Sri Lanka Institute of Information Technology

TMP-22-162

Project Topic Assessment – 2022 (Regular)

Topic

DiaBeta: Intelligent, Secured Smart App for Complete Diabetes Lifestyle Management

Abstract (200 Words Max):

Today's society tends to use new technological devices rather than referring to documentary material in everyday life. Although there are diabetes-related applications, machine learning approaches can more accurately predict users' current and future diabetes stages, be able to predict health risks by analyzing glucose monitoring data, provide users with accurate diet plans for diabetes levels, and connect to devices via Bluetooth The proposed DiaBeta application is unique among diabetes-related applications in that it includes a number of key features such as the ability to automatically log their glucose levels when measuring their blood sugar.

The proposed DiaBeta app will help users reduce their risk of diabetes by being smart enough to give them the right diet according to their current glucose levels. DiaBeta is a life-saving application that can be used to get a more accurate, personalized diet plan not only for diabetics around the world but also for non-diabetics. DiaBeta provides accurate, clinically, validated, standardized solutions.

Research Group/Area: Select the area by referring to the document uploaded to the Course Web

Machine Learning and Soft Computing (MLSC)

ICT for Development (ICTD)

Supervisor should fill this part

Supervisor and Co-Supervisor endorse the proposed project, and hence, guide the students to acquire required knowledge skills pertaining to above sub domains of their specializations.

Supervisor: **Ms. P. K. Suriya Kumari**

Appendix 1
Signature

Continuation of Previous Year Project? ☐

If yes, state the Project ID

and year

Co-Supervisor: **Mr. Ravi Supunya**

Appendix 2

External Supervisor

Name

Team Members:

Student Name	Student ID	Specialization
Leader: Jayasekara J.T.N. N	IT19115894	SE
Member 2: Gunasekera R. H	IT19184272	SE
Member 3: Ravindu Hasanka V. G	IT19156798	IT
Member 4: Hasintha Kashmika H.B. G	IT19115962	CSN

Research Problem:

In today's Sri Lankan health sector, the rapid expansion of noncommunicable diseases is a major issue. One of the most common non-communicable diseases is diabetes. Diabetic patients are increasing worldwide, and the rate in low- and middle-income nations is concerning. In emerging and low-income nations, diabetes medication is still expensive, leading to high mortality. According to recent statistics by the International Diabetes Federation (IDF), the prevalence of diabetes among adults in Sri Lanka is 8.5%. At present, one in 12 adults in the country suffers from diabetes, which totals to 1.16 million [1].

Considering diabetes is a lifelong illness that cannot be cured, prevention and control are essential. However, effective lifestyle management takes awareness, education, and consideration. Information and communication technology has made life simpler by making it easier to locate information. As smartphone prices continue to fall, smartphone-based applications are growing increasingly popular [2].

Most patients neglect to attend clinic sessions, consultations, and treatments as they are not aware of their current situation [3] and haven't kept track with their illness [4]. Most of them haven't followed a proper diet meal plan and keeping track of daily glucose level is also difficult for the patients. If there is a way to know more about their current diabetes situation, reminders of clinic session dates, keep track of daily food consumption, glucose level and future risk of heart, kidney and eye [5], suggest proper diet and exercise [6] to avoid future risk it will be more valuable for the diabetes patients.

[1] Bandara, S., 2021. talkingeconomics - Beat Diabetes in Sri Lanka: Too Much Sugar is Not that Sweet. [online] Ips.lk. Available at: <https://www.ips.lk/talkingeconomics/2016/04/07/beat-diabetes-in-sri-lanka-too-much-sugar-is-not-that-sweet/> [Accessed 16 December 2021].

[2] Callahan, A., Bedosky, L. and Kacy Church, M., 2021. 16 Best Diabetes Apps to Try in 2021. [online] EverydayHealth.com. Available at: <https://www.everydayhealth.com/hs/type-2-diabetes-care/diabetes-apps/> [Accessed 16 December 2021].

