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# Healthcare Application

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**Abstract.** As of March 7, 2020, the coronavirus disease 2019 (COVID-19) outbreak had infected more than 80% of China, with 21110 cases recorded in 93 countries across six continents.Coronavirus takes an average of 5 to 6 days to incubate, but it can take up to 14 days. Before the person begins to show symptoms, he or she may be infectious during the incubation period. As a result, if the afflicted individual interacts with others, it might be harmful. It is difficult to restrict illness transmission internationally due to the unique coronavirus's biological origin, quicker dissemination, and unknown transmission pattern.Because SARS-CoV-2 differs from SARS-CoV and MERS-CoV in terms of biological traits and transmissibility, it has proven to be one of the most difficult obstacles for human beings battling COVID-19 in history. As a result, the best strategy to prevent the disease from spreading is to maintain social distance and adhere to WHO rules. This condition has been linked to an increase in heart rate in studies. Body temperature and heart rate will be monitored in this experiment. As a result, the user interface of the programme will take readings and propose actions based on the provided settings.

## 1 Introduction

Health apps are smartphone and tablet PC application applications that provide health- related services. Health apps are part of the drive toward mobile health (mHealth) initiatives in healthcare since they are available to patients both at home and on the go. The overall purpose of this project is to collect technical knowledge and abilities, grasp new methodologies, and acquire data in order to develop a successful healthcare application. The database entry will be scrutinized. The findings would then be compared to the predefined numbers, and a decision would be made. The gadget will determine whether or not the user is at danger and requires a Covid Test based on the results.

For simulation of project, a previously prepared database is used. The database created has values of parameters like temperature, oxygen level and pulse rate.

We are facing a global pandemic due to CORONA virus outbreak. It has been a year after this widespread disease, but vaccine is available in limited quantities. So the only way to control the spread of the disease is through conducting a series of tests and following proper isolation guidelines provided by the WHO. Therefore making these tests available on a local level was the main motivation behind our efforts.

Not every hospital and clinic has the facility and the equipment to conduct the series of tests

required for COVID-19. As the majority of the population in our country is a part of the lower middle class, not every citizen can afford these tests. As it is mandatory to go through the tests in or to determine whether your infected or not. Using this application will be an easier way to find out if you are actually at risk and whether you need to go through the tests.

COVID-19 is a global pandemic which has resulted in the death of milions of people worldwide. The symptoms for this disease are not easily recognizable, also the PCR tests required for COVID-19 are too costly for the common citizen. Therefore it is necessary there be a simple and cost effective way to determine a person's health condition and his exposure to COVID-19.

Even though we can't determine a person's exposure towards this disease, scientists glob- ally have found a set of symptoms that help in determining whether a person is infected or not. Some of these symptoms are Body temperature, Pulse rate, Oxygen level,etc.

### *1.1.1Normal Range*

A typical adult's body temperature ranges from 97 to 99 degrees Fahrenheit. The temperature range for newborns and children is a little higher: 97.9 to 100.4 degrees Fahrenheit. The temperature of our bodies changes throughout the day and throughout our lives. The following are some of the factors that cause body temperature to fluctuate during the day: Your activity Time of day it is, Age, Sex, What you've had to eat or drink The location on your body where you take your temperature influences the reading. The readings from your underarms are usually a degree lower than the readings from your lips. Rectal temperatures can be up to a degree greater than mouth temperatures.

Fever is defined as a body temperature that is higher than the usual range, while hypothermia is defined as a body temperature that is lower than the usual range. Both of them should be kept an eye on.

The temperature set point is the temperature at which the

| **New born (0-3 months Old)** | **Infants (3-6 months Old )** | **Infants (6-12 months Old )** | **Childerns (1-10 years)** | **Childern over 10 years and adults, including seniors** | **Well-trained adult athletes** |
|---|---|---|---|---|---|
| 99-149 | 89-119 | 79-119 | 69-129 | 59-99 | 39-59 |

Table 1. Human Pulse Rate

### *1.1.3Rhythm*

body seeks to maintain its temperature. The outcome of raising the set point is a fever. Fevers are usually caused by infectious disorders, and they can be treated with antipyretic drugs if necessary. A fever is defined as a temperature that is greater than 37.2 C (99.0 F) in the morning or 37.7 C (99.9 F) in the afternoon, assuming that the temperature is increased owing to a shift in the hypothalamus's set point. For elderly persons, lower criteria are sometimes suitable.] The average daily temperature

fluctuation is 0.5 degrees Celsius (0.90 degrees Fahrenheit), however it can be larger in those recuperating from a fever. Afebrile or apyrexic refers to an organism that is operating at its optimal temperature. Hyperthermia occurs when the temperature is elevated but the set point is not raised [1-2].

