

# Autonomous Dyslexia Evaluation System



**CPG 283**

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# Background of Project

- Dyslexia is a learning disorder where a person faces difficulty in reading, writing and with fluency skills.
- Dyslexia may occur because of genetic heredity or due to differences in different parts of brain.
- Statistics show that one in ten people around the world suffers from dyslexia.
- Our Project is solving the problem by evaluating the dyslexic subject on all parameters which are required to be tested and keeping the track records.

# Scope and Utility of Project

- We offer a personalized remote-based solution that helps to monitor the progress of dyslexic subjects.
- It can be used as a learning tool in special education schools for slow learners.
- We can track the treatment progress of the dyslexic subject through graphical visualizations.
- Registered users will have access to all tests and their previous track records.
- System consists of all types of tests which are required to test dyslexic subject on basis of reading, writing and fluency skills.

# Objectives

- Automate the process of a Dyslexia evaluation.
- Conduct tests for Dyslexia evaluation which includes :
  1. Spelling orientation test
  2. Pronunciation test
  3. Object classification-based spelling orientation test
  4. Color recognition-based fluency test
- Increase efficiency of dyslexia evaluation process and track progress.
- Provide personalized, remote-based solution for evaluating dyslexia.

# Literature Survey

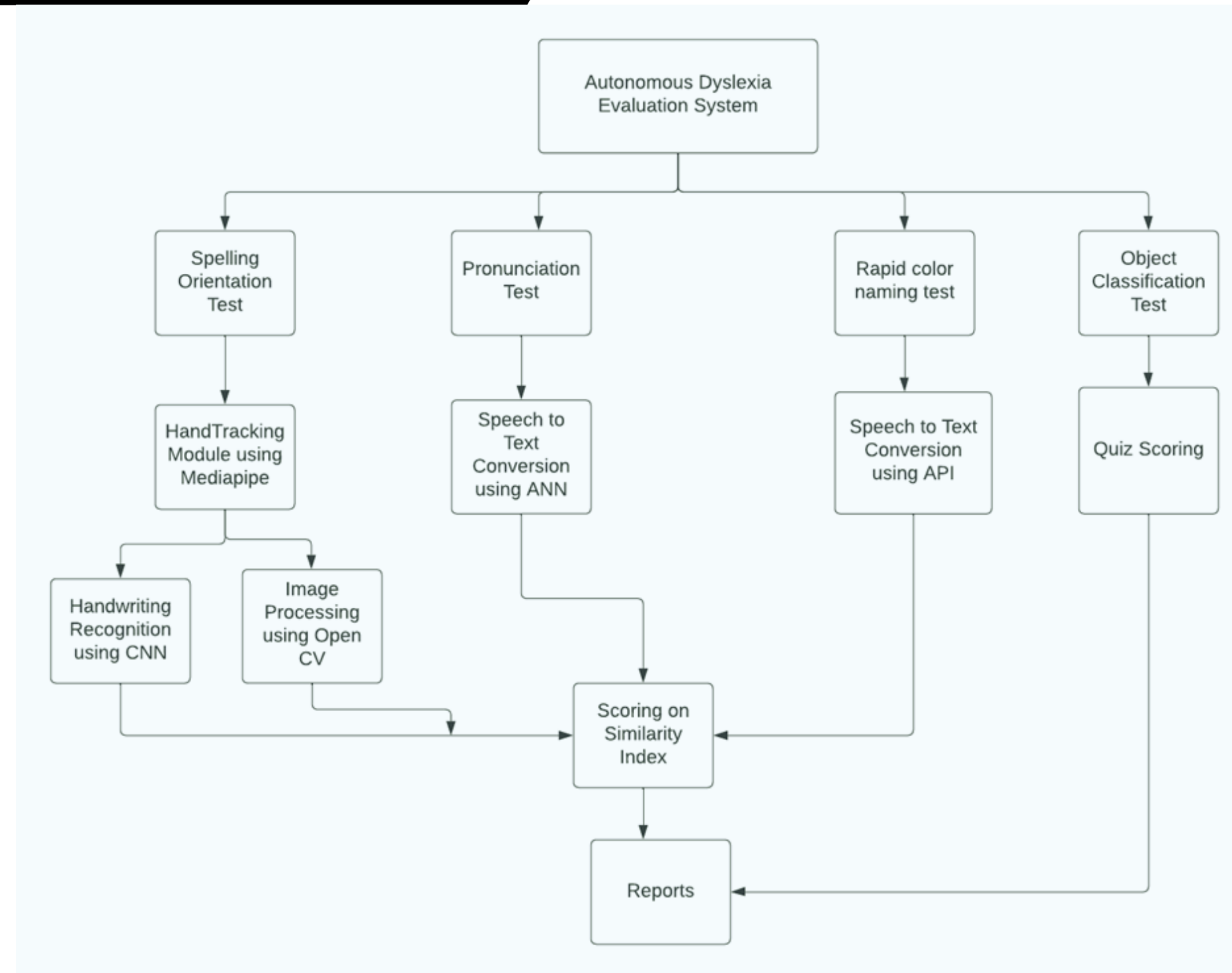
- Dyslexia is a learning disorder that affects reading, writing, and speaking skills.
- It is estimated that dyslexia affects about 10% of the population worldwide.
- Some studies have suggested that the prevalence of dyslexia may be as high as 20% in some countries.
- Handwriting recognition is the process of using artificial intelligence to convert handwritten text to digital format.

