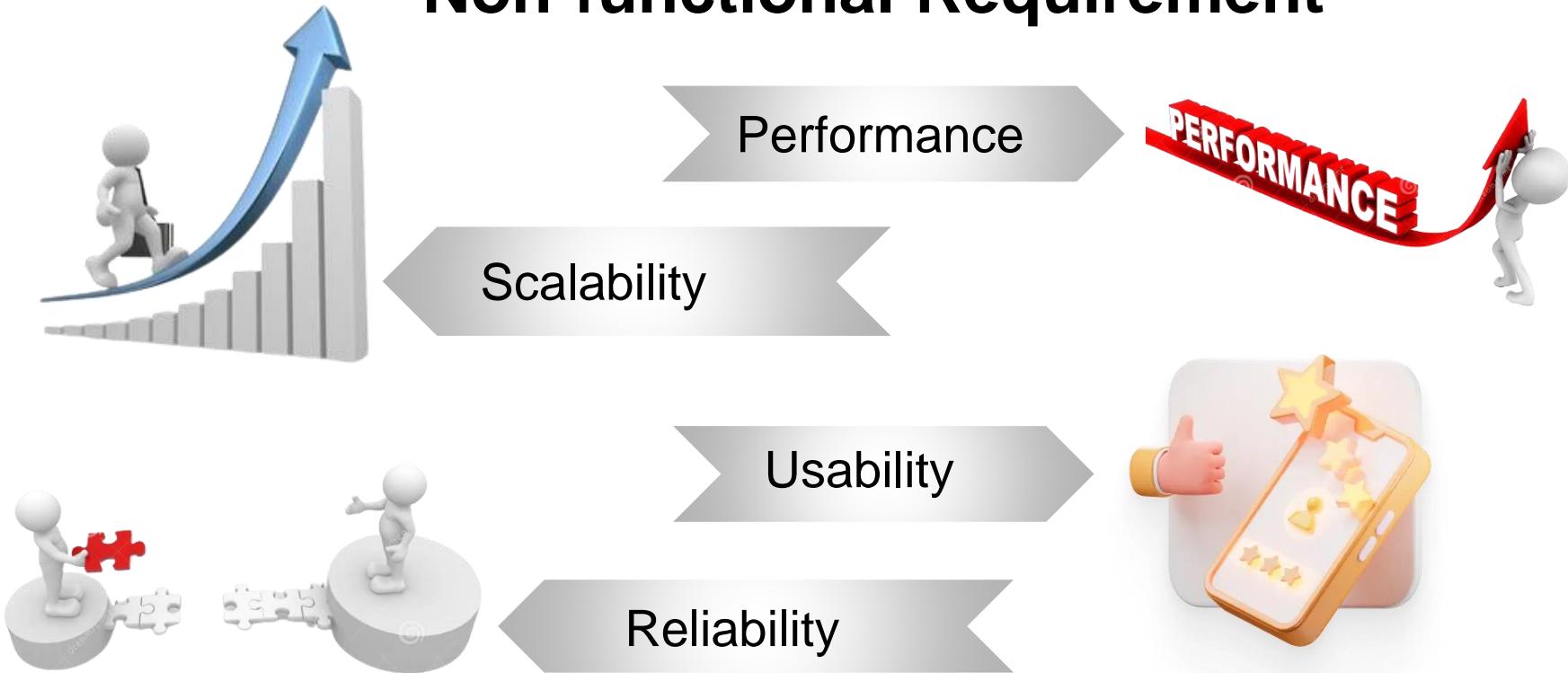
Image Preprocessing



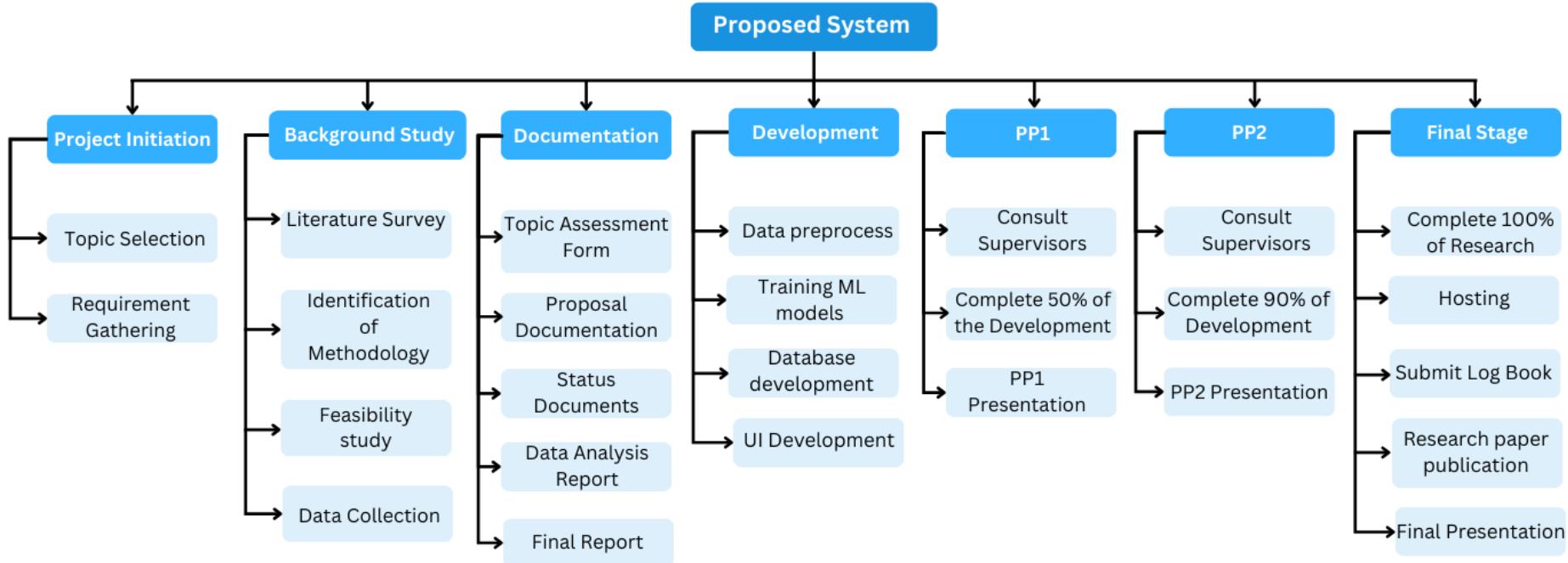
Personalized reward system

COMPONENT SPECIFIC REQUIREMENTS

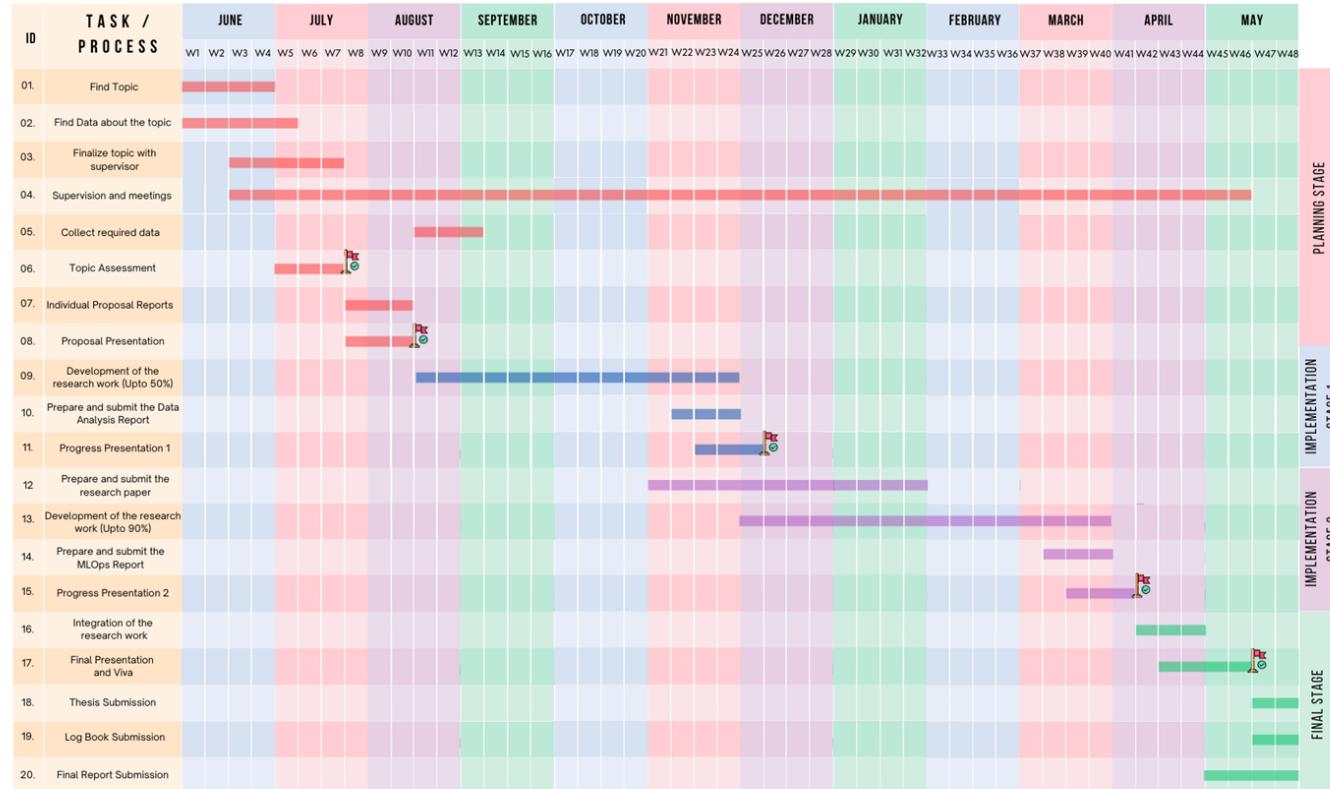
Non-functional Requirement



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>]
- [9]Andrade, Luis Javier Serpa, Roberto Agustin Garcia Velez, and Graciela Del Serpa Andrade. "Information and Communication Technologies Learning Methodologies for Children with Adhd." *AHFE 2022 Conference on Applied Human Factors and Ergonomics International*. 2022.
- [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



IT21379574 | Dilshani H.T.D.P.

Specialization: Information technology

INTRODUCTION

The system for children with hyperactive-impulsive ADHD offers personalized timetables and physical activities, empowering caregivers with tailored solutions for effective symptom management and improved impulse control.



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, including physical exercises and impulsivity level predictions, help children with hyperactive-impulsive ADHD improve impulse control and manage their energy effectively through tailored timetables?



