

# **ADHD CHILDREN MONITORING SYSTEM FOR BEHAVIORAL CHANGE USING INTERNET OF THINGS**

## **About ADHD:**

A good way to understand ADHD is to establish what it isn't. It isn't the result of bad parenting or of your child being lazy or disobedient. ADHD is a biological condition that makes it hard for many children to sit still and concentrate.

There are various areas of the brain that control your child's ability to concentrate and "hit the brakes." These areas may be less active and develop more slowly in kids with ADHD. The best evidence for this occurs in the front part of our brain, or the frontal lobe. This can upset the balance of certain brain chemicals. It can also explain why your child may have more trouble socially than his peers.

Kids don't outgrow ADHD. The symptoms may change over time but ADHD is a lifelong condition. That doesn't mean your child can't be happy and successful. There are many effective strategies and treatment options you can try to manage your child's symptoms.

Kids (and families) are all different, so not all options will work for you. It takes trial and error to see what fits your child and family. But finding the right strategies and seeing an improvement can boost everyone's confidence.

## **Three Types of ADHD**

For many people, the words "hyperactive" or "out of control" come to mind when they hear the term ADHD. If your child doesn't have those symptoms, a diagnosis of ADHD can be puzzling. Kids who don't seem hyperactive often aren't diagnosed as early.

There are actually three types of ADHD, and one of them doesn't include symptoms of impulsive and hyperactive behaviour.

**ADHD, Predominantly Hyperactive-Impulsive Presentation:** Kids who have this type of ADHD have symptoms of hyperactivity and feel the need to move constantly. They also struggle with impulse control.

**ADHD, Predominantly Inattentive Presentation:** Kids who have this type of ADHD have difficulty paying attention. They're easily distracted but don't have issues with impulsivity or hyperactivity. This is sometimes referred to as attention-deficit disorder (or ADD).

**ADHD, Combined Presentation:** This is the most common type of ADHD. Kids who have it show all of the symptoms described above.

## **Literature survey:**

### **A Gesture Recognition System for Detecting Behavioral Patterns of ADHD**

**Miguel Ángel Bautista, Antonio Hernández-Vela, Sergio Escalera, Laura Igual, Oriol Pujol, Josep Moya, Verónica Violant, and María T. Anguera**

**Abstract**—We present an application of gesture recognition using an extension of dynamic time warping (DTW) to recognize behavioral patterns of attention deficit hyperactivity disorder (ADHD). We propose an extension of DTW using one-class classifiers in order to be able to encode the variability of a gesture category, and thus, perform an alignment between a gesture sample and a gesture class. We model the set of gesture samples of a certain gesture category using either Gaussian mixture models or an approximation of convex hulls. Thus, we add a theoretical contribution to classical warping path in DTW by including local modeling of intraclass gesture variability. This methodology is applied in a clinical context, detecting a group of ADHD behavioral patterns defined by experts in psychology/psychiatry, to provide support to

clinicians in the diagnose procedure. The proposed methodology is tested on a novel multimodal dataset (RGB plus depth) of ADHD children recordings with behavioral patterns. We obtain satisfying results when compared to standard state-of-the-art approaches in the DTW context. Index Terms—Attention deficit hyperactivity disorder (ADHD), convex hulls, dynamic time warping (DTW), Gaussian mixture models (GMMs), gesture recognition, multimodal RGB-depth data.

