



Sri Lanka Institute of Information Technology

PROJECT REGISTRATION FORM

(This form should be completed and uploaded to the Cloud space on or before XXXXXXXXX)

The purpose of this form is to allow final year students of the B.Sc. (Hon) degree program to enlist in the final year project group. Enlisting in a project entails specifying the project title and the details of four members in the group, the internal supervisor (compulsory), external supervisor (may be from the industry) and indicating a brief description of the project. The description of the project entered on this form will not be considered as the formal project proposal. It should however indicate the scope of the project and provide the main potential outcome.

PROJECT TITLE (As per the accepted topic assessment form)	IHI:(INATTENTIVE - HYPERACTIVE/IMPULSIVE) A Mobile Application for ADHD Analysis and Detection
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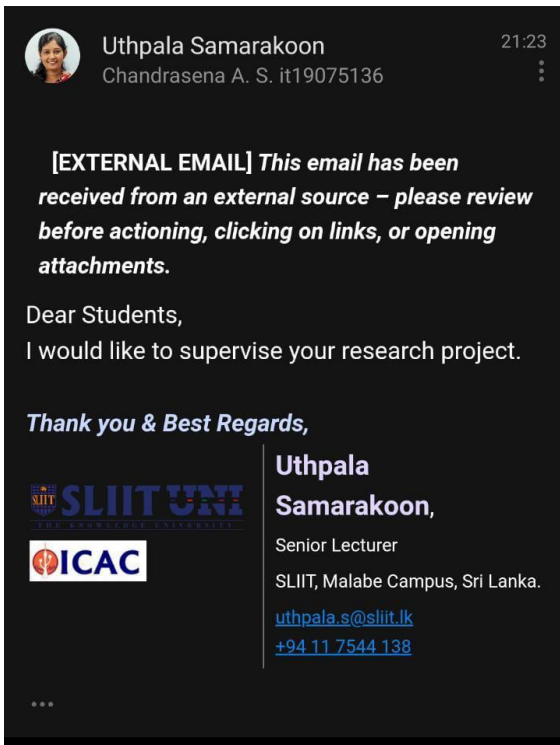
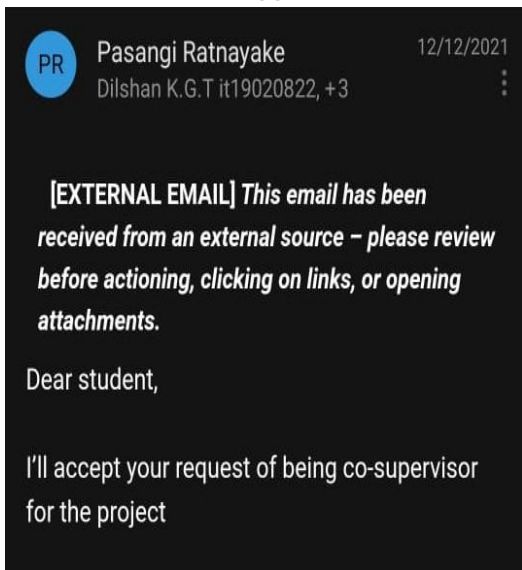
RESEARCH GROUP (as per the Topic assessment Form)	Computing for Inclusive and Equitable Society (CIES)
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PROJECT NUMBER	2022-309	(will be assigned by the lecture in charge)
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PROJECT GROUP MEMBER DETAILS: (Please start with group leader's details)

	STUDENT NAME	STUDENT NO.	CONTACT NO.	EMAIL ADDRESS
1	Chandrasena A.S. (Group Leader)	IT19075136	0766323751	it19075136@my.sliit.lk
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4	Dilshan K.G.T	IT19020822	0764646526	it19020822@my.sliit.lk

SUPERVISOR, CO_ SUPERVISOR Details

SUPERVISOR Name	CO-SUPERVISOR Name
Uthpala Samarakoon	pasangi rathnayaka
Signature	Signature
<p>Attach the email as Appendix 1</p> 	<p>Attach the email as Appendix 2</p> 
17/12/2021	12/12/2021
Date	Date

EXTERNAL SUPERVISOR Details (if any, may be from the industry)