# Literature Survey

- Speech recognition is the process of using artificial intelligence to convert speech to text.
- Deep learning is a type of machine learning that uses artificial neural networks inspired by the human brain.
- Computer vision is a scientific field that involves using computers to understand and interpret digital images or videos.



# Architecture of the Project



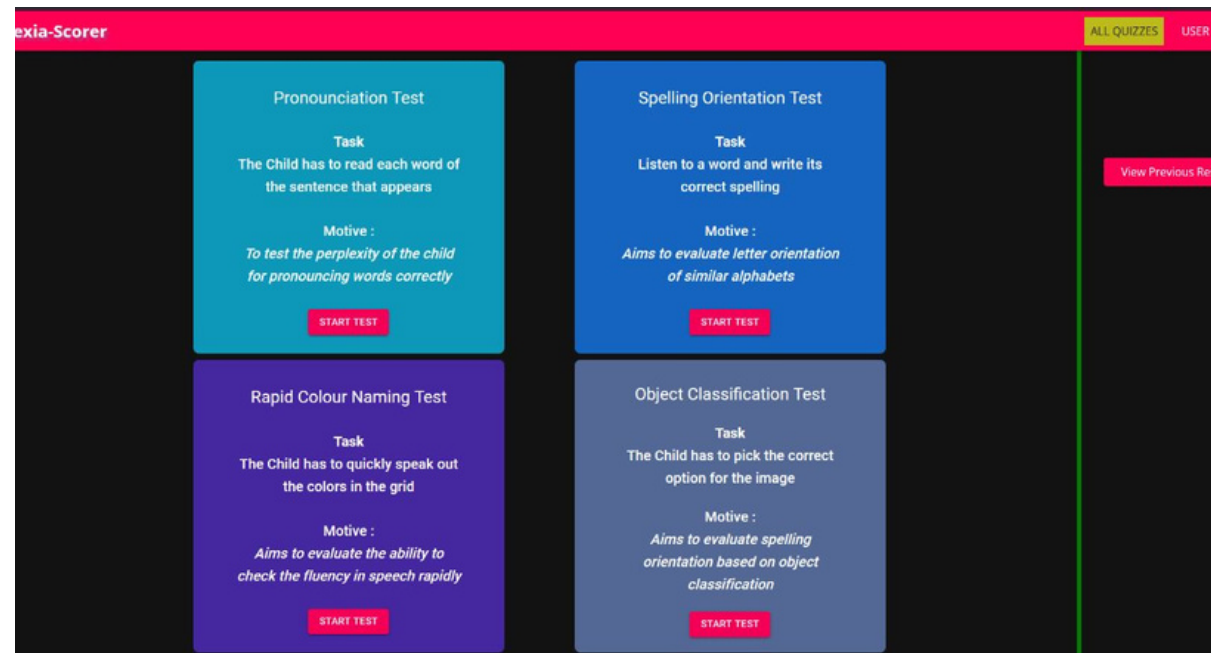
Architecture of the Dyslexia Evaluation System