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.

PROOF OF COMPLETION

ADHD Questionnaire Multi-Step Form

Step 1 of 6

Basic Details

Child ID
Name
Age
Gender
Select Gender
ADHD Subtype
Select Subtype

Next

ADHD Questionnaire Multi-Step Form

Step 2 of 6

A1 Questions

What do you do when you feel angry?
Take deep breaths

What do you do when you got stuck and need help with homework?
Ask a parent

How do you feel when someone ask about you?
Calm

Previous Next

Final Activity Details

Activity Duration (minutes)
15

Response Time (seconds)
790

Energy Level (1-10)
6

Pre-Activity Calmness (1-10)
8

Post-Activity Calmness (1-10)
5

Impulse Control Score (1-10)
9

Activity Effectiveness (1-10)
7

Previous Submit

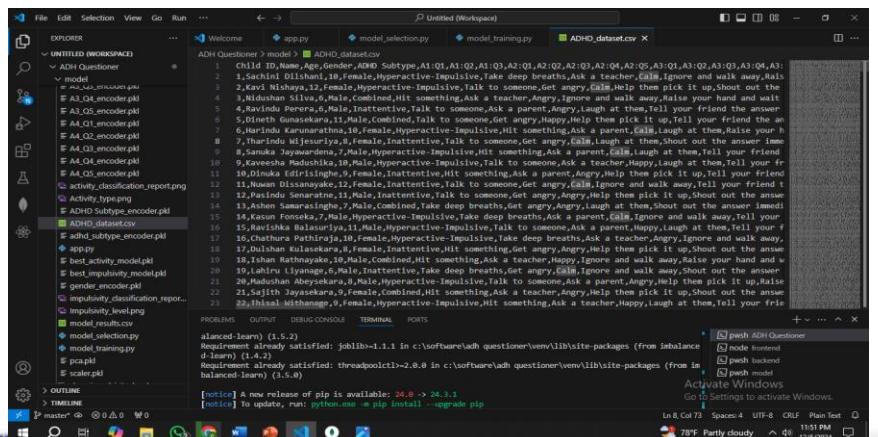
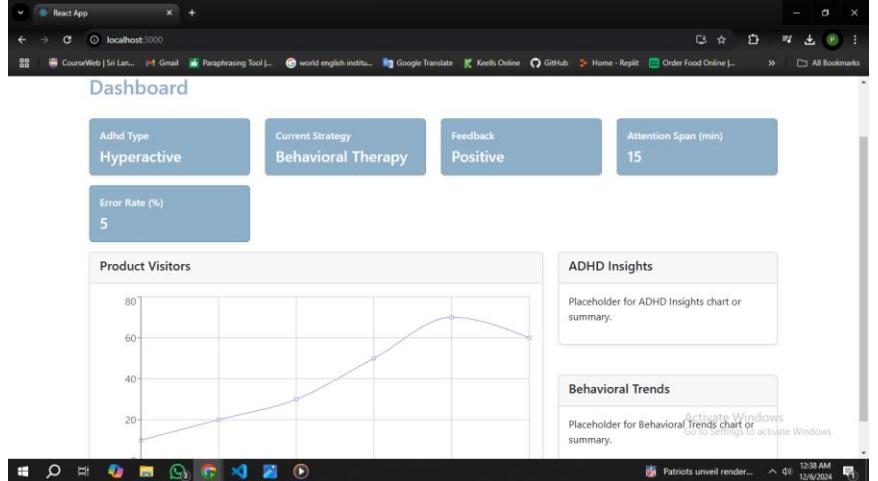
ADHD Questionnaire Multi-Step Form

Prediction Results

Recommended Activity Type: Math Puzzles

Impulsivity Level: High

Start Over



The screenshot shows a developer's workspace with the following details:

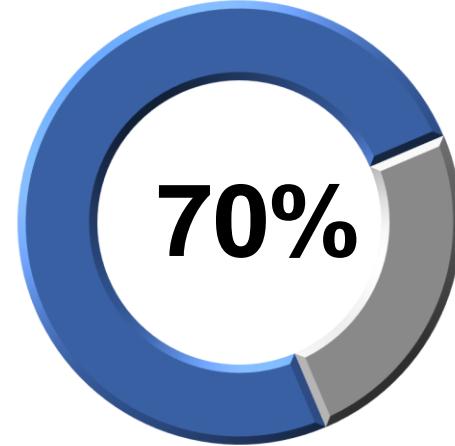
- EXPLORER**: A tree view of the project structure:
 - ADH Questioner
 - backend
 - config
 - controllers
 - models
 - routes
 - services
 - src
 - JS (1)
 - HTML (1)
 - JSON (1)
 - package-lock.json (1)
 - package.json (1)
 - server.js (1)
 - frontend
 - node_modules
 - public
 - src
 - ActivityForm.js (selected)
 - BasicDetailsForm.js
 - FinalDetailsForm.js
 - HomeDashboard.js
 - Index.js
 - Pages
 - Profile
 - Utils
 - utils
- ACTIVITYFORM.JS**: The selected file contains the following code:

```
1 import React from 'react';
2
3 const ActivityForm = ({ formData, updateFormData, section, questions }) => {
4   const handleChange = (e, key) => {
5     const updatedSectionData = [
6       ...formData[section] || []
7     ].map((item) => {
8       if (item.key === key) item.value = e.target.value;
9     });
10    updateFormData(section, updatedSectionData); // Update only the specific section
11  };
12
13  return (
14    <div className="container mt-4">
15      <h3>{section}</h3>
16      {questions.map((question, index) => (
17        <div className="mb-3" key={index}>
18          <label>{question.question}</label>
19          <select className="form-select" value={(formData[section] && formData[section][question.key]) || ""}>
20            <option value="" disabled>DEBUG value</option>
21          </select>
22        </div>
23      ))}
24    </div>
25  );
26}
27
28
```
- PROBLEMS**: Shows several warnings and errors related to Python and pip versions.
- OUTPUT**: Shows logs for the 'npm start' command.
- TERMINAL**: Shows a command to update pip.
- PORTS**: Shows open ports 3001 and 3002.
- STATUS BAR**: Shows the current branch as 'master', the file path as 'src/ActivityForm.js', and the status as 'Analyzing ActivityForm.js and its dependencies'.
- COMMAND PALETTES**: Shows recent commands like 'Install Python', 'Install Python (Python)', 'Install Python (Python)', 'Install Python (Python)', 'Install Python (Python)', and 'Install Python (Python)'.
- ACTIVATE WINDOWS**: Shows options to go to settings or activate windows.

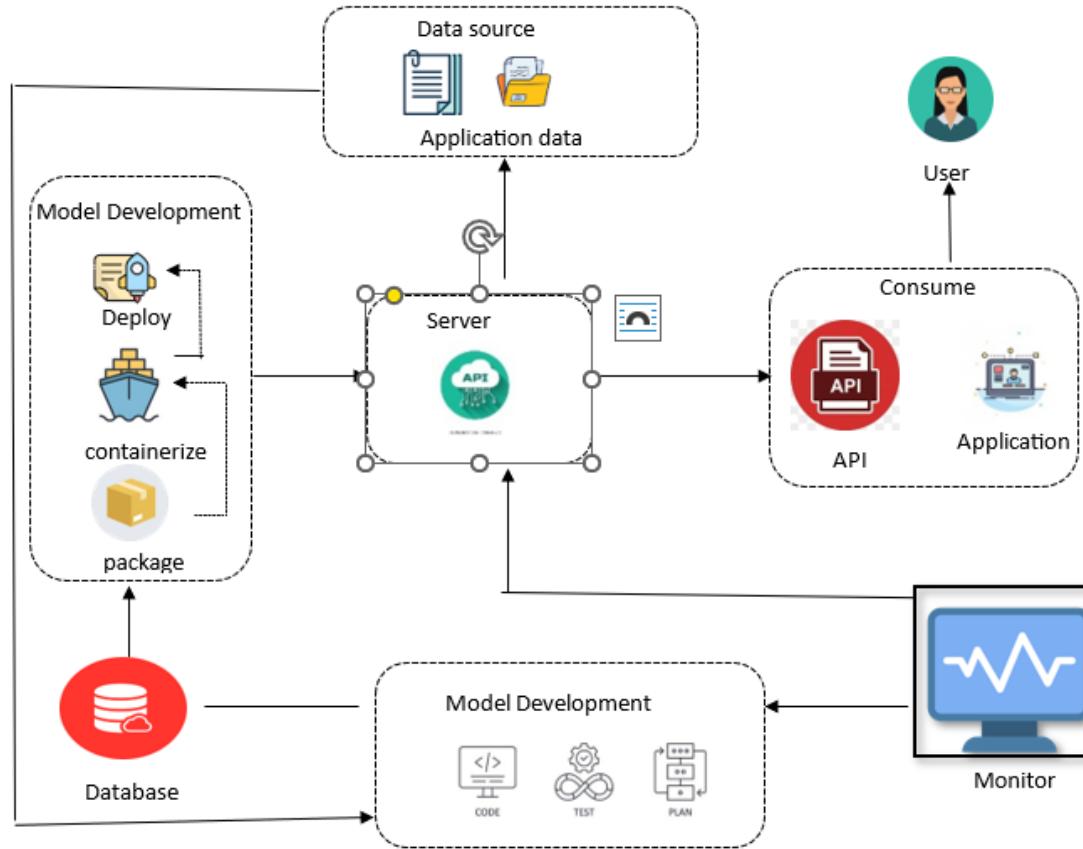
The screenshot shows a Jupyter Notebook interface with several open cells. The current cell contains Python code for model selection and training, specifically using SMOTE to handle class imbalance. The code includes imports for pandas, numpy, and various scikit-learn classifiers. It defines a SMOTE function and uses it to fit and transform both training and test datasets for different models: Logistic Regression, SVC, Random Forest Classifier, and MLPClassifier. The code is annotated with comments explaining the steps.

```
ADH Questioner > model > model_selection.py
33 y_impulsivity = y_impulsivity_encoder.fit_transform(y_impulsivity)
34
35 # Scale numerical features
36 scaler = StandardScaler()
37 X_scaled = scaler.fit_transform(X)
38
39 # Split data into train and test sets
40 X_train, X_test, y_activity_train, y_activity_test, y_impulsivity_train, y_impulsivity_test = train_test_split(
41 X_scaled, y_activity, y_impulsivity, test_size=0.2, random_state=42)
42
43
44 # Address Class imbalance with SMOTE
45 smote = SMOTE(random_state=42)
46 X_train_activity, y_train_activity = smote.fit_resample(X_train, y_activity_train)
47 X_train_imbalance, y_train_imbalance = smote.fit_resample(X_train, y_impulsivity_train)
48
49 # Define models
50 models = [
51     "Logistic Regression": LogisticRegression(max_iter=5000),
52     "SVC": SVC(probability=True),
53     "Random Forest": RandomForestClassifier(),
54     "Neural Network": MLPClassifier(max_iter=5000)
55 ]
```

