DESIGNING AN APP FOR EARLY DETECTION OF ALZHEIMER

V.Senthil Kumar[1], Avantheka.S[2], Nikitha.D[3], Ravivarmaa.K [4] , Sonalikaa.SS [5] , Yogesh.K [6]

[1]V.Senthil Kumar ,Assistant professor ,Department of Computer Science Engineering , Kumaraguru College of Technology, Coimbatore, India

[2] Avantheka.S,Department of Biotechnology ,Kumaraguru College of Technology, Coimbatore, India

[3] Nikitha.D ,Department of Biotechnology ,Kumaraguru College of Technology, Coimbatore, India

[4] Ravivarmaa. K,Department of Electronics and instrumentation engineering, Kumaraguru College of Technology, Coimbatore, India

[5] Sonalikaa. S.S, Department of Biotechnology ,Kumaraguru College of Technology, Coimbatore, India

[6] Yogesh. K , Department of Electronic and instrumentation engineering, Kumaraguru College of Technology, Coimbatore, India

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Abstract - Alzheimer's is a disease that wreaks havoc on memory and other critical mental functions. The patient's brain cell connections and the cells themselves degenerate and die, eventually destroying memory and other important mental functions. Several potential biomarkers are being studied for their ability to indicate the early stages of Alzheimer's disease. Researchers are also concentrating on the psychological field and are finding new avenues to quiz the patients on. The aim is to develop a quizzing app to detect the early stages of Alzheimer's. The quiz will contain specified questions which will test the memory of the app user. Researchers *Simon Baker and Anna Korhonen's* work in the *journal of the American Medical Informatics Association* and the book titled "*Brain Longevity*" by *Dharma Singh Khalsa* were the main papers that aided the project. They had found many unique methods to identify the disease at the earliest stages. The book, *Brain Longevity* states various tendencies of patients in the early stages. Forgetting appointments, names, important days and receding learning capacity are some of the concepts obtained from it. The journal gave us insights into the cognitive and comprehensive functions of the brain. It explained the patient's difficulty in focusing, following instructions, and comprehending questions. All those concepts were utilized to frame questions for the focus quizzing app. We did a test run for our app with the group of senior citizens above the age of 60. The results from our focus group verified the absence of Alzheimer's. Our app gives hope for patients to consult the specialist at the earliest possible time.

Keywords: Alzheimer, quiz, app, unique methods, focus group

1. INTRODUCTION

The number of individuals with dementia is increasing significantly as human society ages. However, people with dementia and their families experience difficulties due to a lack of social knowledge about the disease. Alzheimer's disease is the most common type of dementia. It is a progressive neurologic condition in which the brain weakens (atrophy) and brain cells die. Alzheimer's disease is the most prevalent form of dementia, which is defined as a chronic loss of cognitive, behavioral, and social abilities. Alzheimer's disease is expected to affect 60 percent to 70 percent of the approximately 50 million people globally who have dementia. Forgetting recent events or discussions is one of the first indicators of Alzheimer's disease. A person with Alzheimer's disease will develop severe memory impairment and lose the capacity to carry out daily duties as the disease develops. We aim to detect this unforgiving disease earlier and make the life of the patients and their loved ones easier. A quizzing game specialized to detect the early stages of Alzheimer's is the product of our project.

1.1 Population Facts about Alzheimer's Disease

The number of people living with Alzheimer's disease is rapidly increasing, and only around one out of every four persons with the disease is diagnosed. Around 44 million people worldwide are thought to be living with Alzheimer's disease or a related form of dementia. Cases of Alzheimer's disease are quite common cognitive impairments that residents in most geriatric facilities around the world are diagnosed with. Among those around 70, 61 percent of those with Alzheimer's dementia will die before the age of 80, compared to 30 percent of those without the disease - a rate twice as high. People aged 65 and up live an average of four to eight years after being diagnosed with Alzheimer's disease, while some can live for up to 20 years. This reflects the disease's delayed and unpredictable course. Given the increase in average life expectancy, studies estimate that one in every four people will be diagnosed with cognitive impairment by the age of 85.