## **The Future of Mobile Health ADHD Applications Projecting WHAAM application on Future Mobile Health**

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**Abstract**— Attention Deficit Hyperactivity Disorder (ADHD) is one of the most common disorders that affect children. The diagnosis and the Cognitive-Behavioral treatment approaches are based on child's behavioral assessment through pen and paper procedures. A number of mobile applications have been designed not only to replace traditional methods but also to provide more accurate, objective, direct and reliable recordings, better management of ADHD symptoms, education and training about the ADHD or even tools for ADHD diagnosis. The WHAAM application through a virtual network provides features to monitor behaviors in a SMART way (Specific, Measurable, Attainable, Realistic and Timely). In other words, creating a network of people involved in child's care (parents, educators, health professionals, relatives), WHAAM app allows data collection when the behavior occurs accompanied by information about its content and environment. Subsequently, gathered data is visualized and evaluated making possible an intervention planning and programming by the involved health professional. Additionally, the WHAAM app provides tools for evaluation of intervention efficacy. However, as emerging technologies came to facilitate healthcare delivery, there is a need for a continuous challenging and progress. Therefore, additional health data collection through advanced sensors and storage in big data hubs might be the new challenge of the future m-health applications.

## **Using Healthcare Analytics to Determine an Effective Diagnostic Model for ADHD in Students**

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**Abstract**—Attention Deficit Hyperactivity Disorder (ADHD) is a mental health disorder. People diagnosed with ADHD are often inattentive (have difficulty focusing on a task for a considerable period of time), overly impulsive (make rash decisions), and are hyperactive (moving excessively, often at inappropriate times). ADHD is often diagnosed through psychiatric assessments with additional input from physical/neurological evaluations. Current tools designed for ADHD screening collect data manually and do not interoperate with each other. This paper will first review the effectiveness of common screening tools in

relation to the Diagnostic and Statistical Manual of Mental Disorders (DSM) for ADHD classifier. This paper will also introduce the concept of using written performance data as a method of screening, since previous research has linked written language disorder (WLD) to ADHD as well. The current phase of this research proposes that an integrated computational model that combines outcomes from these screening tools will have a more effective diagnosis of ADHD in adult students than from the diagnosis of any individual screening tool. The integrated computational model, based on neural networks, will be built and tested in a future phase with each of the datasets (physical, behavior and learning performance) being collected from students.

## **ADHD and ASD Classification Based on Emotion Recognition Data**

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**Abstract**—In this work, we focused on classification of the participants with Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorder (ASD) and typically developing children, based on their performances during an emotion recognition experiment that we developed. We prepared an experiment environment where participants were shown images of faces of people exhibiting certain emotions up to a certain strength and then they answered the question “What is the emotion of this person?”. The response and response latency of the participants were recorded and used for the classification process. Before the classification step, in order to select the relevant images which are used as features in this work, ReliefF feature selection algorithm was used. Machine learning feature selection and classification algorithms were used on different definitions of the classification problem where the differentiation between two classes against each other or one class against the other two classes were aimed. The selected features (images shown) and the classification performance changed based on the classification problem definition.

### **Abstract :**

ADHD (Attention deficit hyperactivity disorder) is found in 10 million people in India every year. There are three types of ADHD, they are, ADD(Attention deficit disorder),HDD( Hyper-activity deficit disorder) and Full ADHD(Attention deficit hyper-activity disorder). All the cognitive behavioural treatment approaches are based on child's behavioural assessment through pen and paper procedures.

This project aims to get the procedures automated as much as possible. This project mainly monitor's the movement, speech modulation and attentiveness of the already diagnosed children with ADHD. This project uses two physical entities one of them is a wearable device which monitors the movement and speech modulation of the child and addition to it, it also alert the child with ADHD. The other is a device which monitors the attentiveness is placed on the study desk of