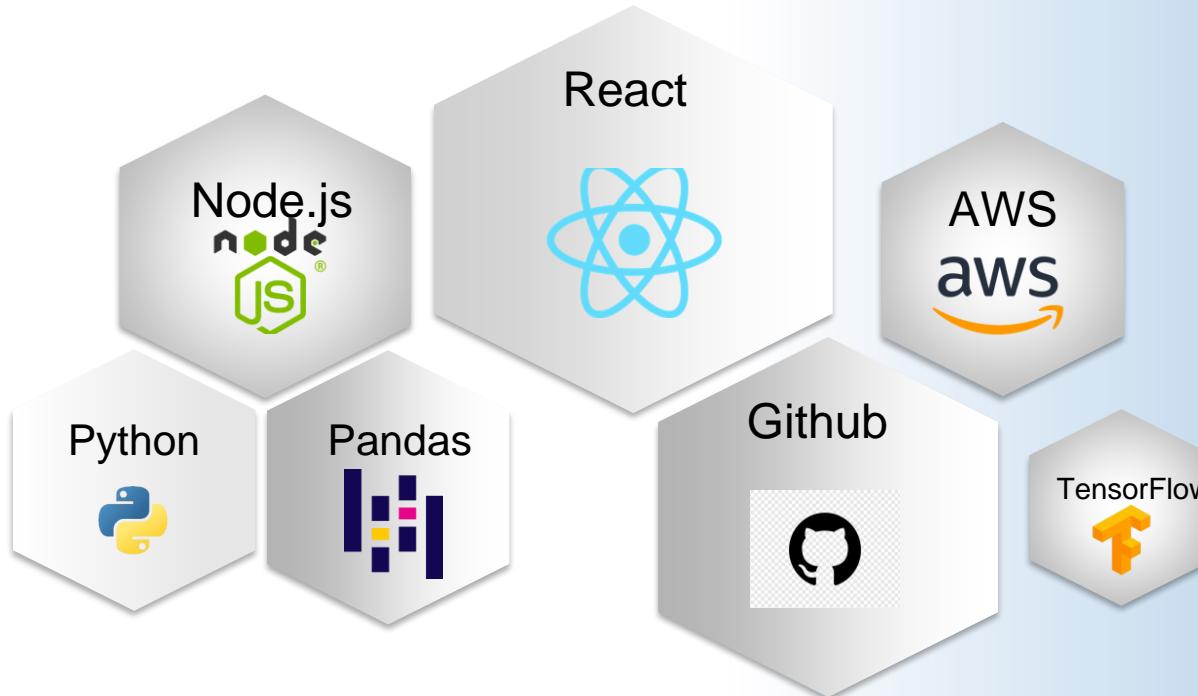
- Implement frontend and backend
- Collect data and generate dataset
- Train a model to identify children's impulsivity level
- Implement the recommended physical activities
- Implement the user-friendly dashboard
- Improve the model and make customized time tables