[3] H. Ahmed, E. M. G. Younis, and A. A. Ali, "Predicting Diabetes using Distributed Machine Learning based on Apache Spark," IEEE Xplore, Feb. 01, 2020. https://ieeexplore.ieee.org/document/9047795 (accessed Dec. 16, 2021).

[4] R. Y. Toledo, A. A. Alzahrani, and L. Martínez, "A Food Recommender System Considering Nutritional Information and User Preferences," IEEE Access, vol. 7, pp. 96695–96711, 2019, doi: 10.1109/ACCESS.2019.2929413.

[5]S. Ananthi and V. Bhuvaneswari, "Prediction of heart and kidney risks in diabetic prone population using fuzzy classification," IEEE Xplore, Jan. 01, 2017. https://ieeexplore.ieee.org/document/8117713 (accessed Dec. 16, 2021).

[6] G. Usic, "Development of a Patient-Specific Model for Patients with Diabetes Type I Using Meal and Exercise Guidelines from Modern Schools of Diabetes," IEEE Xplore, Oct. 01, 2020. https://ieeexplore.ieee.org/document/9280228 (accessed Dec. 16, 2021).

Solution proposed:

As a result of extensive research conducted in the field of health informatics, it was realized that a mobile application with the entire diabetes lifestyle management, which mainly featured data analytic for disease classification, visualization, analytical processing and awareness on data changes is important and useful according to the research problem.

In order to satisfy this necessity, we decided to build a mobile application called, "DiaBeta" which is an Intelligent, Secured Smart App for Complete Diabetes Lifestyle Management.

Diabeta has features that help you make the most out of the app, such as predicting the diabetes in early stages, reminders for the clinic session, daily tracking of blood sugar level, identifying current diabetes situations, predicting future heart, kidney and eye risk and automatically connecting with glucose monitors and reading data etc. All the data and charts are easy to send to your doctor, so you can work together to adjust your treatment and better manage your diabetes based on real, accurate information.

Our application is here to support diabetes patients in figuring out which foods are best for keeping your blood sugar in a healthy range. The app makes it easy for you to track daily food consumption and discover more information about the foods you put in your body. This app is intelligent enough to provide an accurate diet for the users according to their current glucose level.

System Overview Diagram for the solution proposed. Recommended to draw using draw.io. Note: This is not an activity/flow (UML) diagram