				Attach the email as Appendix 3
Name Dr.A.G.H.Menike	Affiliation RHO, National Hospital, Kandy	Contact Address National Hospital, Kandy	Contact Numbers +94 71 036 5469	Signature/Date 

ACCEPTANCE BY CDAP MEMBER (This part will be filled by the RP team)

Name	Signature	Date

PROJECT DETAILS

Brief Description of your Research Problem: (extract from the topic assessment form)

Even though there are many clinical ways to identify ADHD, it is not an easy task to diagnose symptoms. Children these days are overactive and distracted by the smallest thing and it is perfectly normal, but some kids suffer from ADHD and even they might not know it. Since the start of this pandemic mobile applications have become much closer to children hence making it easier for their guardians to identify the symptoms of the disorder through a mobile application. And there are screening tools that diagnose ADHD but they are focused on adults, not children (Adult ADHD Self-Report Scale Symptom Checklist (ASRS), Barkley Adult ADHD Rating Scale - IV, Brown ADD Scales (Adult), Conners' Adult ADHD Rating Scales (CARRS)). Identifying takes time because of several reasons like lack of concentration on the patient, hard to monitor child/adult under different environments, keeping patients record time in memory, etc. Further by developing an app to identify main symptoms using four main components, this application will be able to determine the probability of having ADHD [2]. Since not every child is not alike, these components will have quite different approaches [1] (mini games & pictorial questionnaires) in identifying symptoms. Many developed applications operate using the local storage of the smartphone, not in shared cloud space, hence making the collected data is limited to the mobile owner. [3]

Monterey County Schools
Student Assistance Team (SAT)
Diagnostic Evaluation Report

Name: _____ Date of Birth: _____
Grade: _____ Date of Administration: _____
School: _____
Teacher(s): _____

The Conners 3 Rating Scales (Short Form) are behavior rating scales for the parent and teacher designed to measure common indices of inattention, hyperactivity and problem behaviors in children at home and at school. The Conners uses T-scores with a mean of 50 and a standard deviation of 10. The following scores were obtained:

Conners 3rd Edition (Qualitative Descriptors)

T-Score	Class/Position
70-90	Very Elevated
65-69	Elevated
60-64	High Average
40-59	Average Score
<40	Low Score

CONNERS 3 - Teacher Rating Scale

INDEX	T-Score	Range
Inattention		
Hyperactivity/Impulsivity		
Learning Problems/Executive Functioning		
Aggression		
Peer Relations		

CONNERS 3 - Parent Rating Scale

INDEX	T-Score	Range
Inattention		
Hyperactivity/Impulsivity		
Learning Problems		
Executive Functioning		
Defiance/Aggression		
Peer Relations		

The MTA SNAP-IV Teacher and Parent Rating Scale
James M. Swanson, Ph.D., University of California, Irvine, CA 92715

Name: _____ Gender: _____ Age: _____ Grade: _____

Ethnicity (circle one which best applies): African-American Asian Caucasian Hispanic Other _____

Completed by: _____ Type of Class: _____ Class size: _____

For each item, check the column which best describes this child:

	Not At All	Just A Little	Pretty Much	Very Much
1. Fails to give close attention to details or makes careless mistakes in schoolwork or tasks				
2. Has difficulty sustaining attention in tasks or play activities				
3. Does not seem to listen when spoken to directly				
4. Does not follow through on instructions and fails to finish schoolwork, chores, or duties				
5. Has difficulty organizing tasks and activities				
6. Avoids, dislikes, or reluctantly engages in tasks requiring sustained mental effort				
7. Loses things necessary for activities (e.g., toys, school assignments, pencils, or books)				
8. Is distracted by extraneous stimuli				
9. Is forgetful in daily activities				
10. Fidgets with hands or feet or squirms in seat				
11. Leaves seat in classroom or in other situations in which remaining seated is expected				
12. Runs about or climbs excessively in situations in which it is inappropriate				
13. Has difficulty playing or engaging in leisure activities quietly				
14. Is "on the go" or often acts as if "driven by a motor"				
15. Talks excessively				
16. Blurts out answers before questions have been completed				
17. Has difficulty awaiting turn				
18. Interrupts or intrudes on others (e.g., butts into conversations/games)				
19. Loses temper				
20. Argues with adults				
21. Actively defies or refuses adult requests or rules				
22. Deliberately does things that annoy other people				
23. Blames others for his or her mistakes or misbehavior				
24. Is touchy or easily annoyed by others				
25. Is angry and resentful				
26. Is spiteful or vindictive				

Further, existing applications like iCare-ADHD [4] to monitor ADHD symptoms using the questionnaire-based environment such as using SNAP - IV and CONNER 3 rating applications (figure 1.0). Those are not practical solutions when we come to the daily routine of the parents/teachers or guidance. This monitoring task must be done around 6 months under proper environmental conditions. But those applications fail to monitor child/adult behavior more closely [4].