SYSTEM DIAGRAM



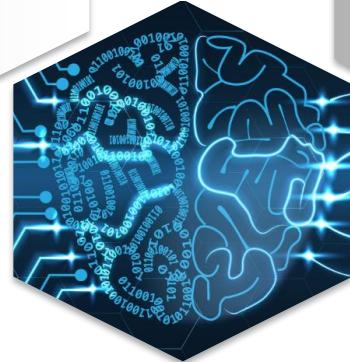
TECHNOLOGIES



KEY PILLARS

Machine
learning

Cloud
computing



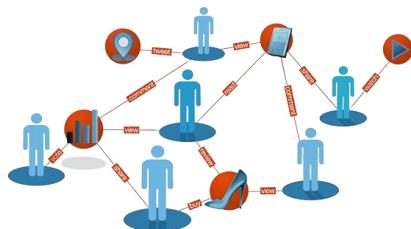
COMPONENT SPECIFIC REQUIREMENTS

Functional Requirement

Customizable Timetables



Activity Integration

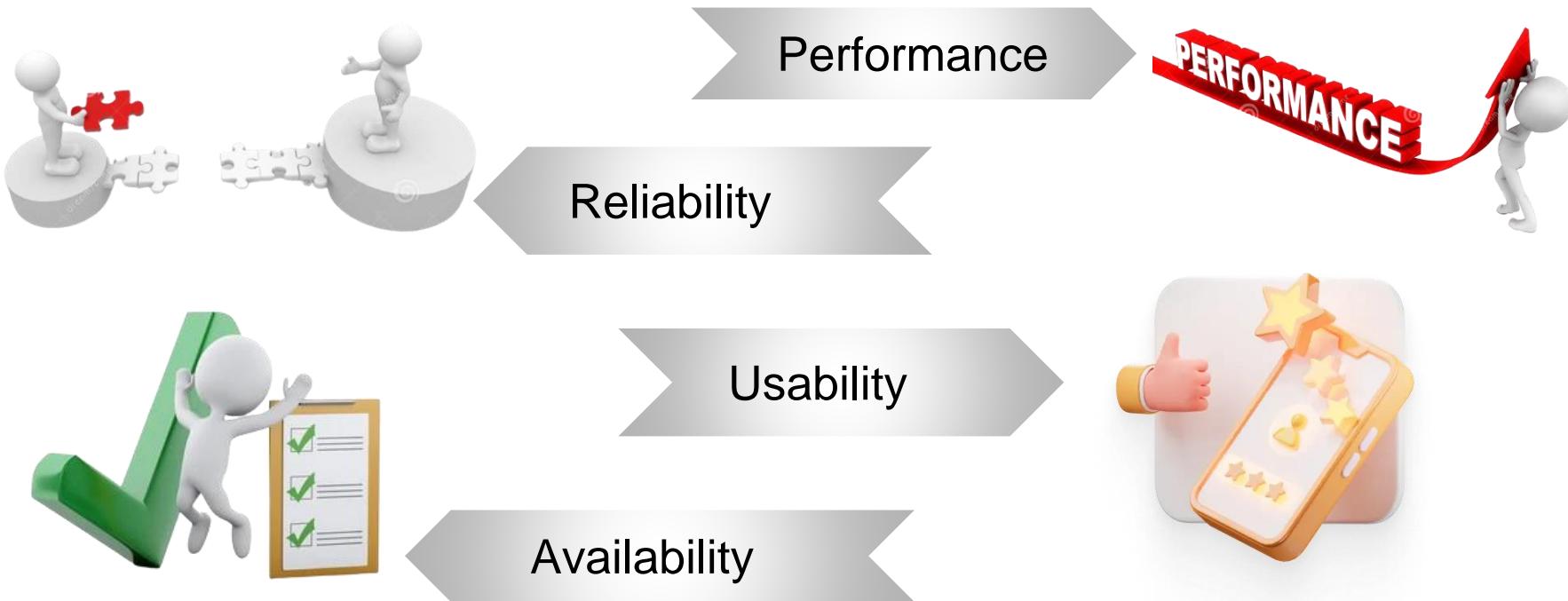


Tracking and Feedback

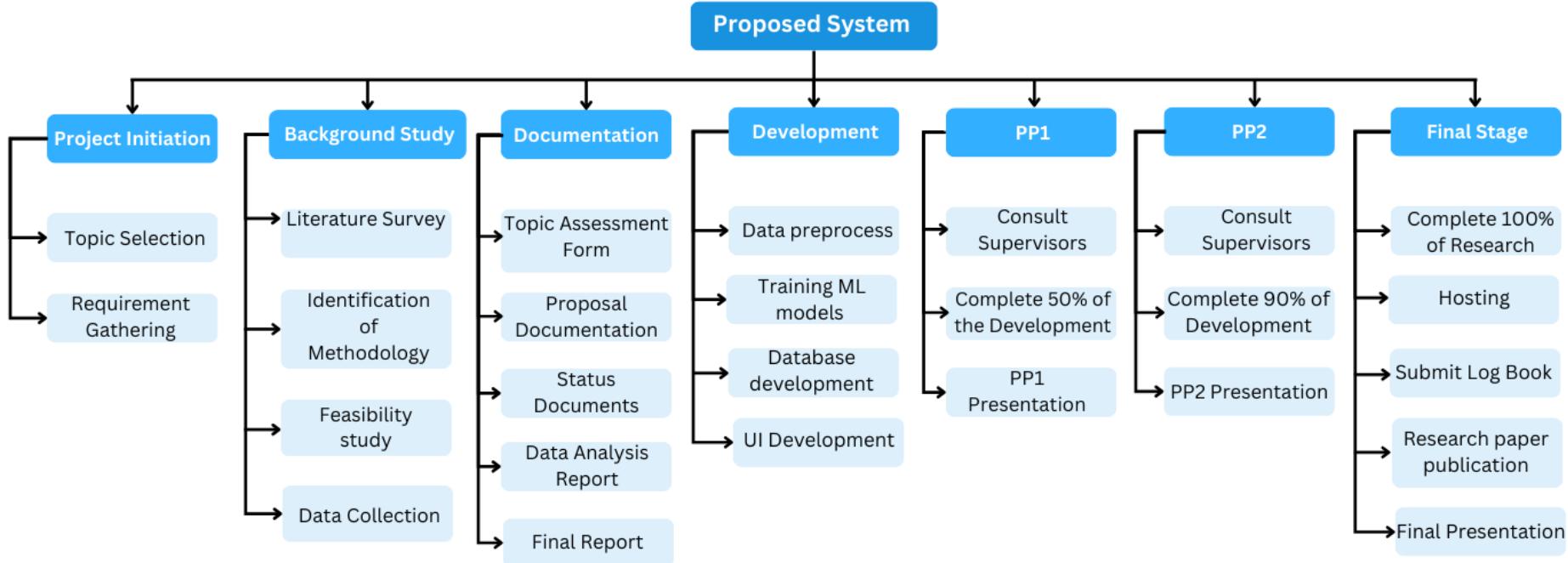
Notifications and Reminders

COMPONENT SPECIFIC REQUIREMENTS

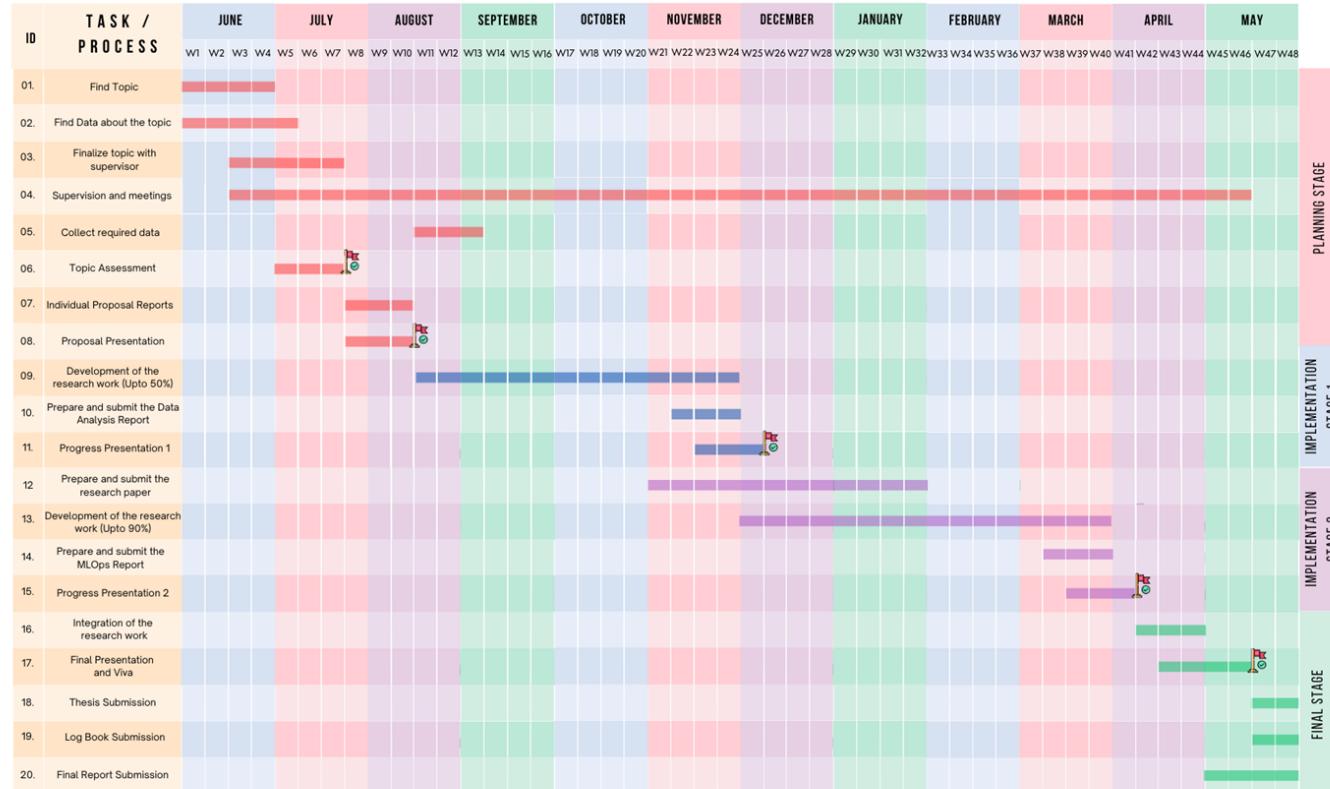
Non-functional Requirement



WORK BREAKDOWN CHART



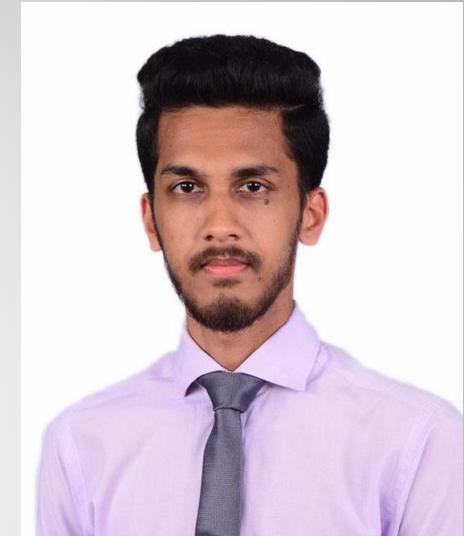
GANNT CHART



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].
- [12]<https://www.researchgate.net/publication/354311415>
Characterizing neuroanatomic heterogeneity in people with and without ADHD based on subcortical brain volumes
- [13]S. K. Beura, A. R. Panigrahi, and P. Yadav, "Development and Standardization of an Impulse Control Scale for Adolescents," *Published Online*, Jun. 12, 2019. Available: <https://www.researchgate.net/publication/360385680>

AI-Driven Adaptive Learning and Intervention System with future predictions for Personalized ADHD Management in Children



IT21380532 | Halliyadda H.U.M.S.

Specialization: Information technology

INTRODUCTION

The research aims to develop an intelligent system for data analysis, pattern recognition, **future challenge prediction** and **prevention mechanisms prediction** that dynamically adapts intervention strategies based on a child's interactions to provide personalized and effective support over time.



What we can predict?

- Progress in academic or learning tasks - **Academic Struggles**
- Attention span and focus duration - **Increased risk of anxiety**
- Impulsivity levels during tasks - **Increased or decreased impulsivity**
- Social interaction patterns and responses - **Social Challenges**



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 caregivers 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.

PROOF OF COMPLETION

localhost:3000

ADHD Assessment App

Dashboard

Welcome Back!

