BGBP – A MOBILE APPLICATION FOR DIABETIC SELF-MANAGEMENT BY CHEW KE XIN

A REPORT

SUBMITTED TO

Universiti Tunku Abdul Rahman in partial fulfillment of the requirements for the degree of BACHELOR OF COMPUTER SCIENCE (HONOURS) Faculty of Information and Communication Technology

(Kampar Campus)

JAN 2023

UNIVERSITI TUNKU ABDUL RAHMAN

Fitle : <u>BGBP – A Mo</u>	bile Application For Diabetic Self-Management
	Academic Session: January 2023
[CHEW KE XIN
	(CAPITAL LETTER)
 The dissertation is a The Library is allow 	property of the Library. ed to make copies of this dissertation for academic purposes.
 The dissertation is a The Library is allow 	property of the Library. ed to make copies of this dissertation for academic purposes.
 The dissertation is a The Library is allow 	property of the Library. ed to make copies of this dissertation for academic purposes. Verified by,
 The dissertation is a The Library is allow 	property of the Library. ed to make copies of this dissertation for academic purposes. Verified by,
 The dissertation is a The Library is allow 	property of the Library. ed to make copies of this dissertation for academic purposes. Verified by,
 The dissertation is a The Library is allow Juna (Author's signature) 	property of the Library. ed to make copies of this dissertation for academic purposes. Verified by,
 The dissertation is a The Library is allow <i>Juva</i> (Author's signature) Address: 	property of the Library. ed to make copies of this dissertation for academic purposes. Verified by,
 The dissertation is a The Library is allow The Library is allow (Author's signature) Address: Laluan Ipoh Permai 4, 	property of the Library. ed to make copies of this dissertation for academic purposes. Verified by,
 The dissertation is a The Library is allow Muse (Author's signature) Address: Laluan Ipoh Permai 4, Taman Ipoh Permai, 	property of the Library. ed to make copies of this dissertation for academic purposes. Verified by,
 The dissertation is a The Library is allow (Author's signature) Address: Laluan Ipoh Permai 4, Taman Ipoh Permai, 31400 Ipoh, Perak 	property of the Library. ed to make copies of this dissertation for academic purposes. Verified by,

Universiti Tunku Abdul Rahman			
Form Title : Sample of Submission Sheet for FYP/Dissertation/Thesis			sis
Form Number: FM-IAD-004	Rev No.: 0	Effective Date: 21 JUNE 2011	Page No.: 1 of 1

FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY UNIVERSITI TUNKU ABDUL RAHMAN
Date: <u>24/04/2023</u>
SUBMISSION OF FINAL YEAR PROJECT /DISSERTATION/THESIS
It is hereby certified that <u>Chew Ke Xin</u> (ID No: <u>19ACB03038</u>) has completed this final year project entitled " <u>BGBP – A Mobile Application</u> <u>For Diabetic Self-Management</u> " under the supervision of <u>Dr Chai Meei Tyng</u> (Supervisor) from the Department of <u>Computer Science</u> , Faculty of <u>Information and Communication</u> <u>Technology</u> .
I understand that University will upload softcopy of my final year project in pdf format into UTAR Institutional Repository, which may be made accessible to UTAR community and public.
Yours truly,
*Delete whichever not applicable

DECLARATION OF ORIGINALITY

I declare that this report entitled "**BGBP** – **A MOBILE APPLICATION FOR DIABETIC SELF-MANAGEMENT**" is my own work except as cited in the references. The report has not been accepted for any degree and is not being submitted concurrently in candidature for any degree or other award.

Signature	:	Ohero	
U	_		

Name : <u>Chew Ke Xin</u>

Date : <u>24/04/2023</u>_____

ACKNOWLEDGEMENTS

I would like to express my sincere thanks and appreciation to my supervisor, Dr Chai Meei Tyng who has given me encouragement and opportunity to engage in this project.

Finally, I must say thanks to my family and my friends for their support and motivation throughout the course.

ABSTRACT

This project is a mobile application project for diabetic self-management. The mobile application will be developed through Android Studio software with Java programming language. It will provide convenience to users to record their blood glucose and blood pressure level. Besides, it is beneficial for elderly patients who always tend to forget to take medicines such as injection of insulin and pill of hypertension as there will be a reminder on medication feature implemented into the project. In order to improve the awareness of diabetes patients on the food nutrition contents especially on the sugar intake amount, food recognition technology will be implemented into this project as well. After capturing the food or selecting image of food from users' devices, then it is able to detect and recognize the food and displaying the relevant nutrition facts such as sugar, carbohydrates, fat and so on, as well as the healthiness level of food so that users can control and plan for their diet.

TABLE OF CONTENTS

ii
iii
iv
v
vi
vii
ix
xiv
1
2
3
3-4
4
5
6
6-9
10-14
15-17
18
18-19
20
20
21
21
22-23

	3.5	Timeline	24-25
CHAI	рте	R 4 SYSTEM DESIGN	26
	4.1	System Design Diagram	26-27
	4.2	Food Recognition Model Design & Usage in the Project	28-29
	4.3	System Architecture Diagram	30-34
CHAI	PTE	CR 5 SYSTEM IMPLEMENTATION	35
4	5.1	Software Setup	35-36
4	5.2	Settings and Configuration	36-39
4	5.3	System Operation	39
		5.3.1 User Interface (UI) of BGBP mobile application	39-50
		5.3.2 Comment and highlight the feasibility of proposed method	51-55
CHAI	PTE	CR 6 SYSTEM EVALUATION AND DISCUSSION	56
6	5.1	Food Recognition Model Testing	56-124
e	6.2	System Testing	124-158
6	6.2	Challenges and Issues	159
CHAI	рте	CR 7 CONCLUSION AND RECOMMENDATION	160
7	7.1	Conclusion	160
-	7.2	Recommendations and Future Work	161-162
REFE	ERE	NCES	163-165
APPE	ND]	IX	166
WI	EEK	XLY LOG	166-171
PO	STI	ER	172
PLAG	JIAI	RISM CHECK RESULT	173
FYP2	СН	ECKLIST	175

LIST OF FIGURES

Figure Number	Title	Page
Figure 2.1	Dashboard of Undermyfork app showing the blood glucose	10
	level and the meal from [13]	
Figure 2.2	Search food feature to view the amount of sugar from [14]	10
Figure 2.3	MySugar – Blood Sugar app includes many categories such	11
	as body temperature, hemoglobin to be recorded but having	
	a lot of pop-up ads [10]	
Figure 2.4	Health2Sync app includes statistics showing the blood	12
	glucose level and this app also requires user to upgrade	
	premium account to access more features [8]	
Figure 2.5	Able to connect to CGM devices, Dexcom meter and etc. to	13
	read the measurement of data from [7]	
Figure 2.6	Reference table showing the suitable range value of blood	13
	pressure and including statistics records from [12]	
Figure 2.7	Include information and knowledge articles about blood	14
	pressure from [11]	
Figure 2.8	Statistics reading, input record and export report to PDF	14
	features from [6]	
Figure 3.0	Agile software development life cycle	18
Figure 3.1	Use case diagram for BGBP mobile application by using	21
	Visual Paradigm Software	
Figure 3.2	Mean latency benchmarks for the food recognition model	22
Figure 3.3	Metadata of model	23
Figure 4.1	Block diagram for the overall features in BGBP mobile	26
	application by using Canva Software	
Figure 4.2	General flow of the pre-trained model	28
Figure 4.3	Code structure for using the model	28
Figure 4.4	One of the additional code is implemented in the food	29
	feature	

Figure 4.5	Flow of the food feature in the project with the food	29
	recognition model usage	
Figure 4.6	Splash screen for mobile application and the	30
	registration/login interface	
Figure 4.7	Home page where user can filter date to view the daily	31
	statistic record of blood glucose and blood pressure level	
Figure 4.8	Add record page where user need to input the data for blood	31
	glucose and pressure and select category such as before	
	breakfast, after lunch and etc. from spinner	
Figure 4.9	Food recognition feature where user can capture photo or	32
	select image to view the nutrition facts of food detected and	
	the food healthiness categorization or by searching the food	
	name manually	
Figure 5.0	More options interface including features such as report	32
	generator, history records, reminder on medication, monthly	
	statistics and logout	
Figure 5.0a	Add reminder on medication interface	33
Figure 5.0b	View history records interface where user is able to apply	33
	date and category filter and perform modification or	
	deletion on the specific record selected	
Figure 5.0c	Report generator interface where user is able to pick the	34
	date range, apply category filter and download the report to	
	device	
Figure 5.0d	Monthly statistics interface where user is able to select the	34
	month to view scatter chart for monthly data and the lowest,	
	highest and average of blood glucose level	
Figure 5.1	Setup 1	36
Figure 5.2	Setup 2	37
Figure 5.3	Setup 3	37
Figure 5.4	Setup 4	38
Figure 5.5	Setup 5	38
Figure 5.6	Setup 6	39

Figure 5.7	App icon and splash screen designed using Canva software	39
	for the mobile application	
Figure 5.8	Login (either using email-password or Google sign-in	40
	method), register account and reset password interface	
Figure 5.9	Home dashboard interface (with daily blood glucose and	40
	blood pressure level graph view) and able to apply date	
	filter from DatePickerDialog function	
Figure 6.0	Alert message will be displayed to user if the day had	41
	exceeded the blood glucose value with 10.5 in home	
	dashboard	
Figure 6.1	Add record interface (with textbox, Spinner for category,	41
	DatePickerDialog, TimePickerDialog for selecting date and	
	time)	
Figure 6.2	Food interface (with search function, load image or capture	42
	image to detect the output (food name) and nutrition table	
	with healthiness level)	
Figure 6.3	Example for using load image function and the food	42
	detected is greek salad with its nutrition details displayed in	
	the table and food healthiness value (healthy) is shown	
Figure 6.4	Example using capture image function and the food	43
	detected is hamburger with its nutrition details displayed in	
	the table and food healthiness value (unhealthy) is shown	
Figure 6.5	Access to list of food available in food database from	43
	search button and user can click to view the specific food	
	nutrition information or enter the food name to search	
	through	
Figure 6.6	The interface after clicking the food (Apple crisp) from the	44
	list	
Figure 6.7	If the food detected (output) is not available in the food	44
	database, user can click the underlined food name ("Pound	
	cake") and it will redirect user to Google quick search for	
	displaying the relevant food nutrition details	

Figure 6.8	More options interface (including other functions),	45
	AlertDialog for logout function	
Figure 6.9	RecyclerView for medication record (Left); Add reminder	45
	on medication interface with textbox, toggle switch to turn	
	on or off the reminder or repetition (Middle); Push	
	notification received as reminder (Right)	
Figure 7.0	Monthly statistics interface (allow user to select the month	46
	from DatePickerDialog) and display blood glucose statistic	
	in scatter chart, blood pressure statistic in line chart with the	
	lowest, highest and average data shown for the month	
Figure 7.1	Report generator interface (allow user to pick from-date, to-	47
	date as well as apply category filter either select all or	
	specific timeline given to download the statistics PDF	
	report into the device)	
Figure 7.2	In the internal storage of the device, the generated PDF	48
	report can be found and the report is in a tabular format	
	showing date, time, blood glucose data, blood pressure data	
	and also category	
Figure 7.3	History records interface with RecyclerView layout of all	49
	records and able to modify or delete the specific record	
Figure 7.4	History records is also able to apply filter for date range	50
	with DatePickerDialog and category filter	
Figure 7.5	Firebase Cloud Messaging push notification (remind user to	50
	fill-in daily blood glucose record)	
Figure 8.0a	Test case 1 for function 1	125
Figure 8.0b	Test case 2 for function 1	126
Figure 8.0c	Test case 3 for function 1	127
Figure 8.0d	Test case 4 for function 1	128
Figure 8.0e	Test case 5 for function 1	129
Figure 8.0f	Test case 6 for function 1	130
Figure 8.0g	Test case 7 for function 1	131
Figure 8.1a	Test case 1 for function 2	132
Figure 8.1b	Test case 2 for function 2	133

Figure 8.1c	Test case 3 for function 2	134
Figure 8.2a	Test case 1 for function 3	135
Figure 8.2b	Test case 2 for function 3	136
Figure 8.2c	Test case 3 for function 3	137
Figure 8.2d	Test case 4 for function 3	138
Figure 8.2e	Test case 5 for function 3	139
Figure 8.3a	Test case 1 for function 4	140
Figure 8.3b	Test case 2 for function 4	141
Figure 8.3c	Test case 3 for function 4	142
Figure 8.3d	Test case 4 for function 4	143
Figure 8.4a	Test case 1 for function 5	144
Figure 8.4b	Test case 2 for function 5	145
Figure 8.4c	Test case 3 for function 5	146
Figure 8.4d	Test case 4 for function 5	147
Figure 8.5a	Test case 1 for function 6	148
Figure 8.5b	Test case 2 for function 6	149
Figure 8.6a	Test case 1 for function 7	150
Figure 8.6b	Test case 2 for function 7	151
Figure 8.7a	Test case 1 for function 8	152
Figure 8.7b	Test case 2 for function 8	153
Figure 8.7c	Test case 3 for function 8	154
Figure 8.7d	Test case 4 for function 8	155
Figure 8.8	Test result 1 for function 9	156
Figure 8.9a	Test result 1 for function 10	157
Figure 8.9b	Test result 2 for function 10	158

LIST OF TABLES

Table Number	Title	Page
Table 2.1	Table of comparison-strengths and limitations of apps	15
Table 3.1	Specifications of Laptop	20
Table 3.2	Specifications of Mobile Phone	20
Table 3.3	Timeline diagram for FYP 1	24
Table 3.4	Timeline diagram for FYP 2	25
Table 6.1	Table of food testing	56
Table 6.2	List of developed functions that are tested	124

Chapter 1 Introduction

Based on [1], hypertension often arises along with diabetes. Both of these diseases share common risk factors such as unhealthy diet and obesity. It is also found that people with diabetes are having the higher rate of getting hypertension too. Both of the diseases might lead to severe effects on health such as kidney failure, stroke and etc. Hence, managing both blood glucose and blood pressure levels can help to reduce the risk of cardiovascular diseases. Having a proper diet plan that limiting sugar and unhealthy food is also considered essential for diabetic and hypertension patients.

Type 1 diabetes is usually diagnosed in children and teens and it is caused by autoimmune reaction while for type 2 diabetes is diagnosed in adults [2]. The only treatment for type 1 diabetes is to rely on insulin pumps and the treatment for type 2 diabetes is to consume oral hypoglycemic medications [3]. Patients with type 1 diabetes are required to monitor glycemic control daily and also control blood pressure and cholesterol [3].

Nowadays, the number of diabetic in Malaysia is increasing drastically. There are around 3.9 million of Malaysia citizens are having diabetes and the rate had increased from 13.4% (2015) to 18.3% (2019) according to a survey [4]. Therefore, the implementation of diabetic self-management mobile application is very beneficial in order to keep track on users' blood glucose and blood pressure level records as well as to help in controlling the diet.

1.1 Problem Statement and Motivation

The problem statements are mentioned as below:

- Poor self-monitoring of blood glucose level and blood pressure level [5]. Lack of attention on their own glucose level and blood pressure level may lead to a more serious effects on health and the current condition may become worse. Patients tend to be lazy or forgetful to record their blood glucose and blood pressure levels. Those records are very important as they act as future references for further consultation with doctors for new treatment and for monitoring own health condition every day to avoid any bad circumstances.
- Poor diet [5]. Lack of awareness or control on their sugar intake amount or other nutrition such as fat, calories, cholesterol and etc. from food. As mentioned before, a healthy and proper diet with limiting sugar and fat is vital for patients to prevent getting worsen on health condition, as well as to avoid another diseases or reduce the risks such as cardiovascular diseases, stroke and so on.
- Poor time management on taking medicine. Patients often forget to take medication especially for the elderly patients. Medication for diabetic and hypertension patients is very important and should not be skipped. It is because it may lead to a worsen condition and also may cause the current treatment that is set by doctor will not be effective anymore.

The aim of the project is to propose a new feature on food recognition technology on BGBP mobile application. This function can help diabetes patients to take note on the sugar intake amount and other nutrition facts label from certain food which will then alert them to plan for a proper diet. Besides, reminder on medication feature is also proposed in this project to help patients avoid any skipping medication.

1.2 Objectives

The project objectives are mentioned as below:

- To provide a mobile platform for checking and monitoring blood glucose and blood pressure level.
- To implement the food recognition feature in diabetic self-management mobile application.
 - Nutrition facts label such as protein, cholesterol, sugar, fats and so on from the meal pictures will be displayed for improving user's awareness.
- To develop an improved diabetic self-management application with food recognition technology and reminder on medication feature.

1.3 Project Scope and Direction

This diabetic self-management mobile application is developed using Android Studio Arctic Fox Version. The splash screen and application icon are designed with Canva software and import to Android Studio. Registration and login function in the app is implemented with Firebase Authentication as it saves user data in the cloud securely and provides built-in library to reset password. Besides, all blood glucose and blood pressure records saved will be stored into Firebase Realtime Database as it is suitable for large data storage and accessible when offline. For plotting the charts of blood glucose and blood pressure level, external libraries are required in Android Studio. MPAndroidChart library which is created by Philipp Jahoda can support few types of graphs such as bar graph, pie chart, scatter chart and so on. Another library implemented in this application is GraphView by Jonas Gehring which can support line graphs, point graphs and so on. Records will be retrieved from Firebase Realtime Database and stored into DataPoint or ArrayList to plot a line graph for blood glucose level overview and bar chart for systolic and diastolic blood pressure level.

For food recognition feature in this application, pre-trained CNN (Convolutional Neural Networks) MobileNet model will be used to recognize the food image from device and the output will then link to the food database for displaying relevant nutrition details and the category of food healthiness. All the food nutrition information is sourced from USDA Food

Data Central and Nutritionix database and the food healthiness level is determined by the percent Daily Value (%DV).

For the history records, RecyclerView will be used as the layout interface for displaying all blood glucose records. Any modification or deletion on the record will be updated instantly to Firebase Realtime Database. The internal Android function such as AlarmManager and BroadcastReceiver will be used to develop the reminder on medication feature. Medicine record will also be saved into Firebase Realtime Database and it is allowed to perform modification and deletion action. Besides, scatter chart and line chart from MPAndroidChart library are utilized for displaying the monthly statistics of blood glucose and blood pressure. In the report generator feature, iTextPdf library is applied to create new PDF documents with the help of Firebase Realtime Database to retrieve the data and write into cell to display a tabular format of report.

1.4 Contributions

The main contribution for this proposed mobile application is to develop a food recognition feature with nutrition facts displayed for users. User is allowed to capture photo or select a food image from device and the image will be processed through a pre-trained CNN model for recognition. Food database is needed for displaying the detected food nutrition facts label such as total fat, cholesterol, sugar, protein and so on. Moreover, the food detected will also be grouped as either healthy, moderate or unhealthy food for user's reference. Alternatively, user can search for the food nutrition information manually through the search button provided. This can improve the awareness of user on the food nutrients especially the sugar intake amount for helping to control or plan a proper diet, reducing the risk of getting cardiovascular diseases. Besides, to solve the issue of being forgetful to take medicine, a reminder of medication feature in this mobile application is able to help notifying user especially for the elderly patient.

1.5 Report Organization

This report is organized into 7 chapters: Chapter 1 Introduction, Chapter 2 Literature Review, Chapter 3 System Methodology/Approach, Chapter 4 System Design, Chapter 5 System Implementation, Chapter 6 System Evaluation and Discussion, Chapter 7 Conclusion and Recommendation. The first chapter is the introduction of this project which includes problem statement, motivation, project scope, project objectives, project contribution and report organization. The second chapter is the literature review where some related existing mobile applications are reviewed. The third chapter is regarding the use case diagram, hardware requirement and food recognition model details. The fourth chapter is discussing the overall system design of this project. The fifth chapter is regarding the details on how to implement the system. Furthermore, the sixth chapter reports the system testing results and project challenges with issues. The last chapter reports the conclusion, recommendations and future work on the mobile application project.

Chapter 2 Literature Review

2.1 Previous Works on Self-Monitoring Applications

Based on the research from Google PlayStore, there are some existing self-monitoring mobile applications for diabetic and hypertension patients, such as Diabetes Diary [6], Glucose Buddy Diabetes Tracker [7], Health2Sync [8], Diabetes:M [9], MySugar – Blood Sugar [10], Blood Pressure Monitor [11], Blood Pressure Diary [12], Undermyfork [13] and No Sugar In Me [14].

The major issue for most of the studied mobile applications such as [6], [7], [9], [10], [11] and [12] is having a lot of pop-up advertisement while in-using, which affects the user experience and users may get annoyed. Besides, another limitation for the existing applications is required to buy plan and upgrade to premium account in order to unlock more features in the applications. For instance, [6], [7], [8], [9] and [10]. Lack of access to apps features lead to user-unfriendly and inconvenience to users as it is limiting the users' actions. Upgrading account to VIP may not be affordable to all users, it costs between MYR 12 to MYR 64 for one to six months of subscription plan [8]. For instance, users are only allowed to generate reports for the first two times in [8], cannot search for food database in [9], cannot access to the articles about health and nutrition in [7] and etc. Hence, the proposed mobile application will be ad-free and all the features will not be limiting for users.

In terms of app features, for the mobile application [6], it includes statistics and charts that showing the blood sugar and blood pressure readings so that users can view the overview record easily. It also provides users to manually input for their sugar concentration and blood pressure data. Report can also be generated into PDF file for user references. However, it does not include reminders on medication and also filling-in the glucose data.

For [7], it brings convenient to patients that are using CGM device or Dexcom meter to measure the blood glucose level. It can connect to those devices to record the readings. Besides, it also provide manual input for tracking blood glucose, blood pressure, medicine, physical activity,

weight, hemoglobin A1c and carbohydrates. In the function of adding carbs, users are allowed to take photo of food, manually search food name as well as barcode scanning. Then, the content of certain food including calories, carbs, fat, protein and so on will be displayed. However, this mobile application requires users to upgrade account to premium in order to unlock more features in it like diabetes education articles. There is also no graphs, charts and statistics available for users to view.

For [8], it has a dashboard displaying the summary of daily record. It also includes charts and graphs for comparison between before and after meal. It provides users to manually input the blood glucose data, blood pressure, weight and medication. Most importantly, this mobile application has the feature of medication reminder. In the diary section, it enables users to view the past records in table or list form and can apply filter on the period as well as item. Nonetheless, it cannot allow users to generate reports anymore after two-time trial as it also requires users to upgrade to premium account.

In [9], it is similar as [6], [7], [8] which need to buy premium to access the additional functions in the application for instance, search for food database. It also requires users to manually input glucose, carbs and medication records. It has the reminder feature on filling-in the glucose data with some options given such as breakfast, lunch, dinner, night reminder to let users to opt. In [10], it enables users to input blood sugar, blood pressure, body temperature, body oxygen saturation, hemoglobin A1c and weight. It also allows users to generate PDF reports by filtering the date period. Yet, this mobile application has a lot of advertisements and requires users to pay RM17.99 for unlocking other premium features.