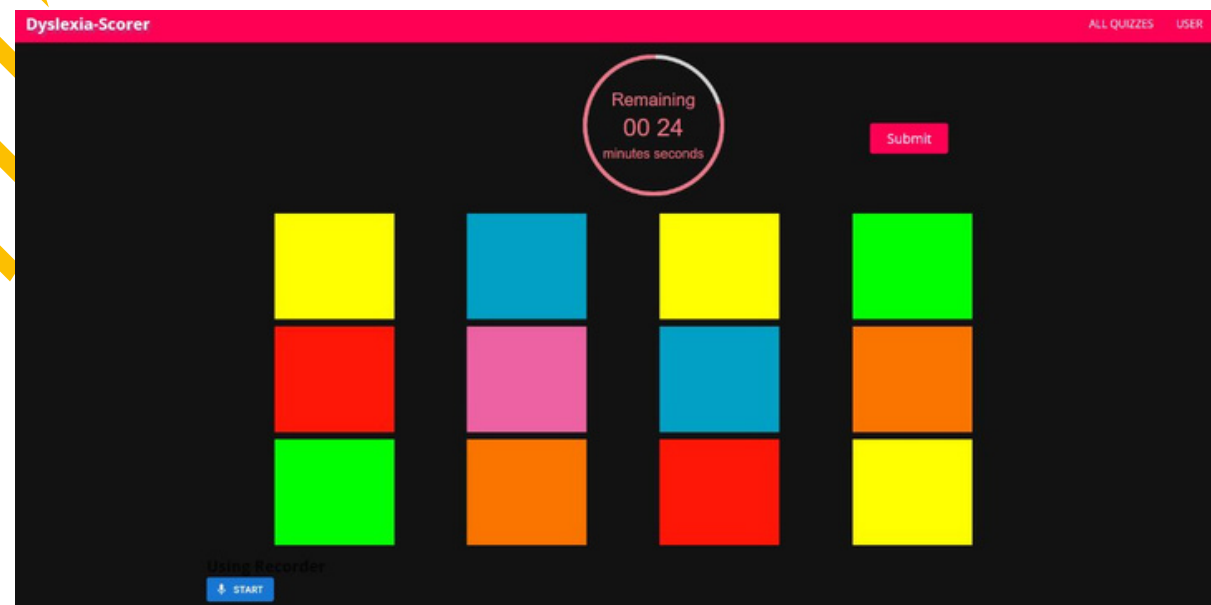
# Techniques and Tools used

- Programming Languages: Python, JavaScript
- Python Packages: OpenCV, Tensorflow, Mediapipe, Librosa Library
- Frontend Frameworks: React JS, Material UI Library
- Backend Frameworks: Django, Django REST Framework, Flask
- IDE : Visual Studio Code , PyCharm
- UML Tools: LucidChart
- Version Control: Git, GitHub
- Cloud Tools and Services : Google Collab, Azure