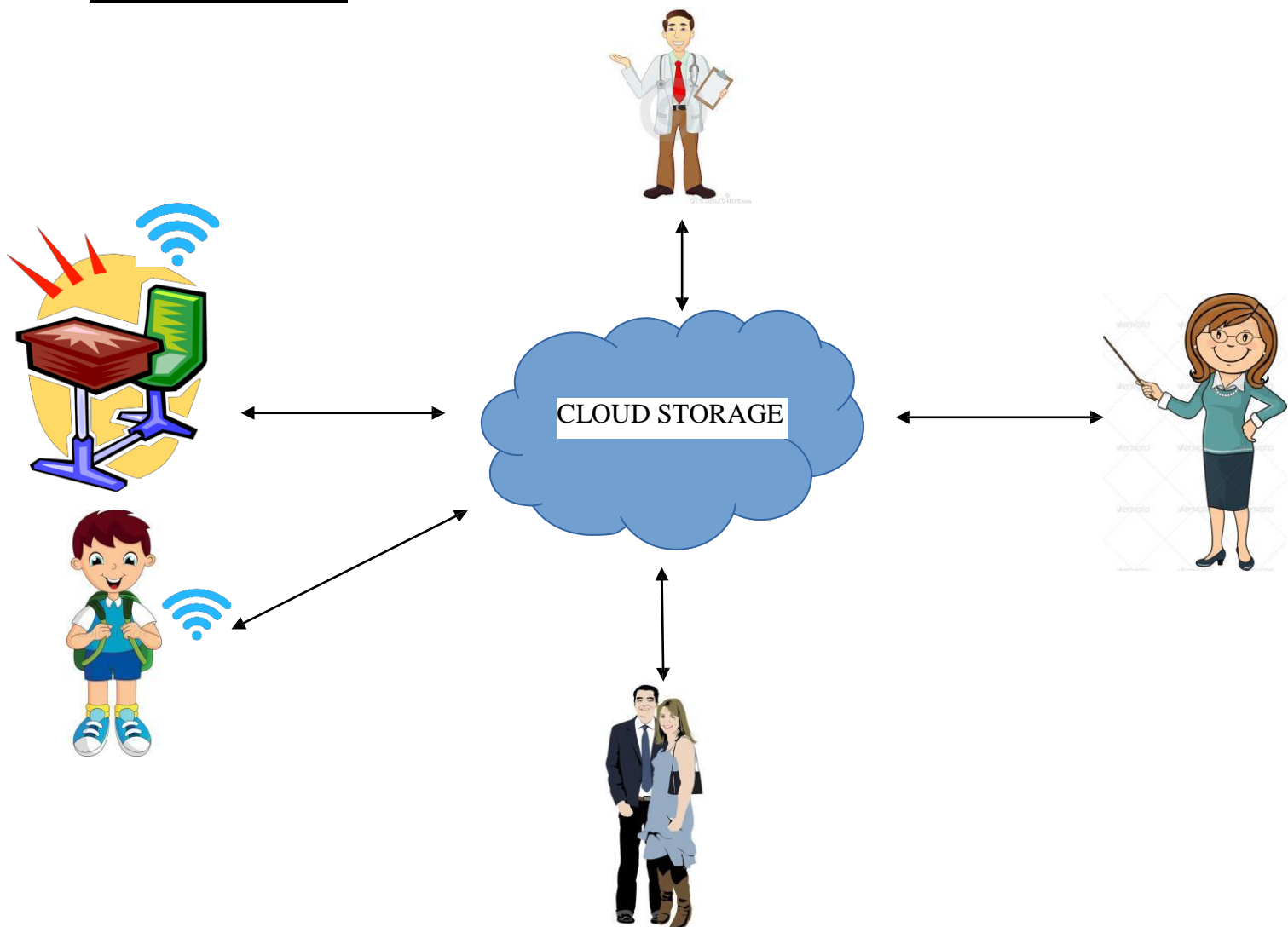
the child affected by ADHD. The data which is collected by the sensors are stored in Google cloud platform and analysed. This analysed data is sent to the parent and doctors through a web application and a Android application.

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**BLOCK DIAGRAM :**



**FEATURES :**

**CHILD**

- ✓ Wearable device
- ✓ Desk

## PARENT

### What we monitor

#### DESK

- ✓ Attentiveness through camera
- ✓ Speech modulation through mike
- ✓ Time taken to complete few tasks through camera
- ✓ Number of times the kid moved away from the desk in the classroom

#### WEARABLE

- ✓ Movement of the kid

### What we take

- ✓ Time taken to complete assignments
- ✓ Queries about the counselling
- ✓ In tolerable behaviour
- ✓ Number of fights/mess the kid started near the house
- ✓ Number of times the kid used the bathroom at home