These rating scale methods will be mostly based on the third-party result (Teacher, parents, or guardians). So, when we consider the practical scenario, those answers also might impact the result of

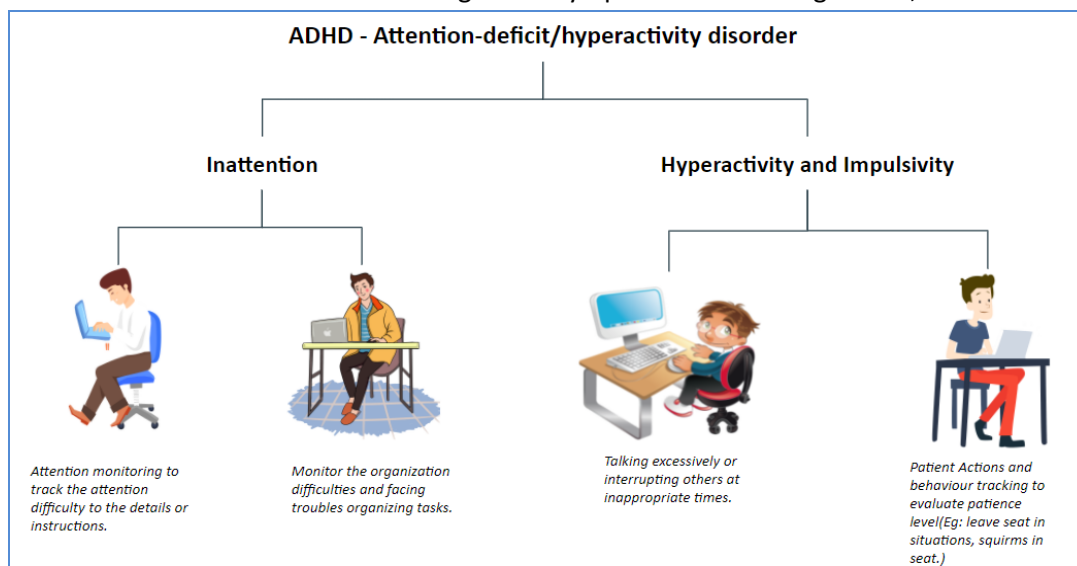
the diagnosis of patient symptoms [4].

References

- [1]Kumar, A., Verma, M. and Chaudhary, V., 2015. *Diagnosis of ADHD through Game Application*. *Diagnosis of ADHD through Game Application* [online] Available at: <https://www.researchgate.net/profile/Akshay-Kumar-21/publication/326697764_Diagnosis_of_ADHD_through_Game_Application/links/5dbeee7e4585151435e3f2aa/Diagnosis-of-ADHD-through-Game-Application.pdf> [Accessed 25 November 2021]
- [2]Felt, B., Biermann, B., Christner, J., Kochhar, P. and Harrison, R., 2021. *Diagnosis and Management of ADHD in Children*. [online] Aafp.org. Available at: <<https://www.aafp.org/afp/2014/1001/p456.html>> [Accessed 15 December 2021].
- [3]2015. *The Future of Mobile Health ADHD Applications*. [ebook] Available at: <<https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7359603>> [Accessed 4 December 2021].
- [4]Mitranont, J., Bousai, B., Soonthornchart, N., Tuanghirunvimon, K. and Mitranont, T., 2018. *iCare-ADHD: A Mobile Application Prototype For Early Child Attention Deficit Hyperactivity Disorder*. [online] Ieeeexplore.ieee.org. Available at: <<https://ieeexplore.ieee.org/abstract/document/8523973>> [Accessed 7 December 2021].