In this mobile application [11], it only can insert blood pressure record which is only designed for hypertension patients. It shows the latest record and the average value in the home page. This app also provides a lot of useful information about blood pressure to gain users' awareness. It also displays bar chart and allows users to export the records as CSV file and share it via email, WeChat or WhatsApp. While in [12], it is also another blood pressure monitoring application. It provides line graph and bar chart in the statistics section and it also provides the reference table, showing the type of hypertension and each suitable range of value for systolic and diastolic in mmHg. This enables users to be more aware and control own blood pressure to avoid exceeding the level. Similar to [11], it also allows users to share data in CSV file via email.

For [13], it only allows users to keep track on their blood glucose level. It has another feature which is to add meals by either inserting photo or capturing photo. Then, it will detect the food and display some relevant food tags to let users to opt for the correct tags. However, it does not provide the nutrition details and sugar amount. The feature only acts as a meal reference together with blood glucose record, time and carbs. There is no advertisement and it is free from purchasing VIP to access functions in [13] and [14]. In [14], this application only keeps track on the sugar amount intake. It allows users to take photo of food, scan barcode and search manually with food name. It is then displayed the amount of sugar of the particular detected food. Nevertheless, it is not very effective and inaccurate for the taking photo feature as testing with different food are done for quite a few times. It is unable to display any result. Moreover, it also includes articles on education about sugar and health concern which is beneficial for users.

From the research and study based on the few existing apps mentioned above, almost all apps are lack of food recognition feature which can give users an idea on what is the sugar amount of the food and other relevant nutrition facts label. It is very important because a healthy and proper diet plan for diabetic and hypertension patients is essential to prevent from getting more serious illness such as stroke, cardiovascular disease. Therefore, this new feature is being proposed to be implemented in the BGBP mobile application, as well as improving those limitations that are found from the existing mobile applications as mentioned earlier.

Some journals related to food classification and food recognition using deep learning techniques had been studied. In this paper [15], food classification model using transfer learning technique has been proposed by G. et al. with utilizing Python programming language and TensorFlow package as well as with Food-101 data. Deep learning is highly recommended as a data analysis technique to deal with the recognition in food domain. The most effective way to construct a food recognition model for a mobile application is by using CNN as it is can detect the important features automatically [15]. Convolution layers are the most important part and the main layers to perform the filtering processes and the feature detector will observe the

picture for the existence of features to focus on basic features like edges and colors. Pooling layers will summarize the characteristics learnt from the convolution layer's feature map [15].

In [15], transfer learning is used. It is a technique to train a learned model for a new problem domain. This includes feature transfer, fine-tuning, using a pre-trained model and train data. A new classification layer will be trained by feature transfer as the input layer maps data from one layer to another layer. Besides, there are a lot of pre-trained models such as YOLO, EfficientNet-b0, MobileNet and etc. It can be used by updating it with features of the convolution layers and retraining the model.

In the paper [16], Jamil et al. had proposed to use a pre-trained model (MobileNet) on TensorFlow Lite deep learning environment to implement a food recognition function for the management of calorie intake. The transfer learning DCNN (Deep Convolutional Neural Network) is being implemented as it can reduce the need for a huge dataset for training. Jamil et al. also had reviewed MobileNet, GoogLeNet and AlexNet transfer learning models. AlexNet consists of five convolutional layers, three pooling layers and two fully-connected layers. GoogLeNet has two convolutional layers and one pooling layer and it is a more powerful architecture compared to others. MobileNet is a more efficient model that is produced specifically for mobile applications due to the flexibility of image size and the suitability in mobile devices [16]. It can achieve a good accuracy however, the problem occurred when there are two or more labels displayed the similar features, for instance, the similarity of sauce's color and shape of noodles between 'laksa' and 'curry noodles' in the test case from [16].

2.2 Screenshots of Existing Self-Monitoring Mobile Apps



Fig. 2.1: Dashboard of Undermyfork app showing the blood glucose level and the meal from [13]

Fig. 2.2: Search food feature to view the amount of sugar from [14]

×

+

+

 (\mathbf{I})



Fig. 2.3: MySugar – Blood Sugar app includes many categories such as body temperature, hemoglobin to be recorded but having a lot of pop-up ads [10]



Fig. 2.4: Health2Sync app includes statistics showing the blood glucose level and this app also requires user to upgrade premium account to access more features [8]



Fig. 2.5: Able to connect to CGM devices, Dexcom meter and etc. to read the measurement of data from [7]



Fig. 2.6: Reference table showing the suitable range value of blood pressure and including statistics records from [12]



Fig. 2.7: Include information and knowledge articles about blood pressure from [11]

Digi Wi fi 🚾 🚛 😪 🖬 🕄 漆67% 💷 11:47	Digi Wi-Fi 🎞 내 응 🖸 🔹 🚺 🕸 66% 💷 11:54	Dig Wifi 📼 🚽 🕿 関 渗67% 💷 11:47
🗉 Diabetes Diary	\leftarrow Blood Sugar 🗸	\leftarrow Report
COMPLETE CARE FOR YOUR SKIN	50% OFF on Pizza Hut Grob Rescal NEWZGE 16C apply Constraints Food	Select type : Blood Sugar 👻
Blood Sugar Medication	Sugar Concentrationmmol/L	From Date: 03/09/2022
Blood Sugar 🝷 All Records 🝷 🏹	Measured	25) To Date: 04/09/2022
300.9	Before breakfast	Export To PDF
300.6	Date & Time 04/09/2022 11:54 AM	View Reports
300 300 300 300 300 300 300 300 300 300	Notes	1pcs Copper Woven Wire 10-2 ^① RM 51.80 Terima Kasih Atas Sokongan Anda Melihat Ke
299.4	Tag	Lani Puas Open AD
6 Jul 6 Jul	S 400 tag	
Plus Size L~8XL 9XL Mens Sp ⁰ RM 109 Brand Name PEILOW. Applicable Scene Casual. Style Casual. Material Polyester Open +		
	< 0 □	

Fig. 2.8: Statistics reading, input record and export report to PDF features from [6] Bachelor of Computer Science (Honours) Faculty of Information and Communication Technology (Kampar Campus), UTAR

Table of Comparison between Existing Mobile Apps and Proposed App 2.3

Limitations
Strengths

	Diabetes	Glucose	Health2Sync	Diabetes:M	MySugar	Blood	Blood	Undermyfork	No	Proposed
	Diary	Buddy			– Blood	Pressure	Pressure		Sugar	self-
		Diabetes			Sugar	Monitor	Diary		In Me	monitoring
		Tracker								mobile
										application
No pop-up ads	×	×	~	×	×	×	×	~	~	✓
No need to upgrade	×	×	×	×	×	✓	✓	✓	✓	✓
premium account										
(to access more										
features)										
	,									
Able to record	\checkmark	✓	✓	✓	✓	×	×	✓	✓	✓
blood glucose data										
Able to record	✓	✓	✓	✓	✓	✓	✓	×	×	✓
blood pressure data										
Reminders on	×	×	×	✓	×	×	×	×	×	√
filling-in record										
Reminders on	×	×	✓	×	×	×	×	×	×	✓
medication										

Graphs/ charts/ statistics displayed	✓	×	√	√	~	√	√	√	•	√
Report generator (PDF or CSV file)	✓ (PDF)	×	×	✓ (HTML)	✓ (PDF)	✓ (CSV)	✓ (CSV)	×	×	~
Can connect to CGM device or Dexcom meter	×	~	×	×	×	×	×	×	×	×
Include articles about health concern	×	×	×	×	×	√	×	×	~	×
Reference table on suitable range value of blood pressure	×	×	×	×	×	×	√	×	×	×
Search food name/ barcode scanning/ take photo of food	×	✓ (display food calories, protein & etc.)	×	×	×	×	×	✓ (but only display food name)	✓ (show amount of sugar)	✓ (Food recognition technology to detect food and display relevant

										nutrition details)
Accurate result of	-	✓	-	-	-	_	-	\checkmark	×	\checkmark
food detected										
Categorize food	×	×	×	×	×	×	×	×	×	\checkmark
healthiness level										
(healthy/moderate/										
unhealthy)										

Table 2.1: Table of comparison of strengths and limitations of apps

Chapter 3 System Methodology/Approach

3.1 System Development Methodology

The software development methodology used for developing the mobile application is Agile methodology as this project is considered as a medium-scale project with one year of development timeline. Agile methodology is suitable for non-complex project and do not require a lot of upfront analysis compared to waterfall methodology. This method also reduces overheads in software process, reduce documentation and it is not necessary to have a very detailed specification to develop a project.



Figure 3.0: Agile software development life cycle

Phase 1: Plan

The background study of diabetes and the problem of diabetes patients encountered are studied and identified. The scope of the project and objectives are then determined. Timeline schedule and the work to be done for each sprint are also planned and estimated.

Phase 2: Design

Existing self-monitoring diabetes mobile applications and software are studied and started to mock-up the user interface (wireframe) for the project. Features are proposed and designed by creating architecture diagrams such as use-case diagram and block diagram. Besides, system requirements such as hardware and software to be used in the project development is also determined.

Phase 3: Develop

All the external libraries are loaded for developing the mobile application. Functionalities proposed in the project as well as the user interfaces are then coded in Android Studio. Each sprint is examined and developed, following the time schedule proposed.

Phase 4: Test

After developing the features, testing is needed to ensure the functionalities work well and correctly. Any bugs and issues found in the system testing are fixed. In the implementation of project, food recognition model is being tested with various number of food images, as well as the functions in the application are tested with test cases and test data.

Phase 5: Deploy

After system testing, the mobile application is ready to be deployed. Users are able to start using the application while developer is ready to provide support to ensure the application runs smoothly without any bugs.

Phase 6: Feedback

Feedback from users will be gathered and it will be used to evaluate the mobile application by helping developer to identify future improvement. Any refinement or update on the mobile application is to be done in this phase based on users' feedback and suggestions. In this project, the food database will be periodically updated.

3.2 System Requirement

3.2.1 Hardware

The hardware involved in this project is computer and it is used for coding the mobile application and a smartphone acts as an emulator for testing this application.

Description	Specifications
Model	Dell Vostro 3478
Processor	Intel Core i5-8250U
Operating System	Windows 10
Graphic	Intel(R) UHD Graphics 620
Memory	20GB RAM
Storage	463GB (C:) & 454GB (D:)

 Table 3.1 Specifications of laptop

Description	Specifications
Model	Huawei Nova 5T
EMUI Version	9.1.0
Android Version	9 (Pie)
CPU	Huawei Kirin 980
GPU	Mali-G76 720 MHz
RAM	8.0 GB
Storage	128 GB

3.2.2 Programming Language

• Java programming language is used for developing this mobile application in Android Studio.

3.3 Use Case Diagram



Figure 3.1: Use case diagram for BGBP mobile application by using Visual Paradigm Software

In general, BGBP mobile application enables user to monitor the daily blood glucose and blood pressure level in graph-view, allows user to add blood glucose and blood pressure records and view the food nutrition details and food healthiness by capturing or selecting photo. Besides, this mobile application also allows user to set reminder on medication, view monthly statistics of blood glucose and blood pressure, view for the past records as well as to generate and download PDF report into user's device.

3.4 Food Recognition Model Details

The food recognition model utilized in this project is obtained from TensorFlow Hub [17]. The model is trained and developed by Google AIY (Artificial Intelligence Yourself) team. Moreover, Convolutional Neural Network (CNN) technique is used to train the model with MobileNetV1 architecture which is specifically designed for embedded device like mobile phone. This architecture is lightweight and efficient for mobile devices that have limited computational resources. It provides lower memory usage and faster processing. CNN technique is commonly used in image classification as it is capable of learning and extracting features from dataset images. When differentiating food types, features such as color, texture and shape are used to identify between food from another.

Besides, the food recognition model has been trained on 2023 dataset of food images. The dataset consists of food that are from different regions and cuisines, such as Western, Japanese, Italian, Chinese cuisines and etc. However, it is mentioned that the dataset is skewed more towards North American food. Food such as pad thai, pizza, spaghetti, ramen, sushi, dim sum, desserts and so on are able to be detected with the pre-trained model. The model is open-source which benefits users, however there is a limitation of the model which is not fine-tunable. This indicates that the model is not allowed to be further trained with additional new dataset or modify its training process by users.



Figure 3.2: Mean latency benchmarks for the food recognition model
Metadata

name	iy/vision/classifier/food V1								
description	Fine grained classification mo	del for recognizing	food dish	165					
version	1								
author	Google								
license	Apache-2.0								
min_parser_version	1.0.0								
		name	probability Deck Liff of the state large						
		description	Probabilities of the outputs classes.						
		stats	max	1					
			min	0					
			nam	e proba	ability-labe	ls.txt			
	output_tensor_metadata		type	TENS	SOR_AXI	S_LABELS			
		associated_files	nam	me probability-labels-en.txt					
			type	type TENSOR_AXIS_LABELS					
			local	e en					
		content	content_properties_type FeatureProperties						
		name	image						
subgraph_metauata		description	Input im per pixe	nput image to be classified. The expected image is 224 ver pixel, with each value in [0.0,255.0].			ige is 224	x 224 with 3 channels	
			max 255						
		stats	min 0						
			options_type NormalizationOptions						
	input_tensor_metadata	process_units		_	mean	127.5			
			option	5	std	127.5	127.5		
			conter	nt_prope	erties_typ	e ImagePro	pertie	S	
						color_s	pace	RGB	
		content	conter	nt_prope	erties			width	224
						default_	default_size		224

Figure 3.3: Metadata of model

Mean latency benchmarks are provided in the documentation [17]. It is used for evaluating the performance of model and it refers to the average amount of time to process an input for the model. The lower the latency, the faster the model can process with the input and generate output. Chart above (Figure 3.2) shows the latency benchmarks for several mobile devices. Metadata of the model is also provided in the documentation (Figure 3.3). The model takes image as input. The input must be a 3-channel RGB color images with size of 224x224. The model will output a list of probabilities of food classes.

3.5 Timeline

Activity Week	1	2	3	4	5	6	7
Design GUI for each section, splash screen and app icon for							
mobile application							
Set up Firebase database and the needed entities, columns		<u> </u>					
etc.							
Code for registration, login, logout and forget password							
features							
Code for 'Add Record' section for blood glucose, blood							
pressure, other categories input							
Code for 'Home' section for the dashboard (graph view)							
Code for 'History Records', modification and deletion							
records							
Code for reminder on medication feature							
Finalizing FYP 1 Report							

Timeline of FYP 1:

Table 3.3: Timeline diagram for FYP 1

Timeline of FYP 2:

Activity Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Food recognition feature with food														
database (Nutrition facts label)														
Code for report generator feature									<u>.</u>					
Code for monthly statistics feature														
Finalizing all features in the mobile application														
Finalizing FYP 2 report														

Table 3.4: Timeline diagram for FYP 2

Chapter 4 System Design

4.1 System Design Diagram



Figure 4.1: Block diagram for the overall features in BGBP mobile application by using Canva Software

User is required to register an account either using Google sign-in method or email-password method. After login, user is redirect to home dashboard which allows user to apply date filter to view daily blood glucose level with line graph and blood pressure level with bar charts. An alert message will be displayed to user if there is a blood glucose level record exceeding 10.5 for the particular day. Besides, user can choose to add blood glucose and blood pressure record by entering data into entry box provided and save the record.

The mobile application enables user to either search manually with food name or capture food photo or select the image from device to view the relevant nutrition information such as total fat, total sugars and etc. Using food recognition technology, the food image will be processed through a pre-trained model and the output (food name) will be displayed in the interface. This will further link to food database to show the relevant details and categorize the food detected healthiness, either healthy, moderate or unhealthy for user reference. If the output (food name) is not available in the food database, user can click into the output and it will automatically redirect user to Google search to display the food nutrition details. This approach is similar to the search function, such that if user manually input the food name and it is not found from the food database, Google page that showing the nutrition details will automatically display to user.

In the more options section, it consists of several features such as reminder on medication, monthly statistics, report generator, history records and logout. User is allowed to set reminder on medication by entering some information into the spaces provided. Moreover, monthly statistics of blood glucose and blood pressure (lowest, highest, average data) and monthly graphs are displayed after user selects the month from date picker. The mobile application also allows user to generate and download PDF report into device by selecting date range and category (all/ before breakfast/ after lunch etc.). User can choose to view the past records by applying date and category filter and also perform modification or deletion on the record. Lastly, logout function is also available in the mobile application.

4.2 Food Recognition Model Design & Usage in the Project



Figure 4.2: General flow of the pre-trained model

The food recognition model obtained from [17] takes image file as input and outputs a list of probability of food category. The food with the highest probability among others will be act as the food detected. The model is implemented into the project by importing it into Android Studio main project folder. After loaded into Android Studio, there is a sample code structure provided (Figure 4.3) in the model file (.tflite), which allows the developers to modify the code based on own usage.



Figure 4.3: Code structure for using the model

In the project, the food feature is developed by allowing user to either take food photo or upload food image from device. The image obtained will be act as the input for the food recognition model and go through the detection process. The model will output a list of probability which is not useful in the project feature development. Food name is the only attribute that is important in the project. Hence, a modification in the code structure is required. Some additional functions such as converting captured or uploaded image into bitmap format as the input for the model and retrieving the food name from the maximum probability list as the output of the project feature (Figure 4.4) are required to be coded.



Figure 4.4: One of the additional code is implemented in the food feature

In general, once the food image is obtained from user's device, its format will be changed and it is passed into the food recognition model as an input. The model will process the input to get an output which is a list of probability of food category. By using looping function, the index of the maximum probability score from the list is obtained and it is then utilized to get the food label name with output.getLabel(). Therefore, the food name is determined and displayed in the textbox provided in the interface. Displaying relevant food nutrition facts and food healthiness level are further to be implemented in this feature as shown in Figure 4.5 as the new flow of this feature with the help of food recognition model. After getting the detected food name, it will pass to the project's food database which mainly sourced from [18], [19] to search its nutrition information and it will be displayed in the interface. Besides, food healthiness level will also be determined based on certain data from nutrition information.



Figure 4.5: Flow of the food feature in the project with the food recognition model usage

4.3 System Architecture Diagram

Wireframe for BGBP mobile application is created by using MockFlow Software:



Figure 4.6: Splash screen for mobile application and the registration/login interface



Figure 4.7: Home page where user can filter date to view the daily statistic record of blood

g	lucose	and	b.	lood	pro	essure)	level	l

31 Aug 2.022. > Time 2.316
Blood Glucose: XXXX mmol/L
Systolic: xxxx mmHg
Diastolic: xxxx mmHg
Category: Select 🛩
Remarks: Input
Save Home Add Record Food More

Figure 4.8: Add record page where user need to input the data for blood glucose and pressure and select category such as before breakfast, after lunch and etc. from spinner

	(Q search food
Capture Photo	Select Image
	3
Food (lake
Food: C Carbohydrates	iake xxx
Food: C Carbohydratos Sugar	xxx
Food: C Carbohydrates Sugar Fats	xxx xxx xxx xxx
Food: C Carbohydrates Sugar Fats Protein	xxx xxx xxx xxx

Figure 4.9: Food recognition feature where user can capture photo or select image to view the nutrition facts of food detected and the food healthiness categorization or by searching the food name manually

Reminde	r on Mea	dication (
Report	Generat	or	
History	Record	5	
Monthly	Statistic	29	
Log Ou	t		
Home Yed	Record	Food	More

Figure 5.0: More options interface including features such as report generator, history records, reminder on medication, monthly statistics and logout

Add Reminder on Medication
37 Aug 2022. 🛗 Time 2.316
Enter medicine name/details
Reminder:
Repeat:
Type of repetition: Select 🗢
+ Add

Figure 5.0a: Add reminder on medication interface

View History Records
IG Aug Aug 2.022 Aug 2.022 Aug 2.022 Aug Category: Select All Apply Date: 2022-08-20 Edit
Time: 06:30 Glucose level: 4.2. mmol/L Systolic level: 12.0 mmHg Diastolic Level: 80 mmHg
Date: 2022-08-20 Time: 13:25 Gilucose level: 4.4 mmol/L Systolic level: 12:2 mmHg Diastolic Level: 13:3 mmHg /

Fig 5.0b: View history records interface where user is able to apply date and category filter and perform modification or deletion on the specific record selected

Geherate Report]
From: 16 Aug 🗎 To: 71 Aug 🗎 Category: Select All 🗸	
Apply Download	

Figure 5.0c: Report generator interface where user is able to pick the date range, apply category filter and download the report to device

Monthly Statistics
2-02-212.
Plot 1 Plot 2.
Plot 5
400 350 300
200 150 100
14 16 18 2.0 2.2. Lowest Highest Average

Figure 5.0d: Monthly statistics interface where user is able to select the month to view scatter chart for monthly data and the lowest, highest and average of blood glucose level

Chapter 5 System Implementation

5.1 Software Setup

- Android Studio
 - Version: Arctic Fox (2020.3.1)
 - o Released Date: July 28, 2021
 - Utilize this platform to build BGBP mobile application
- Firebase:
 - Authentication (for login, logout, registration user account function)
 - Realtime Database (for storing daily blood glucose records, medication records as well as for the food nutrition information food database)
 - Cloud Messaging (push notification for reminding user to add daily records)
- MPAndroidChart
 - Version: 3.1.0
 - o Released Date: March 21, 2019
 - Released by: Philipp Jahoda
 - Use to plot bar chart for blood pressure record
 - Use to plot scatter chart and line graph for monthly statistics feature
- GraphView
 - Version: 3.1
 - Released Date: August 7, 2013
 - o Released by: Jonas Gehring
 - Use to plot line chart for blood glucose record

- TensorFlow Hub
 - Obtain pre-trained food classification model (Architecture: MobileNet V1) from [17]
- USDA (U.S. Department of Agriculture) Food Data Central [18]
 - \circ Obtain food nutrition information to write into BGBP food database
- Nutritionix database [19]
 - Obtain food nutrition information to write into BGBP food database
- iTextPdf
 - Version: 5.5.13.1
 - Released Date: February 25, 2022
 - Use to create PDF documents for report generator feature

5.2 Settings and Configuration

In Android Studio module build.gradle file, enable mlModelBinding to true in order to allow TensorFlow Lite Model to be used in the project file.



Figure 5.1: Setup 1

Add new TensorFlow Lite Model into resource folder (res).



Figure 5.2: Setup 2

In Android Studio project build.gradle file, add "maven {url 'https://jitpack.io'}" into repositories to allow external libraries to be used, and also add "classpath 'com.google.gms:google-services:4.3.14'" into dependencies to allow Firebase services to be used in this project.