### *1.1.2 Pulse rate*

The pulse rate is a measurement of the number of heart beats per minute. A healthy adult's pulse rate should be between 60 and 100 beats per minute.

In medicine, a pulse is defined as the tactile arterial palpation of the cardiac cycle (heart- beat) by skilled fingertips. The pulse can be felt anywhere on the body where an artery may be squeezed near the surface, such as the carotid artery, wrist (radial artery), groyne (femoral artery), behind the knee (popliteal artery), behind the ankle joint (posterior tibial artery), and on foot (dorsalis pedis artery). The measurement of pulse (or the count of arterial pulses per minute) is similar to that of heart rate. The heart rate can also be measured by listening to the heart beat by auscultation, conventionallyusing a stethoscope and counting it for a minute.

Three fingers are often used to measure the radial pulse. Because the two arteries are joined by the palmar arches,the finger closest to the heart is used to occlude the pulsepressure, the middle finger is used to gain a rough estimate of blood pressure, and the finger most distal to the heart (typically the ring finger) is used to neutralise the influence of the ulnar pulse (superficial and deep). Sphygmology is the science of studying the pulse. Normal pulse rates at rest, in beats per minute (BPM).

The pulse rate is a useful tool for determining overall heart health and fitness. Although lower is generally preferable, body cardias can be hazardous. A dangerously slow heart- beat causes fatigue, lack of energy, fainting, and other symptoms.

The rhythm and force of a typical pulse are both consistent. Sinus arrhythmia, ectopic beats, atrial fibrillation, paroxysmal atrial tachycardia, atrial flutter, partial heart block, and other conditions can cause an erratic pulse. The occasional dropping out of beats at pulse is referred to as "intermittent pulse." Pulsus bigeminus and second-degree atri- oventricular block are examples of regular intermittent (regularly irregular) pulses. Atrial fibrillation is an example of an irregular intermittent (irregularly irregular) pulse.

### *1.1.4 Patterns*

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There are a variety of pulse rhythms that might be clinically significant. These are some of them:

Dicrotic pulse: This type of pulse has two pulses every heart cycle, one systolic and one diastolic. The dicrotic wave is the consequence of reflected waves from the lower extremities and aorta, according to physiology. A dicrotic pulse is caused by a combination of inadequate cardiac output and high systemic vascularresistance.

Pulsus alternans is a scary medical indication that suggests systolic heart failure is progressing. The

examiner notices a pattern of a strong pulse followed by a weak pulse again and over again with trained fingertips. The heart's struggle to stay in systole is fading, as shown by this pulse.Pulsus bigeminus: Each pulse is accompanied by a pair of hoofbeats. A gallop rhythm of the native pulse may be seen by simultaneous heart auscultation[3].

Pulsus bisferiens: Unlike the dicrotic pulse, thispulse has two systolic pulses every heart cycle. If the aortic valve does not routinely open and close, it is an uncommon physical feature found in people with aortic valve disorders. Instead of one pulse each heartbeat, trained fingertips will detect two.

The pulsus tardus et parvus, also known as the slow- rising pulse or anacrotic pulse, is feeble (parvus) and late(tardus) in comparison to its predicted features. It is caused by a stiffer aortic valve that becomes increasinglydifficult to open, necessitating higher blood pressure generation in the left ventricle. Aortic valve stenosis causes it.

Pulsus paradoxus: a condition in which certainheartbeats at the radial artery cannot be recognised during the inspiration phase of breathing. It's producedby an excessive drop in blood pressure during this period, and it's indicative of a number of other cardiac and respiratory disorders, including cardiac tamponade. Tachycardia is characterised by an increased resting heart rate. An electrocardio- gram (ECG) is usuallynecessary to determine the kind of tachycardia.

The pulse The inherent physiology of systole and diastole is implied by this descrip- tion of the pulse. Systole and diastole are the forces that expand and constrict the pulmonary and systemic circulations, respectively, according to science.

Hyperdynamic circulation is marked by a collapsing pulse[4].

