**Department of Electrical and Computer Engineering**

**North South University**

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# Junior Designing Project

## **Dietary:** a Cloud-based Nutriment & Fitness Assistant (fact-based) Android App for Bangladeshi Youths.

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# Abstract

Nowadays the mobile phone is the most serviceable device among mass people. The revolution of technology gives the sustainability of ease, automation of uses of mobile devices, and diminishes the time period of manual tasks. In the field of the operating system, Android is on thriving growth with the suitability of cloud computing, which brought larger prosperity such as application, games, and so on. Hence, this paper with an innovatively thought of a cloud-based android application named "Dietary" provides nutrition guidelines, food recommendations, and fitness instruction based on consumer's BMI and lifestyle habits. We propose a machine learning approach for food recommendation. Its recommended food meets the calorie needs of consumers using the K-Nearest Neighbour (KNN) algorithm which will be working as a real-life nutritionist. Also going to implement chatbot API for user guidelines and basic questions and answers for nutrition and fitness related facts using natural language processing (NLP) framework. The eventual aim of this research project is to exhort the young generation to consume food with nutriment and maintenance fitness to lead a healthier life.

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# Chapter 1: Introduction

In this section, we are going to discuss Cloud-based Systems, Android Application, Nutrition, Fitness, Bangladeshi people in case of health and fitness maintenance and why people need this app.

## 1.1 Cloud-based System

Cloud computing is an application-based software infrastructure which is able to store data on remote servers.Through the internet those data can be accessed.[4] It simply means that any application deployed in a cloud environment except hosting on a local machine. It refers to various features like resources polling, on demand self service, easy maintenance, large network access, availability, automatic system, security, measured service and so on. Cloud services proved itself as a helping hand for both hosts and consumers. So the popularity of cloud based systems is rising rapidly.[9]

## 1.2 Android Application

We choose the android Operating system to develop our application. One of the most significant margins Android has over other platforms. The open-source nature of Android makes it easily accessible by mobile phone manufacturers. The code for Android is free and can be applied by any phone manufacturer. This constructs the market for Android devices the largest in the world. According to statistics, more than 80% of smartphones produced in the world run on Android. This creates a remarkable market for any Android app developer and makes the applicable very profitable. Word wide android has a huge market place. Android is also the best-selling OS worldwide. In Bangladesh, Android OS is also very popular. One

more reason for the Android operating system is its accessibility. Android development is easy to acquire by any programmer who has knowledge of the Android SDK tool and java. The Android SDK tool is free and can be perceived quite easily. We develop our app in Android Studio.[5]

## 1.3 Nutrition

Good nutrition has a straight influence on our overall health and quality of life. When we follow a healthy diet that builds off all the nutrients our body needs as a proper amount of carbohydrates, protein, vitamins, minerals, and fats. We aren't just satisfying our hunger, we're nutritive about our body too. We all know that good food choices are essential for a healthy body and mind.

Some reasons why nutrition is significant:

**1. REDUCING THE CHANCE OF DEVELOPING VARIOUS DISEASES:**

Following attribute eating habits can reduce our jeopardy of developing certain diseases that could sharply impact our health.

**2. A HEALTHY WEIGHT:**

Eating natural food in lieu of processed foods can have a positive outcome on our weight.

**3. INCREASES ENERGY LEVELS:**

Normally junk foods make our body weak internally where a healthy diet which consists of proper nutrients will increase our energy levels.

**4. BOOSTING SYSTEM FOR IMMUNE:**

When we try to lead a good healthy nutrition life ,we are always trying to take natural and all kinds of healthy foods that help our body to gain energy.This includes improving our immune system.

So in our app there will be a nutrition guideline feature. It helps to calculate BMI(Body Mass Index). He or she will know whether he or she is overweight or not. Then it gives a proper diet plan accordingly to BMI.[6]

# 1.4 Fitness

We all know that “Health is wealth”. So it’s a vital fact of our life. Without good health, you will not be able to concentrate on anything.

Health is wealth, without it our life will be miserable. People who are sick in different types of disease their life is very hopeless, frustrating and no joyful also they are not punctual in any activities.Those who has good health and perfect body their life is so joyful and they are punctual in any activities.Good health is a key for a successful life. Only Healthy citizens of people in any country can lead a cheerful life.