Figure 5.3: Setup 3

dependencyResolutionManagement { DependencyResolutionManagement it ->
 repositoriesMode.set(RepositoriesMode.FAIL_ON_PROJECT_REPOS)
 repositories { RepositoryHandler it ->
 google()
 mavenCentral()
 maven { url 'https://jitpack.io' }
 jcenter() // Warning: this repository is going to shut down soon
 }
 rootProject.name = "BGBP"
 include ':app'

In settings.gradle file, add "maven {url 'https://jitpack.io'}" into repositories.

Figure 5.4: Setup 4

Under the dependencies of module build.gradle file, add the relevant implementation of external libraries such as google firebase authentication, google firebase database, google firebase messaging, tensorflow lite support, graphview, MPAndroidChart and itextpdf.

~~		
37 ▶ ∣ 38	dependencies {	
39	implementation	
40	implementation	'com.google.android.material:material:1.6.1'
41	implementation	'androidx.constraintlayout:constraintlayout:2.1.4'
42	implementation	
43	implementation	
44	implementation	'com.github.bumptech.glide:glide:4.11.0'
45	implementation	'com.google.firebase:firebase-database:20.1.0'
46	implementation	
47	testImplementat	ion 'junit:junit:4.+'
48	androidTestImpl	ementation 'androidx.test.ext:junit:1.1.3'
49	androidTestImpl	ementation 'androidx.test.espresso:espresso-core:3.4.0'
50	implementation	'org.tensorflow:tensorflow-lite-support:0.1.0'
51	implementation	'org.tensorflow:tensorflow-lite-metadata:0.1.0'
52	implementation	'com.jjoe64:graphview:4.2.2'
53	implementation	'com.github.PhilJay:MPAndroidChart:v3.1.0'
54	implementation	'com.getbase:floatingactionbutton:1.9.0'
55	implementation	'com.wdullaer:materialdatetimepicker:1.2.1'
56	implementation	<pre>group: 'com.itextpdf', name: 'itextpdf', version:'5.5.13.1'</pre>
57	≙}	

Figure 5.5: Setup 5

In the AndroidManifest.xml, grant uses permission for internet, receive boot, schedule exact alarm, set alarm, wake lock and permission to write into external storage for some features such as Firebase, set reminder on medication and generate report into device.



Figure 5.6: Setup 6

5.3 System Operation

5.3.1 User Interface (UI) of BGBP mobile application



Figure 5.7: App icon and splash screen designed using Canva software for the mobile application

BGBP	-₩¢ BGBP	-∕₩∕● BGBP
Login	Register	Reset Password
Enter Email	Enter Email	You will receive an email with link provided to reset your password after input your email and click the send button below.
Enter Password	Enter Password	Enter Email
LOGIN	REGISTER	SEND
Not registered yet? Register Here	Already registered? Login Here	
G Sign In	and the second	and the second
Forgot Password? Click Here	and the second	and the second

Figure 5.8: Login (either using email-password or Google sign-in method), register account and reset password interface



Figure 5.9: Home dashboard interface (with daily blood glucose and blood pressure level graph view) and able to apply date filter from DatePickerDialog function



Figure 6.0: Alert message will be displayed to user if the day had exceeded the blood glucose value with 10.5 in home dashboard



Figure 6.1: Add record interface (with textbox, Spinner for category, DatePickerDialog, TimePickerDialog for selecting date and time)

← Food		÷	Food		
	٩	Output:	Result		
		Serv	ing Size	()g
		Ca	alories		0
					%DV
		Tot	al Fat	0g	0%
		Satu	rated Fat	Og	0%
		Tra	ns Fat	Og	-
		Cho	esterol	0mg	0%
		So	dium	0mg	0%
		Total Ca	rbohydrate	0g	0%
		Dieta	ary Fiber	0g	0%
		Tota	l Sugars	0g	0%
LOAD IMAGE	CAPTURE IMAGE	Adde	d Sugars	Og	-
		Pr	otein	0g	0%
Output: Result		Vita	min C	0mg	0%
			ron	0mg	0%
Serving Size	Og	Ca	lcium	0mg	0%
Calories	0 %DV	1	Food Healthin	ess: -	
< ○		<	1 0		

Figure 6.2: Food interface (with search function, load image or capture image to detect the output (food name) and nutrition table with healthiness level)



Figure 6.3: Example for using load image function and the food detected is greek salad with its nutrition details displayed in the table and food healthiness value (healthy) is shown

← Food		÷	Food		
	Q	Output: Har	nburge	er	
	Silter.	Serving S	ize	200)g
a starter	100	Calories	\$	44	0
and and					%DV
		Total Fa	t	21g	27
Contraction of	A AND A	Saturated F	at	6.9g	34
		Trans Fat		Og	1.20
Contraction of the local division of the loc		Cholester	ol	74mg	25
	-	Sodium		860mg	37%
The second s		Total Carbohy	drate	33.5g	11%
		Dietary Fibe	er	1.6g	6%
		Total Sugar	S	7.1g	14
LOAD IMAGE	CAPTURE IMAGE	Added Suga	rs	Og	
		Protein		27.6g	55%
Output: Hamburge	r	Vitamin (2	4.4mg	5%
	-	Iron		4.2mg	24%
Serving Size	200g	Calcium		122mg	9%
Calories	440 %DV	Food healt	hiness	: Unhealth	у
⊲ 0		\triangleleft	0		

Figure 6.4: Example using capture image function and the food detected is hamburger with its nutrition details displayed in the table and food healthiness value (unhealthy) is shown

BGBP C	BGBP Q
Apple crisp	Hot dog
Apple pie	Hot pot
Asam pedas	Ice cream
Baklava	Ice cream cake
Barbacoa	Icebox cake
Bento	Jelly bean
Bibimbap	Jiaozi
Bread	Kaya toast
Bubble tea	Ketupat
Bulgogi	Kimchi
Burrito	Kung Pao chicken
Butter chicken	Laksa
Caramel	Lasagne
< 0 □	

Figure 6.5: Access to list of food available in food database from search button and user can click to view the specific food nutrition information or enter the food name to search through

Serving Size	1 bar (4	2g)
Calories	160	
		%DV
Total Fat	3.5g	4
Saturated Fat	0g	0
Trans Fat	Og	100
Cholesterol	0mg	0
Sodium	44.9mg	2%
Total Carbohydrate	29g	10%
Dietary Fiber	6g	21%
Total Sugars	9g	18
Added Sugars	Og	1
Protein	3g	6%
Vitamin C	0mg	0%
Iron	1.1mg	6%
Calcium	20.2mg	2%

Figure 6.6: The interface after clicking the food (Apple crisp) from the list

← Food	← Food			🔗 nutrition facts label Pound cake	C
Q	Output: Pound cake			Pound cake, butter Nutrition Facts	
				Amount Per 100 grams	
	Serving Size		-	Calories 388	
	Calories	Ī	-	-	D.I. V.I.
			%DV	74	Dally Value*
	Total Fat	-	-	Total Fat 20 g	30%
	Saturated Fat	100	-	Saturated fat 12 d	60%
	Trans Fat		-	Saturated fat 12 g	00 %
	Cholesterol	-	-	Cholesterol 221 mg	73%
I. The second	Sodium	~	-		
	Total Carbohydrate	1		Sodium 398 mg	16%
	Dietary Fiber	-		Potassium 119 mg	3%
	Total Sugars	(-)	-		
LOAD IMAGE CAPTORE IMAGE	Added Sugars	-	-	Total Carbohydrate 49 g	16%
	Protein	-	-	Dietary fiber 0.5 g	2%
Output: Pound cake	Vitamin C	-	-	Dictary inter 0.0 g	2.0
	Iron	1	-	Protein 6 g	12%
Serving Size -	Calcium	-	-	Vitamin C	0%
Calories -				Vitaliinite	0.0
%DV	Food healthine	ss: -		\leftarrow \rightarrow \bigcirc \Box	: 0
	0				

Figure 6.7: If the food detected (output) is not available in the food database, user can click the underlined food name ("<u>Pound cake</u>") and it will redirect user to Google quick search for displaying the relevant food nutrition details



Figure 6.8: More options interface (including other functions), AlertDialog for logout function

4	Reminder on Medication		← Add Reminder On Medication				10.00 AL 80				
	itermitter on metaleation										
	insulin injection 19/11/2022 11:45 Every 1 Day	/	Ō	Enter Medicir	ne Name	e / Description	:				
				Reminder Off							
				Date							
			0	Time							-
			11	Repeat Off			ېد the Andro	id System	~		¥
			\$	Repeat Number			USB debu Touch to	disable USB	ed debugging		
				Type of Repetitio	on		BGBP Remembe	er to take me	edicinel		
				+ /	ADD		Until I For	ube • 12 min und You - Sti	ago 🏏 ephen Sanch	ez (Weddi	
		Ð									0
	4 O 🗆			< ○ ○	C					٠	

Figure 6.9: RecyclerView for medication record (Left); Add reminder on medication interface with textbox, toggle switch to turn on or off the reminder or repetition (Middle); Push notification received as reminder (Right)



Figure 7.0: Monthly statistics interface (allow user to select the month from DatePickerDialog) and display blood glucose statistic in scatter chart, blood pressure statistic in line chart with the lowest, highest and average data shown for the month



Figure 7.1: Report generator interface (allow user to pick from-date, to-date as well as apply category filter either select all or specific timeline given to download the statistics PDF report into the device)

	\leftarrow	Internal storage	Q	÷	\leftarrow	2023-	04-14 1	9:2	0	+	•
/	Catego	ries > Internal storage >	$\overline{}$								
	A	2023-04-14 19:25:45.pdf 2023/4/14 19:26:15 2.15 KB	\mathcal{A}				BGBP I	REPORT			
	X	2023-04-05 15:10:41.pdf					Blood Glucose & B	lood Pressure Records	8		
					DATE	TIME	BLOOD GLUCOSE (mmol/L)	SYSTOLIC (mmHg)	DIASTOLIC (mmHg)	CATEGO	RY
	1	2023-03-22 00:12:14.pdf			2022-12-05	8.30	4.2	118	78	Before brea	ikfast
	P	2023/3/22 00:12:33 2.31 KB			2022-12-05	10.15	4.5	120	80	After brea	kfast
					2022-12-06	10.30	4.5	120	80	After break	kfast
		2022 02 22 00.07.50 = 45			2022-12-06	14.00	4.6	120	80	After lun	ich
	L	2023-03-22 00:07:58.pdf			2022-12-07	8.08	4.2	120	80	Before brea	ıkfast
	· ·	2023/3/22 00:08:12 3.21 KB			2022-12-23	12.48	10.5	125	85	Before lu	nch
					2022-12-23	12.53	8	120	80	Others	k :
		2023-03-22 00:06:33.pdf			2022-12-23	12.56	11.1	129	86	Others	
	A	2023/3/22 00:06:42 1 56 KB			2022-12-26	15.16	4.5	120	80	After lur	ich
	<u>لم</u> ۲	Sample.pdf 2023/3/21 23:46:36 1.82 KB QTAudioEngine 2021/9/23 16:02:23 280 B 00001.vcf									SGBP
	veard	shopeeMY		>	BGBP Report						Page - 1
		(/) Download (374)		>							
		< ○				\triangleleft	C)			

Figure 7.2: In the internal storage of the device, the generated PDF report can be found and the report is in a tabular format showing date, time, blood glucose data, blood pressure data and also category

← View History Records	Modify/Delete Record
From To E	DATE TIME 2022-11-18 15.13 BLOOD GLUCOSE (mmol/L)
Date: 2022-11-12 Time: 21.45 Glucose level: 5.5 Systolic level: 120 Diastolic level: 80	4.8 SYSTOLIC (mmHg) 122
Date: 2022-11-14 Time: 12.07 Glucose level: 15 Systolic level: 120 Diastolic level: 80	DIASTOLIC (mmHg) 83 CATEGORY After lunch
Date: 2022-11-14 Time: 17.46 Glucose level: 12.5 Systolic level: 128 Diastolic level: 88	Date1
Date: 2022-11-14	

Figure 7.3: History records interface with RecyclerView layout of all records and able to modify or delete the specific record



Figure 7.4: History records is also able to apply filter for date range with DatePickerDialog and category filter (for e.g. only showing 'before breakfast' records from 01/12/2022 to 31/12/2022 after applied filters)

:				
٠				
1				
BGBP	Just now	debugging		
Your Daily Hi user, d today.	y Blood Gluce on't forget to	ose Level! add your blo	ood glucose	record for
de Castin	ne . Elle tenne	for the HOD S		-

Figure 7.5: Firebase Cloud Messaging push notification (remind user to fill-in daily blood glucose record)

5.3.2 Comment and highlight the feasibility of proposed method

The user account registration and login function is implemented with Firebase Authentication where user can choose to use either email with password method or Google sign-in method. Firebase Authentication also provides reset password function. User will receive an email with a link provided to reset the account password after provide email address in the application.

After login, the home dashboard will be displaying the daily blood glucose level in line-chart and also blood pressure level in bar-chart which includes both systolic and diastolic records. This can allow user to view a summary of daily blood glucose and blood pressure level. By default, the date input will be the current date. User is able to pick the wanted date by clicking the calendar button and DatePickerDialog will be displayed so that it is convenient for user to select instead of manually typing the date. GraphView external library and MPAndroidChart library are being used to plot the graphs. Records will be first retrieved from Firebase Realtime Database with the selected date query and only insert into DataPoint and ArrayList for plotting the charts. The charts are able to zoom in and out and also scrollable for a better and clearer view. Besides, Android AlertDialog is being implemented in home dashboard to act as an alert message to aware user if the day has exceeded the blood glucose level with a value of 10.5. This can be done by looping through the blood glucose data from Firebase database with the specific date query to find the exceeding value.

In the 'add record' section, user is required to fill in all textboxes given except remarks. DatePickerDialog and TimePickerDialog features are being used for entering date and time entries. User need to manually fill in blood glucose, systolic and diastolic readings. There is a fixed range of values set for these three inputs, for instance, user can only input numerical value from 3.0 until 15.0 for blood glucose entry (mmol/L), a numerical value from 100 to 180 for systolic entry (mmHg) and 60 to 120 for diastolic entry (mmHg). Spinner feature is also implemented for category entry such as before breakfast, after lunch, before dinner and so on, so that user can directly choose from the options given. When user clicks the 'Save' button, the record will be stored into the Firebase Realtime Database and a toast message will be displayed at the bottom of interface if it is successfully saved into the database. The record will act as reference for user to self-monitor own blood glucose and blood pressure level.

Furthermore, food recognition technology is being implemented in the 'Food' section. A pretrained CNN MobileNet food classification model [17] is imported to Android Studio from TensorFlow Hub and is utilized to detect the food image from user's device. User is allowed to either capture food image or load the image from device. The output (food name) generated will then form a query to pass into Firebase database (food database) through looping to check for the availability of food nutrition information. All the food nutrition data source is from USDA (U.S. Department of Agriculture) Food Data Central [18] and Nutritionix database [19]. The food nutrition information is extracted and written into Firebase database as the food database in BGBP mobile application. The food database consists of 155 food with its nutrition information, including Western food such as spaghetti, pizza and etc., Asian food such as char kway teow, rendang, nasi lemak and etc., as well as desserts such as pancake, cakes and etc.

If the food is available in the food database, the nutrition details including serving size, calories, total fat, saturated fat, trans fat, cholesterol, sodium, total carbohydrate, dietary fiber, total sugars, added sugars, protein, Vitamin C, iron and calcium will be retrieved and write into the table rows and cells provided. Hence, user can view the food nutrition facts label in a tabular form for improving the awareness. The highlighted nutrition information such as the total sugars and saturated fat indicate as the important aspects for diabetes patients to take note.

Besides, the food detected will also be categorized into its healthiness value, either healthy, moderate or unhealthy. Based on [20], the percent Daily Value (%DV) can be used to determine the food healthiness as it shows how much a nutrient in a serving of food contributes to a total daily diet. In this feature, the %DV of total sugars, cholesterol, saturated fat and total fats are retrieved from database and used to evaluate for the healthiness level. If 10%DV or less, it indicates as a healthy level, 20%DV or more indicates as unhealthy level and in between 10%DV to 20%DV indicates as moderate level. First, the %DV of total sugars is considered, if it is 10% or lower, the %DV of saturated fat is checked with the same condition. If both are below 10%DV, then the food is considered healthy. If the %DV of total sugars or saturated fat falls between 10% and 20%, then the food is considered unhealthy. However, if there is no data available for %DV of saturated fat, %DV of cholesterol is then used to check for the same conditions. If there is no data for cholesterol either, the %DV of total fats is used along with the %DV of total sugars to determine the food healthiness level.

Bachelor of Computer Science (Honours)

Faculty of Information and Communication Technology (Kampar Campus), UTAR

If the food is not available in the food database, user is allowed to click the underlined output generated (food name). Then, it will redirect user to Google quick search and show the relevant food detected nutrition facts label to user. Moreover, there is an alternative method to view the food nutrition details in the application. A search button is implemented to allow accessing directly to the food database. Once user clicks the button, a new interface with list of food is displayed to allow user to search for the wanted food to view its details. User can also manually type the food name in the space provided. A query with the food name is again generated to find through within the food database in order to retrieve the nutrition information and to be displayed in the tabular format and determined the food healthiness. If the food is not available in the list, user can click search icon to link to Google quick search again. The list of food in search feature is implemented using MenuItem, ListView and also SearchView. In general, a combination of food recognition technology and manual input have been implemented in this project to handle the case where the model cannot detect certain dishes. In addition, the approach of redirecting user to Google quick search in order to show the food nutrition details is also implemented to handle the case where the food information is not available in the existing food database. This feature can help user to control and plan a healthy diet by providing the important nutrition information of food and healthiness level for user reference.

In the 'more options' section, there are few features such as reminder on notifications, monthly statistics, report generator, history records and logout. Reminder on medication function can help to notify user to take medicine especially for elderly patients that are forgetful. A FloatingActionButton is being implemented in the interface for user to add new medicine reminder. User is required to enter medicine name or description in the textbox provided, select date and time from DatePickerDialog and TimePickerDialog features, enter repeat number if any and choose whether to turn on or off for the reminder and repetition. This medicine record will also be saved into Firebase Realtime Database for further action. A successful toast message will be then displayed to notify user. A RecyclerView layout of medicine records will be displayed for user reference and it is able to update for any changes or remove from database. This push notification reminder is implemented using AlarmManager and BroadcastReceiver Android built-in function.

For the monthly statistics feature, which enables user to view back monthly data of both blood glucose and blood pressure levels as well as the lowest, highest and average value for the specific month. In this feature, user can choose the specific month from DatePickerDialog, and the data will be retrieved from Firebase database to store into ArrayList for finding the lowest and highest value as well as calculate for the average value for both blood glucose and blood pressure records. The data retrieved from the database will also be stored into DataPoint in order to plot scatter chart for displaying the whole month of blood glucose data and to plot line chart for blood pressure data (systolic and diastolic) by using MPAndroidChart external library. Hence, user is allowed to view the overall blood glucose level per day through the scatter chart and blood pressure level in a multi-line graph in the application, as well as the information of the lowest, highest and average readings for the specific month.

In the report generator feature, user can select start date and end date with DatePickerDialog as well as category, either select all or select the specific timeline such as before lunch, after lunch etc. to download the PDF report into device. This function is implemented with an external library, iTextPdf. Before that, permission to access external storage need to be granted so that the PDF documents are able to download into user's device. After selecting date and category, a query is created to pass through Firebase database to retrieve the wanted records and store them into an ArrayList. Then, the parameter is passed to a function which helps to create a new PDF file, where a new file path is first created and the document margin is set to create page header, table, cell, padding, alignment and color. In this feature, the data that will be displayed to user in the PDF report table are date, time, blood glucose, blood pressure (systolic and diastolic) and category. This feature enables user to take note and monitor on the blood glucose level for a specific range of dates and the report acts as future reference for medical consultation.

User is also allowed to view back all blood glucose records in 'history records' section. All records are retrieved from Firebase Realtime Database and a general view of the records are displayed by using RecyclerView layout. User can select the edit button to view the more detailed record and perform any modification or deletion. There is also a date range filter function to bring convenience for user to view a specific range of records. User need to click the calendar button and choose the date from DatePickerDialog for 'from' date and 'to' date in order to apply changes. If there is no record found between the date ranges, a toast message

Bachelor of Computer Science (Honours) Faculty of Information and Communication Technology (Kampar Campus), UTAR will be displayed to notify user. Likewise, a category filter is also included in this feature to allow user for viewing more specific records. User can select to view all categories or specific category such as before breakfast, after breakfast, before lunch and etc. from the Spinner feature.

Firebase Cloud Messaging is also implemented in this mobile application. A recurring scheduled push notification is sent to all app users at specific time daily, 3pm (GMT+08:00 Malaysia Time) to act as a reminder for user to add daily blood glucose records. For the logout function, an AlertDialog box will be pop out asking for user confirmation. If user has successfully logout, it will redirect user to the login interface again.