1. **Man components including the data sources, stakeholders, interaction among the stakeholders, etc.**
2. **Interconnection among the components**
3. **Major SW and HW components**
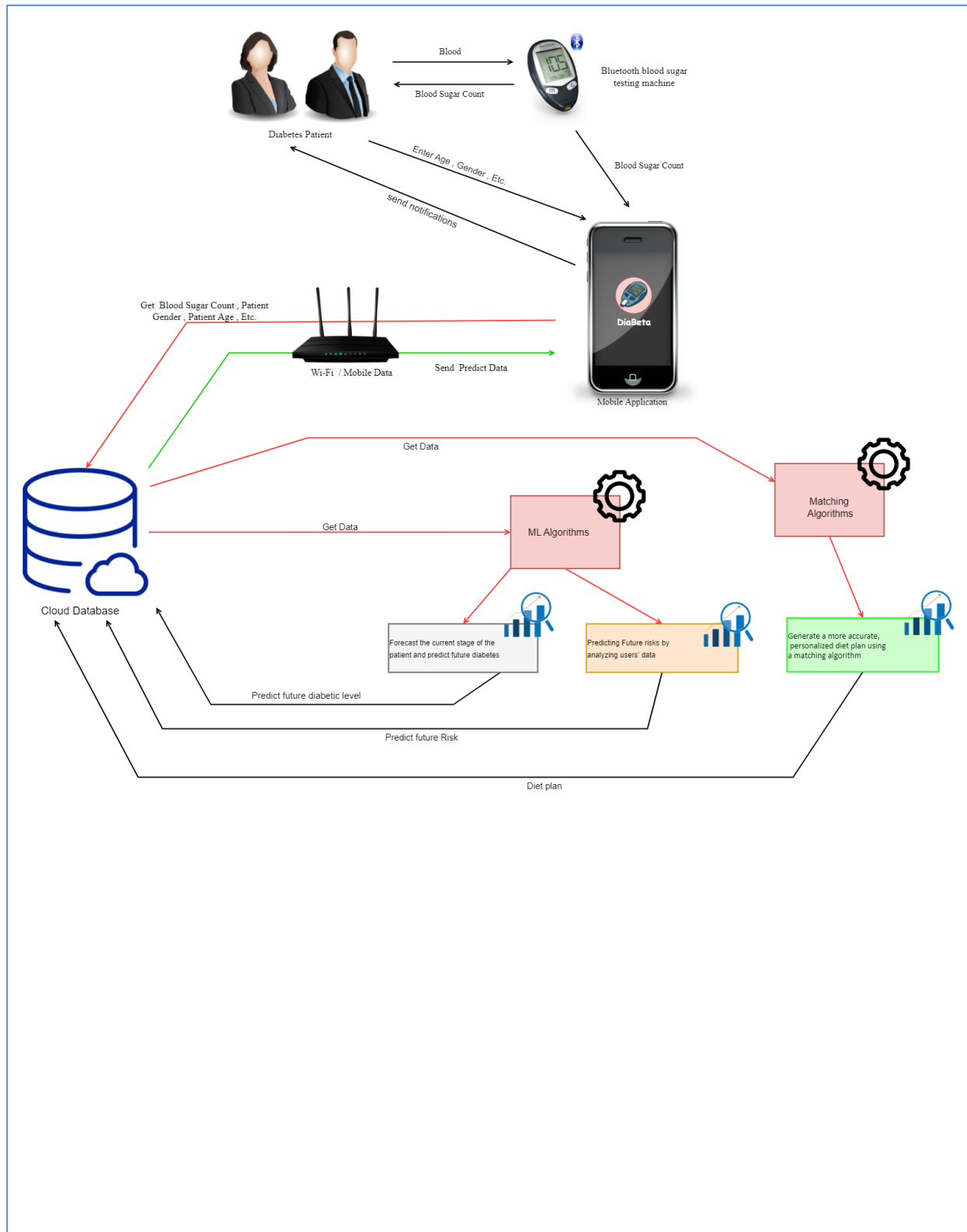
Objectives (1 main objective and 4 sub objectives):

Main Objective:

The main goal of our project is to develop an intelligent, secure smart mobile application for complete diabetes lifestyle management that will encourage users to be more engaged with their diabetes, keep track of their healthy habits, and avoid getting into critical situations.

Sub Objective 1: Forecast the current stage of the patient and predict future diabetes level and keep track of the user's data

Sub Objective 2: Predicting Heart risks, Eyes Risk and Kidney risks by analyzing users' data.

Sub Objective 3: Keep track of daily glucose level and predict healthy meal plans and exercises.

Sub Objective 4: Automated Transfer of blood and glucose data from devices and logged the data without input it manually.

Task divided among the members

Member 1: IT19115894

Implement diabetes level prediction using machine learning and health history logging. When it comes to existing mobile applications in google play store, there aren't much that use a machine learning technique to predict users' current and future stages. Instead, most of them use a basic questionnaire to determine the user stage. DiaBeta can more precisely forecast users' current and future diabetes phases using machine learning approaches.

- Gather requirements and history details of patients.
- Disease classification through past data records of patients and data visualization.
- Forecast the current stage of the patient.
- Predict future diabetes level and keep track of the user's data. (Sugar levels, medicines, insulin and other health vitals etc.)