Description of the Solution: (extract from the topic assessment form)

ADHD symptoms were identified using the DSM criteria (**DSM - Diagnostic & Statistical Manual of Mental Disorders**). Based on the DSM criteria (Inattention & Hyperactivity and Impulsivity), this research have divided this into 4 areas according to the symptoms as below figure 2.0,



This application can track patient activities with their behaviors and provide a decision as the result. Most commonly, nowadays children and adults are more engaged with recent technologies. Inattention and Hyperactivity/impulsivity contain 9 symptoms per each as shown in figure 2.2.

DSM CRITERIA FOR ADHD

INATTENTION

- Often **fails to give close attention to details** or makes careless mistakes in schoolwork, at work, or with other activities.
- Often has **trouble holding attention** on tasks or play activities.
- Often **does not seem to listen** when spoken to directly.
- Often **does not follow through on instructions** and **fails to finish schoolwork, chores, or duties** in the workplace (e.g., loses focus, side-tracked).
- Often has **trouble organizing tasks** and activities.
- Often **avoids, dislikes, or is reluctant** to do tasks **that require mental effort** over a long period of time (such as schoolwork or homework).
- Often **loses things necessary for tasks and activities** (e.g. school materials, pencils, books, tools, wallets, keys, paperwork, eyeglasses, mobile telephones).
- Is often **easily distracted**
- Is often **forgetful in daily activities**.

HYPERACTIVITY AND IMPULSIVITY

- Often **fidgets with or taps hands or feet**, or **squirms in seat**.
- Often **leaves seat in situations when remaining seated is expected**.
- Often **runs about or climbs in situations** where it is not appropriate (**adolescents or adults may be limited to feeling restless**).
- Often **unable to play or take part in leisure activities quietly**.
- Is often **"on the go" acting** as if "driven by a motor".
- Often **talks excessively**.
- Often **blurts out an answer before a question has been completed**.
- Often has **trouble waiting his/her turn**.
- Often **interrupts or intrudes on others** (e.g., butts into conversations or games)

figure 2.2 - DSM Criteria for ADHD

At present, - ADHD symptoms were tracked physically. It is hard to monitor those symptoms more when situations like covid-19 pandemic occur. As a solution to this patients' activities can be tracked under the supervision of the parents or the guardian at any place using this mobile application. When users interact with this application, we have started with patient attention monitoring and after completing those tasks, patients will face some questions. These types of activities will monitor the patient's memory power. As the next steps, our monitoring system tracks the patient's patience and his behaviors by recording his/h/her facial expressions. All these games and questionnaires will cover most symptoms of DSM criteria.

Finally, if the user completes the daily task that is provided by the application, he/she will collect some points/marks and the progress will be recorded. Likewise, this application will track the patient's symptoms day by day. After 2 - 6-month of usage of the application, all records related to the patient will be summarized and provided as an output result based on the DSM criteria. Using this application result doctors can identify whether the patient has Inattention, hyperactivity, and impulsivity, or both.

Main expected outcomes of the project: (extract from the topic assessment form)

Design and develop a mobile application to diagnose ADHD based on attention monitoring, organizational skills, memory power, problem solving abilities, hyperactivity monitoring and impulsiveness detection.

1. Design and develop a component to identify ADHD via attention monitoring through voice commands and storyboarding.
2. Design and develop a component to identify ADHD based on organizational skills, memory power, and problem-solving abilities in a game-based environment.
3. Design and develop a component to identify ADHD based on monitoring hyperactivity using a video monitoring environment followed by a pictorial questionnaire.
4. Design and develop a component to identify ADHD through detecting impulsiveness using a questionnaire and a multiplayer game.

WORKLOAD ALLOCATION (extract from the topic assessment form after the correction suggested by the topic assessment panel.)

(Please provide a brief description about the workload allocation)

MEMBER 1

.....**Chandrasena A.S.**
 (IT19075136)

Impulsivity - Identify user's impulsivity based on a questionnaire and a simple game
Novelty

This component will be implemented considering child behavior patterns and a localized environment in all activities. All activities are dynamic based on the user details such as age, country etc. The patient will be presented with simple activities or games where they will make several choices. Based on those choices and behavior patterns, the impulsivity level of the user will be generated assessing all the aspects such as impatience.