Chapter 6 System Evaluation and Discussion

6.1 Food Recognition Model Testing

Food detection testing (100 types of food) for the recognition model:

No.	Food	Testing Outcom	me		Outpu	t Corr	ect	ness	
1	Angel food cake	LOAD IMAGE LOAD IMAGE LOAD IMAGE Dutput: Angel food Output: Angel food Output: Angel food Serving Size 0.11 Calories 1 Total Fat Saturated Fat Trans Fat Cholesterol Sodium Total Carbohydrate Dietary Fiber Total Sugars Added Sugars Protein Vitamin C Iron Calcium	CAPTURE CAPTURE d cake d cake	Q IMAGE 499) %DV 0 0 5% 9% 0% 42 - 6% 0% 42 -		Able food c Nutrit food level high % are dis	to correction (un %DV spla	detect ectly. details healthi healthy V in sug yed.	the and iness $\gamma \rightarrow$ gars)

2	Apple pie	← Food		•	Able to detect the
			٩		food correctly.
					Nutrition details and
			Cas		food boolthings
		57			ioou ilealuiniess
					level (unhealthy \rightarrow
			3-+-		high %DV in sugars)
					are displayed.
		LOAD IMAGE 0	CAPTURE IMAGE		
		Output: <u>Apple pie</u>			
		Output: <u>Apple pie</u>			
		Serving Size 1/8	8 pie (131g)		
		Calories	380 %DV		
		Total Fat	15.1g 19		
		Saturated Fat	3g 15		
		Cholesterol	Oma O		
		Sodium 2	262mg 11%		
		Total Carbohydrate	58.3g 19%		
		Dietary Fiber	2.1g 7%		
		Added Sugars	28.89 58 Og -		
		Protein	2.8g 6%		
		Vitamin C	7.5mg 8%		
		Iron 1	1.2mg 7%		
		Calcium	18.3mg 1%		
		Food healthiness: U	Unhealthy		
3	Asam pedas	← Food		•	Able to detect the
			Q		food correctly.
		C 2 19	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	-	Nutrition details and
			1-		food healthiness
					level (unhealthy \rightarrow
		And a	5%		
			19		nigh %DV in
			1.		cholesterol) are
					displayed.
		LOAD IMAGE	CAPTURE IMAGE		
		0.4			
		Output: Asam peda	S		

Output: Asam pedas
Serving Size 1 serving (190g)
Calories 156
Saturated Eat
Trans Fat Og -
Cholesterol 127mg 42
Sodium 918mg 38%
Total Carbohydrate 4g 1.00%
Dietary Fiber 0g 0%
Added Sugars 0g 0
Protein 15.7a 31%
Vitamin C Omg 0%
Iron Omg O%
Calcium Omg 0%
Food healthiness: Unhealthy Baklaya
Dakiava
Q
and an and the second
Contraction of the Contraction o
LOAD IMAGE CAPTURE IMAGE
Output: Baklava
Serving Size 1 piece (78g)
I otal Fat 22./g 29 Saturated Eat 9.5a 49
Trans Fat 0g -
Cholesterol 35.1mg 12
Sodium 262.9mg 11%
Total Carbohydrate 29.3g 10%
Dietary Fiber 2g 7%
Total Sugars 9.9g 20
Added Sugars 0g -
Protein 5.2g 10%
Vitamin C 1mg 1%
Calcium 31.2mg 2%
Food healthiness: Unhealthy
5

6

		Output: Baozi				
		Serving Size	1 bun (93g)		
		Calories	217	, ,		
		-		%DV		
		Total Fat	4.1g	5		
		Saturated Fat	1.4g	7		
		Trans Fat	0g	$\frac{1}{1}$		
		Cholesterol	13mg	4		
		Total Carbobydrata	320mg	14%		
		Dietary Fiber	1.3d	5%		
		Total Sugars	4.1g	8		
		Added Sugars	Og	-		
		Protein	8.8g	14%		
		Vitamin C	Omg	0%		
		Iron	2.2mg	12%		
		Calcium	51mg	4%		
		Food healthines	s: Health	y		
		F000		-		
7	Bento		8		-	Able to detect the
				٩		food correctly
						lood confectiy.
		Section 2	2.5		-	Nutrition details and
		A STATE	16			food healthiness
				2		level (unhealthy \rightarrow
			E.	2		high %DV in total
		Commission of the second		9		
						fat) are displayed.
		LOAD IMAGE Output: Bento Output: Bento	CAPTUR	E IMAGE		
		Serving Size	1 ser	ving		
		Calories	44	3 %DV		
		Total Fat	13a	36		
		Saturated Fat	0g	0		
		Trans Fat	Og			
		Cholesterol	Omg	0		
		Total Carbobydrate	40g	10%		
		Dietary Fiber	-40 9	0%		
		Total Sugars	0g	0		
		Added Sugars	Og			
		Protein	13g	16%		
		Vitamin C	Umg	0%		
		Coloium	Omg	0%		
		Calcium	Louid	0 10		
		Food healthiness	: Unhealt	hy		

8	Bibimbap	← Food				Able to detect the
				٩		food correctly
						lood conteerry.
		and the second sec	-man		•	Nutrition details and
		1 miles		A.		food healthiness
		Contraction of the second	-			level (unhealthy \rightarrow
		1000 B		-		high %DV in
			and the second			saturated fat) are
						displayed
						displayed.
		LOAD IMAGE	CAPTURE	MAGE		
		Output: Bibimban				
		Output: Bibimban				
		Serving Size 1	bowl (86	4g)		
		Calories	972	%DV		
		Total Fat	22g	28		
		Saturated Fat	5.7g	29		
		Trans Fat	0.3g	-		
		Sodium	23911g 1655mg	72%		
		Total Carbohydrate	155g	56%		
		Dietary Fiber	6.4g	23%		
		Total Sugars	11g 0a	0		
		Protein	36g	-		
		Vitamin C	0mg	0%		
		Iron	8.3mg	46%		
		Calcium	233mg	18%		
		Food healthiness:	Unhealth	y		
•	Declara Cha Cha	← Food			_	Connet latest the
9	Bubur Cha Cha				-	Cannot detect the
				٩		food correctly
						(recognized as
		and the second s				(recognized as
		1000				muesli)
			- 21			No data available
						110 data available
		- Aller		AN IN		(Nutrition details and
				- Ale		food healthiness
		-				level)
		LOAD IMAGE	CAPTURE IN	MAGE		
		Output: <u>Muesli</u>				

		Output: Muesii				
		Serving Size		_		
		Calories		-		
		Culories		%DV		
		Total Eat		-		
		Saturated Fat	1			
		Trans Fat	1.00	-		
		Cholesterol				
		Sodium		-		
		Total Carbohydrate	-			
		Dietary Fiber	-	-		
		Added Sugars	-			
		Protein	- 1			
		Vitamin C		-		
		Iron		-		
		Calcium	-	-		
		Food bealthin	ACC' -			
1.0	D	Food Reald	cəə			
10	Butter chicken	× Food			-	Able to detect the
				٩		food correctly.
		seTro Eata	<	>	-	Nutrition details and
		-	1	all ,		Truthion uctails allu
			2			food healthiness
		1974		Ten.		level (unhealthy \rightarrow
			-	2		high %DV in
		1 OP-				
				NAL OF		saturated fat) are
			-			displayed.
		LOAD IMAGE	CAPTURE	IMAGE		
		Output: Butter chick	<u>ken</u>			
		Output: Butter chick	<u>ken</u>			
		Serving Size 4 p	oieces	(75g)		
		Calories	220			
				%DV		
		Total Fat	13g	17		
		Saturated Fat	7g	35		
		Cholesterol	35.3mc	1 12		
		Sodium	210mg	9%		
		Total Carbohydrate	18g	6%		
		Dietary Fiber	4g	14%		
		Total Sugars	1g	2		
		Added Sugars	0g	10%		
		Vitamin C	2 4ma	3%		
		Iron	2.7mg	15%		
		Calcium	30,3mr	1 6%		
				<u> </u>		
		Food healthiness:	Unhealt	hy		

11	Carbonara	← Food	• Able to detect the
		Q	food correctly
			Tood contently.
		S. Setter	 Nutrition details and
			food healthiness
		El . Ser	level (unhealthy \rightarrow
			high %DV in
			saturated fat) are
			displayed.
		LOAD IMAGE CAPTURE IMAGE	
		Output: Carbonara	
		Output: Carbonara	
		Serving Size 512g	
		Calories 1018	
		Total Fat 33g 42	
		Saturated Fat 11g 55	
		Trans Fat 0.4g -	
		Cholesterol 186mg 62	
		Total Carbohydrate 133g 28%	
		Dietary Fiber 7.5g 27%	
		Total Sugars 2.5g 0	
		Protein 44g -	
		Vitamin C 0mg 0%	
		Iron 6.3mg 35%	
		Calcium 383mg 29%	
		Food healthiness: Unhealthy	
12	Century egg	← Food	• Able to detect the
		٩	food correctly.
			 Nutrition details and
			food healthiness
			level (moderate) are
			level (moderate) are
			displayed.
		LOAD IMAGE CAPTURE IMAGE	
		Output: Century egg	

		Output: Century e	gg			
		Serving Size	71	g		
		Calories	13	30		
				%DV		
		Total Fat	9.6g	12		
		Saturated Fat	2.6g	13		
		Trans Fat	0g	-		
		Cholesterol	619mg	206		
		Total Carbobydrate	1 52911g	23%		
		Dietary Fiber	Oq	0%		
		Total Sugars	0.7g	0		
		Added Sugars	Og			
		Protein	9g	-		
		Vitamin C	0mg	0%		
		Iron	2.7mg	15%		
		Calcium	45mg	3%		
		Food bootthings	Moderat			
		roou nearthiness	. Moderat	e		
13	Cha siu bao	Food			-	Able to detect the
				٩		food correctly.
		Hung Troom Cantre	< >	: ×	-	Nutrition details and
						food healthiness
			×.	0		laval (moderate) are
			K)	2		level (moderate) are
		0		2		displayed.
		LOAD IMAGE	CAPTURE	IMAGE		
		Output: Cha siu b	<u>ao</u>			
			<u>ao</u>			
		Serving Size	1 b	un		
		Calories	25	0		
			İ	%DV		
		Total Fat	7g	11		
		Saturated Fat	2.5g	13		
		Trans Fat	0g	-		
		Cholesterol	20mg	7		
		Sodium Total Carbabudate	250mg	10%		
		Dietary Fiber	3/g	4%		
		Total Sugars	8g	18		
		Added Sugars	0g	-		
		Protein	9g	14%		
		Vitamin C	0mg	0%		
		Iron	1.8mg	10%		
		Calcium	51mg	4%		
		Food healthiness	: Moderat	e		

14	Char kway teow	Food	• Able to detect the
		Q	food correctly.
		- Alexandra	• Nutrition details and
			food healthiness
			level (healthy) are
			displayed.
		Output: Char kway teow	
		Output: Char Kway teow	
		Serving Size 1 serving (298g)	
		Calories 365	
		Total Fat 15g 19	
		Saturated Fat 1.9g 10	
		Trans Fat 0.1g -	
		Sodium 1122mg 49%	
		Total Carbohydrate 36g 13%	
		Dietary Fiber 2.7g 10%	
		Added Sugars 0g -	
		Protein 22g -	
		Vitamin C 0mg 0%	
		Iron 1.9mg 11%	
		Food healthiness: Healthy	
15	Char siu	← Food	• Able to detect the
		Q	food compativ
			lood confectly.
			 Nutrition details and
			food healthiness
			100d hearthiness
			level (healthy) are
			displayed
			elispingeni
		LOAD IMAGE CAPTURE IMAGE	
		Output: Char siu	

		Serving Size	1 oz (2	'8a)	
		Calories	43	<u> </u>	
			1	%DV	
		Total Fat	0.9g	1	
		Saturated Fat	0.3g	2	
		Trans Fat	Ûg		
		Cholesterol	17mg	6	
		Sodium	83mg	4%	
			2.1g	0%	
		Total Sugars	1.9g	3	
		Added Sugars	0g	-	
		Protein	6.2g	<u> </u>	
		Vitamin C	0mg	0%	
		Iron	0.3mg	2%	
		Calcium	2.3mg	0%	
		Food healthines	s: Health	,	
	<u> </u>				
.6	Cheesecake	← Food			• Able to detect
			_	Q	food correctly
		6 M	2 de	1	Tood confectiy.
		19	103		 Nutrition details a
					food healthing
				-	level (unhealthy
			and the second	1	iever (uniteditity
			4		high %DV in be
					sugars and satura
		the second second			fat) are displayed
					int) are displayed.
		LOAD IMAGE	CAPTURE	IMAGE	
		Output: Cheeseca	ike		
		Output: Cheeseca	ke		
		Serving Size	1 slice (9	94g)	
		Calories	360	% DV	
		Total Eat	220	20	
		Saturated Fat	22g	55	
		Trans Fat	Og		
		Cholesterol	55.5mg	18	
		Sodium	260.4mg	11%	
		Total Carbobudrata	36g	12%	
		Total Carbonydrate		4.0	
		Dietary Fiber	1g 22g	4%	
		Dietary Fiber Total Sugars Added Sugars	1g 22g 0g	4%	
		Dietary Fiber Total Sugars Added Sugars Protein	1g 22g 0g 4g	4% 44 - 8%	
		Dietary Fiber Total Sugars Added Sugars Protein Vitamin C	1g 22g 0g 4g 0mg	4% 44 - 8% 0%	
		Dietary Fiber Total Sugars Added Sugars Protein Vitamin C Iron	1g 22g 0g 4g 0mg 0.7mg	4% 44 - 8% 0% 4%	

17	Chicago-style	r Food	• Able to detect the
	nizzo	٩	food correctly
	pizza		food coffectiy.
			 Nutrition details and
			food healthiness
			level (unhealthy) are
			displayed.
		LOAD IMAGE CAPTURE IMAGE	
		Output: Chicago-style pizza	
		Food: Chicago-style pizza	
		Serving Size 0.25 pizza (126g)	
		Calories 330	
		Total Fat 12g 15	
		Saturated Fat 5g 25	
		Trans Fat 0g -	
		Sodium 419.6mg 18%	
		Total Carbohydrate 41g 14%	
		Dietary Fiber 2g 7%	
		Added Sugars Og -	
		Protein 14g 28%	
		Vitamin C 2.4mg 3%	
		lion 2.7mg 15%	
10	Chickon curry	Food healthiness: Unhealthy	• Abla to dotact the
10	Chicken curry	Q	- Able to detect the
			food correctly.
			 Nutrition details and
		11 interest	
			food healthiness
		and the second second	level (healthy) are
			diamlawad
			displayed.
		and have a set of the	
		LOAD IMAGE CAPTURE IMAGE	
		Output: Chicken curry	

		FOOA: Unicken cur	ry			
		Serving Size	1 cup (2	35a)		
		Calories	243	009)		
			1	%DV		
		Total Fat	11a	14		
		Saturated Fat	1.5g	8		
		Trans Fat	0.2g			
		Cholesterol	74mg	25		
		Sodium	73mg	3%		
		Total Carbohydrate	7.5g	3%		
		Dietary Fiber	1.5g	5%		
		Added Sugars	Og	-		
		Protein	28g	-		
		Vitamin C	0mg	0%		
		Iron	2mg	11%		
		Calcium	39mg	3%		
		Food healthines	s: Health	y		
10	Chielsen ausgest	- F000	l.		_	Able to detect the
19	Chicken nugget				-	Able to detect the
			1.000 · ····	4		food correctly
		10	-	-		roou conteery.
			CTP-		-	Nutrition details and
			10	6		food healthiness
			199			level (healthy) are
			1 and			iever (neurop) are
		a pro	THE S	6		displayed.
			1000	/		
		a man				
		LOAD IMAGE	CAPTURE	IMAGE		
		Output: Chicken r	nugget			
		Fooa: Unicken nug	ygei			
		Comits - Olar	1	16		
		Serving Size	i piece (rog)		
		Calories	49	2 DV		
		Total Eat	2.20			
		Saturated Fat	0.60	3		
		Trans Fat	Og			
		Cholesterol	8.8mg	3		
		Sodium	95mg	4%		
		Total Carbohydrate	2.4g	1%		
		Dietary Fiber	0.1g	1%		
		Added Sugars	Οg	-		
		Protein	2.5a	-		
		Vitamin C	0mg	0%		
		Iron	0.1mg	1%		
		Calcium	1.8mg	0%		
		Food healthines	s: Health	у		

20	Chocolate	← Food	1			Able to detect the
	brownie	-		٩		food correctly.
		-	<	>		Nutrition details and
						food hoolthings
						rood nearthiness
						level (unhealthy \rightarrow
			San C			high %DV in both
				No.		sugars and saturated
		The Descentions				fat) are displayed.
		LOAD IMAGE	CAPTURE	IMAGE		
		Out-off Office Lat				
			orownie			
			1			
		Serving Size Calories	23	g5		
				%DV		
		Total Fat	12g	15		
		Saturated Fat Trans Fat	7g 0q	35		
		Cholesterol	54.7mg	18		
		Sodium	65mg	3%		
		Total Carbohydrate	31g	10%		
		Dietary Fiber	1.5g	5%		
		Added Sugars	0g	-		
		Protein	3g	6%		
		Vitamin C	0mg	0%		
		Iron	0.4mg	2%		
		Calcium	0mg	0%		
		Food healthiness	: Unhealth	у		
21	Chocolate chip	← Food				Able to detect the
21	chocolate emp					The to detect the
	cookie			~		food correctly.
		P	19		-	Nutrition details and
			-			Nutrition details and
		(Take				food healthiness
		A C A	040			level (unhealthy) are
		10 -10	× 4			· · · ·
		to the	- 10	1		displayed.
		-	1	1		
		and the second se				
		LOAD IMAGE	CAPTURE I	MAGE		
		Output: Chocolate	e chip coo	<u>kie</u>		

		Food: Chocolate	спір соок	Je
		Serving Size	3(0a
		Calories	14	48
				%DV
		Total Fat	7.4g	9
		Saturated Fat	2.4g	12
		Trans Fat	0.2g	
		Cholesterol	0mg	0
		Sodium	93mg	4%
		Total Carbohydrat	.e 20g	7%
		Dietary Fiber	0.6g	2%
		Added Sugars	0g	-
		Protein	1.5g	-
		Vitamin C	0mg	0%
		Iron	1.7mg	9%
		Calcium	6.3mg	0%
_		Food healthine	ss: Unhealth	ny
2	Churro			
		tchen	,	Q
				'
			S. mar	
				A
			A Star	20
			W-ALL	
			16 Alto	
		CX Second	-	
		Charles T	-	S.
		and the second		
		LOAD IMAGE	CAPTURE	IMAGE
		Output: Churro		
		Food: Churro		
		Serving Size	1 cnurro (∠og)
		Calories	125	% DV
		Total Eat	00	10
		Saturated Fat	2.2a	11
		Trans Fat	Og	
		Cholesterol	1.8mg	1
		Sodium	41.6mg	2%
		Total Carbohydrat	e 12.9g	4%
		Total Sugars	0.2g	1%
		Added Sugars	Og	14
		Protein	0.8g	2%
		Vitamin C	0mg	0%
		Iron	0.4mg	2%
		Calcium	1.8mg	0%
		Food healthine	ss: Moderat	te

23	Club sandwich	← Food				Able to detect the
			<u>م</u>		food correctly.	
		Carrow Contraction		•	Nutrition details and	
						food healthiness
		A TON	Contraction of the second			level (unhealthy) are
			No. and a second			diamlare d
						displayed.
		LOAD IMAGE C	CAPTURE IMAGE			
		Output: <u>Club sandwi</u>	ich			
		Food: Club sandwich	ı			
		Serving Size	292g			
		Calories	710			
		Total Fat	36g 46			
		Saturated Fat	17g 85			
		Trans Fat	0g -			
		Sodium 190	00.9mg 83%			
		Total Carbohydrate	59g 20%			
		Dietary Fiber	4.1g 15%			
		Added Sugars	5g 10 0g -			
		Protein	41g 82%			
		Vitamin C 9).1mg 10%			
		Iron 3	3.6mg 20%			
		Calcium 49	9.3mg 38%			
		Food healthiness: U	nhealthy			
24	Congee	← Food			•	Able to detect the
	6		٩			C 1 (1
		stie at Home	< >			food correctly.
					•	Nutrition details and
		Com ,				food healthiness
						level (healthy) are
						displayed.
						1 7
		General Chicken Conges				
		LOAD IMAGE C	APTURE IMAGE			
		Output O				
		Output: Congee				

25 Cupcake FOOD • Able to food corres Image: Contract of the con	
25 Cupcake Contract Cupcake Contract C	
25 Cupcake Current of the second s	
25 Cupcake Cup	
Total Pate 2.3g 3 Trans Fat 0.7g 1 Cholesterol 34.9mg 12 Total Carbohydrate 15.2g 5% Dietary Fiber 0.2g 1% Total Sugars 0.9 - Added Sugars 0.9 - Protein 12.9 24% Vitamin C 0.9 - Calcium 14.9mg 1% Food healthiness: Healthy - Able to food correst - Nutrition food level (unit displayed. Output: Cupcake - Output: Cupcake - Food - Carture indee Output: Cupcake - Souther - - Coutume - -	
Trans Fat 09 - Cholesterol 34.9mg 12 Sodium 610.1mg 27% Total Carbohydrate 15.2g 5% Dietary Fiber 0.2g 1% Total Stagars 09 0 Added Stagars 09 0 Protein 12.2g 24% Vitamin C 0mg 0% Iron 1.1mg 6% Calcium 14.9mg 1% Food healthiness: Healthy • Able to food correst Nutrition food level (unit displayed) Icon Carture Icon Carture Icon Carture Icon Carture Icon Carture Icon Icon Icon	
Cholesterol 34.9mg 12 Sodium 610.1mg 27% Total Carbohydrate 15.2g 5% Detary Fiber Protein 12g 24% Vitamin C 0mg 0% Iron 1.1mg 6% Calcium 14.9mg 1% Food healthiness: Healthy Calcium 14.9mg 1% Food healthiness: Healthy Cupcake Cupca	
Sodium 610.1mg 27% Total Carbohydrate 15.2g 5% Dietary Fiber 0.20 1% Added Sugars 0.9 - Protein 1.2g 24% Vitamin C 00mg 0% Iron 1.1mg 6% Calcium 14.9mg 1% Food healthiness: Healthy • Able to food correst Nutrition food evel (unf displayed) Ion MAGE CAPTURE IMAGE • Nutrition food Ion IMAGE CAPTURE IMAGE • Signal (unf displayed)	
Total Carbohydrate 15.2g 5% Detary Fiber 0.2g 1% Total Sugars 0.9 0 Added Sugars 0.9 0 Added Sugars 0.9 0 Protein 12.g 24% Vitamin C 0 mg 0% Calcium 14.9mg 1% Food healthiness: Healthy • Able to food correst Food healthines: Healthy • Nutrition food level (unl displayed) Iton MAGE CAPTURE IMAGE Output: Cupcake FOOL • Output: Cupcake • Output: FOOL • Capture IMAGE	
Dietary Fiber 0.2g 1% Total Sugars 0g 0 Protein 12g 24% Vitamin C 0mg 0% Iron 1.1mg 6% Calcium 14.9mg 1% Food healthiness: Healthy • Able to food correst S Cupcake • Nutrition food level (unif displayed) Image: Contrast Contrest Contrast Contrast Contrest Contrast Co	
Total Sugars 0g 0 Added Sugars 0g 0 Protein 12g 24% Vitamin C 0mg 0% Iron 1.1mg 6% Calcium 14.9mg 1% Food healthiness: Healthy • Able to food correst Image: Source • Output: Cupcake Image: Source • Nutrition food Image: Source • Output: Cupcake Image: Source • Output: Cupcake Image: Source • Output: Cupcake	
 Added Sugars Ug 24% Protein 12g 24% Vitamin C Omg 0% Iron 1.1mg 6% Calcium 14.9mg 1% Food healthiness: Healthy 5 Cupcake Food healthiness: Healthy a Able to food correst fo	
 Vitamin C Omg 24% Vitamin C Omg 6% Calcium 11.1mg 6% Calcium 14.9mg 1% Food healthiness: Healthy Food healthiness: Healthy Able to food correst food Nutrition food level (unl displayed) LOAD MAGE CAPTURE MAGE Output: Cupcake FOOL Cupcake (75g) 	
Image: Solution of the second seco	
5 Cupcake Calcium 14.9mg 1% Food healthiness: Healthy Calcium 14.9mg 1% Food healthiness: Healthy Able to food corres Nutrition food level (unh displayed) LOAD MAGE CAPTURE MAGE FOUL: Cupcake FOUL: FOUL: FOUL FOUL: FOUL FOUL: FOUL FOUL: FOUL FOUL: FOUL FOUL: FOUL FOUL FOUL FOUL: FOUL F	
5 Cupcake Cupcake Cup	
Food healthiness: Healthy • Able to food correst Cupcake • Nutrition food Image: Cupcake • Nutrition food Image: Cupcake • Cupcake Image: Cupcake • Cupcake <	
5 Cupcake • Able to food correst food • Nutrition food • Nutrition food • Image: State of the s	
 Cupcake Cupcake Able to food correst of /li>	
Image: Contract of the second sec	detect 1
food correst • Nutrition food food level (unk displayed. UAD IMAGE CAPTURE IMAGE Output: Cupcake FUGU. Cupcake Serving Size 1 cupcake (75g)	
Nutrition food level (uni displayed. LOAD IMAGE CAPTURE IMAGE Dutput: Cupcake Food: Cupcake Serving Size 1 cupcake (75g)	ctly.
food level (unk displayed.	details a
LOAD IMAGE CAPTURE IMAGE Output: Cupcake FOUL: Cupcake Serving Size 1 cupcake (75g)	healthin
LOAD IMAGE CAPTURE IMAGE Output: Cupcake FOUL: Cupcake Serving Size 1 cupcake (75g)	nourinn
displayed.	ealthy)
LOAD IMAGE CAPTURE IMAGE Output: Cupcake FOUL Cupcake Serving Size 1 cupcake (75g)	• •
LOAD IMAGE CAPTURE IMAGE Output: Cupcake FOOL. Cupcake Serving Size 1 cupcake (75g)	
Output: Cupcake	
Output: Cupcake FOOL Cupcake Serving Size 1 cupcake (75g)	
Serving Size 1 cupcake (75g)	
Serving Size 1 cupcake (75g)	
Calories 292	
%DV	
Total Fat 15g 19	
Saturated Fat 4.4g 22	
Irans Fat 1g -	
Cholesterol 17/lig 6	
Dietary Fiber 170 6%	
Total Sugars 30g 0	
Added Sugars Og -	
Protein 2.6g -	
Vitamin C 0mg 0%	
Iron 2.3mg 13%	
Calcium 23mg 2%	