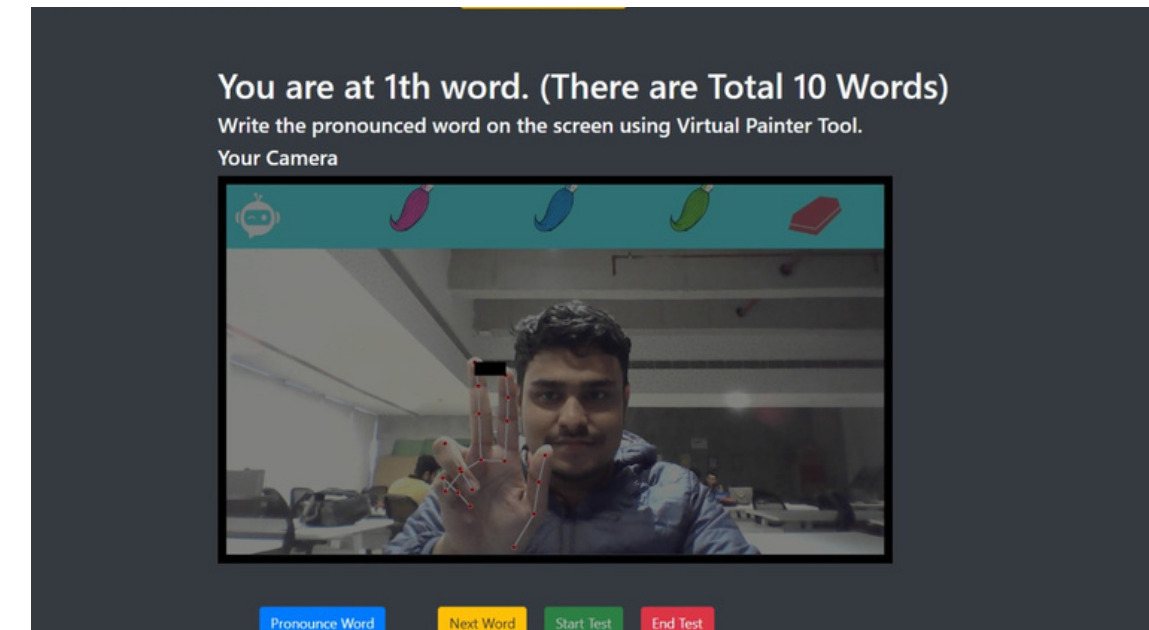
# Snapshots of Project



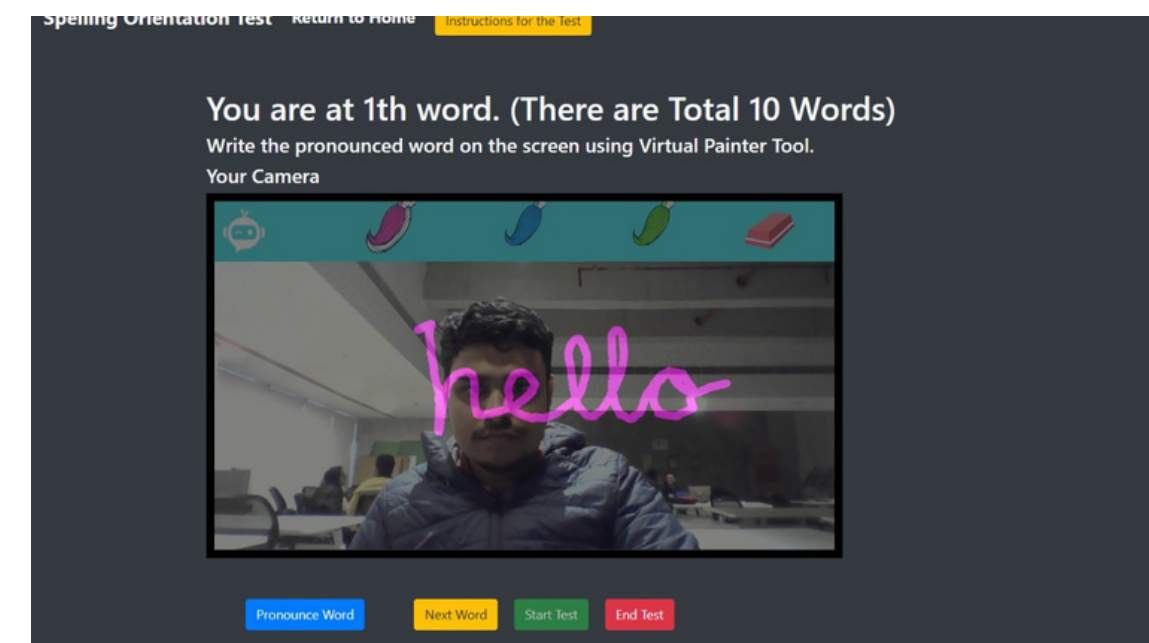
Home Screen of Evaluation System



Rapid Color Naming Test