1.2 Dementia and Alzheimer's Disease

The number of individuals with dementia is increasing significantly as human society ages. However, people with dementia and their families experience difficulties due to a lack of social knowledge about the disease. Alzheimer's disease is the most common type of dementia. It is a progressive neurologic condition in which the brain weakens (atrophy), and brain cells die. Alzheimer's disease is the most prevalent form of dementia, which is defined as a chronic loss of cognitive, behavioral, and social abilities. Alzheimer's disease is expected to affect 60 percent to 70 percent of the approximately 50 million people globally who have dementia. Forgetting recent events or discussions is one of the first indicators of Alzheimer's disease. A person with Alzheimer's disease will develop severe memory impairment and lose the capacity to carry out daily duties as the disease develops. We aim to detect this unforgiving disease earlier and make the life of the patients and their loved ones easier. A quizzing game specialized to detect the early stages of Alzheimer's is the product of our project.

1.3 Challenges for this Population

Although most industrialized countries' average life expectancies are increasing due to continual developments in modern medicine, this does not guarantee that health concerns or illnesses associated with old age would not afflict the growing elderly population. Older persons, on the other hand, maybe prone to diseases that are not life-threatening but might impair their cognitive ability.   When addressing the issues encountered in the interaction between caregivers and residents, the importance of allowing technology to play a role in increasing the quality of life of the elderly people should also be considered, Examining the symptoms of these disorders, and determining how agitation and other interpersonal hindrances emerge is also necessary. In older people dementia and Alzheimer's disease cause a loss of brain function, impairing their capacity to think intellectually, communicate, make a reasonable decision, conduct lucidly, and recall memories. Speech patterns change as they develop the habit of repeating themselves and losing track of what was being said. Especially for those with late-stage dementia, memory loss, incoherent speech, and often irrational behavior are common. As caring for dementia patients, who grow increasingly reliant on others around them, causes stress for both the family and the cares. Residents would display paranoia or feel frightened by anyone who offered to assist them. It is not unusual for nursing staff to face hostility when taking them for showers, restrooms, or walks. The increased agitation contributes to stress in caregiver resident interactions. With that and the incoherent or limited speech that is often adopted as these illnesses progress, geriatric facilities can become an environment burdened with immense stress and tension.

2. LITERATURE SURVEY

[1] The goal of this revised international guideline was to provide a peer-reviewed, evidence-based statement for clinical neurologists, geriatricians, psychiatrists, and other specialized clinicians caring for patients with Alzheimer's disease. In the domains of CSF, neuropsychology, neuroimaging, and non-evidence-based therapy, several new suggestions and good practice guidelines are presented.

[2] The assessment of executive function (EF) and activities of daily living (ADL) are key factors in the diagnosis of Alzheimer's disease, according to this study. The meta-analysis finds a persistent moderate relationship between ADL and EF, strengthening the rising quantity of evidence linking ADL and executive dysfunction in early dementia.

[3] The utility of combining biomarkers, cognitive indicators, and risk factors to predict conversion from mild cognitive impairment to Alzheimer's disease in patients participating in the Alzheimer's Disease Neuroimaging Initiative is investigated in this study. At baseline, cognitive markers were more accurate predictors of conversion than most biomarkers. Longitudinal studies found that conversion was triggered more by a significant reduction in functional ability and, to a lesser extent, declines in executive function than by changes in the disease's neurobiological trajectory.

[4] This research looks at a systematic literature review on automatic Alzheimer's disease detection using voice and language. The comprehensive literature review backed up the idea that language and speech may be utilized to automatically identify dementia.

[5] This article looked at the most significant advancements in Alzheimer's disease research as well as the distinction between dementia and Alzheimer's disease. This research covered all the most recent advancements in Alzheimer's disease detection. The latest developments in CSF and plasma biomarkers are discussed.

[6] Biochemical Biomarkers for Detection of Alzheimer Disease Pathology in Patients: Prospects and Challenges for Clinical Use The decision to test or not test, like with any illness process, is ultimately made by the patient's physician. The testing recommendations are offered in the context of the many different diagnostic techniques usually in conjunction with a spouse or close family member, that is frequently utilized for patients who seek diagnostic examination of their cognitive problems

[7] The Multicenter Standardized F-FDG PET Diagnosis of Mild Cognitive Impairment, Alzheimer's Disease, and Other Dementias is investigated in this study. Automated analysis of 18F-FDG PET scans could give objective and sensitive support for early dementia clinical diagnosis.