Problem Area

Assessing the impulsivity of the user based on impatience level and the tendency to act without considering the consequences of the actions.

Suggested Solution

Below behaviors will be assessed in this component (According to the DSM Criteria),

- Often ***blurts out an answer before a question has been completed.***

- Often has **trouble waiting his/her turn.**
- Often **takes on quick less rewards than waiting for much bigger rewards and doesn't seem to consider consequences of the actions.**

A questionnaire-based activity will be presented to the user, a localized audio record will be played while providing the answers at the same time to check the user's patience level. (Whether the user waits for the question to be revealed completely to check the patience level) and a group game will be also provided to assess waiting his/her turn and further check the patience on bigger rewards in a longer time period rather than accepting quick smaller rewards. From this component the patient's impulsiveness will be measured based on the answers to the questions and choices.

Tools and Techniques

A mobile application will be implemented to present the questionnaire and the game to detect the impulsivity levels of the user. The questionnaire will be displayed in the user's local environment along with a localized audio. Multiple answers will be provided per each question and the audio clip-based questions will also have a set of answers. The game will be implemented.

Research area

Patient's impulsivity is important to diagnose ADHD. This can be tracked using questionnaires and several other activities. An appropriate set of questions can be used to identify the impulsivity level of the user.

Inputs

Answers to the questionnaire and choices made at several activities.

Outputs

Impulsivity level of the patient.

MEMBER 2

... Weerasinghe G.G.D.D
(IT19075204) ...

Hyperactivity - Identify hyperactivity using an environmental monitoring system and a pictorial questionnaire

Novelty

This component will be assessed using an environmental monitoring system which will use a camera to assess if the patient is staying in one place. The short video clip will be shown and the patient is expected to sit through it until the end. Face detection will be used to identify if the user is paying attention and facial expressions will be analyzed. Next a pictorial questionnaire will be used to assess the symptom of behaving appropriately in a situation.

Problem Area

Hyperactivity can be assessed based on the user's inability to stay in one place even when it is expected and the unusual behavior commonly known as acting like a motor. We are mainly focusing on diagnosing the patient to determine if the patient is positive towards hyperactivity.

Suggested Solution

Patients will be monitored by a monitoring environment (Using mobile phone camera) determining the ability to stay in one place paying attention to a video clip followed by a pictorial questionnaire. To identify that the user is paying attention eye tracking software will be used along with a face identifying algorithm. A pictorial questionnaire will be used to determine users' thinking pattern towards behaving in a given situation.

Below behaviors will be assessed in this component (According to the DSM Criteria),

- Often *leaves the seat in situations when remaining seated is expected..*
- Is often *"on the go" acting as if "driven by a motor".*
- Often runs about or climbs in situations where it is not appropriate (adolescents or adults may be limited to feeling restless).

Tools and Techniques

An Android mobile application will be used to perform questionnaires and face detection to diagnose hyperactivity of the patient.

Research Area

Hyperactivity is among the main symptoms. This can be tracked using pictorial questionnaire and a monitoring environment. Using these methods we'll be able to determine patients positivity towards hyperactivity

Inputs

Answers to the pictorial questionnaire and behavior of the monitoring environment.

Outputs

Hyperactivity level of the patient.

MEMBER 3

Sadun G.W.P
(IT19390260)

Inattention - Identify user's Attention based on an audio questionnaire and a simple game Novelty

This component will develop the localized environment in all activities. Child inattention will be checked in this will not take parents' or teachers' marks to check whether the child has an inattention problem. to the patient we will provide activities or games where they will do some work. based on the user's choices, the attention level of the user will be checked.

Problem Area

Detect the attention level of the user by user's actions and behavior.

Suggested Solution

Detecting the patient's attention by giving an audio clip and rebuilding the audio scenario using the storyboard and detecting the patient's close attention to details and easily distracting symptoms using the picture difference identify mobile game. These activities detect the attention level of the user and maintain statistics.

Below behaviors will be assessed in this component (According to the DSM Criteria),

- Often has *fails to give close attention to details* or makes careless mistakes
- Often has *trouble holding attention on task or play activities.*
- Often *activities do not seem to listen* Often when spoken to directly.
- IS often *fails easily distracted*
- Often *fails loses things necessary for task and activities*

Tools and Techniques

an android mobile application will be implemented to present the game to detect the attention levels of the user.

research area:

patient's attention is important to diagnose ADHD. In this research area detect the patients attention problems and attention level of the user.