Dashboard

Form

80 x 80

Adhd Type
Type: Hyperactive
Description: Most common in children under 12

Quiz
Name: Attention Control Test
Score: 85/100

Suggested Activity
Activity: Logic Puzzles
Benefit: Enhances problem-solving skills

Points
Total Points: 1200
Earned From: Completed activities

Goal Overview

Completed (Green) In Progress (Yellow)



Progress

This Month (Blue Line)

Last Month (Grey Line)



Date	This Month	Last Month
01	45	44
05	46	45
09	47	46
13	48	46.5
17	47	44.5
21	49	47.5
26	50	48
28	50	48

localhost:3000/form

ADHD Assessment App

ADHD Assessment Form

Child ID

Name

Age

Gender
 Select Gender

ADHD Subtype
 Select ADHD Subtype

Attention Span (min)

Home Form

localhost:3000/results

ADHD Assessment App

Prediction Results

Future Challenge: Reduced attention span during tasks

Prevention Mechanism: Social skills training

Start Over

The screenshot shows a Jupyter Notebook interface with the following details:

- File Bar:** File, Edit, Selection, View, Go, Run, ...
- Title Bar:** ADH Challenge
- Left Sidebar (EXPLORER):** Shows the project structure:
 - ADH CHALLENGE
 - frontend
 - src
 - setupTests.js
 - .gitignore
 - package-lock.json
 - package.json
 - README.md
 - model
 - Academic_Grade_encoder.pkl
 - ADHD_subtype_encoder.pkl
 - adhd_children_dataset.csv
 - appy.py
 - best_future_challenge_model.pkl
 - best_logistic_regression.model.pkl
 - best_prevention_mechanism.model...
 - challenge_encoder.pkl
 - Current_Strategy_encoder.pkl
 - Figure_1.png
 - Gender_encoder.pkl
 - model_selection.py
 - model_creation.py
 - prevention_encoder.pkl
 - scaler.pkl
 - shape_future_challenge.png
 - Teacher_Feedback_encoder.pkl
 - OUTLINE
 - TIMELINE
- Code Cell:** Displays Python code for initializing a Flask application and loading pre-trained models.

```
from flask import Flask, request, jsonify
from joblib import load
import numpy as np

app = Flask(__name__)

# Load pre-trained models and scaler
future_challenge_model = load("best_future_challenge_model.pkl")
prevention_mechanism_model = load("best_prevention_mechanism_model.pkl")
scaler = load("scaler.pkl")

# Load encoders for categorical features and target variables
gender_encoder = load("Gender_encoder.pkl")
adhd_subtype_encoder = load("ADHD_subtype_encoder.pkl")
current_strategy_encoder = load("Current_Strategy_encoder.pkl")
teacher_feedback_encoder = load("Teacher_Feedback_encoder.pkl")
academic_grade_encoder = load("Academic_Grade_encoder.pkl")
challenge_encoder = load("challenge_encoder.pkl")
innovation_encoder = load("innovation_encoder.pkl")
```
- Output Cell:** Shows the results of running the code cell, including MongoDB connection logs and POST requests to the /api/predict endpoint.

```
(Use "node --trace-warnings ..." to show where the warning was created)
(node:15880) [MONGODB DRIVER] Warning: useUnifiedTopology is a deprecated option: useUnifiedTopology has no effect since Node.js
(node:15880) [MONGODB DRIVER] Warning: useUnifiedTopology is a deprecated option: useUnifiedTopology has no effect since Node.js
Driver version 4.0.0 and will be removed in the next major version
Server running on http://localhost:5881
MongoDB connected...
POST /api/predict 200 1788.478 ms - 170
POST /api/predict 200 38.227 ms - 185
MongoDB connected...
POST /api/predict 200 1788.478 ms - 170
POST /api/predict 200 38.227 ms - 185
POST /api/predict 200 1788.478 ms - 170
POST /api/predict 200 38.227 ms - 185
```

The screenshot shows a Jupyter Notebook environment with several open files:

- `model_selection.py`:

```
import pandas as pd
from sklearn.model_selection import train_test_split, cross_val_score
from sklearn.ensemble import RandomForestClassifier
from sklearn.preprocessing import LabelEncoder, StandardScaler
from sklearn.neural_network import MLPClassifier
from sklearn.pipeline import make_pipeline
from sklearn.svm import SVC
import numpy as np

# Load the dataset
file_path = "ahhd_children_dataset.csv" # Update the path as needed
dataset = pd.read_csv(file_path)

# Drop unnecessary columns
data = dataset.drop(columns=['Child id', 'Name'])

# Separate features (X) and targets (y)
X = data.drop(columns=['Future Challenge', 'Prevention Mechanism'])
y_challenge = data['Future Challenge']

# Encode categorical features and targets
categorical_columns = X.select_dtypes(include='object').columns
```
- `model_creation.py`:

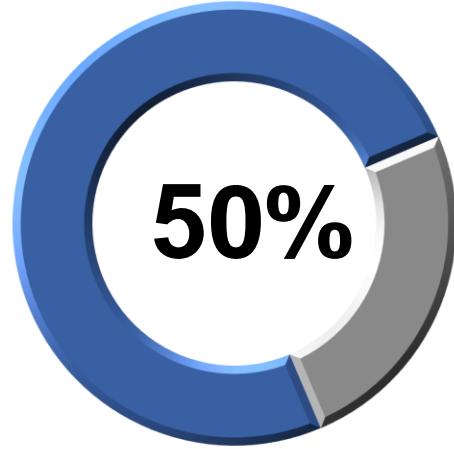
```
POST /api/predict 208 1708.478 ms - 170
POST /api/predict 208 36.227 ms - 365
```
- `model_selection.ipynb`:

```
Backend API endpoint: http://localhost:5000
```
- `model_creation.ipynb`:

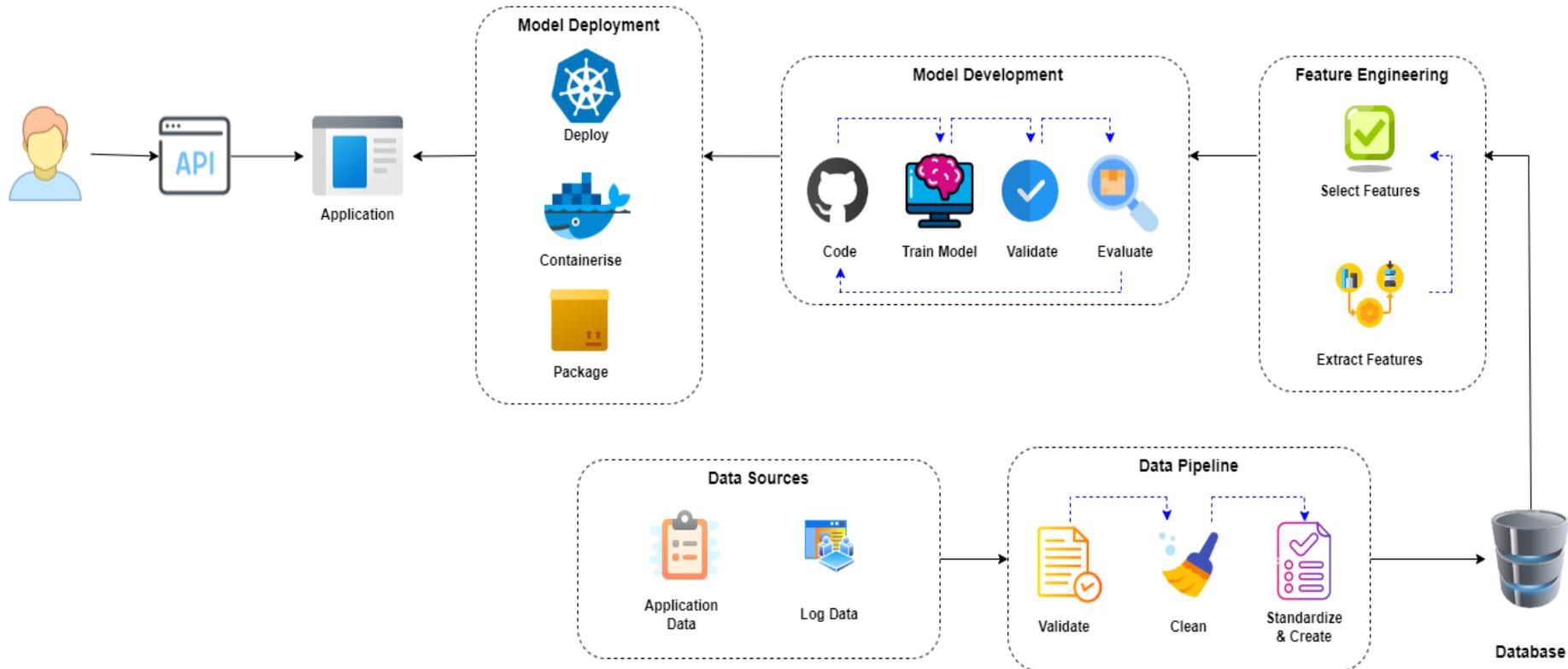
```
Backend API endpoint: http://localhost:5000
```
- `app.py`:

```
Backend API endpoint: http://localhost:5000
```

