

# Development of Health Web App with Integration of Ensemble Machine Learning for Early Diagnosis in Obesity-related Chronic Diseases

## Project Overview

### Problem:

In a recent report, the World Health Organization (WHO) mentioned that obesity-related chronic diseases have contributed to approximately about 41 million premature deaths annually, which is about 71% of all deaths worldwide. If the situation unmitigated, we are expected that the overall number of obesity-related chronic diseases related-deaths to be risen up to 52 million yearly by the end of 2030. The most common obesity-related chronic diseases are the obesity, diabetes, and hypertension.

Furthermore, we are currently now facing the crisis of the COVID-19 pandemic, hence it is expected that the number of people developing the obesity-related chronic diseases to rise as most people are working from home in order to curb the spread of the COVID-19 virus in the community. Furthermore, based on a recent news article, about 1/3 of the Singaporeans have gained weight during the COVID-19 pandemic and many people would point their fingers that at how their lifestyles have changed to become more sedentary life since the start of the COVID-19 pandemic.

Thus, it is an alarming concern in the road of the COVID-19 pandemic as obesity-related chronic diseases are more vulnerable to threat of the COVID-19. In addition, the majority of the people are unaware of their overall health status and some do not have time to go for a simple health screening.

### Solution:

A user-friendly and easy-to-use web application was implemented via Streamlit to simulate the real-life practical application with the integration of the **proposed classifier models (random forest, gradient boosting, extra trees)** with optimized hyperparameters to predict the respective obesity-related chronic diseases such as obesity, diabetes, and hypertension such that it is offering an individual an effective and appropriate way to monitor their current health status.

### How does this health web app benefit to the user?

This health web app would provide an individual to know their likelihood of being developing the obesity-related chronic diseases such as diabetes, obesity, and hypertension, and hence, reduce their time to visit the office clinic in person.

Being cost-effective as the users are able to know the diagnosis right on the spot and also provide the users the time to prevent and manage obesity-related chronic diseases by making them aware of their present condition.

## Application Overview

Please choose one to explore:

Diabetes Mellitus

**What's so unique about this diabetes prediction app?**

This application uses **Gradient Boosting Algorithm** (Supervised ML) with the best hyperparameters to predict the likelihood of developing diabetes in an individual. During the testing phase, the outcome shows that the gradient boosting algorithm can be achieved with **at least 90% accuracy, precision, recall, and AUC**.

Evaluation outcome from the testing set:

	Accuracy	Precision	Recall	F1 Score	AUC
Diabetes	0.92	0.91	0.93	0.92	0.94
Not Diabetes	0.88	0.89	0.87	0.88	0.90

**NOTE:** The objective of the testing set is to evaluate the performance of the trained model and was unseen during the training phase.

**What's Diabetes?**

**What's Diabetes?**

Diabetes is a chronic health condition that affects how your body generate food into energy.

Most of the food you eat is broken down into sugar and released into your bloodstream. When your blood sugar elevated, it signals your pancreas to produce insulin. Insulin acts like a key to let the blood sugar into your body cells to use it as energy.


If you have diabetes, your body either not producing enough insulin or cannot use the insulin it makes as well as it should. When there is not enough insulin or cell stop responding to insulin, too much blood sugar remains in your bloodstream. Over time, that can cause serious health problems such as vision loss, or kidney disease, etc.

You may click the link below to know more about diabetes.

<https://www.cdc.gov/diabetes/basics/diabe>

**How can we control or prevent**

### Diabetes Mellitus Prediction



**Medical Disclaimer:** This platform is not serve as an alternative to medical advice from medical professional healthcare provider. If you have any specific questions about any medical matter, you should consult your doctor or other medical professional healthcare provider.

**General guideline(s) to the user:**

1) You are **required** to fill up all the information in this form in less than 5 mins.

2) Some information may required your blood test results.

Enter your name:

Jefferson Wong

Enter your identification no.:

TA301

Enter your name:

Jefferson Wong

Enter your identification no.:

TA301

Gender:

☒ Male

☐ Female

Enter your age:

28

Enter your body mass index (BMI):

19.50

Enter the amount of fasting blood sugar level (in mmol/L):

4.5

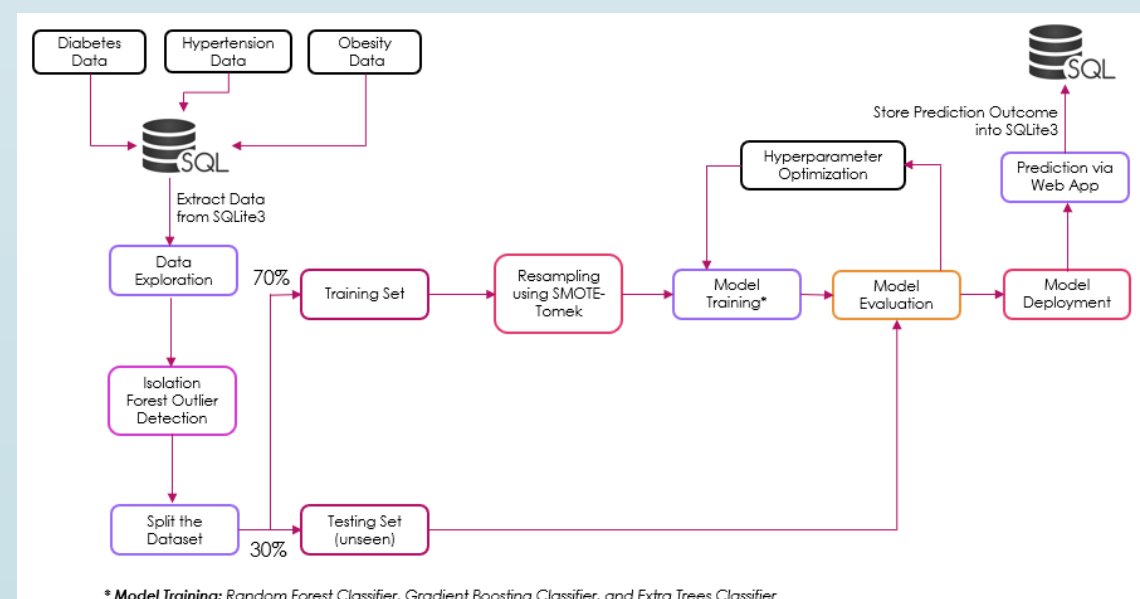
Predict

**Outcome:**

Hi Jefferson Wong! You have a [51.79532895]% chance at low risk of developing diabetes.

**Recommendation:**

Please continue to achieve a healthy weight by balancing your caloric input and physical activity.



Architecture Design of Machine Learning and Web Application