Inputs.

detect the user attention with rebuilding the audio scenario measurable the game result.

Outputs

attention level of the patient.

MEMBER 4

.....Dilshan K.G.T
(IT19020822)

Inattention - Identify user organizational skills and forgetfulness symptoms using questionnaire and game base environment.

Novelty: Existing applications only monitor child activities under parent/guardian or physician supervision, also results for those activities are provided by them. But in this application, I do not engage parents or guardians in the outcome result. Also, from this monitoring criteria, I have tracked the child's progress and the results for a particular period to provide a more accurate outcome. The patient only gets guidance from them but all the activities should be completed patient by themselves. Furthermore, using questionnaires and game base environments we will cover most of the identification of the symptom's inattention, and it is easier for parents/guidance to handle and monitor child actions even if they are busy.

Problem Area:

ADHD inattention patients face organization skills difficulties and forgetfulness symptoms. These terms should be identified from the very beginning stage to start with the treatments. These kinds of patients are facing a lot of difficulties when they manage their day-to-day tasks and School/University works. Even though there are so many applications like Evernote, Todo list, Microsoft to-do list, and many more apps to have notes and reminders. But there are no existing applications to identify organization and forgetfulness difficulties.

Suggested Solution:

As a suggested solution to this particular difficulty, it can be diagnosed using the DSM criteria syntax in two different areas. Mainly to identify the forgetfulness we provide a list of questionnaires to the parent/physician/gradient to answer from the very beginning. Based on the answers that they provided regarding the patient day to day activities application will create questionnaires to the patient forgetfulness tracking.

Organization skill will be tracked with using the mobile game and here the game will provide a chance to complete a task or otherwise the user can skip and exit from the task without completing it. With these results we can get track of the patient skills and difficulties that he/she has.

Bellow behavior will be assessed in this component (According to the DSM Criteria),

- Often **does not follow through on instructions** and **fails to finish schoolwork, chores, or duties** in the workplace (e.g., loses focus, side-tracked).
- Often has **trouble organizing tasks** and activities.
- Often **avoids, dislikes, or is reluctant** to do tasks **that require mental effort** over a long period of time (such as schoolwork or homework).
- Is often **forgetful in daily activities**.

Tools and Techniques:

As tools and techniques, I will use Android based games (Puzzle, Sudoku, etc.) to determine the patient's thinking patterns and organization skills. In addition to that forgetfulness will be measured using a question-based forum. Users can easily interact with applications because of the application localizations.

Research Area:

In this application I will try to identify the user's organizational and task organizing difficulties that he/she faces. Suitable procedures will be implemented to measure the patient difficulty percentage and find the probability of having ADHD which is one of the parts from the DSM criteria for a particular symptom.

Input:

Collect user Data using questionnaire to track the user memory about the day today work/activities also as input value collect user organizational skills measurable game result.

Output:

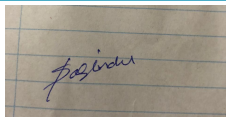
Identify user disorders for organizational difficulties using the patient input values and out the percentage of ADHD probability resulting from the lack of organizational and memory power areas using the DSM criteria standards.

DECLARATION (Students should add the Digital Signature)

"We declare that the project would involve material prepared by the Group members and that it would not fully or partially incorporate any material prepared by other

persons for a fee or free of charge or that it would include material previously submitted by a candidate for a Degree or Diploma in any other University or Institute of Higher Learning and that, to the best of our knowledge and belief, it would not incorporate any material previously published or written by another person in relation to another project except with prior written approval from the supervisor and/or the coordinator of such project and that such unauthorized reproductions will construe offenses punishable under the SLIIT Regulations.

We are aware that if we are found guilty for the above-mentioned offenses or any project related plagiarism, the SLIIT has the right to suspend the project at any time and or to suspend us from the examination and or from the Institution for a minimum period of one year”.

	STUDENT NAME	STUDENT NO.	SIGNATURE
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2	Weerasinghe G.G.D.D.	IT19075204	
3	Sadun G.W.P	IT19390260	
4	Dilshan K.G.T.	IT19020822	