[8] Alzheimer's disease (AD) is a neurodegenerative disorder that affects the brain. Computer scientists have recently created several early detection techniques using computer vision and machine learning techniques. The following are the four contributions of this study: We proposed and demonstrated the usage of the displacement field in the application of Alzheimer's disease detection. (ii) We examined SVM and its two variations (GEPSVM and TSVM), and we found that TSVM outperformed SVM and GEPSVM. (iii) With ten state-of-the-art algorithms, the proposed solution obtained equivalent sensitivity, specificity, and accuracy. (iv) According to 28 recent peer-reviewed studies, the suggested computer aided diagnosis (CAD) approach can find AD-related brain areas.

3. OBJECTIVE

[1] To frame questions for early detection of Alzheimer

[2] To develop an app appropriate for senior citizen

[3] To detect Alzheimer's in the early stages.

4. SCOPE

[1] Health care

Early identification of Alzheimer's disease increases the likelihood of treatment success. Receiving an early Alzheimer's diagnosis might help people feel more at ease about their symptoms. Their family can also make the most of their time together by making use of resources and support programmers.

[2] Senior citizen care systems

Seniors can express their preferences for legal, financial, and end-of-life decisions by planning after their early detection Their family will be able to look over and amend legal documents, talk about finances and property, and learn about their care choices.

5. MATERIALS

- ✦ Flutter
- ✦ Android Studio

6. PROCEDURE

[1] Question Framing

This process was based on the online journals and books we had referred to during the literature survey. Fifteen questions were uniquely framed to address the memory of the user.

These are the 5 true or false questions.

[1] My friends and family seem to think I am more forgetful now than I used to be.

[2] Sometimes I forget the names of my friends.

[3] I frequently miss appointments because I forget them.

[4] I rarely feel energetic.

[5] It takes longer for me to learn things than it used to

The previously mentioned five (1-5) questions check for the basic symptoms.

[6] A previously asked true or false question is repeated to test the short-term memory of the user.

[7] The patients often confuse important days. They also find remembering months and dates difficult. We exploited this symptom with the question, "When is the Independence Day of India?"

[8] Find the personality questions. patients tend to forget names and personalities. In the early stages of this disease famous personalities, even their role models are the ones they forget. As the disease progress, they even tend to forget their loved ones.

Fig1.1-image 1

[9] Patients will find it difficult to remember the thing, which is around them, so using this concept we famed the question to remember the things in the picture.

link– dog, link – pencil, link- table

Remember the pictures

Fig 1.2-image 2

10. This question asks the user to locate an object in the confusing picture. Patients will find it difficult to concentrate and the chances of not finding the object within the allotted time are high.

Fig 1.3 – image 3

link- living room.

This question is based on the memory of the app user. Patients may not be able to memorize the things they will get confused and at times they may also forget the thing that they see before. With this base, we farmed the set of 2 questions

[11] What is the colour of the numbers?

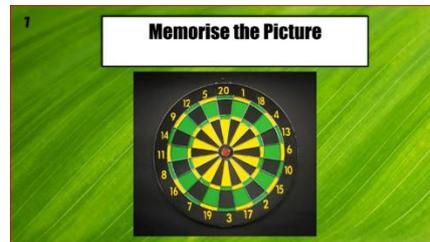[12] What colour is the wall behind the dartboard?

Fig 1.4 -image 4

link – memory

13. This question asking the user to pick the box with the green cat exploits the easily confusable brain of the patients. They will not be able to quickly analyses the correct meaning of the question.
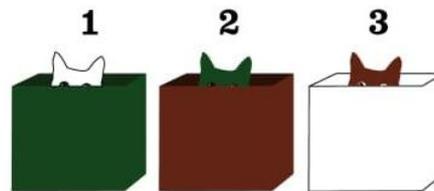

Fig 1.5-image 5

[14] This question asks the user to choose the colour from the picture. It is difficult for the patients to follow the instructions and they may also get confused by the colours.

Fig 1.6 – image 6

[15] The patients will feel difficult to do the mental calculation of adding 2 digits numbers. so, the question of adding 2-digit numbers will help to test the memory condition of the patient.