So In our app we create Fitness guideline Features, where we will develop yoga exercise with a time counter, full body workout weekly plan with proper instructions. [6]

## 1.5 Bangladeshi People

Nowadays many people do not care about the importance of maintaining good physical fitness and a healthy lifestyle. Most of them are careless about physical fitness and a healthy food habit. This behaviour causes life-threatening situations like obesity, heart disease, high blood pressure, and sometimes cancer like disease. We are going to make a nutrition & fitness guideline providing an android application which will be user friendly. We are also focusing on user practical situations. By enduring daily physical activities, we not only can improve the state and condition of our body, but also state of mind as well.

### 1.5.1 Bangladeshi Youth

Our main target is youth generations of Bangladesh because, nowadays most of the young people are leading an unhealthy lifestyle and a tight busy scheduled life which makes them so inactive on the purpose of healthy life. In our system we will provide proper guidelines for a youth to maintain a good healthy lifestyle. Our main focus is on fitness and nutrition. On the nutrition side we will provide a proper diet plan according to their current body condition based on their BMI. On the fitness side we will provide a proper workout plan based on their regular activity. A user also can get the solutions of nutrition related questions by sending messages through chatbot also.

# Chapter 2: Literature Review

We study different articles which are related to our project. Some articles are very common with our project.We choose two article papers which take some idea from there for our project.

## 2.1 Literature Explanation

A study has been done in [2] Robert A. Sowah et al. to design a fitness System which is called design and Development of Diabetes Management System Using Machine Learning.They developed their project with genetic algo where meal number can select and fitness part can calculate by using in calories meals and calories needed for any user. They were satisfied that their project was a very good one because it is an excellent solution for diabetics patients.

Fico et al. [7] give an idea that will construct three parts like exercise ,meals and user's data. It synchronizes them with this item and sends a reminder note to the user. This is the way the system made a relationship with them. System will advise time for exercise, some information about sugar level and food habits.it will not give any advantages of visual interface with a chatbox.

Alotaibi et al. [8] work on this project by using PHP and MYSQl for web version and he also use C for iPhone also use JAVA for android mobile application. System also updated their SMS system to remind patient and AI system that will determine their health condition by using Fuzzy logic.This system also made a well relation with doctor and patient.Doctor will get update of patient.But tracking system does not included in system because monitoring patient activity is very tough for managing patient health.

Phanich et al. use algorithms and maps for grouping foods on a list that is based on their fitness and nutrition topics.They divide food in three ways: limited food, normal food and must avoided food. This system will not give any suggestions for food, it will give advice on healthy food instead of avoidable food. It also gives patients good advice not to take any food which is not good for the patient, for this reason it will not take data from the user. There are disadvantages also different body type people need different charts for their body, their exercise, food suggestions will not be the same for everyone. If weight, height, minimum calories needed for a patient is not implemented in the system ,then it will make server issues for patients.

Gu et al. represent an alternative smartphone based system which will monitor glucose blood. Also there is a system that will automatically measure all activity of patients by using smartphone sensors.After examining 112 users they declared that their system accuracy level is 82.14%.There is a lackings in chatbot where patient and doctor can question and give answers to those questions for the patient.

Mokdara et al. presented a system where recommendations system will be there.They will suggest recipes which can be matched with the patient food type or it will be a user's searching dishes,but limitation is there is an issue with chatbot .

Bianchini et al. presented a system that will give a user a healthy menu by taking user’s data from account, it can be a patient 's personal preference or can be their medical prescriptions.This prescriptions justify user’s information which is good for them and which is not,but there is a lackings about Q&A chatbot which give exact education to patient and also a reminder notification on their phone.

In another work Xie et al. work on a mobile base system which can Q&A and also give a warning called DiaAID,which is helping diabetes patients and high risk patients.This system works in a three different way , one is large scale multi language,another is multi fusion framework,one more way is health data process system,but lackings is notification on system on phone,meal suggestion also food synchronization capacities.

After total analysis from these group works we saw some organised shortcomings. Firstly they did not focus on the user's searching meal,there is no health education technology for their patient and also there is no reminder notification on the system which is a must needed scenario in any fitness management system.Even if consider the searching system for food the patient there is no food sustaining capacity which is base on online computer version with helping hand system not offered. Also lack of nutrition concept other system models not enough for this system.This management system app gives some general news search also they ignore a big thing which is counseling their patient also offer medicine,question and answer chatbot in phone apps with data storing. It will be very tough to manage this type of system to manage their patient's health condition.

# Chapter 3: Methodology

This chapter provides an overview of the different segments of this project work. It mainly contains the theories, all techniques, and breakdown workflow of this project.

## 3.1 System Overview

Here is the system overview of this project.