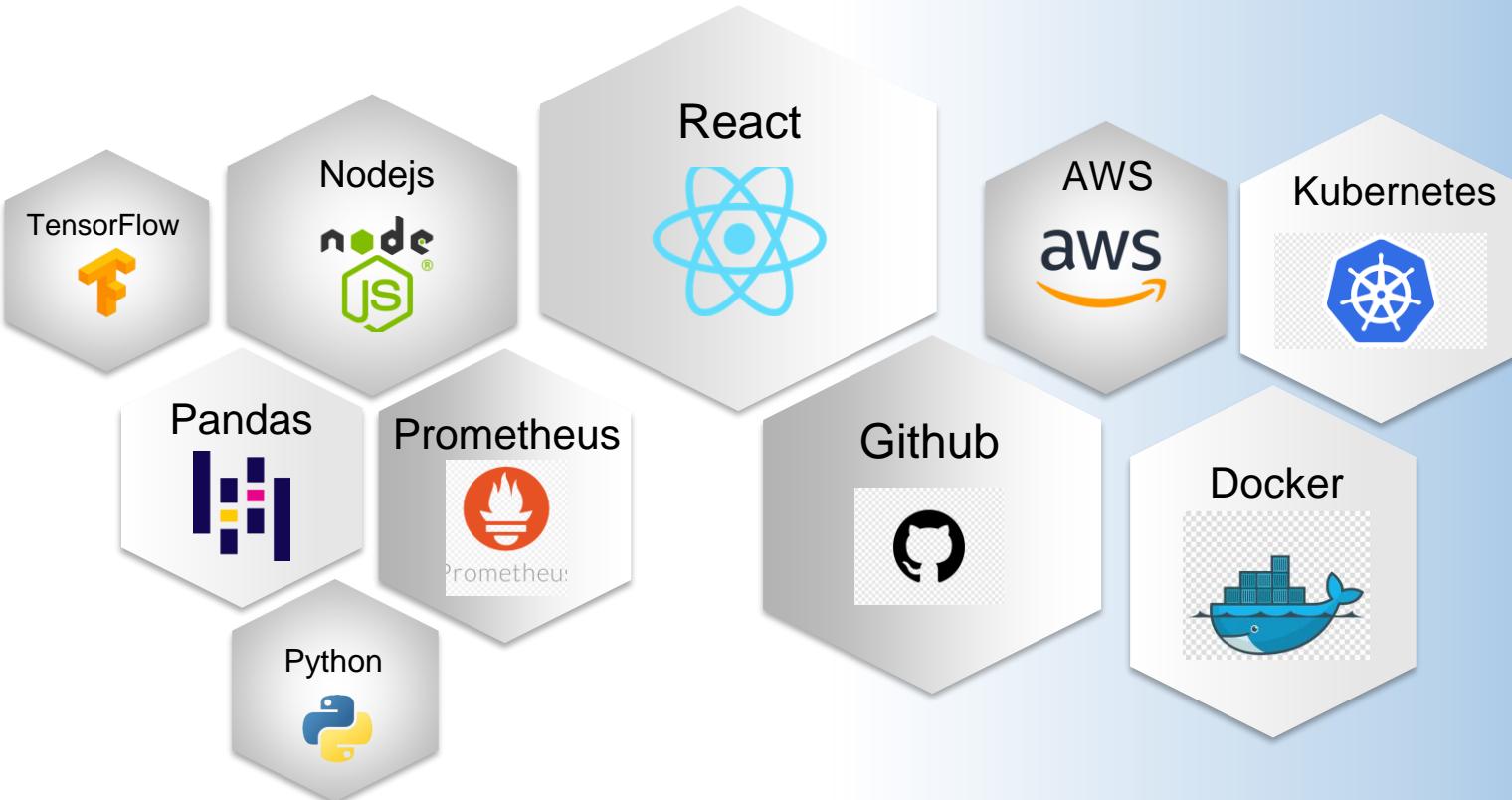
- Implement frontend and backend
- Collect and generate dataset
- Train a future predictive machine learning model
- Implement user-friendly dashboard for monitoring
- Implement user-friendly dashboard for monitoring
- Validate and improve model
- Integrate dashboard with components to monitoring