[2] APP DEVELOPMENT

Description:

main.dart:

In Flutter *main. dart* file is the entry point from which the code starts executing. In the *main. dart* file firstly material design package has been imported in addition to quiz. Dart, *result.dart* and *dart:async* . Then a function *MyApp* has been created for the home page. A function *MyhomePage* is creating which is a stateful widget and its state *_MyhomePageState* has been laid out. Now that is followed by the 15 questions along with their respective answer options and score in the class *MyhomeState*. And at the end, the widget tree for the home screen, which shows the appBar with title, body with the questions and options. At the last, the debug banner is disabled.

quiz.dart :

This file was already imported in the *main. dart* file. In this file the class Quiz is being defined which is used in the main.dart file. Class Quiz has been extended as a stateless widget as it need not change any time in the run cycle of the app, which is followed by constructor Quiz. Then we have the widget tree that defines the structure of the class Quiz which is the questions and their options.

question.dart:

This file has already been imported into the *quiz. dart* file, which uses the class Question. The class Question is a stateless one as it needs no change in the run cycle. Then we have the constructor Question which is followed by the widget tree that gives structure to the Question widget.

answer. dart:

This file was also imported into the *quiz. dart* file. This file contains the Answer class which was uses in the *quiz. dart* file. The answer is a stateless widget. In the class Answer function, selectHandeler and string answerText have been passed using the keyword final as they belong to stateful widget and hence need to be specified immutable and not doing so will result in a dart analysis warning. That is followed by the constructor and the usual widget tree to give it a structure.

result. dart:

This file had been imported in the *main. dart* file already as the class Result is defined in this file. The class result will not change in the app run cycle therefore it is a stateless widget. As subclasses or variables which are used in the stateful widget needs to be made immutable keyword final has been used, it is followed by the Result keyword. After that, we have the resulting logic which decided which remark would be shown after the quiz bases on the final score. And at last, we have the widget tree that defines the structure of the class Result.

main. dart

Step 1: Start

Step 2: Import dart.ui , material.dart , quiz.dart, result.dart and dart:async files.

Step 3: Create a class MyApp to build a widget for the home page.

Step 4: Create a class MyHomePage with its state _MyHomePageState.

Step 5: _MyHomePageState returns a container with child as the logo.

Step 6: Create a class MyhomeState with its state MyHome.

Step 7: Add the questions along with their answers and score.

Step 8: Create a function for restarting the quiz.

Step 9: Create a widget tree for the home screen, which shows the *appBar* with title, body with the questions and options.
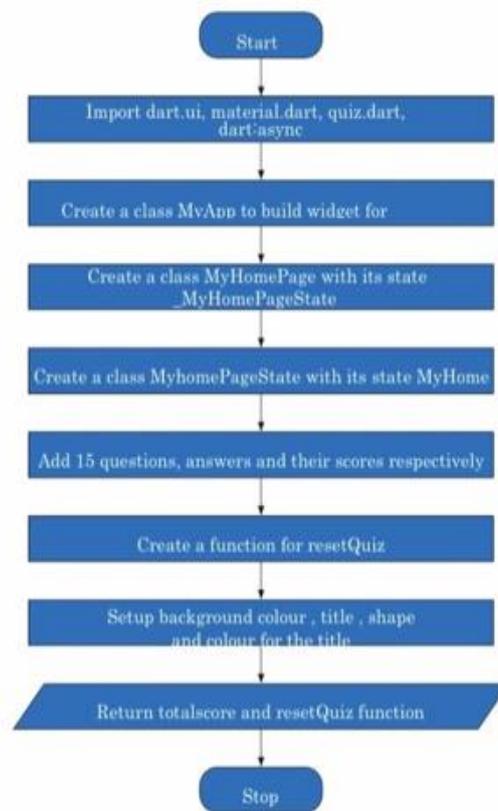
Step 10: Stop

Chart 1 – main.dart

question.dart

Step 1: Start

Step 2: Import material.dart file

Step 3: Create class Question followed by constructor Question.

Step 4: Create a widget tree that defines the structure of the class Question.
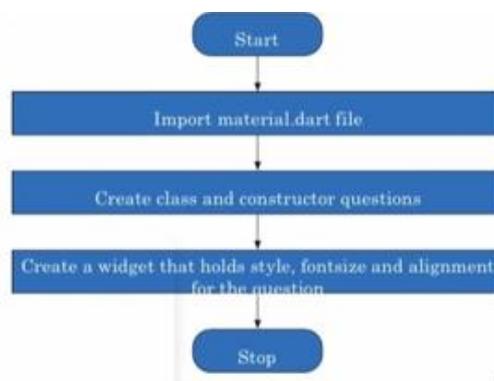
Step 5: Stop

Chart 2 – question.dart

quiz. dart

Step 1: Start

Step 2: Import material.dart , question.dart and answer.dart files.

Step 3: Create class Quiz followed by constructor Quiz.

Step 4: Create a widget tree that defines the structure of the class Quiz which defines the questions and their options.