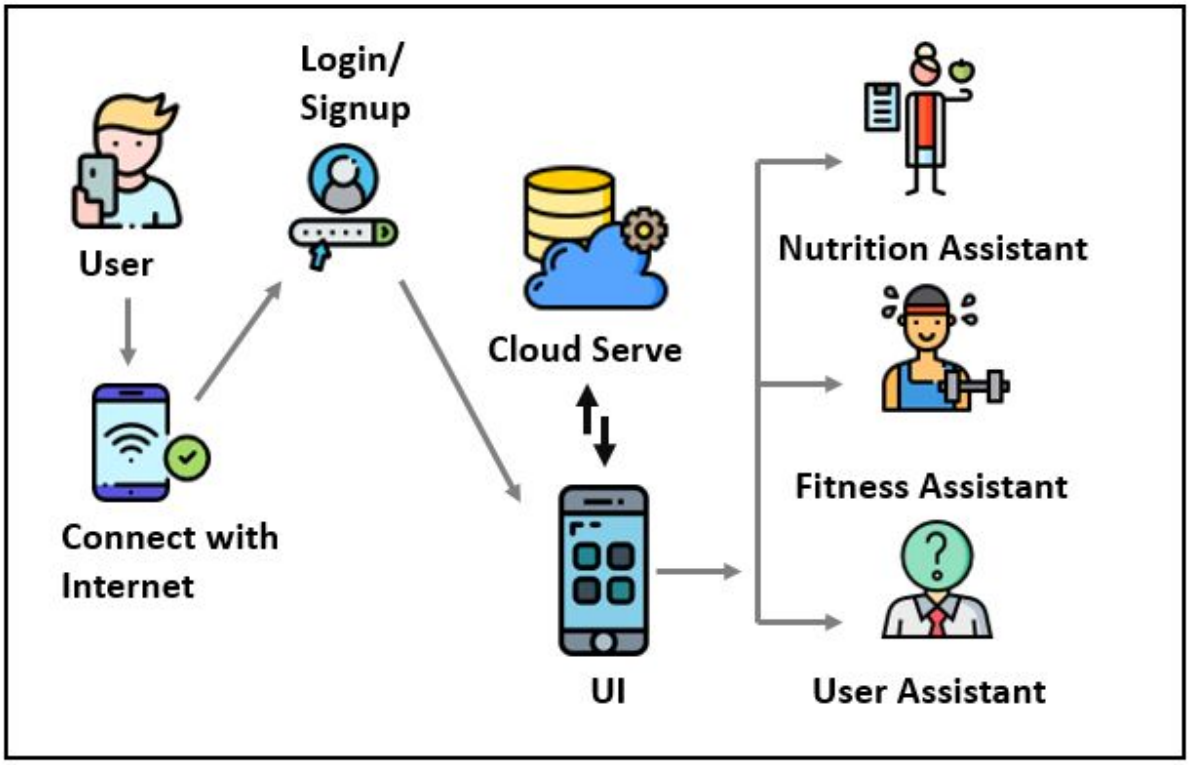


Figure 1: Overall system diagram of the proposed application

This diagram shows the overall system overview. For authentication, the user must need to connect with the internet. After authentication users can experience cloud services like store and retrieve data and also be able to see three virtual Nutrition, Fitness, and User Assistant in User Interface.

### 3.1.1 Nutrition Assistant

The first option is to calculate the BMI with the following input information like height & weight and provide BMI [1] with a physical state like normal, overweight, underweight as output.

$$BMI = \frac{Weight(Kg)}{Height^2(m^2)} \quad \text{.....(1)}$$

Body mass index (BMI) will be calculated using this formula.

Our expected Nutrition Assistant for food planner will be trained with the Tensorflow neural network model and KNN Classifier for food recommendation. [2] Using gender, age, and BMI as input it will make recommendations of food.