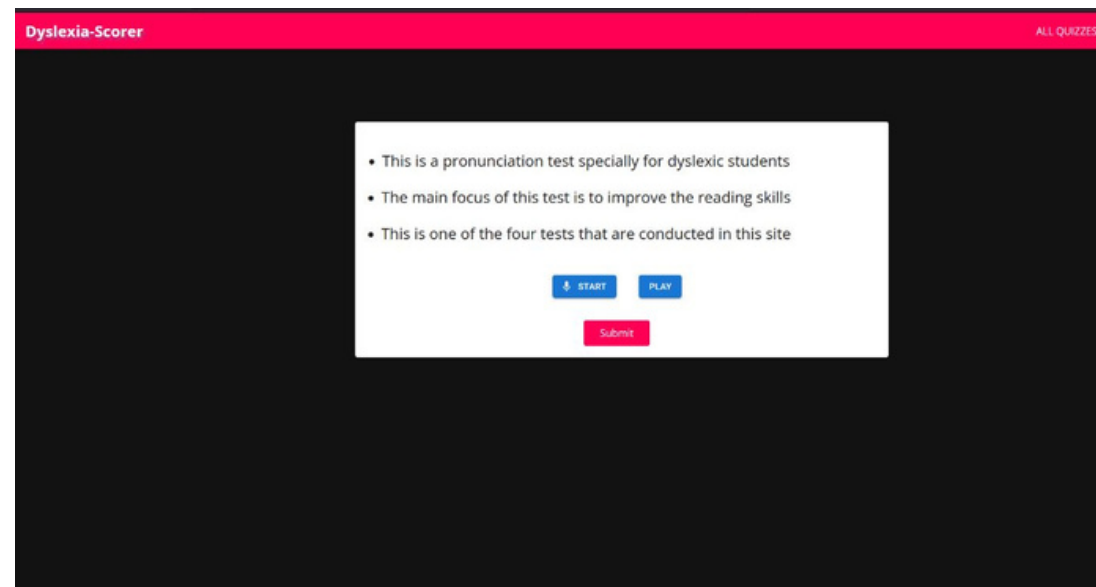


Spelling Orientation Test

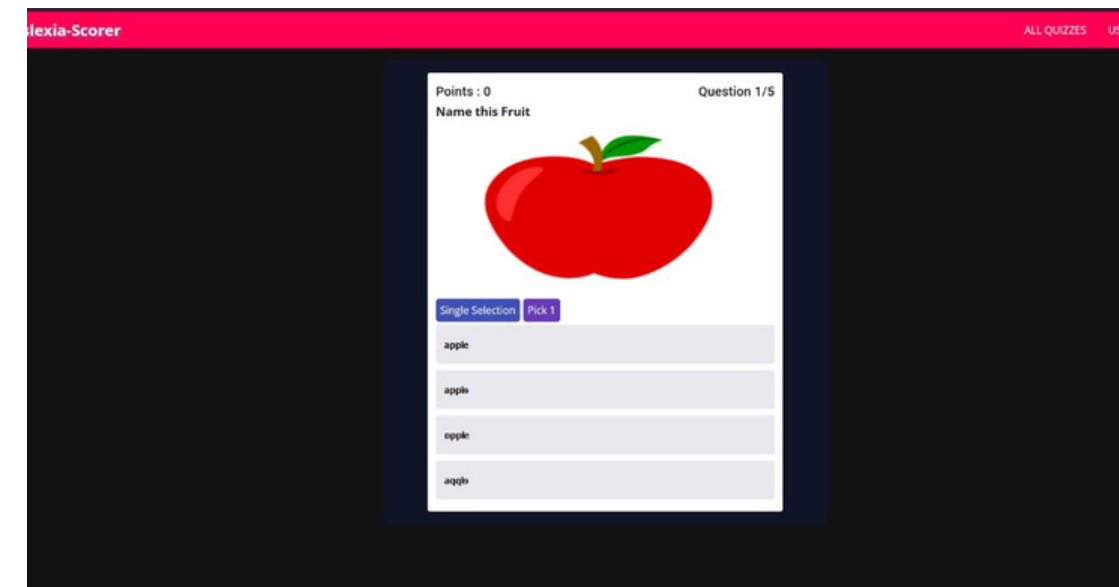


Spelling Orientation Test

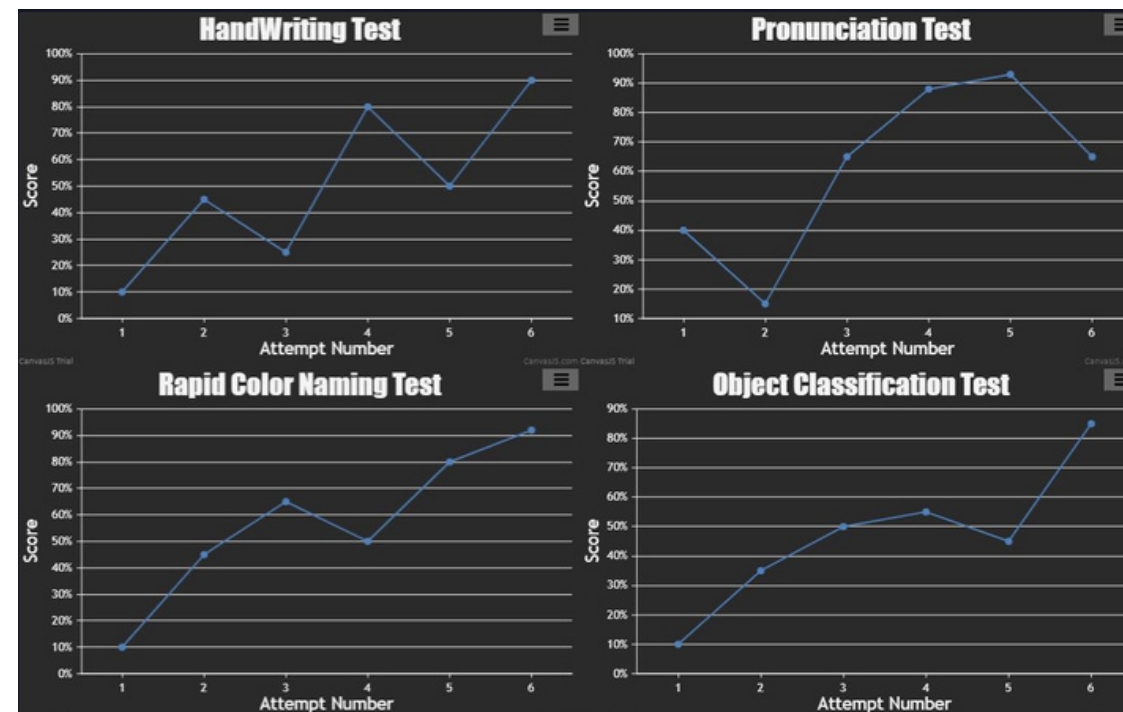