Step 5: Return score and text to the function answerQuestion .
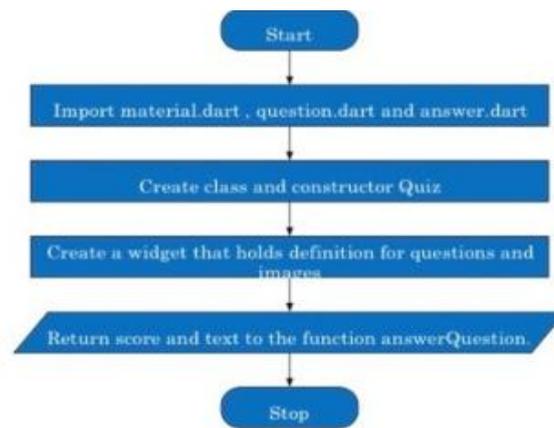
Step 6: Stop

Chart 3 – quiz.dart

answer. dart

Step 1: Start

Step 2: Import material.dart file

Step 3: Create class Answer followed by constructor Answer

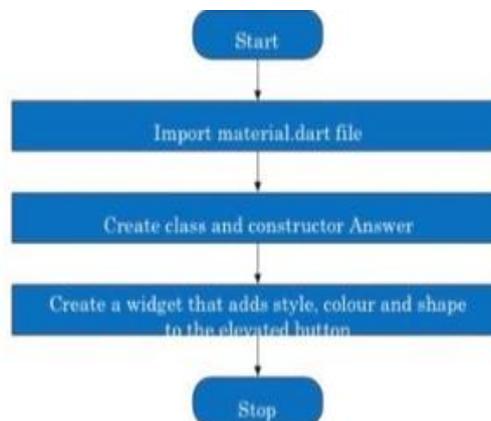Step 4: Create a widget tree that defines the structure of the class Answer

Step 5: Stop

Chart 4 – answer.dart

result. dart

Step 1: Start

Step 2: Import material.dart file

Step 3: Create class Result followed by constructor Result

Step 4: Create a widget tree that defines the structure of the class Result

Step 5: Create a string resultScore that holds the result after evaluation

Step 6: If resultScore is between 12 and 15 then display "Your brain is running on empty. You should see your doctor. You can refuel your brain and prevent further memory loss with food, vitamins, herbs, exercises, and medications. "

Step 7: If resultScore is between 9 and 11 then display "Your brain is in danger. Check your diet today. You can reduce brain drain and memory loss with vitamins, brain foods, herbs, yoga and meditation techniques, and appropriate medications."

Step 8: If resultScore is between 5 and 8 then display "Your brain is functioning okay. By learning to relax and maintain a healthy diet, your brain can function at even higher levels."

Step 9: If resultScore is less then 5 then display "You are healthy. you are of no immediate danger!"

Step 10: Create a widget that holds style, alignment for the result displayed and restarting function
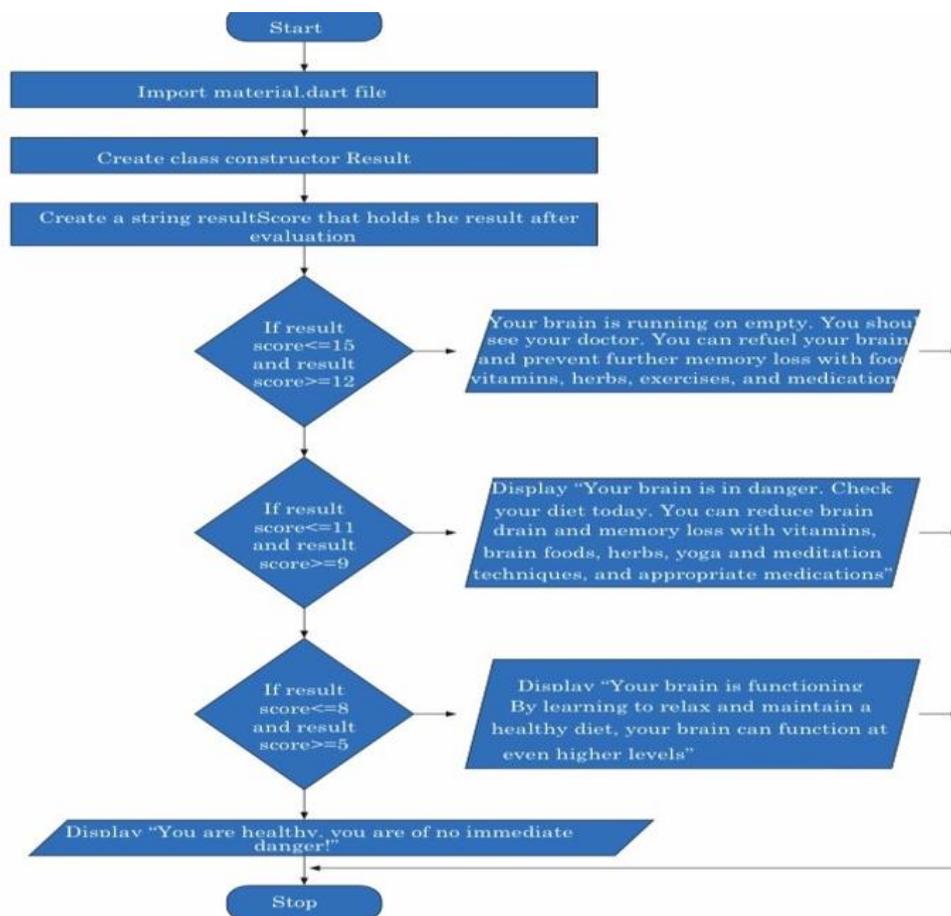
Step 11: Stop