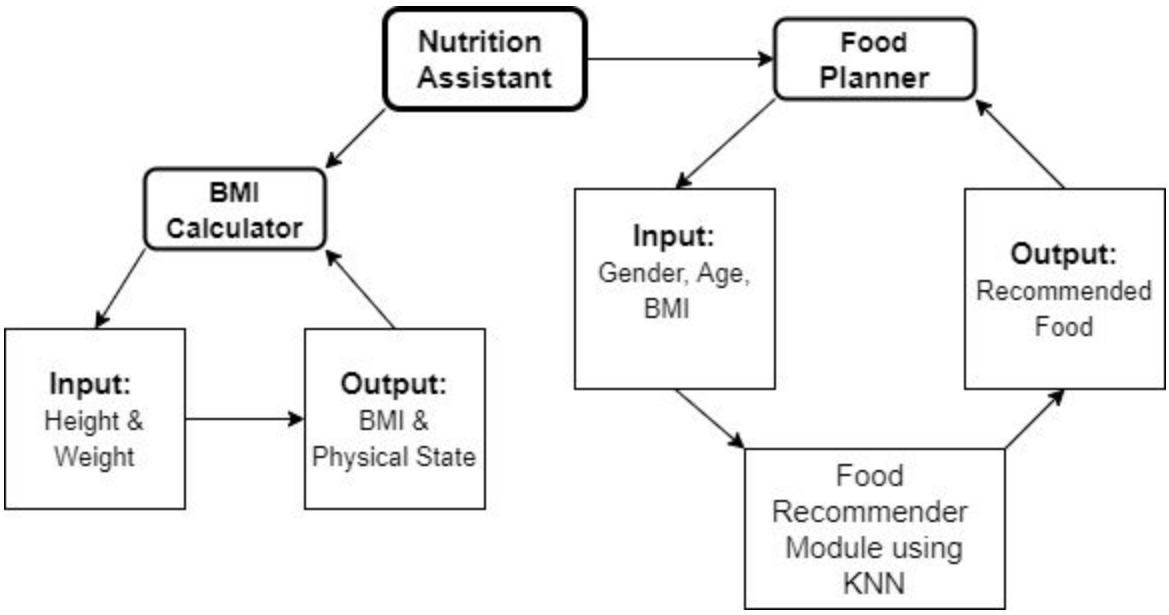


Figure 2: Block diagram of the proposed Nutrition Assistant

We also think about multiple food recommendations to help users find out his or her appropriate food choices according to his or her tests and also with proper calories. We are thinking about a guideline providing feature to operate this Nutrition Assistant.

### 3.1.2 Fitness Assistant

Fitness Assistant will provide fitness training guidelines based on the user's lifestyles.

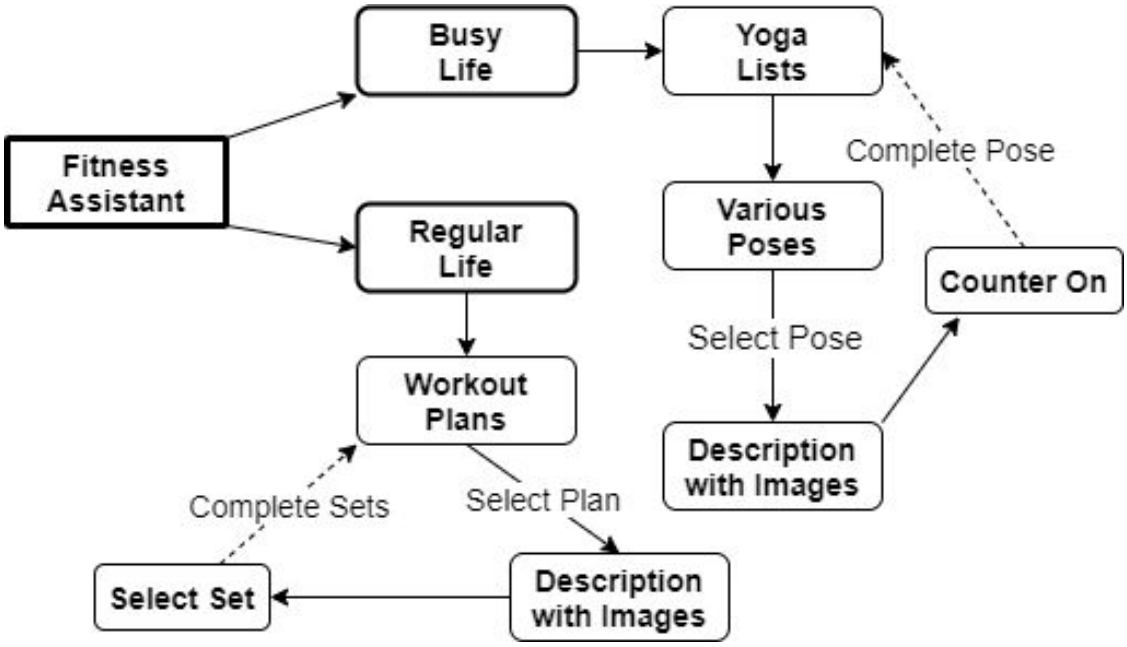


Figure 3: Block diagram of the proposed Fitness Assistant

First, it will provide two modes like Regular Life and Busy life. According to this mode, the user can select his or her appropriate exercise plane with detailed

guidance like a description with images and a set routine. We will be planning a customised exercise set routine especially dedicated to our country people and their physical fitness strength. We are also planning for a link with our User Assistant for getting help to figure out which exercise routing will be appropriate for users.