26	Devil's	food	← Food	1			Able to	detect	the
	cake			-	۹		food corr	ectly.	
			2 the			•	Nutrition	details	and
			1 States				food	healthi	ness
			A CONTRACTOR				level (un	healthy)	are
			LOAD IMAGE	CAPTURE I	MAGE		displayed		
			Output: Devil's fo	od cake					
			Output: Devil's for	od cake					
			Serving Size	1 slice (9	5g)				
			Calories	352	%D V				
			Total Fat	14.3a	18				
			Saturated Fat	5.2g	26				
			Trans Fat	0g	-				
			Cholesterol	55.1mg	18				
			Total Carbohydrate	299.3mg	17%				
			Dietary Fiber	1.5g	5%				
			Total Sugars	40g	0				
			Added Sugars	0g	-				
			Vitamin C	0.2mg	0%				
			Iron	1.5mg	8%				
			Calcium	57mg	4%				
27	Dim sum		Food healthiness	s: Unhealthy		-	Able to	detect	the
			Table State State State	A. 199	Q		food corr	ectly	
							1000 0011	cetty:	
			60	Ch.		•	Nutrition	details	and
							food	healthi	ness
			A Star 4	A 180			1000	neartin	1000
			Str.	-			level (h	ealthy)	are
			-	A.	2		displayed		
							uispiayeu		
			LOAD IMAGE	CAPTURE II	MAGE				
			Output: Dim sum						

	Serving Size	1 piece (6	5a)
	Calories	134	- 3/
			%DV
	Total Fat	3.7g	5
	Saturated Fat	0.9g	4
	Trans Fat	0g	-
	Cholesterol	10mg	3
	Total Carbobydrate	225mg	7%
	Dietary Fiber	0.9a	3%
	Total Sugars	1.9g	3
	Added Sugars	Og	-
	Protein	5.2g	E
	Vitamin C	0mg	0%
	Iron	1.2mg	7%
	Calcium	27mg	2%
Doughnut	Food healthines	s: Healthy	
			٩
	E Concession	-	
			-
		10	1
	E (O)	-	
		A.C.	200
	LOAD IMAGE	CAPTURE	MAGE
	LOAD IMAGE	CAPTURE	MAGE
	LOAD IMAGE Output: Doughnut Foog: Dougnnut	CAPTURE I	MAGE
	LOAD IMAGE Output: Doughnut Food: Doughnut Serving Size	CAPTURE I	MAGE
	LOAD IMAGE Output: Doughnut Food: Doughnut Serving Size Calories	CAPTURE I 60	маде 93
	LOAD IMAGE Output: Doughnut Food: Dougnnut Serving Size Calories	CAPTURE I 60 25	MAGE g 3 %DV
	LOAD IMAGE Output: Doughnut Food: Dougnnut Serving Size Calories Total Fat	CAPTURE I 60 25 14g	MAGE 9 3 %DV 18
	LOAD IMAGE Output: Doughnut Food: Doughnut Serving Size Calories Total Fat Saturated Fat Trans Fat	CAPTURE I 60 25 14g 5.7g 0.3q	MAGE 9 3 %DV 18 29
	LOAD IMAGE Output: Doughnut Food: Doughnut Serving Size Calories Total Fat Saturated Fat Trans Fat Cholesterol	CAPTURE I 60 25 14g 5.7g 0.3g 18mg	MAGE 9 3 %DV 18 29 - 6
	LOAD IMAGE Output: Doughnut Food: Doughnut Serving Size Calories Total Fat Saturated Fat Trans Fat Cholesterol Sodium	CAPTURE I 60 25 14g 5.7g 0.3g 18mg 190mg	MAGE 9 3 3 %DV 18 29 - 6 8%
	LOAD IMAGE Output: Doughnut Food: Doughnut Serving Size Calories Total Fat Saturated Fat Trans Fat Cholesterol Sodium Total Carbohydrate	CAPTURE I 600 5.79 0.39 18mg 190mg 299	MAGE 9 3 %DV 18 29 - 6 8% 8% 8%
	LOAD IMAGE Output: Doughnut Food: Doughnut Serving Size Calories Total Fat Saturated Fat Trans Fat Cholesterol Sodium Total Carbohydrate Dietary Fiber	CAPTURE I 60 25 14g 5.7g 0.3g 18mg 190mg 29g 1.3g	MAGE 9 3 %DV 18 29 - 6 8% 11% 5% 0
	LOAD IMAGE Output: Doughnut FOOD: Doughnut Serving Size Calories Total Fat Saturated Fat Trans Fat Cholesterol Sodium Total Carbohydrate Dietary Fiber Total Sugars Added Sugars	CAPTURE I 600 255 14g 5.7g 0.3g 18mg 190mg 29g 1.3g 14g 0g	MAGE 9 3 %DV 18 29 - 6 8% 111% 5% 0 0
	LOAD IMAGE Output: Doughnut Food: Doughnut Serving Size Calories Total Fat Saturated Fat Trans Fat Cholesterol Sodium Total Carbohydrate Dietary Fiber Total Sugars Added Sugars Protein	CAPTURE I 600 5.79 0.39 148mg 190mg 299 1.39 149 0g 3.79	MAGE 9 3 %DV 18 29 - 6 8% 111% 5% 0 0 -
	LOAD IMAGE Output: Doughnut Food: Doughnut Serving Size Calories Calories Total Fat Saturated Fat Trans Fat Cholesterol Sodium Total Carbohydrate Dietary Fiber Total Sugars Added Sugars Protein Vitamin C	CAPTURE I 600 25 14g 5.7g 0.3g 18mg 190mg 29g 1.3g 14g 0g 3.7g 0mg	MAGE 9 3 %DV 18 29 - 6 8% 11% 5% 0 - - - 0%
	LOAD IMAGE Output: Doughnut Food: Doughnut Serving Size Calories Total Fat Saturated Fat Trans Fat Cholesterol Sodium Total Carbohydrate Dietary Fiber Total Sugars Added Sugars Protein Vitamin C Iron	CAPTURE I CAPTURE I 600 255 14g 5.7g 0.3g 14g 29g 1.3g 14g 0g 3.7g 0mg 1.4mg	MAGE 9 3 %DV 18 29 - 6 6 8% 11% 5% 0 - - - 0% 8% 5% 00% 8%

29	Dumpling	← Food	-	Able to detect the
	1 0	٩		food correctly
				Tood confectly.
			-	Nutrition details and
				food healthiness
				level (unhealthy) are
				displayed.
		· · · ·		
		LOAD IMAGE CAPTURE IMAGE		
		Output: Dumpling		
		rooa. Dumping		
		Serving Size 1 serving (97g)		
		Calories 348		
		%DV		
		Total Fat 22.1g 28		
		Trans Fat Og -		
		Cholesterol 33.9mg 11		
		Sodium 424.9mg 18%		
		Total Carbohydrate 24.6g 8%		
		Dietary Fiber 0.9g 3%		
		Added Sugars Og -		
		Protein 12.2g 24%		
		Vitamin C Omg 0%		
		Iron 2.3mg 13%		
		Calcium 10.7mg 1%		
		Food healthiness: Unhealthy		
30	Fish ball	Food	-	Able to detect the
	1 1011 0 011	Q		· · · ·
		aus Online < >		food correctly.
		star M	•	Nutrition details and
				food healthiness
				level (healthy) are
				displayed.
		C.C.		
		LOAD IMAGE CAPTURE IMAGE		
		Output: Fish ball		

		Food: Fish ball				
		Serving Size	1 hall (2	(8a)		
		Calories	1 Dall (2 62	.09)		
				%DV		
		Total Fat	3.9a	5		
		Saturated Fat	0.9g	4		
		Trans Fat	Og	-		
		Cholesterol	15mg	5		
		Sodium	172mg	7%		
		Total Carbohydrate	1.1g	0%		
		Dietary Fiber	0g	0%		
		Added Sugars	Og	-		
		Protein	5.3g	7%		
		Vitamin C	0mg	0%		
		Iron	0.3mg	2%		
		Calcium	3.7mg	0%		
		Food healthines	s: Health	,		
21	Enon oh ta ast	Food			_	Able to detect the
31	French toast			Q	-	Able to detect the
			1			food correctly.
			L'OS		-	Nutrition details and
		1 MI	And a star			food healthiness
		100 Paris	17			level (moderate) are
			-			diamlassed
			/			displayed.
		Contraction of the second				
		LOAD IMAGE	CAPTURE	IMAGE		
		Output: French to	<u>ast</u>			
		Output: French to:	<u>ast</u>			
		Serving Size	1 slice (6	5g)		
		Calories	176			
				%DV		
		Total Fat	7.1g	9		
		Saturated Fat	2.1g	11		
		Cholesterol	104ma	35		
		Sodium	214.5mg	9%		
		Total Carbohydrate	21g	7%		
		Dietary Fiber	0.9g	3%		
		Total Sugars	6.7g	13		
		Added Sugars	0g	-		
		Vitamin C	0.0y	0%		
		Iron	1.7mg	9%		
		Calcium	72.8mg	6%		
			g	<u> </u>		
		Food healthiness	: Moderat	е		

32	Fried chicken	← Food	• Able to detect the
		٩	food correctly.
		76	 Nutrition details and
		1 Andrews	food healthiness
			level (unhealthy) are
			displayed.
		LOAD IMAGE CAPTURE IMAGE	
		Output: Fried chicken	
		Output: Fried chicken	
		Serving Size 1 piece (140g)	
		Calories 377	
		%DV	
		Saturated Fat 5.7g 29	
		Trans Fat 0g -	
		Cholesterol 126mg 42	
		Sodium 118mg 5%	
		Dietary Fiber 0.1g 1%	
		Total Sugars Og O	
		Added Sugars Og -	
		Vitamin C 0mg 0%	
		Iron 1 9mg 11%	
		Calcium 24mg 2%	
- 22		Food healthiness: Unhealthy	
33	Fried fish	٩	• Able to detect the food correctly
			 Nutrition details and
			food healthiness
			level (moderate) are
			lever (moderate) are
			displayed.
		LOAD IMAGE CAPTURE IMAGE Output: Fried fish	

		Serving Size	1 fillet /G	27a)
		Calorios	1 Tillet (8	s/g)
		Calories	199	%DV
		Total Eat	120	15
		Saturated Fat	2.9g	14
		Trans Fat	Og	
		Cholesterol	62mg	21
		Sodium	244mg	11%
		Total Carbohydrate	7g	3%
		Dietary Fiber	0.6g	2%
		Added Sugars	Og	-
		Protein	16g	-
		Vitamin C	0mg	0%
		Iron	1.2mg	7%
		Calcium	38mg	3%
ŀ	Fried rice	← Food	. woderat	5
				٩
	and and	MAR		
			6	
			TA KAT	V
			1.5	1
				Ĵ.
		LOAD IMAGE Output: Fried rice	CAPTURE	IMAGE
		LOAD IMAGE Output: Fried rice Output: Fried rice	CAPTURE	IMAGE
		LOAD IMAGE Output: Fried rice Output: Fried rice Serving Size 1	CAPTURE	IMAGE 27g)
		LOAD IMAGE Uutput: Fried rice Uutput: Fried rice Serving Size 1 Calories	САРТИRE 1 bowl (2: 411	1 IMAGE 27g)
		LOAD IMAGE LOAD IMAGE Output: Fried rice Output: Fried rice Serving Size Calories Table 5-4	CAPTURE 1 bowl (22 411	1 IMAGE 27g) %DV
		LOAD IMAGE LOAD IMAGE Dutput: Fried rice Output: Fried rice Serving Size Calories Total Fat Soturated East	CAPTURE 1 bowl (2: 411 12g 2.55	1 MAGE 27g) 8 0V 15
		LOAD IMAGE LOAD IMAGE Output: Fried rice Output: Fried rice Serving Size Calories Total Fat Saturated Fat Trans Fat	CAPTURE 1 bowl (2: 411 12g 2.5g 0g	1MAGE 27g) %DV 15 12 -
		LOAD IMAGE LOAD IMAGE Output: Fried rice Output: Fried rice Serving Size Calories Total Fat Saturated Fat Trans Fat Cholesterol	CAPTURE 1 bowl (2) 411 12g 2.5g 0g 40.9mg	27g) %DV 15 12 - 14
		LOAD IMAGE LOAD IMAGE Output: Fried rice Output: Fried rice Serving Size 1 Calories Total Fat Saturated Fat Trans Fat Cholesterol Sodium	CAPTURE 1 bowl (2: 411 12g 2.5g 0g 40.9mg 1150.9m	IMAGE 27g) \$\frac{27g}{50\frac{1}{2}}
		LOAD IMAGE LOAD IMAGE Output: Fried rice Output: Fried rice Serving Size 1 Calories Total Fat Saturated Fat Trans Fat Cholesterol Sodium Total Carbohydrate	CAPTURE 1 bowl (2 411 12g 2.5g 0g 40.9mg 1150.9m 64g	MAGE 27g) 27g) 15 12 - 14 g 50% 21%
		LOAD IMAGE LOAD IMAGE Dutput: Fried rice Output: Fried rice Output: Fried rice Serving Size 1 Calories Total Fat Saturated Fat Trans Fat Cholesterol Sodium Total Carbohydrate Dietary Fiber	CAPTURE CAPTURE 1 bowl (2 411 12g 2.5g 0g 40.9mg 1150.9m 64g 2g	27g) %DV 15 12 14 g 50% 21% 7%
		LOAD IMAGE LOAD IMAGE Output: Fried rice Output: Fried rice Output: Fried rice Serving Size 1 Calories Total Fat Saturated Fat Trans Fat Cholesterol Sodium Total Carbohydrate Dietary Fiber Total Sugars	CAPTURE CAPTURE 1 bowl (2: 411 12g 2.5g 0g 40.9mg 1150.9m 64g 2g 2g 0g	MAGE 27g) 27g) 15 12 14 g 50% 21% 7% 4 4
		LOAD IMAGE LOAD IMAGE Output: Fried rice Output: Fried rice Output: Fried rice Serving Size 1 Calories Total Fat Saturated Fat Trans Fat Cholesterol Sodium Total Carbohydrate Dietary Fiber Total Sugars Added Sugars	CAPTURE CAPTURE 1 bowl (2: 411 12g 2.5g 0g 40.9mg 1150.9m 64g 2g 0g 13c	27g) 27g) 27g) 27g) 15 12 - 14 g 50% 21% 7% 4 - 26%
		LOAD IMAGE LOAD IMAGE Output: Fried rice Output: Fried rice Output: Fried rice Serving Size 1 Calories Total Fat Saturated Fat Trans Fat Cholesterol Sodium Total Carbohydrate Dietary Fiber Total Sugars Added Sugars Protein Vitamin C	CAPTURE CAPTURE I bowl (2: 411 12g 2.5g 0g 40.9mg 1150.9m 64g 2g 0g 13g 9,1mg	IMAGE 27g) \$\frac{27g}{15} 12
		LOAD IMAGE LOAD IMAGE Output: Fried rice Output: Fried rice Output: Fried rice Serving Size 1 Calories Total Fat Saturated Fat Trans Fat Cholesterol Sodium Total Carbohydrate Dietary Fiber Total Sugars Added Sugars Protein Vitamin C Iron	CAPTURE CAPTURE 1 bowl (2: 411 12g 2.5g 0g 40.9mg 1150.9m 64g 2g 0g 13g 9.1mg 2.7mg	IMAGE 27g) %DV 15 12 - 14 g 50% 21% 7% 4 - 10% 15%

35	Frozen yogurt	× 1000	_		•	Able to detect the
			٩			food correctly.
					-	Nutrition details and
			6			food healthiness
		Nilling and Balance	Martine and Control of			level (unhealthy) are
		30 0 0	around we			displayed.
		LOAD IMAGE CAPT	URE IMAGE			
		Food: Frozen yogurt				
		Serving Size	100g			
		Calories	112			
		Total Fat	%DV			
		Saturated Fat Og	0			
		Trans Fat Og	-			
		Cholesterol 0m	g 0			
		Total Carbohydrate 25.8	lg 3%			
		Dietary Fiber 1.1	g 4%			
		Total Sugars 20.2	g 40			
		Added Sugars Og Protein 3.4	α 7%			
		Vitamin C 0m	a 0%			
		Iron 0.4n	ng 2%			
		Calcium 90m	ng 7%			
		Food healthiness: Unhe	althy			
36	Fruit cake	← Food			•	Cannot detect the
			Q			food correctly
						(recognized as
					Cornbread)	
					-	No data available
					(Nutrition details and	
						food healthiness
						1 1)
		LOAD IMAGE CAPTU	IRE IMAGE			level)
		Output: Cornbread				

		output. combrea	<u>u</u>			
		Serving Size				
		Calories				
				%DV		
		Total Fat		-		
		Saturated Fat	-	-		
		Trans Fat	-	-		
		Cholesterol	-	-		
		Sodium		-		
		Total Carbohydrat	e -			
		Total Sugars	-	-		
		Added Sugars	-	-		
		Protein		141		
		Vitamin C	-	-		
		Iron	2-2			
		Calcium		-		
		Food health	iness: -			
37	Gimbap	← Food				Able to detect the
	F			Q		food correctly
						Netwitien 14 11
			Ser			Nutrition details and
						food healthiness
						level (unhealthy) are
						displayed.
		LOAD IMAGE	CAPTURE	IMAGE		
		Output: <u>Gimbap</u>				
			4 11 (2)	<u> </u>		
		Serving Size	1 roll (29	93g)		
		Calories	+34	%DV		
		Total Fat	18a	23		
		Saturated Fat	4.2g	21		
		Trans Fat	0.1g	-		
		Cholesterol	132mg	44		
		Sodium	1059mg	100		
		Dietory Eiber	51g	19%		
		Total Sugars	12g	0		
		Added Sugars	Og	-		
		Protein	17g	14%		
		Vitamin C	0mg	0%		
		Iron	3.4mg	19%		
		Calcium	99mg	8%		
		Food healthiness	: Unhealth	hy		

38	Greek salad	← Food	•	Able to detect the
		٩		food correctly.
		CAR	•	Nutrition details and
		AN PROPERTY AND		food healthiness
				level (healthy) are
		LOAD IMAGE CAPTURE IMAGE		displayed.
		Output: Greek salad		
		Output: Greek salad		
		Serving Size 1 cup (105g)		
		Calories 44		
		Total Fat 2.3g 3		
		Saturated Fat 1g 5 Trans Fat 0g -		
		Cholesterol 7.4mg 2		
		Sodium 242.6mg 11%		
		Total Carbohydrate 4g 1%		
		Total Sugars 1.6g 3		
		Added Sugars 0g -		
		Protein 2.7g 5%		
		Iron 1.1mg 6%		
		Calcium 69.3mg 5%		
		Food healthiness: Healthy		
39	Hainanese	Food	•	Able to detect the
	chicken rice	٩		food correctly
	CHICKEN HCC			lood confectly.
			-	Nutrition details and
				food healthiness
				nearthiness
				level (unhealthy) are
				displayed
				ansprayea.
		LOAD IMAGE CAPTURE IMAGE		
		Output: Hainanese chicken rice		

		Food: Hainanese (CNICKEN	rice			
				<u>.</u>			
		Serving Size	1 pla	ate			
		Calories	61	8			
		Tatal Fat	229	%DV			
		Total Fat		34			
		Trans Fat	0g	-			
		Cholesterol		0			
		Sodium	~	12			
		Total Carbohydrate	76g	50%			
		Dietary Fiber	-	-			
		Total Sugars	0g	0			
		Protein	25.7a	17%			
		Vitamin C	0mg	0%			
		Iron	0mg	0%			
		Calcium	0mg	0%			
		Culcium	ong				
		Food healthiness	: Unhealt	hy			
		Eoor	1	-			
40	Hamburger		4			•	Able to detect the
				Q			
					•		food correctly.
		and the second second	Ren				Nutrition dotails and
		1		120		-	Nutrition details and
				1			food healthiness
		S	-	-			ioou nourimest
		N PROFESSION	19				level (unhealthy) are
			1	312			· · · · · ·
		· · · · · · · · · · · · · · · · · · ·		-			displayed.
		a description	a series	and a			
			TIME M	150			
		1	11/11/12	0122			
		LOAD IMAGE	CAPTUR	RE IMAGE			
					•		
		Output: Hamburg	ler				
		Food: Hampurger					
		Serving Size	20	0g			
		Calories	44	40			
				%DV			
		Total Fat	21g	27			
		Saturated Fat	6.9g	34			
		Trans Fat	0g				
		Cholesterol	/4mg	25			
		Soaium	800mg	3/%			
		Dietary Eiber	33.5g	6%			
		Total Sugars	7.1g	14			
		Added Sugars	Og	-			
		Protein	27.6g	55%			
		Vitamin C	4.4mg	5%			
		Iron	4.2mg	24%			
		Calcium	122mg	9%			
		Food healthiness	: Unhealt	hy			