### What we give

- ✓ Graphs of the inputs
- ✓ Video portal

## DOCTOR/COUNSELOR

### What we monitor

#### DESK

- ✓ Attentiveness through camera
- ✓ Speech modulation through mike
- ✓ Time taken to complete few tasks through camera
- ✓ Number of times the kid moved away from the desk in the classroom

#### WEARABLE

- ✓ Movement of the kid

### What we take

- ✓ Time taken to complete tasks
- ✓ Counselling to the kid

### What we give

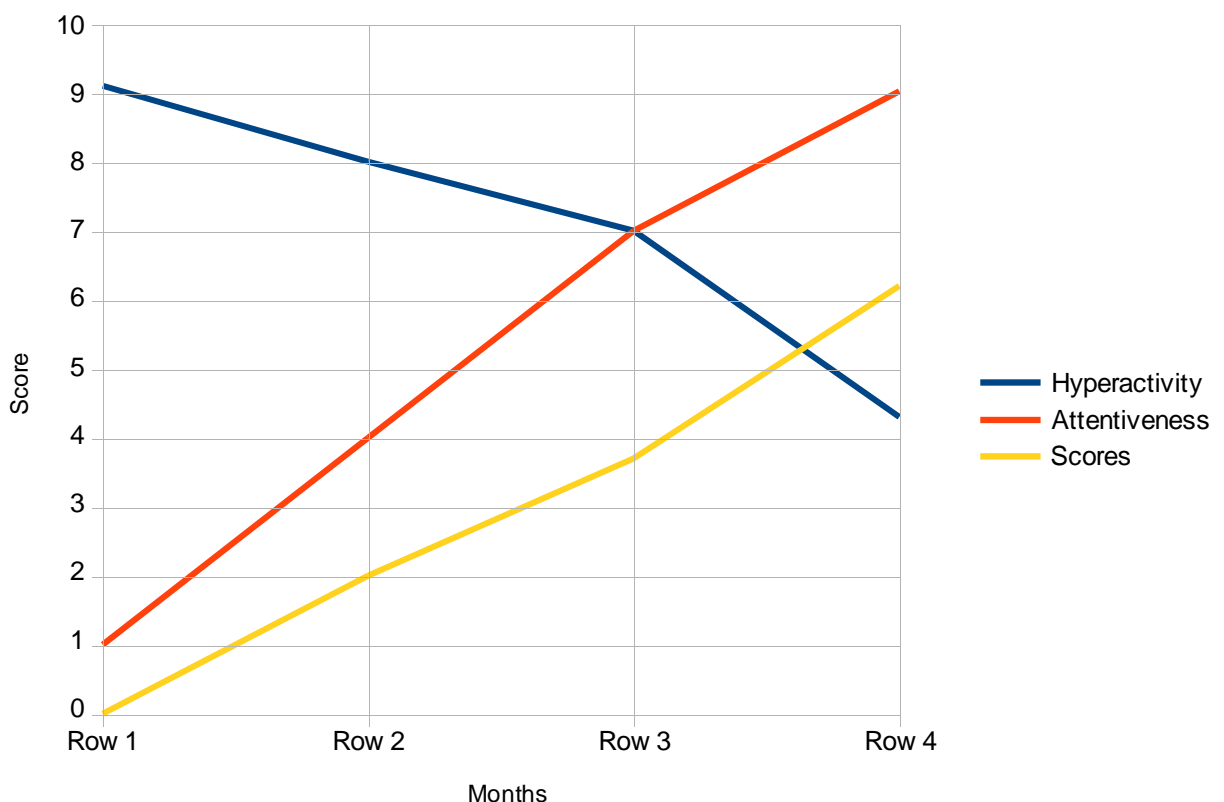
- ✓ Graphs of the inputs
- ✓ Video portal