# Snapshots of Project



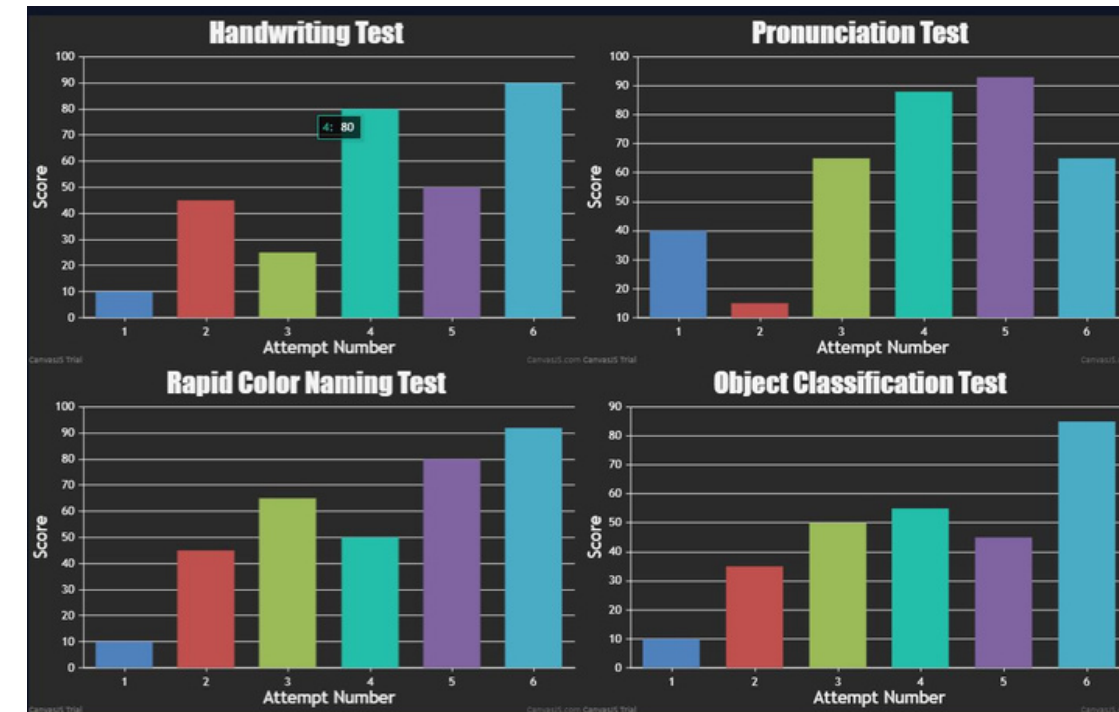
Pronunciation Test



Object Classification Test



Results Outcomes (Line Chart)