41	Hokkien mee	← Food				Cannot detect the
		LOAD IMAGE	APTURE	Q	-	food correctly (recognized as Chow mein) No data available (Nutrition details and food healthiness level)
		Output: Cnow mem				
		Serving Size	1	-		
		Calories		-		
				%DV		
		Total Fat	122			
		Saturated Fat	1943			
		Cholesterol	-	-		
		Sodium	-			
		Total Carbohydrate	120			
		Dietary Fiber	101			
		Added Sugars	-			
		Protein	-	-		
		Vitamin C	-	-		
		Iron	2 - 2			
		Calcium	-	-		
42	Hot dog	Food healthine Food healthine Food Food Food Food Food	SS: -	Q RE IMAGE	•	Able to detect the food correctly. Nutrition details and food healthiness level (unhealthy) are displayed.
		output. Hot dog				

		Fooa: Hot dog					
		Serving Size	1 convina ((19a)			
		Calories	155	40 <u>y</u>)			
			100	%DV			
		Total Fat	14a	18			
		Saturated Fat	5.6g	28			
		Trans Fat	Og				
		Cholesterol	28mg	9			
		Sodium	409mg	18%			
		Total Carbohydrat	e 1.3g	0%			
		Dietary Fiber	0g	0%			
		Added Sugars	0.6g	-			
		Protein	5.6a	-			
		Vitamin C	0ma	0%			
		Iron	0.6mg	3%			
		Calcium	5.3mg	0%			
		Food healthines	ss: Unhealth	ıy			
		Æ Fo	od				
43	Hot pot	х те	ou			-	Able to detect the
		-		Q			food comments
		1 March	J.L.		-		food correctly.
		and a los	1 2001	6,2			Nutrition details and
		300 - 310	20				Nutrition details and
							food healthiness
		B. Carl		TA			
		AR POR					level (unhealthy) are
				have			
		3 N	1	100			displayed.
		0		No.			
		8/18-3	10.1	- 63			
			1. m.C	alla			
				-			
			CADTU				
		LUAD IMAGE	CAPTO	REIMAGE			
		Output: Hot po	t				
		I VOU. HOLPOL					
		Serving Size 1	serving (4	194g)			
		Calories	622				
				%DV			
		Total Fat	33g	42			
		Saturated Fat	9.1g	45			
		Trans Fat	Og	-			
		Cholesterol	114mg	38			
		Sodium Tatal Carbabydrat	2180mg	95%			
		Dietary Eibor	e 35g	13%			
		Total Sugars	14g	24			
		Added Sugars	Og				
		Protein	46g	-			
		Vitamin C	0mg	0%			
		Iron	5.9mg	33%			
		Calcium	250mg	19%			
		Food healthines	ss: Unhealth	у			

44	Icebox cake	← Food	• Able to detect the
		Q	food correctly.
			 Nutrition details and
			food healthiness
		Alltin	lovel (unhealthy) are
			lever (uniteartity) are
			displayed.
		Serving Size 0.056 cake (91g) Calories 250	
		%DV	
		Total Fat 13g 17	
		Saturated Fat 10g 50	
		Cholesterol 24.6mg 8	
		Sodium 150.2mg 7%	
		Total Carbohydrate 28g 9%	
		Dietary Fiber 1g 4%	
		Added Sugars Og -	
		Protein 4g 8%	
		Vitamin C Omg 0%	
		Iron 0.4mg 2%	
		Food healthiness: Unhealthy	
45	T''	← Food	- Alle 4- le44 (le-
45	J1aoz1	Fuu	• Able to detect the
		Q	food correctly.
			 Nutrition details and
			food healthiness
			neutriness
			level (healthy) are
			displayed
			displayed.
		LOAD IMAGECAPTURE IMAGE	
		Output: Jiaozi	

		Output: Jiaozi				
		Serving Size	1 piece (37g)		
		Calories	67			
				%DV		
		Total Fat	2.3g	3		
		Saturated Fat	0.8g	4		
		Cholesterol	9.5mg	3		
		Sodium	146mg	6%		
		Total Carbohydrate	7.7g	3%		
		Dietary Fiber	0.6g	2%		
		Total Sugars	0.5g	1		
		Protein	3.60			
		Vitamin C	0mg	0%		
		Iron	0.6mg	3%		
		Calcium	14mg	1%		
46	Ketupat	Food healthines	ss: Health od	y	•	Able to detect the
				Q		food correctly.
					-	Nutrition details and
			Mar.			food healthingas
			W.o.sti			rood nearthiness
			-10-			level (healthy) are
		ST-TA				d:
		LOAD IMAGE	CAPTL	URE IMAGE		uispiayeu.
		Output: Ketupat				
		Food: Ketupat				
		Com/ing Cing	لم 1	ling		
		Calories	1 4410	mig		
				%DV		
		Total Fat	0g	0		
		Saturated Fat	0g	0		
		Trans Fat	0g	-		
		Cholesterol	1 umg			
		Total Carbohydrate	e 20a	91%		
		Dietary Fiber	0g	0%		
		Total Sugars	0g	0		
		Added Sugars	0g 2a	9%		
		Vitamin C	0ma	0%		
		Iron	0mg	0%		
		Calcium	0mg	0%		
		Food healthine	ss: Health	у		

47	Kimchi	← Food	-	Able to detect the
		Q		
				food correctly.
			•	Nutrition details and
				food healthiness
				level (healthy) are
		LOAD IMAGE CAPTURE IMAGE		displayed.
		Output: Kimchi		
		Food: Kimchi		
		Calories 23		
		%DV		
		Total Fat 0.8g 1		
		Trans Fat Og -		
		Cholesterol 0mg 0		
		Sodium 747mg 32%		
		Dietary Fiber 2.4g 9%		
		Total Sugars 1.6g 3		
		Added Sugars 0g -		
		Vitamin C Omg 0%		
		Iron 3.8mg 21%		
		Calcium 50mg 4%		
		Food healthiness: Healthy		
19	Kung Doo	- Poou	-	Able to detect the
40	Kullg Pao	Q	-	Able to detect the
	chicken			food correctly.
				Nutrition details and
				Nutrition details and
				food healthiness
				level (unhealthy) are
				10,01 (<i>minoming</i>) with
				displayed.
		LOAD IMAGE CAPTURE IMAGE		
		Output: Kung Pao chicken		

		Food: Kung Pao c	hicken			
		Serving Size 1 s	servina (6	04a)		
		Calories	779	<u></u>		
				%DV		
		Total Fat	42g	54		
		Saturated Fat	8.2g	41		
		Trans Fat	0.2g			
		Sodium	2428	52 106%		
		Total Carbohydrate	41a	15%		
		Dietary Fiber	9.1g	33%		
		Total Sugars	18g	0		
		Added Sugars	0g	-		
		Vitamin C	0mg	0%		
		Iron	4.6ma	26%		
		Calcium	121mg	9%		
		Food healthiness	: Unhealth	y		
40	Laksa	← Food				Cannot detect the
77	Laksa					Califiot detect the
				<u>م</u>		food correctly
						(
			(-		(recognized as Udon)
		200			-	Hence, nutrition
		A A A A A A A A A A A A A A A A A A A				details and
		dias.				healthiness level of
		and the second second				TT1 1'1 1
						Udon are displayed.
		LOAD IMAGE	CAPTURE	MAGE		
		Output: Udon				
		Output: Uaon				
		Serving Size	6	Da		
		Calories	2	50		
				%DV		
		Total Fat	7 <u>g</u>	9		
		Saturated Fat	3.5g	17		
		Cholosteral	0g			
		Sodium	880.2m	1 38%		
		Total Carbohydrate	42a	14%		
		Dietary Fiber	2g	7%		
		Total Sugars	2g	4		
		Added Sugars	0g	-		
		Vitamin C	1 4y Oma	0%		
		Iron	1.4mn	8%		
		Calcium	Oma	0%		
		Food healthines	s: Modera	te		

1 Layer cake Fod • Cannot detect the nutrition details and food correctly. 51 Layer cake • fod • Cannot detect the nutrition details and food correctly. 1 Layer cake • fod • fod • fod correctly. • fod • fod • fod • fod	50	Lasagne	← Food	• Able to detect the
51 Layer cake Control of the authines Image: Control of the authines Control of the authines Image: Control of the authines Control of the authines Image: Control of the authines Control of the authines Image: Control of the authines Control of the authines Image: Control of the authines Control of the authines Image: Control of the authines Control of the authines Image: Control of the authines Control of the authines Image: Control of the authines Control of the authines Image: Control of the authines Control of the authines Image: Control of the authines Control of the authines Image: Control of the authines Control of the authines Image: Control of the authines Control of the authines Image: Control of the authines Control of the authines Image: Control of the authines Control of the authines Image: Control of the authines Control of the authines Image: Control of the authines Control of the authines Image: Control of the authines Control of the authines Image: Control of the authines Control of the authines Image: Contro of the authines			<u>्</u>	food correctly
1 Layer cake food healthines 1 Layer cake food healthines 1 Layer cake food csrume twate 1 Layer cake				 Nutrition details and
51 Layer cake Fod • Cannot detect the food correctly (recognized a Waffle) 51 Layer cake • Fod • Cannot detect the food correctly (recognized a Waffle) • Hence, the nutrition details and healthiness level o Waffle are displayed • Waffle are displayed			A DE LA DE L	food hoolthings
51 Layer cake C Fod Cannot detect the food correctly (recognized a Waffle) Hence, the nutrition details and healthiness level o Waffle are displayed. 				1000 nearminess
51 Layer cake Fod 			A Dec al of the	level (unhealthy) are
51 Layer cake Control Contro Control Control			8	displayed.
State Output: Lasagne Foo: Lasagne Serving Size Serving Size 1 serving (385g) Calcierie 602 Total Fat 32g Sodium 157 orng 69% Calcierie 44g Vitamin C 0.99 Calcium 527mg 41% Foot healthines: Unbealthy Protein State Content State Content Vitamin C 0.99 Calcium 527mg 41% Foot healthines: Unbealthy Protein State Content State Content Vitamin C 0.90 Calcium 527mg 41% Foot enablines: Unbealthy Protein State Calcium Vitamin C 0.90 <			LOAD IMAGE CAPTURE IMAGE	
51 Layer cake				
Serving Size 1 serving (385g) Gelories 1 serving (38				
Serving (3859). Calories 602 Calories 602 %DV Total Fat 32g 41 Saturated Fat 15g 75 Cholesterol 165mg 55 Sodium 157mg 69%. Total Supar 90 14%. Added Supar 90 14%. Protein 44g - Vitamin C 00 9%. Caloium 527mg 41%. Food healthness: Unhealthy - - Calcium 527mg 41%. Food - - - Good healthness: Unhealthy - - - Total Supar - - - - Vitamin C 0 - - - - Calcium 527mg 41%. - - - Food - - - - - - Hence, the nutrition details a - - - - - Image and thealthiness <				
51 Layer cake Fod Q - <			Serving Size 1 serving (385g) Calories 602	
51 Layer cake Image: Solution of the second of the se			%DV	
Saturate Fat 15g 75 Trans Fat 0.3g Cholesterol 166mg 55 Sodium 1576mg 69% Total Carbohydrate 35g 13% Detary Ther 3.5g 14% Total Carbohydrate 35g 13% Detary Ther 3.5g 13% Total Carbohydrate 35g 14% Vitamin C Omg 0% Iron 4.6mg 26% Calcium 527mg 41% Fod healthines: Unhealthy Fod Cannot detect the food correctly (recognized a Waffle) Hence, the nutrition details and healthiness level o Waffle are displayed Matter details and healthiness level o Waffle are displayed Matter details and healthiness level o Waffle are displayed Matter details and healthiness level o Waffle are displayed Matter details and healthiness level o Waffle are displayed Matter details and healthiness level o Waffle are displayed Matter details and healthiness level o Waffle are displayed Matter details and healthiness level o Waffle are displayed Matter details and healthiness level o Waffle are displayed Matter details and healthiness Matter details and healthines Matter details Matter details Matter details			Total Fat 32g 41	
51 Layer cake Fod • Cannot detect the food correctly (recognized a Waffle) • Hence, the nutrition details and healthiness level o Waffle are displayed • Waffle are displayed			Saturated Fat 15g 75	
Sodium 1576mg 69% Total Carbohydrate 35g 13% Dietary Priore 3.9g 14% Added Sugars 0.9 - Protein 4.4g - Protein 4.4g - Protein 4.9 - Protein 4.0mg 0% Calcium 527mg 41% Food healthiness: Unhealthy - - Calcium 527mg 41% Food healthiness: Unhealthy - - Calcium 527mg - - Calcium 527mg - - God healthiness: Unhealthy - - - Food healthiness: Unhealthy - - - Food - -			Cholesterol 166mg 55	
Total Carbohydrate 35g 13% Dietary Fiber 3.9g 14% Total Sugars 10 - Added Sugars 0g - Protein 44g - Vitamin C Omg 0% Total Carbohydrate 3.9g 14% Vitamin C Omg 0% Vitamin C Omg 0% Total Carbohydrate 26% - Calcium 527mg 41% Food healthiness: Unhealthy - - Calcium 527mg 41% Food healthiness: Unhealthy - - Calcium 527mg 41% Food healthiness: Unhealthy - - Calcium 527mg 41% Hence, the nutrition - Waffle) - - Hence, the nutrition - - Mathiness Ievel o - Waffle are displayed - -			Sodium 1576mg 69%	
51 Layer cake			Total Carbohydrate 35g 13%	
51 Layer cake Control detect the food correctly (recognized a Waffle) • Hence, the nutrition details and healthiness level o Waffle are displayed			Dietary Fiber 3.9g 14%	
Protein 44g - Vitamin C 0mg 0% Iron 4.6mg 26% Calcium 527mg 41% Food healthiness: Unhealthy - - S1 Layer cake Food - Calcium 527mg 41% - Image: Calcium 527mg - Cannot detect the food correctly (recognized a Waffle) Image: Calcium - - Hence, the nutrition details and healthiness level o Waffle are displayed			Added Sugars 0g -	
Vitamin C Omg 0% Iron 4.6mg 26% Calcium 527mg 41% Food healthiness: Unhealthy • Cannot detect the food correctly (recognized a Waffle) • Hence, the nutrition details and healthiness level o Waffle are displayed			Protein 44g -	
Iron 4.6mg 26% Calcium 527mg 41% Food healthiness: Unhealthy • Cannot detect the food correctly (recognized a Waffle) • Hence, the nutrition details and healthiness level o Waffle are displayed			Vitamin C Omg 0%	
51 Layer cake Food healthiness: Unhealthy Cannot detect the food correctly (recognized a Waffle) Hence, the nutrition details and healthiness level o Waffle are displayed 			Iron 4.6mg 26%	
Food healthiness: Unhealthy ● Cannot detect the food correctly (recognized a Waffle) • Hence, the nutrition details and healthiness level or Waffle are displayed			Calcium 52/mg 41%	
 51 Layer cake ✓ Food Cannot detect the food correctly (recognized a Waffle) Hence, the nutrition details and healthiness level o Waffle are displayed 			Food healthiness: Unhealthy	
Output: Waffle	51	Layer cake	 ← Food ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓	 Cannot detect the food correctly (recognized as Waffle) Hence, the nutrition details and healthiness level of Waffle are displayed.

Serving Size 1 waffle (125g) Calories 460 Voto 100 Saturated Fat 5.3.9 Cholesterol 87.5mg Cholesterol 87.5mg Sodium 957.5mg Sodium 957.5mg Vitamin C 0ng Org 0% Vitamin C 0ng Calcium 300mg Calcium 00mg Calcium 00mg <tr< th=""></tr<>
Action of the second se
Acaron Content of the second s
Total Fat 23.2g 30 Saturated Fat 5.3g 27 Trans Fat 0g - Cholesterol 87.5mg 29 Sodium 957.5mg 29 Dietary Fiber 3.1g 11% Total Sugars 10.9g 22% Vitamin C 0rg 0% Iron 2.2mg 12% Calcium 300mg 23% Vitamin C 0rg 0% Iron 2.2mg 12% Calcium 300mg 23% Food Iron 2.2mg Output Saturated Fat 0.4 Iron 2.2mg 12% Calcium 300mg 23% Distary Fiber 0.10,0 Iron Iron 2.2mg 10% Calcium 300mg 23% Distary Fiber 0.10,0 Iron Iron Date Iron Iron Iron Date Iron Iron Iron Date Iron Iron
Saturated Fat 5.3g 27 Trans Fat 0g - Cholesterol 87.5mg 29 Sodium 957.5mg 42% Total Carbohydrate 51.9g 17% Dietary Fiber 3.1g 11% Total Sugars 0g - Added Sugars 0g - Added Sugars 0g - Vitamin C Orng 0% Iron 2.2mg 12% Calcium 300mg 23% Food healthiness: Unhealthy - Macaron Image: Coloring Coloring Image: Coloring Coloring Image: Coloring Coloring Image: Coloring Coloring Image: Coloring 1.9g Image: Coloring 1.9g <t< td=""></t<>
Trans Fat 0g - Cholesterol 87.5mg 29 Sodium 957.5mg 42% Total Carbohydrate 51.9g 17% Total Sugars 10.5g 21 Added Sugars 0g - Protein 10.9g 22% Vitamin C 0mg 0% Iron 2.2mg 12% Calcium 300mg 23% Food Iron 2.2mg Iron 2.2mg 12% Calcium 300mg 23% Calcium 300mg 23% Iron 2.2mg 12% Calcium 300mg 23% Iron 2.2mg 12% Calcium 300mg 23% Iron 170 170 Iron Iron 2 Calcium 300mg 2 Iron Iron 2 Iron Iron 2 Iron Iron 2 Iron Iron 2
Crolesterol 87.5mg 42% Sodium 957.5mg 42% Total Carbohydrate 51.9g 17% Detary Fiber 3.1g 11% Total Sugars 0.g - Protein 10.9g 22% Vitamin C Omg 0% Iron 2.2mg 12% Calcium 300mg 23% Food healthiness: Unhealthy Calcium 300mg 23% Calcium 300mg 23% Ca
Sodum 957.3mg 42% Total Carbohydrate 51.9g 17% Total Sugars 10.9g 22% Vitamin C 0mg 0% Iron 2.2mg 12% Calcium 3000mg 23% Food healthiness: Unhealthy Calcium 3000mg 23% Calcium 3000mg 23% Calcium 3000mg 23% Calcium 3000mg 23% Calcium 3000mg 23% Calcium 3000mg 23% Cod healthiness: Unhealthy Calcium 3000mg 23% Calcium 3000mg 23% Cod healthiness: Unhealthy Calcium 3000mg 23% Calcium 3000mg
Total Sugars 11.9g 17.9g Total Sugars 0g - Protein 10.9g 22% Vitamin C 0mg 0% Iron 2.2mg 12% Calcium 300mg 23% Food healthiness: Unhealthy
Total Sugars 10.5g 21 Added Sugars 0g - Protein 10.9g 22% Vitamin C 0mg 0% Iron 2.2mg 12% Calcium 300mg 23% Food healthiness: Unhealthy
Added Sugars 0g · Protein 10.9g 22% Vitamin C 0mg 0% Iron 2.2mg 12% Calcium 300mg 23% Food healthiness: Unhealthy Cod healthy Cod healthiness: Unhealthy Cod healthiness: Unhealthy Cod healthy Cod healthy Cod healthy Cod healthy Cod healthy
Protein 10.9g 22% Vitamin C Omg 0% Iron 2.2mg 12% Calcium 300mg 23% Food healthiness: Unhealthy Calcium 300mg 23% Food healthiness: Unhealthy Calcium 300mg 23% Cod healthy Calcium 300mg 23% Cod healthy
Vitamin C Omg 0% Iron 2.2mg 12% Calcium 300mg 23% Food healthiness: Unhealthy Acaron C Food C Food C CAPTURE IMAGE LOAD IMAGE CAPTURE IMAGE CAPTURE IMAGE Cutput: Macaron Output: Macaron Serving Size 1 cookie (11g) Calories 43 Total Fat 1.9g 2 Saturated Fat 0.7g 4 Trans Fat 0.9 2
Iron 2.2mg 12% Calcium 300mg 23% Food healthiness: Unhealthy Acaron Food Image: Status <li< td=""></li<>
Calcium 300mg [23%] Food healthiness: Unhealthy Acaron Image: Contract of the second
Food Image: Colspan="2">Colspan="2" <colspan="2">Colspan="2"<colspan="2">Colspan="2"<colspan="2">Colspan="2"<colspan="2">Colspan="2"<colspan="2">Colspan="2"<colspan="2">Colspan="2"<colspan="2">Colspan="2"<colspan="2">Colspan="2"<colspan="2">Colspan="2"<colspan="2">Colspan="2"<colspan="2">Colspan="2"<colspan="2">Colspan="2"<colspan="2">Colspan="2"<colspan="2">Colspan="2"<colspan="2">Colspan="2"<colspan="2">Colspan="2"<colspan="2">Colspan="2"<colspan="2">Colspan="2"<colspan="2"<colspan="2">Colspan="2"<colspan="2"<colspan="2">Colspan="2"<colspan="2"<colspan="2">Colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2">Colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2">Colspan="2"<colspan="2"<colspan="2"<colspan="2">Colspan="2"<colspan="2"<colspan="2"<colspan="2">Colspan="2"<colspan="2"<colspan="2"<colspan="2">Colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<c< th=""></colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<colspan="2"<c<></colspan="2"<colspan="2"<colspan="2"></colspan="2"<colspan="2"<colspan="2"></colspan="2"<colspan="2"<colspan="2"></colspan="2"<colspan="2"<colspan="2"<colspan="2"></colspan="2"<colspan="2"<colspan="2"<colspan="2"></colspan="2"<colspan="2"></colspan="2"<colspan="2"></colspan="2"<colspan="2"></colspan="2"></colspan="2"></colspan="2"></colspan="2"></colspan="2"></colspan="2"></colspan="2"></colspan="2"></colspan="2"></colspan="2"></colspan="2"></colspan="2"></colspan="2"></colspan="2"></colspan="2"></colspan="2"></colspan="2"></colspan="2">
Acaron
Acaron
Contract of the second seco
LOAD IMAGE CAPTURE IMAGE DAD IMAGE CAPTURE IMAGE Ditput: Macaron Striput: Macaron
LOAD IMAGE CAPTURE IMAGE DATURE CAPTURE IMAGE Output: Macaron Striput: Macaron Serving Size 1 cookie (11g) Calories 43 With the serving size 1 sobe Saturated Fat 0.7g Trans Fat 0g Saturated Fat 0.7g
LOAD IMAGE CAPTURE IMAGE Dutput: Macaron Output: Macaron Serving Size 1 cookie (11g) Calories 43 Image: 1 cookie (11g) Calories 1 cookie (11g) Calories 43 Image: 1 cookie (11g) Calories 1 cookie (1
LOAD IMAGE CAPTURE IMAGE Dutput: Macaron Output: Macaron Serving Size 1 cookie (11g) Calories 43 Macaron Saturated Fat Org Saturated Fat Org Calories Fat 1.9g 2 Saturated Fat 0.7g 4 Trans Fat 0g - Calories Fat 0.7g 4 Trans Fat 0g - Calories Fat 0.7g 4 Trans Fat 0g - Calories Fat 0.7g 4 Trans Fat 0.7g 4
LOAD IMAGE CAPTURE IMAGE Dutput: Macaron Output: Macaron Serving Size 1 cookie (11g) Calories 43 Image: Saturated Fat 0.7g Yaturated Fat 0.7g
LOAD IMAGE CAPTURE IMAGE Dutput: Macaron Output: Macaron Serving Size 1 cookie (11g) Calories 43
LOAD IMAGE CAPTURE IMAGE Dutput: Macaron Output: Macaron Serving Size 1 cookie (11g) Calories 43
LOAD IMAGE CAPTURE IMAGE Output: Macaron Output: Macaron Serving Size 1 cookie (11g) Calories 43 Yourget Calories
LOAD IMAGE CAPTURE IMAGE Output: Macaron Output: Macaron Serving Size 1 cookie (11g) Calories 43 \u00edyname
LOAD IMAGE CAPTURE IMAGE Output: Macaron Output: Macaron Serving Size 1 cookie (11g) Calories 43 \u03c6 \u03c6 \u03c6 \u03c6 Saturated Fat 0.7g Urans Fat 0g \u03c6 \u03c6
LOAD IMAGE CAPTURE IMAGE Output: Macaron Output: Macaron Serving Size 1 cookie (11g) Calories 43 %DV Total Fat 1.9g 2 Saturated Fat 0.7g Trans Fat 0.0g
LOAD IMAGE CAPTURE IMAGE Output: Macaron Output: Macaron Serving Size 1 cookie (11g) Calories 43 %DV Total Fat 1.9g 2 Saturated Fat 0.7g Trans Fat 0.0g
Output: Macaron Output: Macaron Serving Size 1 cookie (11g) Calories 43 Calories 43 Total Fat 1.9g 2 Saturated Fat 0.7g 4 Trans Fat 0g -
Output: Macaron Serving Size 1 cookie (11g) Calories 43 Calories 43 Total Fat 1.9g 2 Saturated Fat 0.7g 4 Trans Fat 0g - Calories 3 -
Output: Macaron Output: Macaron Serving Size 1 cookie (11g) Calories 43 %DV Total Fat 1.9g 2 Saturated Fat 0.7g 4 Trans Fat 0g -
Serving Size 1 cookie (11g) Calories 43 Calories 43 Total Fat 1.9g 2 Saturated Fat 0.7g 4 Trans Fat 0g - Character 2 -
Serving Size1 cookie (11g)Calories43Calories43Total Fat1.9gSaturated Fat0.7gTrans Fat0.0gChoice for the form0.7g
Serving Size1 cookie (11g)Calories43Calories%DVTotal Fat1.9gSaturated Fat0.7gTrans Fat0.0gOther term log2
Calories437%DVTotal Fat1.9g2Saturated Fat0.7g4Trans Fat0g
Korney Total Fat 1.9g 2 Saturated Fat 0.7g 4 Trans Fat 0g - Other trans 0 -
Total Fat1.9g2Saturated Fat0.7g4Trans Fat0g-Staturated Fat2,7g2
Saturated Fat 0.7g 4 Trans Fat 0g -
Trans Fat 0g -
Sodium 18mg 1%
Dietary Eiber 0.5a 2%
Total Sugars 5.2g 0
Added Sugars 0g -
Protein 0.9g -
Vitamin C 0mg 0%
Iron 0.4mg 2%
Calcium 6.7mg 1%
Food healthiness: Healthy