SYSTEM DIAGRAM



TECHNOLOGIES



KEY PILLARS

Cloud
Computing



Adaptive
Monitoring

Machine
Learning

COMPONENT SPECIFIC REQUIREMENTS

Functional Requirement



Data collection and feature engineering

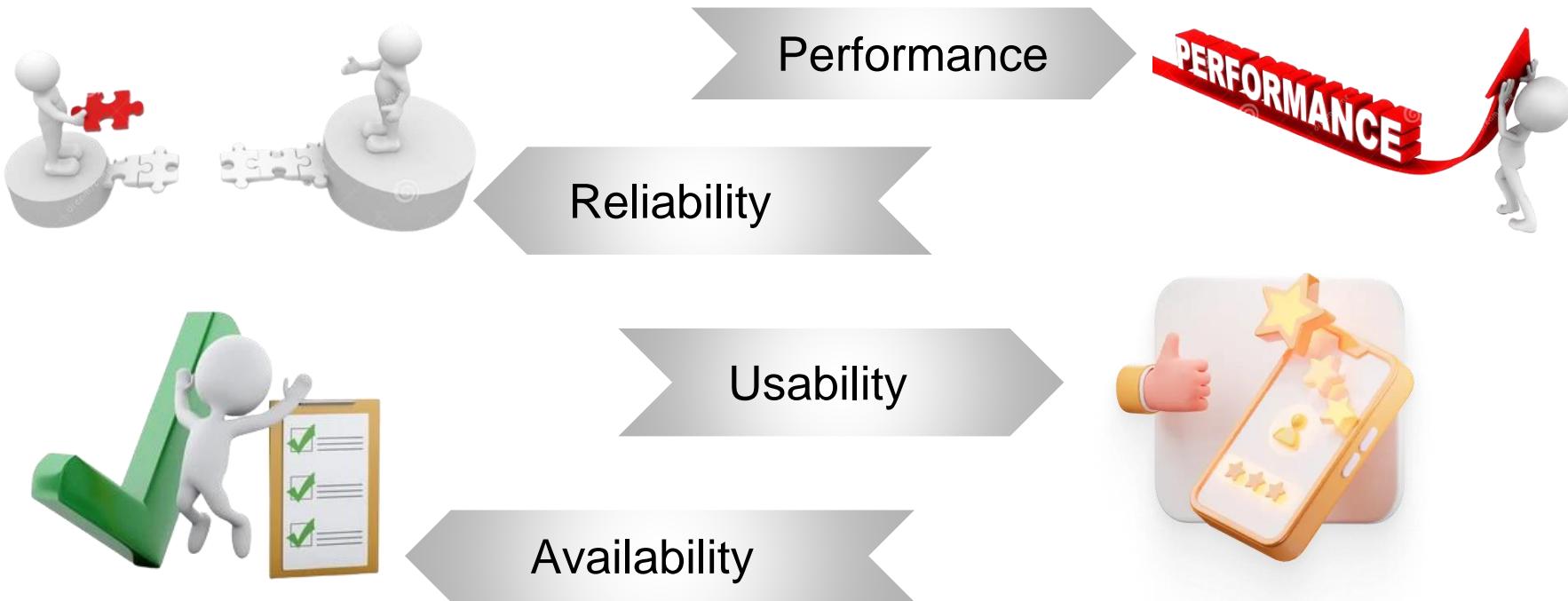
User-friendly Dashboard

Future Predictions and Risk Identification

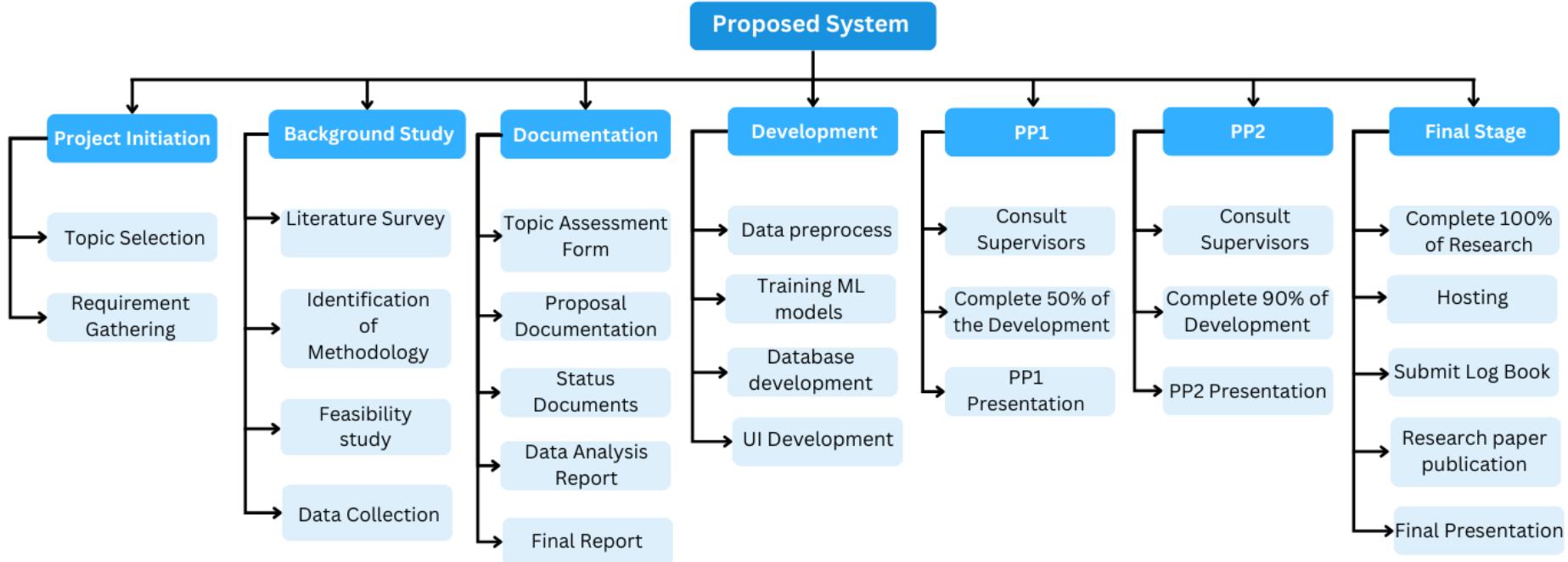
Personalized Feedback and Alerts

COMPONENT SPECIFIC REQUIREMENTS

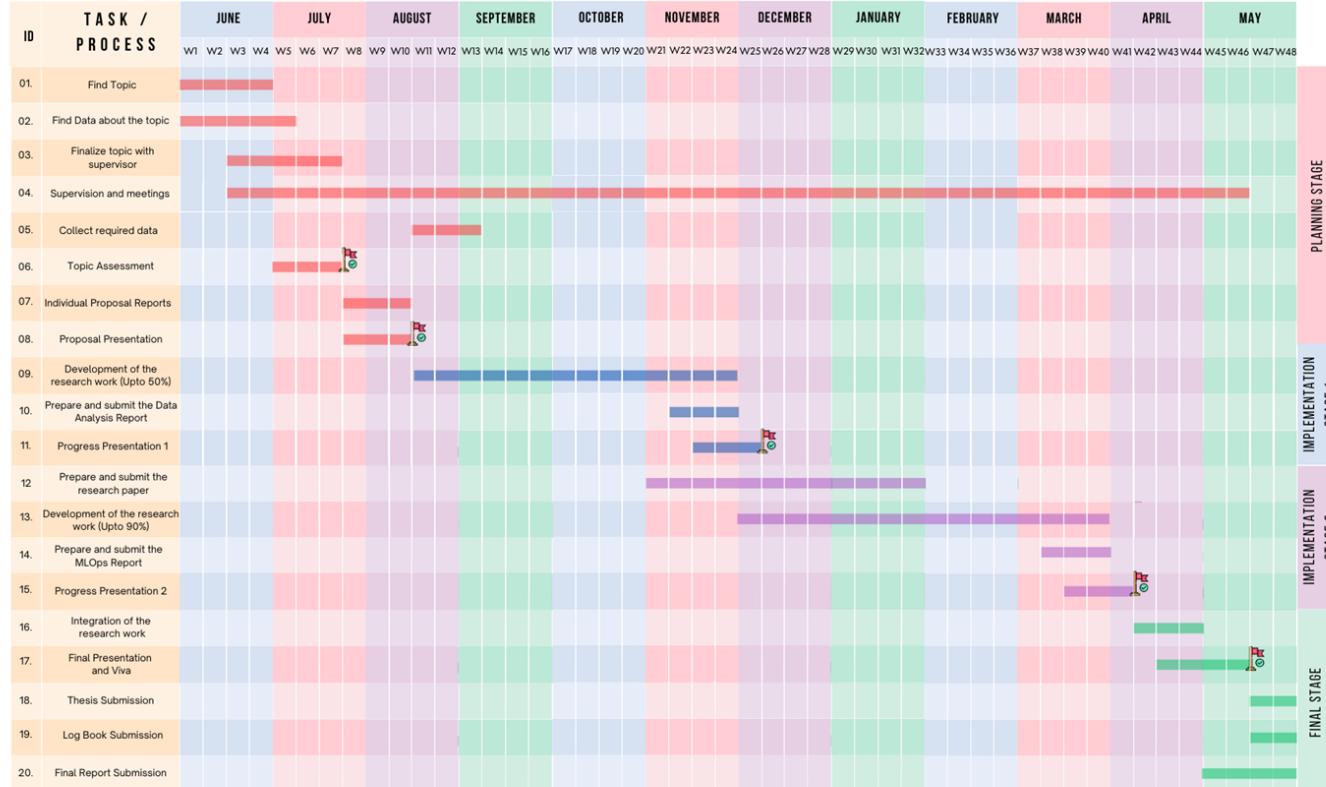
Non-functional Requirement



WORK BREAKDOWN CHART



GANNT CHART



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THANK YOU