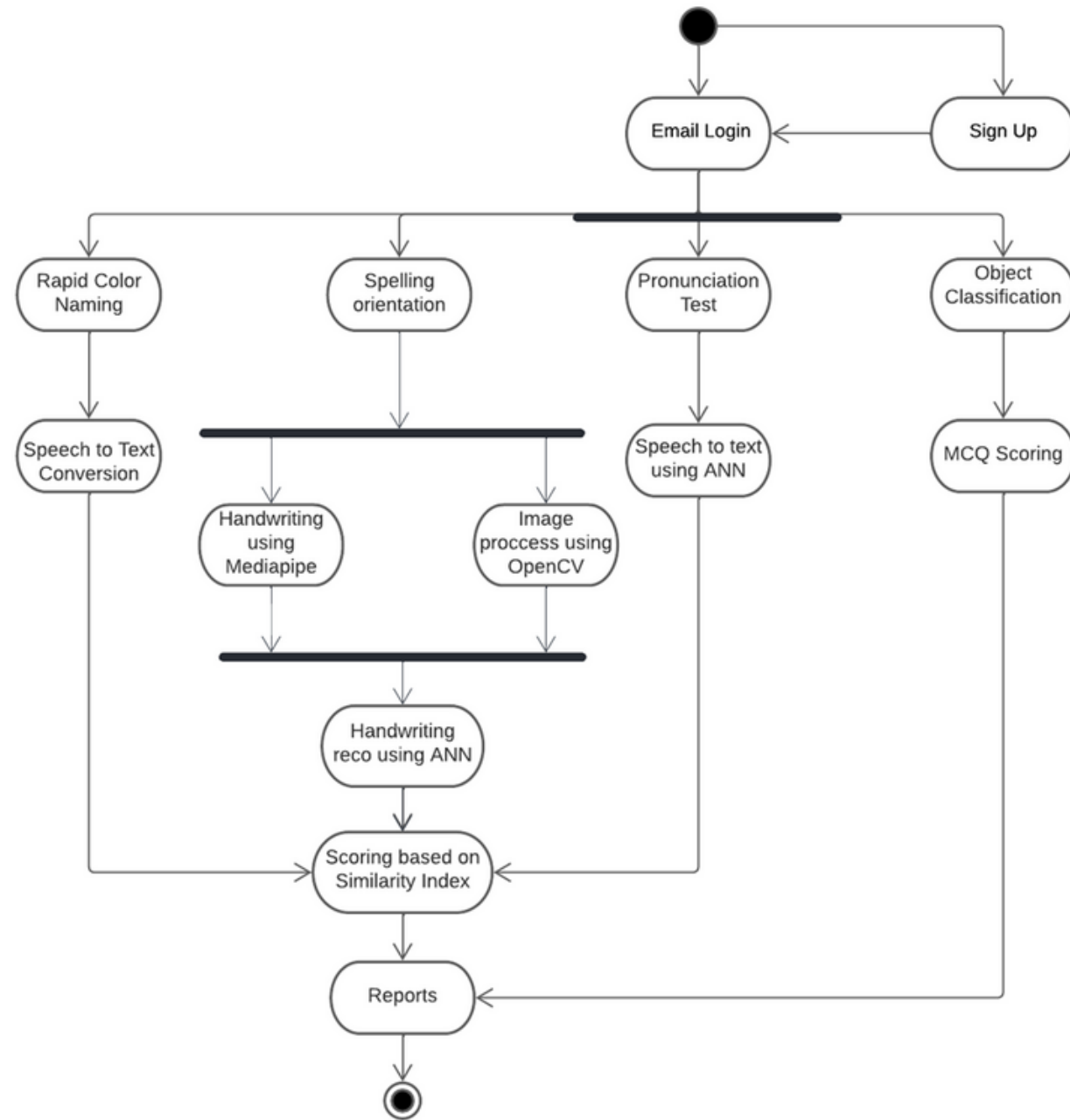


Results Outcomes (Histogram)

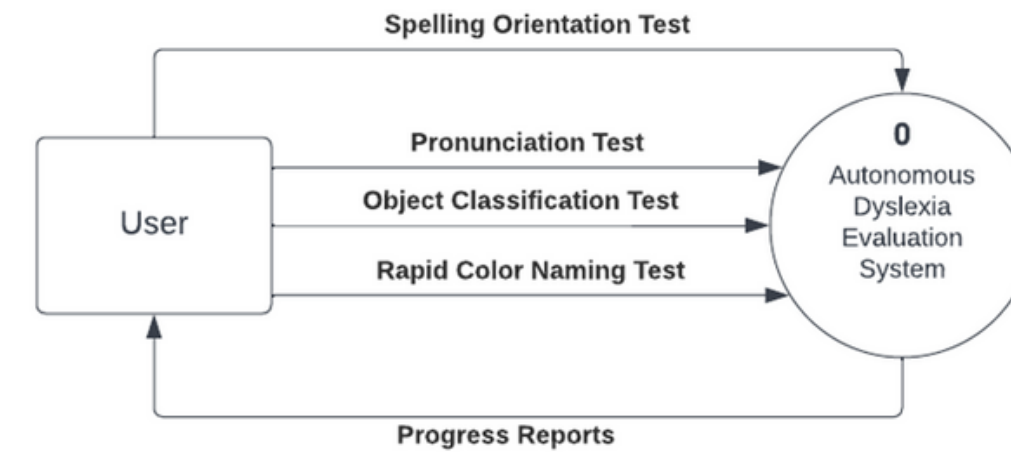
# Methodology

- Hand tracking: Google's Mediapipe library, a collection of pre-trained deep learning modules is used to track human hands.
- Handwriting Recognition: A custom-trained and hand-crafted convolutional neural network (CNN) is being used for handwriting recognition.
- Speech Recognition: A custom-trained RNN (recurrent neural network) with LSTM layers is being used for speech recognition.
- Speech to Text Conversion: Using inbuilt speech recognition modules available in JavaScript.