53	Macaroni and	← Food	• Able to detect the
	cheese	Q	food correctly
	cheese		rood concerty.
			 Nutrition details and
			food healthiness
			level (moderate) are
		LOAD IMAGE CAPTURE IMAGE	displayed.
		Output: Macaroni and cheese	
		Output: Macaroni and cheese	
		Serving Size 1 serving (198g)	
		%DV	
		Total Fat 16g 21	
		Trans Fat 2.5g -	
		Cholesterol 5.9mg 2	
		Sodium 669mg 29%	
		Dietary Fiber 2.4g 9%	
		Total Sugars 8.5g 0	
		Added Sugars 0g -	
		Vitamin C 0mg 0%	
		Iron 2mg 11%	
		Calcium 125mg 10%	
		Food healthiness: Moderate	
54	Mapo doufu	Food	 Able to detect the food correctly.
			Nutrition details and
			- Nutrition details and
			food healthiness
			level (unhealthy) are
			diamlana d
		Contraction of the second seco	displayed.
		LOAD IMAGE CAPTURE IMAGE	
		Output: Mapo doufu	

		Food: Mapo douf	u			
		Conving Cine 1	andra (A	71 m		
		Calories	482 482	(7 T <u>G)</u>		
		Culorico				
		Total Fat	35g	45		
		Saturated Fat	5.6g	28		
		Trans Fat	0.4g	(9)		
		Cholesterol	39mg	13		
		Sodium	1/9/mg	/8%		
		Dietary Eiber	14g	3%		
		Total Sugars	4.8g	10		
		Added Sugars	Og	700		
		Protein	34g	-		
		Vitamin C	0mg	0%		
		Calcium	5.5mg	17%		
		Calcium	orzing	47%		
		Food healthiness	: Unhealth	iy		
55	Marble cake	← Food			-	Cannot detect the
				Q		
				_		food correctly
			0.94			(recognized as
		and the second second	-			(recognized as
		Care Care Care	-			Cozonac)
		1111	1			
			1.11		-	No data available for
		A lilla	1 C			nutrition details and
			and the second			nutition details and
						healthiness level.
		LOAD IMAGE	CAPTURE	IMAGE		
		a				
		Output: Cozonac				
56	Mashed potato	← Foo	bd		•	Able to detect the
00	number pound					
						food correctly.
					_	NT / '/' 1 / 'I I
			-		-	Nutrition details and
		-				food healthiness
						nearthiness
		Contraction of the				level (unhealthy) are
			and the second	112		
		1				displayed.
		Sec. 1	and the second	and the second		
			State of the local division of the local div			
			CARTH			
		LOAD IMAGE	CAPTU			
		Output: Mashed	potato			

		Food: Mashed po	tato				
		Serving Size	200	Dq			
		Calories	17	9			
				%DV			
		Total Fat	7.4g	38			
		Saturated Fat	4.7g	23			
		Trans Fat	Oma	-			
		Sodium	Oma	0%			
		Total Carbohydrate	24a	54%			
		Dietary Fiber	Og	0%			
		Total Sugars	0g	0			
		Added Sugars	0g	- 00/			
		Vitamin C	0mg	0%			
		Iron	Oma	0%			
		Calcium	Omg	0%			
		Food healthiness	s: Unhealth	ıy			
	3.6	- Foo	d				
57	Miso soup			_		-	Able to detect the
				٩			food correctly
							ioou conteeuj.
		6 5				-	Nutrition details and
		0	5				food healthings
		1.0	G. N				loou healunness
			2				level (healthy) are
		~ ~ ~ ~	-				
		A COLOR	- 1				displayed.
		2 gr	-				
		0.80	- B				
			~ ~	10			
					_		
		LOAD IMAGE	CAPTUR	E IMAGE			
					-		
		Output: Miso so	an				
		Food: Miso soup					
		rood. Miso soup					
		Serving Size	1 cup (24	41g)			
		Calories	59				
				%DV			
		Total Fat	3g	4			
		Saturated Fat	0.5g	3			
		Cholesterol	0.1mg	0			
		Sodium	1071mg	47%			
		Total Carbohydrate	3.5g	1%			
		Dietary Fiber	1.1g	4%			
		Total Sugars	1.2g	0			
		Protein	5.8a				
		Vitamin C	0ma	0%			
		Iron	1.2mg	7%			
		Calcium	139mg	11%			
		Food healthine	ss: Healthy	/			

58	Mochi		• Able to detect the			
		٩	food correctly			
			Nutrition details and			
		Un	food healthings			
			100d healthiness			
			level (moderate) are			
		LOAD IMAGE CAPTURE IMAGE	displayed.			
		Output Mark				
		Food: Mochi				
		Serving Size 1 piece (46g)				
		Calories 126				
		Total Eat				
		Saturated Fat 2.1g 11				
		Trans Fat 0g -				
		Cholesterol 2mg 1				
		Sodium 9.2mg 0%				
		Total Carbohydrate 25g 9%				
		Dietary Fiber 0.2g 1%				
		Added Sugars Og -				
		Protein 1.3g -				
		Vitamin C 0mg 0%				
		Iron 0.4mg 2%				
		Calcium 20mg 2%				
		Food healthiness: Moderate				
59	Mooncake	e Food C T T T T T T T T T T T T T T T T T T	 Able to detect the food correctly. Nutrition details and food healthiness level (unhealthy) are displayed. 			
		Output: Mooncake	2			
------	------------	------------------------------------	-----------	----------	---	---------------------
		Serving Size 1 larg	ne cake	(138a)		
		Calories	394	(1009)		
				%DV		
		Total Fat	16g	21		
		Saturated Fat	4.5g	23		
		Trans Fat	0.1g	-		
		Cholesterol	470mg	157		
		Sodium	315mg	1 14%		
		Total Carbohydrate	50g	18%		
		Total Sugars	2.6g	9% 54		
		Added Sugars	Og	-		
		Protein	13g	-		
		Vitamin C	0mg	0%		
		Iron	2.1mg	12%		
		Calcium	82mg	6%		
		Food healthiness	: Unhealt	ny		
) Na	asi kandar	← Food			-	Cannot detect t
		IN REAL	-	٩		food
						100d correc
		10 ml				(recognized as Pila
		28	-		-	No data available
		The second		75		nutrition dataila a
		AC MANY THE				nutition details a
			19			healthiness level.
		LOAD IMAGE Output: <u>Pilaf</u>	CAPTURE	IMAGE		
		Serving Size				
		Calories		-		
				%DV		
		Total Fat				
		Saturated Fat	- 22	-		
		Trans Fat	-			
		Cholesterol	17.			
		Sodium				
		Total Carbohydrate	e -	-		
		Dietary Fiber	-			
		Added Sugars		-		
		Protein	-	-		
		Vitamin C		-		
		Iron	-	-		
		Calcium	7-6			
		Food healthi	ness: -			

61	Nasi lemak	 ← Food Q Image: Capture image 	 Able to detect the food correctly. Nutrition details and food healthiness level (unhealthy) are displayed.
		Output: <u>Nasi lemak</u> Food: Nasi lemak	
		Serving Size 1 plate (305g)	
		Calories 587	
		%DV	
		Total Fat 33g 42 Saturated Fat 14g 70	
		Trans Fat 0.1g -	
		Cholesterol 128mg 43	
		Sodium 1259mg 55%	
		Dietary Fiber 2.2g 8%	
		Total Sugars 7.3g 14	
		Added Sugars Og -	
		Vitamin C Omg 0%	
		Calcium Omg 0%	
		Food healthiness: Unhealthy	
02	Oden	Q	 Able to detect the food correctly. Nutrition details and food healthiness level (healthy) are
		LOAD IMAGE CAPTURE IMAGE Output: Oden	displayed.

		Food: Oden					
			1	•			
		Serving Size	1 ser	ving			
		Calories	1/	0			
		Tatal Cat	0.5-	70 U V			
		Iotal Fat	8.5g	40			
		Trans Fat	2.2g	- 10			
		Cholesterol	212ma	70			
		Sodium	262.5mg	12%			
		Total Carbohydrate	16.1g	34%			
		Dietary Fiber	2.3g	9%			
		Total Sugars	1.7g	3			
		Added Sugars	0g	-			
		Protein Vitemin C	12.7g	20%			
		Vitamin C		23.10%			
		Coloium	-	11/0			
		Calcium	-	22%			
		Food healthing	ss' Health	v			
		roou nearuiline	.ss. nearth	7			
63	Omurice	- F0	ou				Able to detect the
				0			action action and
							food correctly.
			4	3074		-	Nutrition details and
		1 des	a had				
				1			food healthiness
			and a	F			lovel (unhealthy) are
		affits Ver	1 30-10	Collins of			level (uniteartity) are
			132.5	2/			displayed
			120	Contraction of the			displayed.
				T			
		_					
		LOAD IMAGE	CAPTL	JRE IMAGE			
			_		•		
		.					
		Output: Omuric	<u>e</u>				
		Food: Umurice					
			_				
		Serving Size	19	95g			
		Calories	3	38			
				%DV			
		Total Fat	19g	24			
		Saturated Fat	5.7g	29			
		Chalacteral	0.2g	1 52			
		Sodium	211mg	1 1 1 1 1 1			
		Total Carbobydrat	0 250				
		Dietary Fiber	2.5g	5%			
		Total Sugars	2.5g	6			
		Added Sugars	Og	-			
		Protein	17g	-			
		Vitamin C	0mg	0%			
		Iron	1.3mg	7%			
		Calcium	133mg	10%			
		Food healthines	ss: Unheal	thy			

64	Onigiri	← Food	• Able to detect the
	- 0	Q	
			food correctly.
		AND AND AND	 Nutrition details and
			food healthiness
		Farmer and a second	level (healthy) are
			displayed.
		LOAD IMAGE CAPTURE IMAGE	
		Output: <u>Onigiri</u>	
		Food: Onigiri	
		Serving Size 1 piece (142g)	
		Calories 232	
		%DV	
		Total Fat 7.8g 10	
		Trans Fat 0g -	
		Cholesterol 20mg 7	
		Sodium 76mg 3%	
		Total Carbohydrate 30g 11%	
		Total Sugars 0.3g 0	
		Added Sugars 0g -	
		Protein 8.9g 14%	
		Vitamin C Omg 0%	
		Calcium 8 1mg 1%	
		Food healthiness: Healthy	
65	Onion ring	Image: Coord of the second	 Able to detect the food correctly. Nutrition details and food healthiness level (unhealthy) are displayed.

	roou. Oniorring		
	Serving Size	1 order (2	82a)
	Calories	1004	02 <u>9</u>)
		1	%DV
	Total Fat	54g	69
	Saturated Fat	9.6g	48
	Trans Fat	0.5g	-
	Cholesterol	1051mg	0.5%
	Sodium Total Carbabudrata	1951mg	85%
	Dietary Eiber	7.30	26%
	Total Sugars	13g	0
	Added Sugars	Og	-
	Protein	14g	-
	Vitamin C	0mg	0%
	Iron	2mg	11%
	Calcium	59mg	5%
	ers in The Kitzberr	CAPTUR	RE IMAGE
	Output: Pad that Food: Pad that Serving Size Calories Total Fat Saturated Fat Trans Fat Cholesterol Sodium Total Carbohydrate Dietary Fiber Total Sugars Added Sugars Protein Vitamin C	i 494 83 45g 11g 0.8g 402mg 1301mg 402mg 1301mg 46g 4.4g 18g 0g 64g 0g 64g	1 g 8 8 55 55 134 57% 17% 16% 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
	Vitamin C Iron Calcium	0mg 4.2mg 107mg	0% 23% 8%
	Total Carbohydrate Dietary Fiber Total Sugars Added Sugars Protein Vitamin C Iron Calcium	46g 4.4g 18g 0g 64g 0mg 4.2mg 107mg s: Unhealth	17% 16% 0 - 0% 23% 8%

67	Pan mee	← Food				•	Cannot detect the
				٩			food correctly
			1	1		(recognized as	
		7.000		_			Tekwan)
		200				_	No data available for
		Cartes-	-			-	No data available for
		and a second					nutrition details and
		A	-				healthiness level.
		LOAD IMAGE C	CAPTUR	REIMAGE			
		Output: <u>Tekwan</u>					
		Output: <u>Tekwan</u>					
		Serving Size		-			
		Calories		-			
		Total Fat	-	<u>*DV</u>			
		Saturated Fat	-	-			
		Trans Fat	-	-			
		Sodium	-	-			
		Total Carbohydrate	-	-			
		Dietary Fiber	1	-			
		Total Sugars	-	-			
		Protein	-	-			
		Vitamin C	-	-			
		Iron	-	-			
		Calcium	-	-			
		Food healthine	ss: -				
68	Pancake	← Food				•	Able to detect the
				٩			food correctly.
							ioou concerny.
		1				•	Nutrition details and
		1					food healthiness
							neurinness
							level (moderate) are
			1				diamlawad
			-	al an			displayed.
		A State of the second second		- 19 M			
		LOAD IMAGE	CAPTU	JRE IMAGE			
		Output: Pancake					

		Output: Pancake					
		Serving Size 1	pancake ('90a)			
		Calories	250				
				%DV			
		Total Fat	10.7g	14			
		Saturated Fat	2.8g	14			
		Trans Fat	0g	-			
		Cholesterol	54mg	18			
		Total Carbobydrate	21.90	11%			
		Dietary Fiber	1.9g	7%			
		Total Sugars	6.5g	13			
		Added Sugars	Og	<u> </u>			
		Protein	6.7g	13%			
		Vitamin C	0g	0%			
		Iron	1.3mg	1.4%			
		Calcium	163.000	14%			
		Food healthines	s: Moderat	e			
69	Peking duck	← F00	ba			-	Able to detect the
				Q			
				~	-		food correctly.
						_	Nutrition details and
		1 11	mark			_	Nutrition details and
			A STATE				food healthiness
							level (unhealthy) are
							diaplayed
				15			displayed.
		A Comment	Bran	6 /			
		N N M	1				
			1				
					-		
		LOAD IMAGE	CAPTUR	RE IMAGE			
		Output: Doking	duck				
			uuck				
		Food: Peking duc	k				
		Serving Size 0.	3 duck (2	75g)			
		Calories	663	0.01			
		Tatal 5-1	41	%DV			
		Iotal Fat	41g	53			
		Trans Fat	0g	-			
		Cholesterol	118mg	39			
		Sodium	925mg	40%			
		Total Carbohydrate	42g	15%			
		Dietary Fiber	2.6g	9%			
		Added Sugars	29g 0a	- 00			
		Protein	30g	-			
		Vitamin C	0mg	0%			
		Iron	5mg	28%			
		Calcium	67mg	5%			
		Food healthiness	: Unhealth	у			

70	Pho	← Food	• Able to detect the
		Q	f 1
			food correctly.
		AT LAS	 Nutrition details and
			food healthiness
		and the second second	level (unhealthy) are
			displayed.
		LOAD IMAGE CAPTURE IMAGE	
		Output: Pho	
		FOUL. PHO	
		Serving Size 1 bowl (710g)	
		Calories 638	
		Total Fat	
		Saturated Fat 3.1g 16	
		Trans Fat 0.2g -	
		Cholesterol 86mg 29	
		Sodium 3268mg 142%	
		Dietary Fiber 5.8g 21%	
		Total Sugars 14g 24	
		Added Sugars 0g -	
		Vitamin C Omg 0%	
		Iron 6.7mg 37%	
		Calcium 113mg 9%	
		Food healthiness: Unhealthy	
71	Donich	← Food	• Able to detect the
/1	Popiali		- Able to detect the
			food correctly.
		A CONTRACTOR OF A CONT	 Nutrition details and
			- Nutrition details and
			food healthiness
		and the second sec	
		CHURCH SCALE	level (moderate) are
			displayed.
			1 2
		Con Castler	
		LOAD IMAGE CAPTURE IMAGE	
		Output: Popiah	

		Food: Poplah				
		Comulana Cine	1 mall (1)	57=)		
		Calorios	1 1011 (1:	57 <u>g</u>)		
		Calories	1/3	%DV		
		Total Fat	6.40	8		
		Saturated Fat	1.2g	6		
		Trans Fat	0.1g	-		
		Cholesterol	10mg	3		
		Sodium	309mg	13%		
		Total Carbohydrate	24g	9%		
		Dietary Fiber	3.5g	13%		
		Added Sugars	Og	-		
		Protein	6.7g	-		
		Vitamin C	0mg	0%		
		Iron	1mg	6%		
		Calcium	44mg	3%		
		Food healthines	s: Moderat	te		
12	Pumpkin pie	LOAD IMAGE Output: Pumpkin pi	CAPTUR n pie e	REIMAGE		Able to detect the food correctly. Nutrition details and food healthiness level (unhealthy) are displayed.
		Serving Size	1 slice (1	13g)		
		Calories	260	10.51		
				%DV		
		Total Fat	11g	14		
		Trans Fat	0g Da			
		Cholesterol	45.2mg	15		
		Sodium	140.1mg	6%		
		Total Carbohydrate	37g	12%		
		Dietary Fiber	2g	7%		
		Total Sugars	24g	48		
		Protein	5g	10%		
		Vitamin C	2.4ma	3%		
		Iron	1.8mg	10%		
		Calcium	59.9mg	5%		
		Food healthiness	s: Unhealth	iy		

73	Ramen	← Food				•	Able to	detect	the
				Q			6	41	
		1900					1000 COITE	ecuy.	
		6 GL		SIL	•	•	Nutrition	details	and
			2				food	healthin	ness
		P Star		10			level (unl	nealthy)	are
		LOAD IMAGE	CAPTURE				displayed		
		Output: Paman							
		Food: Ramen							
		Serving Size	47g						
				%DV					
		Total Fat	10g	13					
		Saturated Fat Trans Fat	5g 0g	25					
		Cholesterol	0mg	0					
		Sodium 10	000.2mg	43%					
		Dietary Fiber	28g	7%					
		Total Sugars	4g	8					
		Added Sugars	0g	10%					
		Vitamin C	0ma	0%					
		Iron	2.7mg	15%					
		Calcium 3	39.9mg	3%					
		Food healthiness: U	Unhealthy						
74	Red velvet cake	← Food				•	Able to	detect	the
/ 4	Red verver eake			Q				deteet	the
		s the Heat	<	>			food corre	ectly.	
			-			•	Nutrition	details	and
		Sec. 1	14	1			food	haalthi	nace
			n Carlos				1000	neartin	11055
							level (unl	nealthy)	are
							displayed		
		LOAD IMAGE	CAPTURE	IMAGE					
		Output: Red velvet	t cake						