### *1.1.4 Oxygen Rate*

The percentage of oxygen-saturated haemoglobin in the blood compared to total haemoglobin (unsaturated

+ saturated) is known as oxygen saturation. The human body requires and manages a precise and precise oxygen balance in the blood. Humans have a normal ar- terial blood oxygen saturation level of 95 to 100 percent. Hypoxemia is a condition in which the amount of oxygen in the blood is less than 90%. 1st Low levels of arterial blood oxygen, such as those found in the brainand heart, might affect organ function and should be handled promptly.

Continued low oxygen levels can lead to cardiac orrespiratory collapse. To assist raise blood oxygen levels, oxygen treatment can be employed. Oxygenation happens when oxygen molecules enter the body'stissues. The lungs, for example, oxygenate the blood by transporting oxygen molecules from the air into the bloodstream. Medical oxygen saturation is commonlyreferred to as oxygenation.

Hypoxemia is defined as a decrease in arterial oxygen saturation (as measured by an ar- terial blood gastest) below 90%. (which can also be caused by anemia). Cyanosis is a symptom of hypoxemia caused by low SaO2. The saturation of oxygen in various tissues maybe calculated.

The percentage of oxygenated haemoglobin re- turning to the right side of the heart is known as venous oxygen saturation (SvO2). It may be assessed to check if oxygen supply satisfies the needs of

the tissues. SvO2 levels normally range between 60 and 80 percent. A lower result indicates a shortage of oxygen in the body, which can lead to ischemic disorders. This measurement is frequently used during therapy with a heart-lung machine (extracorporeal circulation), and it can help the perfusionist determine how much flow the patient needto be healthy.

Near-infrared spectroscopy can be used to determine tissue oxygen saturation (StO2). Despite the fact that the data are still debated, they provide an indication of tissue oxygenation under varied situations. Peripheral oxygen saturation (SpO2) is a measurement of oxygen saturation that is often taken with a pulse oximeter. It may be computed using pulse oximetry andthe formula below.

$$\mathrm{SpO_2} = \frac{\mathrm{HbO_2}}{\mathrm{HbO_2} + \mathrm{Hb}}$$

where HbO2 is oxygenated hemoglobin (oxyhemoglobin) and Hb is deoxygenated hemoglobin.

## 2. Devices

### *2.1.1 Pulse oximetry*

Pulse oximetry is a technique for estimating the amount of oxygen bound to haemoglobin in the bloodstream. SpO2 is the abbreviation for this close approximation to SaO2 (pe- ripheral oxygen saturation). The pulse oximeter is a little gadget that is clasped to the body (usually a finger or an infant's foot) and sends its readings to a reading metre by wire or wireless. The gadget measures the absorption of red and infrared light in the extrem- ities using light-emitting diodes of various colours in combination with a light-sensitive sensor. Calculations are based on the differential in absorption between oxygenated and deoxygenated haemoglobin.

### *2.1.2 Medical Significance*

At sea level, individuals in excellent physical condition normally have oxygen saturation readings between 96 and 99 percent, and should not go below 94 percent. The oxygen saturation level at 1,600 metres (about one mile) must be more than 92 percent. Hypoxia occurs when the SaO2 (arterial oxygen saturation) level falls below 90%. (Ane- mia can also lead to hypoxia.) Cyanosis indicates hypoxia owing to low SaO2, howevertissue oxygenation is not immediately represented by oxygen saturation. The affinity of haemoglobin for oxygen may reduce or increase oxygen release at the tissue level.

Because oxygen is more easily absorbed by the tissues, haemoglobin has a reduced affinity for oxygen. When the pH is lowered, the body temperature rises, the arterial partial pres- sure of carbon dioxide (PaCO2) rises, and 2,3-DPG levels rise (a consequence of glucose metabolism seen in stored blood products).

When haemoglobin has a higher affinity for oxygen, it is less accessible to the tissues. Increased oxygen binding to haemoglobin and limited oxygen release to tissue are caused by conditions such as increased pH, lowered temperature, lowered PaCO2, and decreased 2,3-DPG.

## 3 System design

### *3.1 Software Design :Android Studio*

Android Studio is Google's official integrated development environment (IDE), based on JetBrains IntelliJ IDEA software and tailored exclusively for Android development.

Android Studio employs a Gradle-based build system, emulator, code templates, and Github integration to assist application development on the Android operating system. Every Android Studio project contains one or more source code and resource file types. Android app modules, Library modules, and Google App Engine modules are among these modalities.

To push code and resource changes to a running application, Android Studio employs the Instant Push functionality. A code editor helps programmers write code by providing code completion, refraction, and analysis. Android Studio applications are subsequently compiled into the APK file and submitted to the Google Play Store.