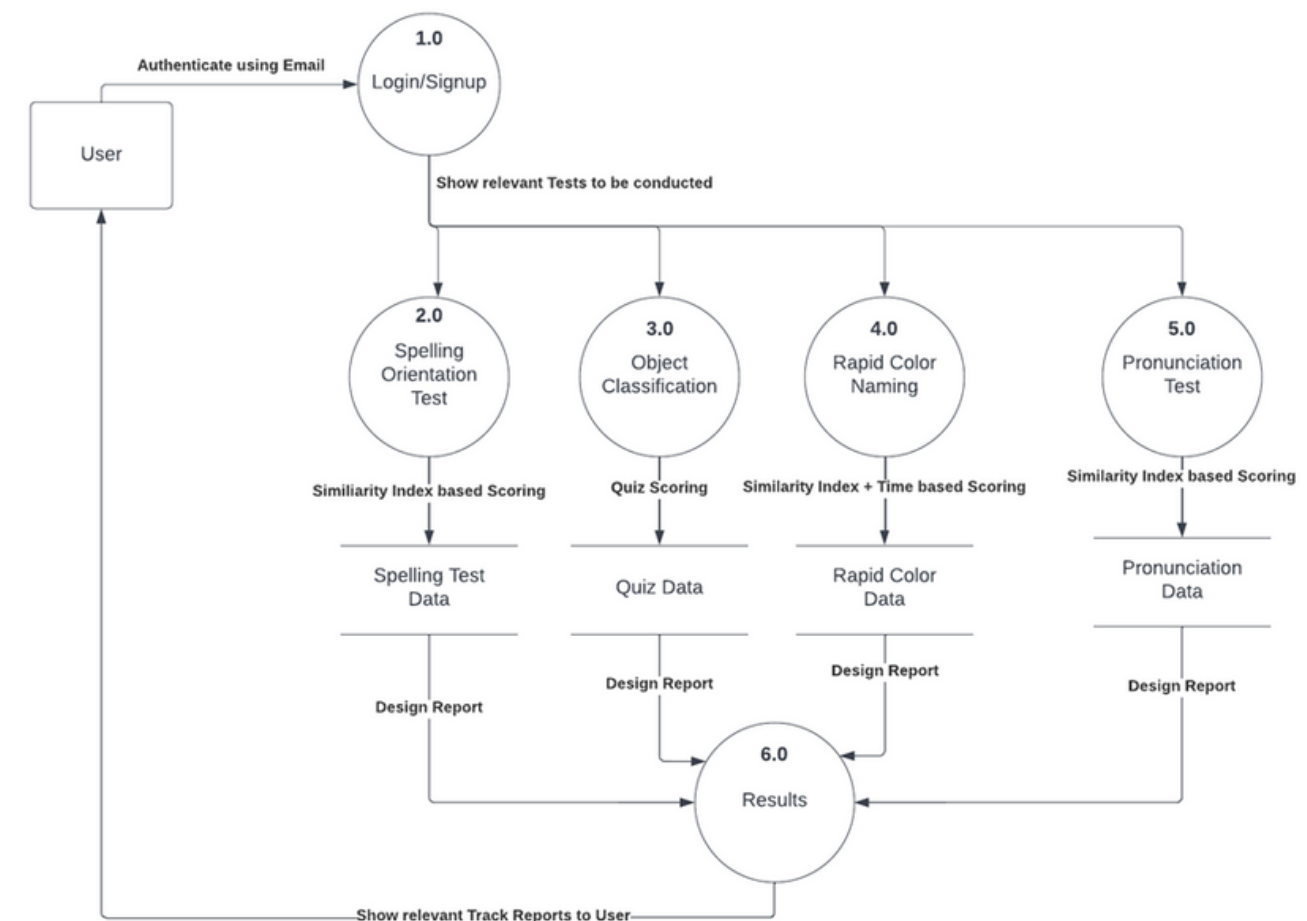
# Diagrams



**Activity diagram**



**DFD Level 0**



**DFD Level 1**



# Deliverables of the Project

- Automate the process of evaluating dyslexic subjects through various tests specifically designed for them.
- A dyslexic subject has been tested on all the required parameters, such as reading, writing, and fluency skills.
- Maintain a track record of the entire test history to help analyze progress after each test.
- Provide a personalized, remote-based solution that is easily accessible and free of cost.

# Professional and Technical Learning

- Developing complex technical systems from scratch.
- Applying deep learning techniques and neural networks, such as convolutional neural networks (CNN) and recurrent neural networks (RNN).
- Understanding application programming interfaces (API) and how to use them to integrate the frontend and backend.
- Applying computer vision techniques using libraries like OpenCV.
- Implementing strategies and evaluation methods for dyslexia.
- Designing UML diagrams and preparing technical reports.



# Individual Roles

- Kashish: UML Diagram, Front end, Backend, Database, Software Requirements Specification
- Paras Bakshi: Deep Learning Model for Speech Recognition, Documentation, Data Collection, Testing Software
- Sanidhiya: Deep Learning model on handwriting recognition, Documentation, Cost Analysis, Testing Software
- Shreya Somani: UML Diagram , Front end, Literature Survey, Software Requirements Specification

# Results

- The pronunciation evaluation module is producing accurate results.
- The spelling orientation module is correctly recognizing handwriting.
- The rapid color naming module is accurately recording and identifying the order of the names of colors spoken.
- The object classification module is producing seamless results based on the options selected.



# Thank You