Member 2: IT19184272

Implement a healthy meal and wellness plan. There are some applications which suggest meal plans but most of them do not provide accurate diet plans according to users' diabetes level. Other applications provide mostly foreign not local, cuisine. User's need to provide their current meal plan for DiaBeta App to generate a more accurate, personalized diet plan using a matching algorithm.

- Gather requirements and history details of patients.
- Predict healthy diet plans according to the user's current stage.
- Provide healthy exercise plans to avoid future risks.
- Manage appointment details by planning days for tests to be done and send reminders to the patient about clinic days.

Member 3: IT19156798

Implement future health risk prediction using machine learning approaches. Although there are few applications that have capability of identifying health risks, they are not predicting health risks by analyzing glucose monitoring data. DiaBeta provides an accurate health risk prediction for kidney, eye, feet, heart, etc. by using machine learning techniques.

- Gather requirements and history details of patients.
- Compare the patient's history details with the current situation for decision making on ongoing treatments.
- Predict future Heart risks, Eyes Risk, Feet and Kidney risks by analyzing users' data.
- Analyze the data sets to generate reports based on charts.

Member 4: IT19115962

Implement IOT devices connectivity and 3rd party app integrations. Most diabetes applications need to input sugar level manually. In DiaBeta we connect our application via Bluetooth to the devices and log their glucose level automatically when they measure their blood sugar. The DiaBeta application supports tracking users' daily steps and calories they burn.

- Get access to physical devices (glucose monitor) to help and manage patient conditions.
- Keep daily track of user's glucose level and log it.
- Keep track of carbs and body mass index details.
- Gather necessary information about exercise details of the user.

Technologies to be used:

- Flutter / React Native
- Python
- Node js
- Docker / Kubernetes
- MLlib

If supervisor States that this year is a continuation of previous work, state the further work the students should do compared to the previous years.
(NOTE: This part has to be filled by the supervisor)

This part will be filled by the Topic Screening Panel members

Acceptable: Mark/select as necessary

Acceptance/ Rejection	Correction State	
	Minor Correction	Major Corrections
Accepted	☐	☐
Resubmit	☐	☐
Rejected	☐	

Corrections (if necessary)

Any other Comments:

_____

_____

_____

Approved by the review panel:

Member's Name	Signature

Important:

1. According to the comments given by the panel, do the necessary modifications and get the approval by the **same panel**.
2. If the project topic is rejected, find out a new topic and inform the CDAP Group for a new topic pre-assessment.
3. A form approved by the panel must be attached to the **Project Charter Form**.

Appendix 1

2022-Regular-Topic Assesment form of TMP-22-162 for Supervisor Ms.P.K.Suriya Kumari Endorsement

📎 1 ⌄   ▣

Suriyaa Kumari <suriyaa.k@sliit.lk>
Fri 12/17/2021 11:50 PM
To: Jayasekara J.T.N.N. it19115894

👍 ↶ ↞ → ⋯

[EXTERNAL EMAIL] *This email has been received from an external source – pleas review before actioning, clicking on links, or opening attachments.*

Dear Research Team,

As the supervisor, I acknowledge the submission of the topic assessment.

Best Regards,

Get [Outlook for Android](#)

Appendix 2

2022-Regular-Topic Assessment form of TMP-22-162 for Co Supervisor Mr.Ravi Supunya Endorsement

📎 1 ⌄   ▣

Ravi Supunya <ravi.s@sliit.lk>
Sat 12/18/2021 11:10 AM
To: Jayasekara J.T.N.N. it19115894

👍 ↶ ↞ → ⋯

[EXTERNAL EMAIL] *This email has been received from an external source – pleas review before actioning, clicking on links, or opening attachments.*

This is ok

N.H.P. Ravi Supunya Swarnakantha (MSc, PGd, BSc, MCSSL),
Lecturer
Faculty of Computing
Department of Information Technology
SLIIT | Matara Center
041 754 4509/0714209799
ravi.s@sliit.lk