### 3.1.3 User Assistant

As a chatbot consumer, get a User Assistant. It will be working as two separate chatbots.

One will be able to provide useful guidelines to operate this entire application and another one will provide answers for questions asked by users as like nutrition and fitness related queries.

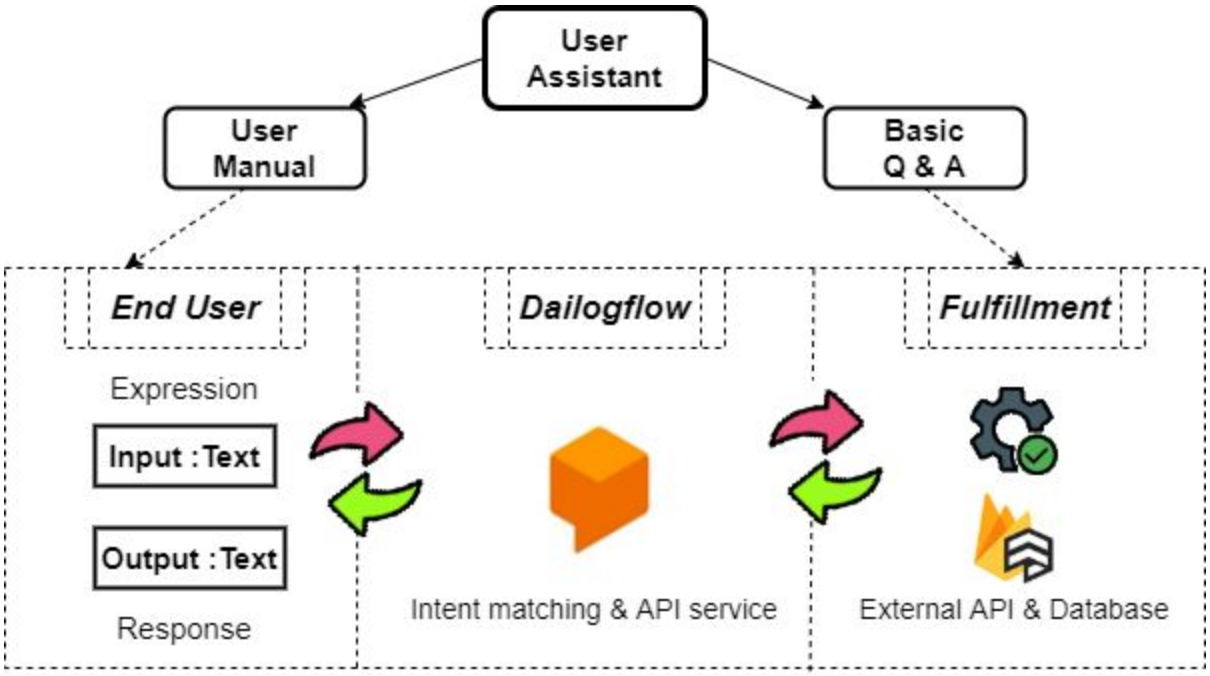


Figure 4: Block diagram of the proposed User Assistant

We decided to use a NLP framework like  Dailogflow for our chatbot API.

Dialogflow responds with intent matching. It also acts with action and parameters. This response is defined for the intent. As the service performs actions we will use firebase as database and external API. A message will be sent by it and the process will continue until the conversation stops. We will still be thinking about this User Assistant efficiency. Our target is to provide a proper and efficient chatbot option to guide users to operate this application and its each and every function.

## 3.2 Cloud Service

This application provides cloud services like authentication, store data, retriever data and data security.