In the current stable version the following featuresare included:

Support for Gradle-based builds

Refactoring for Android and fast fixes Performance, usability, version compatibility, and other issues are caught using lint tools.

Integration and app-signing capabilities with ProGuard Wizards based on templates for creating standard Android designs and components

Users may drag-and-drop UI components in a powerful •layout editor, and layouts may be previewed on numerous screen configurations.

Building Android Wear applications is now possible. Support for Google Cloud Platform is built-in, allowing for connection with Firebase.

Google App Engine with Cloud Messaging (formerly Google Cloud Messaging)

In the Android studio, use the Android Virtual Device(Emulator) to execute and debug apps.

Android Studio 3.0 or later supports Kotlin and all Java 7 language features, as well as a subset of Java 8 language features that vary by platform version, including Java, C++, and more with extensions, such as Go; and Android Studio 3.0 or later supports Kotlin and all Java 7 language features, as well as a subset of Java 8 language features that vary by platform version. Some Java 9 features have been backported by other projects[5-6].

Although IntelliJ claims that Android Studio supports all available Java versions as far as Java 12, it is unclear to what extent Android Studio supports Java versions up to Java 12. (the documentation mentions partial Java 8 support). In Android, at least some new language features up to Java 12 are available. An app may be published on the Google Play Store once it has been built with Android Studio. The application must adhere to the Google Play Store's developer content guidelines.

Program :

Database

What is a database, exactly?

A database is a collection of connected data that depicts a real-world situation. A database system is made to be developed and filled with information fora certain activity.

What is a database management system (DBMS)?

A database management system (DBMS) is software that stores and retrieves data for users while taking proper security precautions. It is made up of a collection of applica- tions that alter the database. The DBMS accepts an application's request for data and informs the operating system to give the requested data. A database management system (DBMS) aids users and other third-party applications in storing and retrieving data in huge systems.

Users can design their own databases using a database management system (DBMS). The word DBMS refers to the database user as well as other application applications. It serves as a link between the data and the software programme.

Characteristics of Database Management System, Ensures security and eliminates duplication, A database system's self-descriptive nature, Isolation between programmes and data abstraction, Support for different views of data, Data sharing and multiuser transaction processing, DBMS permits entities and relationships between them to build tables It adheres to the ACID principle ( Atomicity, Consistency, Isolation, and Durability) A multi-user environment is supported by DBMS, allowing users to view and ma- nipulate data in concurrently.

MongoDB

MongoDB is a cross-platform document-oriented database application that is open source. MongoDB is a NoSQL database application that works with JSON- like documents and optional schemas. MongoDB is a database that was created by MongoDB Inc. and is distributed under the Server Side Public License (SSPL).

Main features Ad-hoc queries:

MongoDB allows you to search by field, range, or regular expression. Queries can retrieve specified fields from documents and can also include JavaScript functions supplied by the user. Queries can also be setup to return a random sample of a certain number of results.

Indexing:

Primary and secondary indices can be used to index fields in a MongoDB document.

Replication:

With replica sets, MongoDB delivers high availability. Two or more copies of the data make up areplica set. At any point, any member of the replica- set can take on the position of primary or

secondary replica. By default, all writes and reads are performed on the primary replica. Built-in replication allows secondary copies to keep a copy of the primary's data.

When a primary replica fails, the replica set performs an automated election to select which secondary shall take its place as the primary. Read operations can be served by secondaries if desired, however data is only eventually consistent by default. A additional daemon called an arbiter must be added to the set if the replicated Mon- goDB deployment only has one secondary member. It only has one responsibility: to settle the election of the new primary. As a result, even with just one primary and one secondary server, an optimal distributed MongoDB implementation need at least three different servers.

Load balancing:

Sharding allows MongoDB to scale horizontally. A shard key is chosen by the user, and it controls how the data in a collection is dispersed. The data is divided into ranges and spread over several shards (depending on the shard key). (A master with one or more copies is referred to as a shard.) The shard key can also be hashed to map to a shard, allowing for even data distribution.

MongoDB may be distributed over numerous servers, balancing the demand or replicating data to keep the system operational in the event of hardware failure.

File storage:

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GridFS, a MongoDB-based file system with load

balancing and data replication capabil- ities, may be used to store files across several workstations.