# TEACHER

What we monitor	What we take	What we give
<b>DESK</b> <ul style="list-style-type: none"> <li>✓ Attentiveness through camera</li> <li>✓ Speech modulation through mike</li> <li>✓ Time taken to complete few tasks through camera</li> <li>✓ Number of times the kid moved away from the desk in the classroom</li> </ul>	<ul style="list-style-type: none"> <li>✓ Time taken to complete assignments</li> <li>✓ Test results</li> <li>✓ In tolerable behaviour</li> <li>✓ Number of times the kid was punished</li> <li>✓ Number of times the kid asked to use the bathroom at school</li> </ul>	<ul style="list-style-type: none"> <li>✓ Graphs of the inputs</li> <li>✓ Video portal</li> </ul>
<b>WEARABLE</b> <ul style="list-style-type: none"> <li>✓ Movement of the kid</li> </ul>		

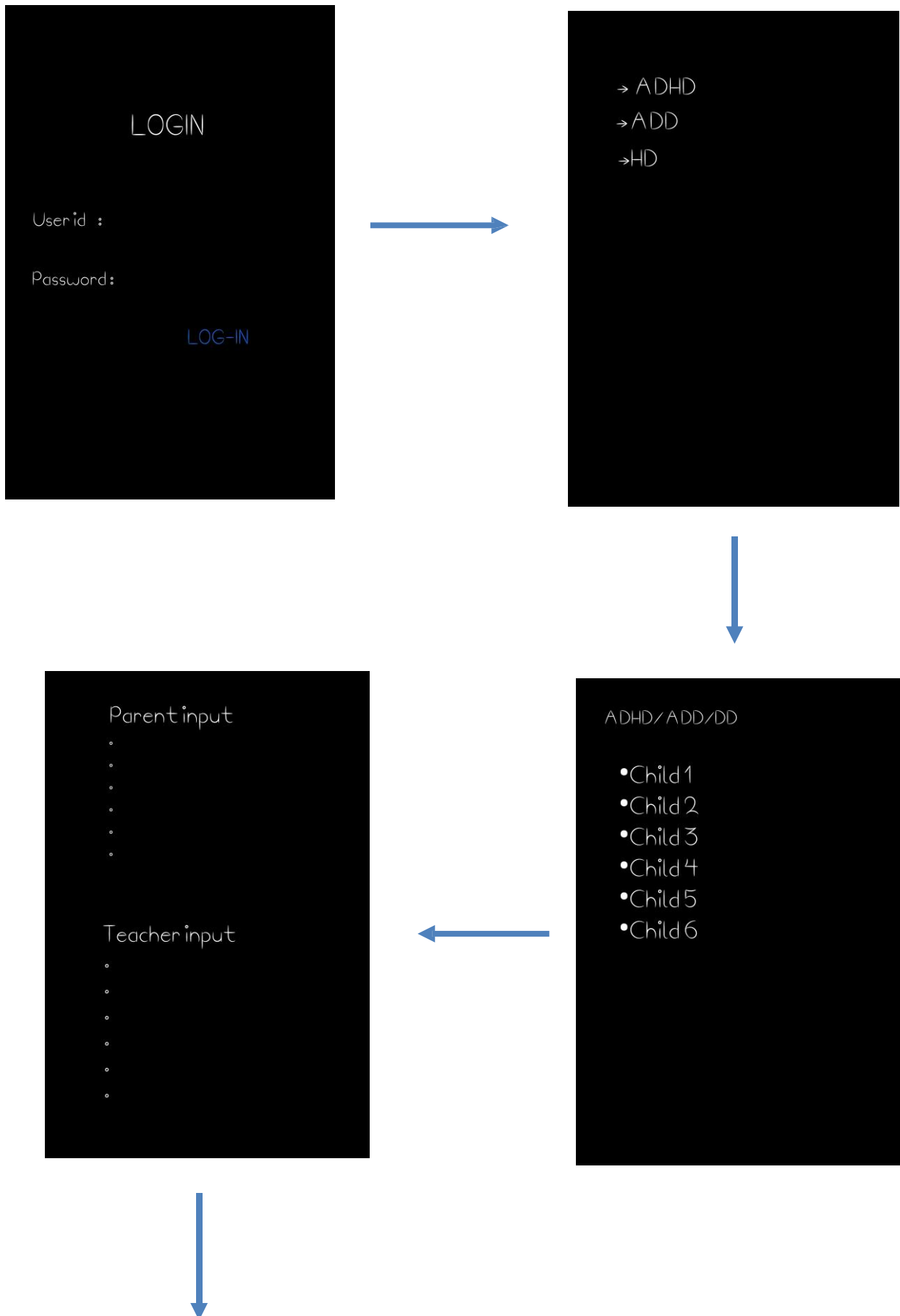
## Reports:

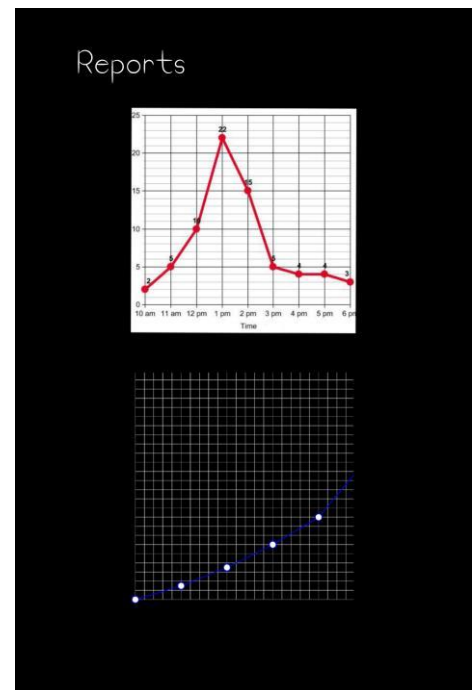
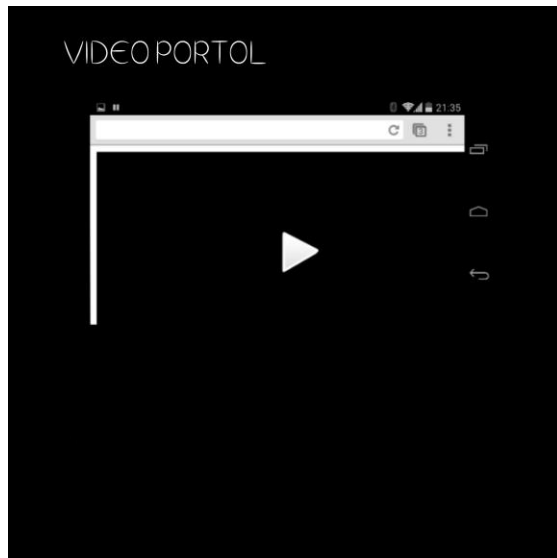
A two dimensional graph where , X-axis represents Months and Y-axis represents Score , is generated using the data given by the Doctor, Parent and the Teacher .



## Graphical User Interface (GUI)

### DOCTOR



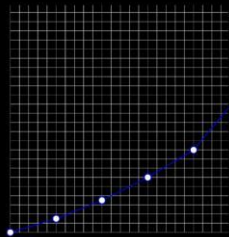
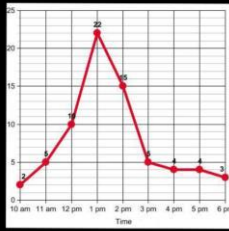


## PARENT AND TEACHER

A screenshot of a mobile application interface titled "LOGIN". The interface is dark-themed. At the top, there is a title "LOGIN". Below the title, there are two input fields: "User id :" and "Password:". Below the input fields, there is a blue button labeled "LOG-IN".A screenshot of a mobile application interface with two sections: "Parent input" and "Teacher input". Both sections have a list of empty circles for input. The "Parent input" section has 6 circles, and the "Teacher input" section has 6 circles. The interface is dark-themed.



## Reports



## VIDEO PORTOL