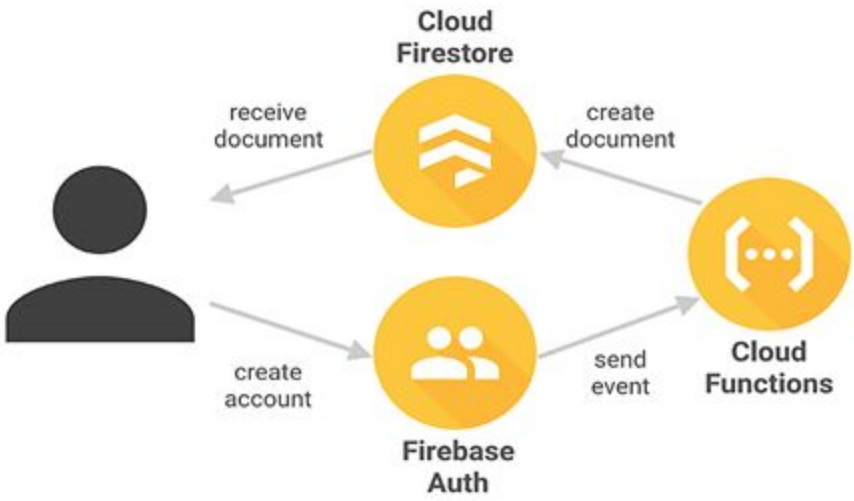


Figure 5: Cloud Firestore work flow diagram

We used Firebase Firestore as our cloud storage service and performed authentication. It caches data from the app which it is actively using. That's why in offline mode this app is able to read, write and query data also. Cloud Firestore

synchronizes with all local changes with Cloud Firestore when the device is on online mode.

## 3.3 Dataset

Our expected dataset for food recommendation is The food nutrition data [2] will be collecting (on progress) from the Department of Nutrition and Food Science, University of Ghana. We will also think about the Artificial dataset for this project as a backup plan.

## 3.4 Machine Learning Model

The K-Nearest Neighbour (KNN) algorithm is a basic classification algorithm in machine learning.

$$d(x, y) = \sqrt{\sum_{i=1}^{n} (x_i - y_i)^2}$$

.....(2)

It's considered under supervised learning. It follows the most straightforward classification techniques with similar features. First it trains the dataset and stores all the new cases.We will be going to use a data classification technique using this algorithm. This project is in development mode so we start with this KNN classifier and day by day we will move towards more advanced algorithms for better efficient performance.

# References

[1] f. health and b. calculator, "BMI Calculator", *Calculator.net*, 2020. [Online]. Available: https://www.calculator.net/bmi-calculator.html. [Accessed: 12- Aug- 2020].

[2] Sowah, R., Bampoe-Addo, A., Armoo, S., Saalia, F., Gatsi, F. and Sarkodie-Mensah, B., 2020. Design and Development of Diabetes Management System Using Machine Learning. *International Journal of Telemedicine and Applications*, 2020, pp.1-17.

[3] G. Ershad, "Classify Data Based On K-Nearest Neighbor Algorithm Machine Learning", *C-sharpcorner.com*, 2020. [Online]. Available: https://www.c-sharpcorner.com/article/classify-data-based-on-k-nearest-neighbor-algorithm-machine-learning/. [Accessed: 12- Aug- 2020].

[4] "How Does Cloud Computing Work? | HCL Technologies", *Hcltech.com*, 2020. [Online]. Available: https://www.hcltech.com/technology-qa/how-does-cloud-computing-work. [Accessed: 13- Aug- 2020].

[5] "10 Reasons Choose Android For Mobile Application Development Platform", *HokuApps*, 2020. [Online]. Available: https://www.hokuapps.com/blogs/10-reasons-choose-android-mobile-application-development/. [Accessed: 12- Aug- 2020].

[6] H. Articles and H. Eating, "The Important Roles of Nutrition in Our Daily Life", *Practo.com*, 2020. [Online]. Available: https://www.practo.com/healthfeed/the-important-roles-of-nutrition-in-our-daily-life-38010/post. [Accessed: 12- Aug- 2020].

[7] G. Fico, A. Fioravanti, M. Arredondo et al.,“Integration of per-sonalized healthcare pathways in an ICT platform for diabetes management: a small-scale exploratory study,”IEEE Journal ofBiomedical and Health Informatics, vol. 20, no. 1, pp. 29–38,2016.

[8] M. Alotaibi,“A mobile diabetes educational system for fasting type-2 diabetics in Saudi Arabia,”in2015 2nd InternationalConference on Information Technology, Computer, and Electri-cal Engineering (ICITACEE), pp. 173–176, Semarang, Indone-sia, October 2015.

[9] D. Team, "Features of Cloud Computing - 10 Major Characteristics of Cloud Computing - DataFlair", *DataFlair*, 2020. [Online]. Available: https://data-flair.training/blogs/features-of-cloud-computing/. [Accessed: 13- Aug- 2020].