Chart 5- result.dart

7. RESULTS AND FINDINGS

A focus group containing four senior citizens of the sixty-plus age group was put together based on availability. All the participants were knowledgeable in English or Tamil, and they knew basic calculations.

The participants were:

Chandra. B – age 72

[1] Rajammal. N – age 75

[2] Kasthuri.S -age 62

[3] Perumalsami. R -age 70

Here are their photographs.

Image 2.1-Chandra. B

Result of the quiz: Your brain is functioning okay. By learning to relax and maintain a healthy diet, your brain can function at even higher levels.

Image 2.2-Rajammal. N

Result of the quiz: You can reduce brain drain and memory loss with vitamins, brain foods, herbs, yoga and meditation techniques, and appropriate medications.

Image 2.3-Kasthuri.S

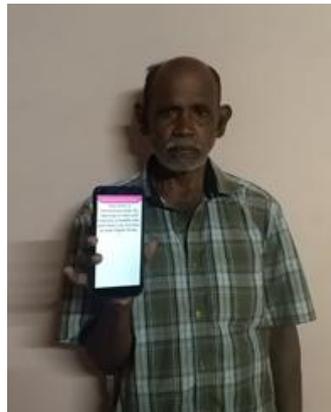Result of the quiz: You are healthy. You are of no immediate danger!

Image 2.4-Perumalsami. R

Result of the quiz: Your brain is functioning okay. By learning to relax and maintain a healthy diet, your brain can function at even higher levels.

We found our app to be successful on this small scale. A larger focus group with a previous professional evaluation will yield better insights.

8. CONCLUSION

Alzheimer's disease is a life-altering disease, and reactions to a diagnosis can range from disappointment and sadness to rage and despair. For many people, though, it can also be a relief. A diagnosis could bring long-awaited explanations for memory loss, communication issues, and behavioural abnormalities. A timely diagnosis allows for better care and treatment in the future. It enables people to make crucial decisions about their care and support needs, as well as financial and legal matters, while they are still able. It also enables them and their families to obtain useful information, counsel, and support as they face new problems. Our programme has been installed successfully on Android phones. . Our small focus group showed positive and encouraging results. This project is a small drop in helping the mighty ocean of dementia and senior citizens care systems.

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BIOGRAPHIES

V.Senthil Kumar
Assistant professor
Department of Computer Science
Kumaraguru College of Technology
Coimbatore, India
senthilkumar.v.cse@kct.ac.in

Avantheka.S
Department of Biotechnology
Kumaraguru College of Technology
Coimbatore, India
avantheka.20bt@kct.ac.in

Nikitha.D
Department of Biotechnology
Kumaraguru College of Technology
Coimbatore, India
nikitha.20bt@kct.ac.in

Ravivarmaa. K
Department of Electronics and Instrumentation Engineering
Kumaraguru College of Technology
Coimbatore, India
ravivarmaa.20ei@kct.ac.in

Sonalikaa. S.S
Department of Biotechnology
Kumaraguru College of Technology
Coimbatore, India
sonalikaa.20bt@kct.ac.in

Yogesh. K
Department of Electronic and instrumentation Engineering
Kumaraguru College of Technology
Coimbatore, India
yogesh.20ei@kct.ac.in