The grid file system function is supplied with MongoDB drivers. MongoDB provides de- velopers with capabilities for manipulating files and information. GridFS may be accessed using the mongofiles tool or Nginx and lighttpd plugins. GridFS splits a file into sections, or chunks, and saves each piece as its own document.

Aggregation:

Aggregation is performed in MongoDB using three approaches: the aggregation pipeline, the mapreduce function, and single-purpose aggregation techniques.

For batch data processing and aggregation activities, map-reduce can be employed. The Aggregation Pipeline, however, delivers greater performance for most aggregation oper- ations, according to MongoDB literature. Users can utilise the aggregation framework to get the kinds of results that the SQL GROUP BY clause may produce. Aggregation operators can be connected in a pipeline similar to Unix pipes. The $lookup operator, which may combine documents from several collections, as well as statistical operators like standard deviation, are part of the aggregation framework.

Server-side JavaScript execution:

JavaScript may be used in queries, aggregation functions (such as MapReduce), and can even be passed directly to the database to run.

Capped collections:

Capped collections are a type of collection in MongoDB that has a defined size. This sort of collection keeps insertion order and functions as a circular queue after the desired size is achieved.

Transactions:

Since the 4.0 release in June 2018, MongoDB promises to offer multi-document ACID transactions. This assertion was shown to be false since MongoDB does not adhere to snapshot isolation[7].

## 4 System implementation

Algorithm

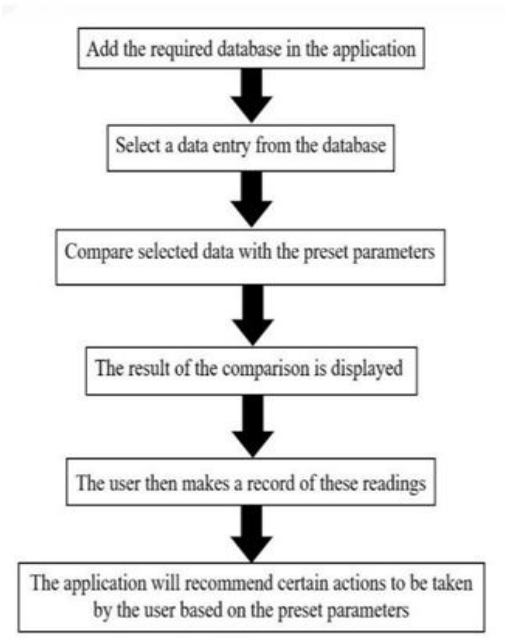
Step 1: Read database in app.

Step 2: Select a data entry from database.

Step 3: Compare the selected data with the presetparameters.

Step 4: The result is displayed.

Step5:The application will recommend certain actions to bes taken by the user based on the preset parameters.




Flowchart description: The database created is synced with the application. The user can select

one value for each parameter from the database. The selected valueswill then be compared with the preset values of parameters. According to the analysis, the result will be displayed on the User Interface[8].

## 5. Results

**Table 1:** Result for Temperature

| Temperature Values ( In Degree F) | Remarks |
|---|---|
| 97 | Normal |
| 98 | Normal |
| 100 | Risk |
| 101 | Risk |
| 104 | Risk |

**Table 2**: Results for Oxygen Level

| Oxygen level ( In %) | Remarks |
|---|---|
| 97 | Normal |
| 98 | Normal |
| 95 | Risk |
| 90 | Risk |
| 89 | Risk |

**Table 3:** Results for Heart rate

| Heart Rate(In BPM) | Remarks |
|---|---|
| 80 | Normal |
| 93 | Normal |
| 105 | Risk |
| 70 | Normal |
| 110 | Risk |

Above are the tables showing the values of parameters and their expected outputs:

Body Temperature: The ideal range for human body temperature is 97F to 99F. So if the value selected exceeds these values, the output will indicate that the person is at risk.

Pulse Rate: The normal range for heart rate is 70-100 beats per minute. If the se- lected value is out of this range, then the output will show that the person is at risk Oxygen level: The reading shows percentage of oxygen level in someones blood. A normal level of oxygen is usually 95% or higher and for people with chronic lung diseases, the normal level is around 90%. So if the value is less than these values, the output will show that the person is at risk.

## 6. Simulation Results

Figure: Simulation Results

## 8. Conclusion

This is a basic version of testing in which a data entry from a database is used to cross reference data with the application to know the various risk factors and the precautions that need to be taken. It can be further implemented on an advanced level in which it can be connected via cloud computing to make it accessible to as many people as possible for them to enter their data such as body temperature, heart rate and get their necessary precautions.

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