Serving Size 1 align (100g)	
Colorios 269	
Total Fat 23g 29	
Saturated Fat 14g 70	
Trans Fat 0.3g -	
Cholesterol 93mg 31	
Sodium 318mg 14%	
Total Carbohydrate 36g 13%	
Total Sugars 25g 0	
Added Sugars 0g -	
Protein 4.2g -	
Vitamin C Omg 0%	
Iron 1.4mg 8%	
Calcium 58mg 4%	
Food healthinger: Unhealthy	
rood nearminess. Onnearmy	
75 Rendang ← Food • Able to detect	he
food correctly.	
Nutrition details	
- Inutrition details a	na
food healthin	ss
level (unhealthy)	re
lever (uniteditity)	10
displayed.	
LOAD IMAGE CAPTURE IMAGE	
Output: Rendang	
Food: Kendang	
Serving Size 1 serving (357g)	
Calories 612	
I Otal Fat 44g 56 Saturated Fat 27a 135	
Trans Fat 0g -	
Cholesterol 128mg 43	
Sodium 123mg 5%	
Total Carbohydrate 20g 7%	
Dietary Fiber 2.9g 10%	
Added Sugars 0g -	
Protein 38g	
Vitamin C Omg 0%	
Iron 8.1mg 45%	
Calcium 76mg 6%	
Food healthiness: Unnealthy	

76	Rojak	← Food	-	Cannot detect the
		Q		food correctly
				(recognized as
				Kimchi)
			· ·	Hence, the nutrition
				details and
				healthiness level of
				Kimchi are
		LOAD IMAGE CAPTURE IMAGE		displayed.
		Output: <u>Kimchi</u>		
		Serving Size 1 cup (150g)	-	
		Calories 23	•	
		Total Fat 0.8g 1	-	
		Saturated Fat 0.1g 1		
		Trans Fat Og -	=	
		Cholesterol Omg 0	-	
		Total Carbobydrate 3.6g 1%	-	
		Dietary Fiber 2.4g 9%	-	
		Total Sugars 1.6g 3	=	
		Added Sugars 0g -	-	
		Vitamin C Omg 0%	-	
		Iron 3.8mg 21%	-	
		Calcium 50mg 4%	=	
		Food healthinger: Healthy	-	
		roou nearinness. neariny		
77	Roti canai	← Food	•	Cannot detect the
		Q		food
		-		(recognized as
		- AND -		Parfait)
			-	No data available for
				nutrition details and
		and the second sec		healthiness level.
		LOAD IMAGE CAPTURE IMAGE		
		Output: Partait		

		Output: Parrait					
		Serving Size		-			
		Calories		-			
			T I	%DV			
		Total Fat		-			
		Saturated Fat	-	-			
		Trans Fat	-				
		Cholesterol	·				
		Sodium	-				
		Dietary Eiber	.e -				
		Total Sugars	-	-			
		Added Sugars	-	-			
		Protein		-			
		Vitamin C	-	-			
		Iron	-	-			
		Calcium	-	-			
		Food health	iness: -				
78	Sandwich	← Foo	d			•	Able to detect the
				0			C 1
							tood correctly.
						_	Nutrition details and
			7	450		_	Nutrition details and
				ALL .			food healthiness
			TI .				
			JAN ST	1			level (healthy) are
			113				diaplayed
				1			displayed.
				The			
					_		
		LOAD IMAGE	CAPTU	RE IMAGE			
					-		
		Output: Sandwid	<u>ch</u>				
		Output: Sandwich	1				
		Serving Size	11:	2g			
		Calories	25	50			
				%DV			
		Total Fat	7g	9			
		Saturated Fat	1.4g	7			
		Trans Fat	0g	-			
		Sodium	48.2mg	10			
		Total Carbobydrate	26.40	9%			
		Dietary Fiber	1.5g	5%			
		Total Sugars	3.1g	6			
		Added Sugars	0g				
		Protein	19.9g	40%			
		vitamin C	umg	1.2%			
		Calcium	2.2mg	6%			
		Calcium	04ing	0%			
		Food healthines	ss: Healthy	1			

79	Satay	F000	• Able to detect the
		Q	food correctly.
			Nutrition details and
			food healthiness
			laval (unhaalthy) ara
			level (unnearing) are
			displayed.
		LOAD IMAGE CAPTURE IMAGE	
		Output: <u>Satay</u>	
		Food: Satay	
		Serving Size 1 serving (203g)	
		Calories 417	
		Total Fat 29g 37	
		Saturated Fat 16g 80 Trans Fat 0g -	
		Cholesterol 53mg 18	
		Sodium 686mg 30%	
		Dietary Fiber 2.5g 9%	
		Total Sugars 14g 24	
		Protein 22g -	
		Vitamin C Omg 0%	
		Calcium 53mg 4%	
		Food healthiness: Unhealthy	
80	Sfogliatella	← Food	• Able to detect the
	_	Q	food correctly
			 Nutrition details and
			food healthiness
			level (unhealthy) are
			displayed.
		LOAD IMAGE CAPTURE IMAGE	
		Output: Sfogliatella	

		Food: Stogilatella	3				
		Serving Size	67	7a			
		Calories	27	72			
			[%DV			
		Total Fat	14.1g	18			
		Saturated Fat	7.8g	39			
		Trans Fat	0g	-			
		Cholesterol	44.9mg	15			
		Total Carbobydrate	257.300				
		Dietary Fiber	1.7a	6%			
		Total Sugars	7.5g	15			
		Added Sugars	0g	-			
		Protein	5.5g	11%			
		Vitamin C	0.1mg	0%			
		Iron	1.4mg	8%			
		Calcium	24.8mg	2%			
		Food healthines	s: Unhealtł	ıv			
				· *			
81	Shaved ice	← Foo	bd			-	Able to detect the
				Q			6 1 1
					•		tood correctly.
							Nutrition details and
			205				Nutrition uctails and
							food healthiness
		100 C	1				
		15 A 48	AS X	•			level (unhealthy) are
		27.00		201			displayed
		834	Pro a la				displayed.
		LOAD IMAGE	CAPTU	RE IMAGE			
			are and a second and a				
		Output: Shaved	ice				
		Food: Shaved ice					
		_					
		Serving Size	80	oz 💦			
		Calories	50	<u>D</u>			
				%DV			
		Total Fat	0g	0			
		Trans Fat	0g 0g	-			
		Cholesterol	0mg	0			
		Sodium	0mg	0%			
		Total Carbohydrate	e 14g	5%			
		Dietary Fiber	Og	0%			
		Added Sugars	14g	24			
		Protein	0a	0			
		Vitamin C	0mg	0%			
		Iron	0mg	0%			
		Calcium	Omg	0%			
		Food healthiness	: Unhealth	y			

82	Soufflé	← Food				•	Able to detect the
				Q			food correctly.
		-				•	However, there is no
		Contraction of the local division of the loc					data available for its
							nutrition details and
			-				healthiness level
		0					nearminess iever.
		_					
		LOAD IMAGE	CAPT	URE IMAGE			
		Output: <u>Soufflé</u>					
		Output: Souttle					
		Serving Size	I	-			
		Calories		- % D\/			
		Total Fat	-	%DV -			
		Saturated Fat	-	-			
		Trans Fat		-			
		Sodium					
		Total Carbohydrate		-			
		Dietary Fiber	-	-			
		Added Sugars	-				
		Protein	720	-			
		Vitamin C	-				
		Iron	-				
			1-				
		Food healthine	ss: -				
83	Spaghetti	× F000				•	Able to detect the
				٩			food correctly.
							Nutrition details and
		-	3	N/2		-	Nutrition details and
							food healthiness
		1 CAVES		SD X			level (unhealthy) are
							level (unificatiny) are
		THAN	5	15			displayed.
		Con le	2)				
		LOAD IMAGE	CAP	TURE IMAGE			
		Output: Spaghetti					

	Serving Size	66)g		
	Calories	66	7		
			%DV		
	Total Fat	22g	28		
	Saturated Fat	6.5g	33		
	Chalasteral	0.5g			
	Sodium	637mg	28%		
	Total Carbohydrate	840	31%		
	Dietary Fiber	11g	39%		
	Total Sugars	14g	24		
	Added Sugars	0g	<u> </u>		
	Vitamin C	35y	-		
	Iron	6.7mg	37%		
	Calcium	204mg	18%		
				-	Nutrition details food health level (healthy) displayed.
	LOAD IMAGE Output: Sushi Ecod: Sushi	САРТИ	REIMAGE		
	LOAD IMAGE Output: Sushi Food: Sushi	Сарти	REIMAGE		
	LOAD IMAGE Output: Sushi Food: Sushi Serving Size	Сарти 1 ріесе (;			
	LOAD IMAGE Output: Sushi Food: Sushi Serving Size Calories	САРТU 1 ріесе (1 28			
	LOAD IMAGE Dutput: Sushi Food: Sushi Serving Size Calories	Сарти 1 ріесе (; 28	RE IMAGE		
	LOAD IMAGE LOAD IMAGE Output: Sushi Food: Sushi Serving Size Calories Total Fat Saturated Fat	CAPTU CAPTU 1 piece (; 28 0.2g 00	RE IMAGE		
	LOAD IMAGE LOAD IMAGE Output: Sushi Food: Sushi Serving Size Calories Total Fat Saturated Fat Trans Fat	CAPTU CAPTU 1 piece (% 28 0.2g 0g 0g	RE IMAGE		
	LOAD IMAGE Dutput: Sushi Food: Sushi Serving Size Calories Total Fat Saturated Fat Trans Fat Cholesterol	CAPTU CAPTU 1 piece (: 28 0.2g 0g 0g 1.2mg	RE IMAGE		
	LOAD IMAGE LOAD IMAGE Output: Sushi Food: Sushi Serving Size Calories Total Fat Saturated Fat Trans Fat Cholesterol Sodium	CAPTU CAPTU 1 piece (: 28 0.2g 0g 0g 1.2mg 128.7mg	RE IMAGE		
	LOAD IMAGE LOAD IMAGE Output: Sushi Food: Sushi Serving Size Calories Total Fat Saturated Fat Trans Fat Cholesterol Sodium Total Carbohydrate	CAPTU 1 piece (i 28 0.2g 0g 1.2mg 128.7mg 5.5g	RE IMAGE		
	LOAD IMAGE LOAD IMAGE Output: Sushi Food: Sushi Serving Size Calories Total Fat Saturated Fat Trans Fat Cholesterol Sodium Total Carbohydrate Dietary Fiber Total Suars	CAPTU CAPTU 1 piece (1 28 0.2g 0g 1.2mg 128.7mg 5.5g 0.3g 0.6a	RE IMAGE 1009) %DV 0 0 6% 2% 1% 1		
	LOAD IMAGE LOAD IMAGE Output: Sushi Food: Sushi Serving Size Calories Total Fat Saturated Fat Trans Fat Cholesterol Sodium Total Carbohydrate Dietary Fiber Total Sugars Added Sugars	CAPTU CAPTU 1 piece (1 28 0.2g 0g 0g 1.2mg 1.2mg 1.2mg 1.28.7mg 5.5g 0.39 0.6g 0g	RE IMAGE 109) %DV 0 0 0 6% 2% 1% 1 -		
	LOAD IMAGE LOAD IMAGE Dutput: Sushi Food: Sushi Serving Size Calories Total Fat Saturated Fat Trans Fat Cholesterol Sodium Total Carbohydrate Dietary Fiber Total Sugars Added Sugars Protein	CAPTU CAPTU 1 piece (3 28 0.2g 0g 0g 1.2mg 1.2mg 1.28.7mg 5.5g 0.3g 0.6g 0.9g 0.9g	RE IMAGE 80g) %DV 0 0 0 6% 2% 1% 1 - 2%		
	LOAD IMAGE Cutput: Sushi Food: Sushi Serving Size Calories Calories Total Fat Saturated Fat Trans Fat Cholesterol Sodium Total Carbohydrate Dietary Fiber Total Sugars Added Sugars Protein Vitamin C	CAPTU CAPTU 1 piece (: 28 0.2g 0g 0g 1.2mg 1.2mg 1.28.7mg 5.5g 0.3g 0.6g 0g 0.9g 0.9g 0.3mg	RE IMAGE 80g) %DV 0 0 0 6% 2% 1% 1 - 2% 0%		
	LOAD IMAGE LOAD IMAGE Dutput: Sushi Food: Sushi Serving Size Calories Total Fat Saturated Fat Trans Fat Cholesterol Sodium Total Carbohydrate Dietary Fiber Total Sugars Added Sugars Protein Vitamin C Iron	CAPTU CAPTU 1 piece (: 28 0.2g 0g 1.2mg 128.7mg 5.5g 0.3g 0.3g 0.3g 0.9g 0.9g 0.3mg 0.9g 0.3mg 0.1mg	RE IMAGE 80g) %DV 0 0 0 6% 2% 1% 1 - 2% 0% 0%		

85	Swiss roll	F000	• Able to detect the
		Kilchn K	food correctly.
			 Nutrition details and
			food healthiness
		200	level (moderate) are
		LOAD IMAGE CAPTURE IMAGE	displayed.
		Output: Swiss roll	
		Food: Swiss roll	
		Serving Size 1 snack cake (31g)	
		Calories 124	
		Total Fat 4.9g 6	
		Saturated Fat 1.5g 8	
		Cholesterol Omg 0	
		Sodium 103mg 4%	
		Dietary Fiber 1g 4%	
		Total Sugars 12g 18 Added Sugars 0g -	
		Protein 1.1g -	
		Vitamin C 0mg 0%	
		Calcium 36mg 3%	
		Food healthiness: Moderate	
86	Тасо		• Able to detect the
			food correctly.
			 Nutrition details and
			food healthiness
			level (healthy) are
			displayed.
			1 2
		LOAD IMAGE CAPTURE IMAGE	
		Output: Taco	

		Serving Size 1	servina (1	80a)
		Calories	280	
				%DV
		Total Fat	17.2g	22
		Saturated Fat	1.7g	9
		Trans Fat	Og	-
		Cholesterol	2.4mg	
		Total Carbobydrate	250.4mg	0%
		Dietary Fiber	27.9g	9%
		Total Sugars	1.7g	3
		Added Sugars	Og	-
		Protein	3.5g	7%
		Vitamin C	Umg	0%
		Iron	0.6mg	3%
		Calcium	50.4mg	4%
		Food healthine	ss: Healthy	
		F0	010	
7	Takoyaki			
				Q
		Sec. 1		
		Distance N	64	
			State.	
			10.	6 1km
			Alan a	
			The second second	
			1 dent	
			in i	
		\checkmark		
		\checkmark		
		LOAD IMAGE	CAPTUR	REIMAGE
		LOAD IMAGE	САРТИЯ	REIMAGE
		LOAD IMAGE Output: Takoya	CAPTUR	REIMAGE
		LOAD IMAGE Output: Takoya Food: Takoyaki	CAPTUF	REIMAGE
		LOAD IMAGE Output: Takoya Food: Takoyaki	CAPTUF Kİ	REIMAGE
		LOAD IMAGE Output: Takoya Food: Takoyaki Serving Size	Сартия Кі 1 ріесе (3	RE IMAGE
		LOAD IMAGE Output: Takoya Food: Takoyaki Serving Size Calories	САРТИ (1) 1) ріесе (3) 58	RE IMAGE
		LOAD IMAGE Dutput: Takoya Food: Takoyaki Serving Size Calories	CAPTUF Ki 1 piece (3 58	RE IMAGE 399g) %DV 2
		LOAD IMAGE LOAD IMAGE Output: Takoya Food: Iakoyaki Serving Size Calories Total Fat Saturated Fat	CAPTUF Ki 1 piece (3 58 2.5g 2.5g	REIMAGE 399) %DV 3 2
		LOAD IMAGE LOAD IMAGE Dutput: Takoya Food: Iakoyaki Serving Size Calories Total Fat Saturated Fat Trans Fat	CAPTUF	39g) %DV 3 2
		LOAD IMAGE LOAD IMAGE Output: Takoya Food: Iakoyaki Serving Size Calories Total Fat Saturated Fat Trans Fat Cholesterol	CAPTUF Ki 1 piece (3 58 2.5g 0.3g 0g 19mg	39g) %DV 3 2 - 6
		LOAD IMAGE Dutput: Takoya Food: Takoyaki Serving Size Calories Total Fat Saturated Fat Trans Fat Cholesterol Sodium	CAPTUF CAPTUF	399) %DV 3 2 - 6 7%
		LOAD IMAGE Dutput: Takoya Food: Takoyaki Serving Size Calories Total Fat Saturated Fat Trans Fat Cholesterol Sodium Total Carbohydrate	CAPTUR CAPTUR CAPTUR 1 piece (3 58 2.5g 0.3g 0g 19mg 161mg 5.8g	89g) %DV 3 2 - 6 7% 2%
		LOAD IMAGE LOAD IMAGE Output: Takoya Food: Takoyaki Serving Size Calories Total Fat Saturated Fat Trans Fat Cholesterol Sodium Total Carbohydrate Dietary Fiber	CAPTUR CAPTUR CAPTUR 1 piece (3 58 2.5g 0.3g 0g 19mg 161mg 5.8g 0.2g 0.2g	39g) %DV 3 2 - 6 7% 2% 1%
		LOAD IMAGE LOAD IMAGE Output: Takoya Food: Takoyaki Serving Size Calories Total Fat Saturated Fat Trans Fat Cholesterol Sodium Total Carbohydrate Dietary Fiber Total Sugars	CAPTUR CAPTUR CAPTUR CAPTUR CAPTUR 2.5g 0.3g 0g 19mg 161mg 2.58g 0.2g 0.1g 0a	39g) %DV 3 2 - 6 7% 2% 1% 0
		LOAD IMAGE LOAD IMAGE Dutput: Takoya Food: Iakoyaki Serving Size Calories Total Fat Saturated Fat Trans Fat Cholesterol Sodium Total Carbohydrate Dietary Fiber Total Sugars Added Sugars Protein	CAPTUF CAPTUF	39g) %DV 3 2 - 6 7% 2% 1% 0 - -
		LOAD IMAGE LOAD IMAGE Dutput: Takoya Food: Takoyaki Serving Size Calories Total Fat Saturated Fat Trans Fat Cholesterol Sodium Total Carbohydrate Dietary Fiber Total Sugars Added Sugars Protein Vitamin C	 CAPTUF CAPTUF CAPTUF 1 piece (3 58 2.5g 0.3g 0g 19mg 161mg 5.8g 0.2g 0.1g 0g 3g 0g 3g 0ma 	3999) %DV 3 2 - 6 7% 2% 1% 0 - 0%
		LOAD IMAGE LOAD IMAGE Dutput: Takoya Food: Jakoyaki Serving Size Calories Total Fat Saturated Fat Trans Fat Cholesterol Sodium Total Carbohydrate Dietary Fiber Total Sugars Added Sugars Protein Vitamin C Iron	CAPTUF CAPTUF CAPTUF CAPTUF CAPTUF S8 2.5g 0.3g 0g 19mg 161mg 5.8g 0.2g 0.1g 0g 3g 0g 0g 0g 0g 0g 19mg 161mg 0g 0g 0g 0g 0,0g 0g 0g 0,0g 0g 0,0g	39g) %DV 3 2 - 6 7% 2% 1% 0 - 0% 5%
		LOAD IMAGE Dutput: Takoya Food: Takoyak Food: Takoyak Serving Size Calories Total Fat Saturated Fat Trans Fat Cholesterol Sodium Total Carbohydrate Dietary Fiber Total Sugars Added Sugars Protein Vitamin C Iron Calcium	CAPTUF CAPTUF CAPTUF CAPTUF CAPTUF S8 2.5g 0.3g 0g 19mg 161mg 5.8g 0.2g 0.1g 0g 3g 0g 0,9mg 0.9mg 31mg	39g) %DV 3 2 - 6 7% 2% 1% 0 - 0% 5% 2%

88	Tandoori	F000		Able to detect the
	chicken	Abes and Juliennes		food correctly.
		A AND C	-	Nutrition details and
				food healthiness
				level (unhealthy) are
		LOAD IMAGE CAPTURE IMAGE		displayed.
		Food: landoori chicken		
		Serving Size 1 piece (200g)		
		Calories 263		
		%DV		
		Iotal Fat 12g 15 Saturated Fat 4.2g 21		
		Trans Fat Og -		
		Sodium 132mg 6%		
		Total Carbohydrate 6.1g 2%		
		Dietary Fiber 0.7g 3%		
		Total Sugars 3.7g 8 Added Sugars 0g -		
		Protein 31g -		
		Vitamin C Omg 0%		
		Iron 1.5mg 8%		
		Each hadthinger: Unhealthy		
89	Tart	× roou	-	Able to detect the
				food correctly.
			_	NT / '/' 1 / '1 1
		Taxan I Constant Taxan	-	Nutrition details and
				food healthiness
		1000		
		NOT THE REAL PROPERTY.		level (unnealthy) are
				displayed.
		0		
		CAP TOKETWAGE		
		Output: Tart		
		ousput. <u>Turt</u>		

		Food: Tart		
		Serving Size	l clico (1	47a)
		Calories	412	<u>+/y/</u>
		Calories		%DV
		Total Fat	18a	23
		Saturated Fat	11g	55
		Trans Fat	0.7g	-
		Cholesterol	46mg	15
		Sodium	139mg	6%
		Total Carbohydrate	62g	23%
		Dietary Fiber	2.1g	8%
		Total Sugars	38g	70
		Protein	3.3a	-
		Vitamin C	0mg	0%
		Iron	1.5mg	8%
		Calcium	25mg	2%
		Food healthiness	: Unhealt	hy
U	Tiramisu	Food)	
				٩
			49	
		Contraction of the second		
			ALC: NO	
			der -	2 - 22
		LOAD IMAGE Output: Simore Output: Simore Serving Size Calories	CAPTURE	IMAGE
				%DV
		Total Fat		-
		Saturated Fat		2
		Trans Fat	-	-
		Cholesterol	-	-
		Sodium	<u>_</u>	
		Diatany Eiber	e -	-
		Total Sugars	-	2
		Added Sugars	5	-
		Protein	-	-
		Vitamin C	-	-
		Iron	-	
		Calcium	-	-
		Food health	iness: -	

91	Tom vum	← Food	• Able to detect the
-	J.		
		daysta < >	food correctly.
			 Nutrition details and
			food healthiness
			level (unhealthy) are
		LOAD IMAGE CAPTURE IMAGE	displayed.
		Output: Tom yum	
		output: <u>Iom yum</u>	
		Food: Tom yum	
		Serving Size 1 bowl (60g)	
		Calories 260	
		Total Fat 9g 35	
		Saturated Fat 4.5g 22	
		Cholesterol Omg 0	
		Sodium 1780mg -	
		Total Carbohydrate 31g 53%	
		Dietary Fiber 2g 9% Total Sugars 2g 4	
		Added Sugars 0g -	
		Vitamin C 0mg 0%	
		Iron 1.1mg 6%	
		Calcium - 2%	
		Food healthiness: Unhealthy	
92	Tuna	ish Food	Able to detect the
14	i una		
	sandwich	bne's Kitchen < >	food correctly.
			 Nutrition details and
		and the second states and the	food hoalthings
			100d healthness
			level (moderate) are
		Constant of the	displayed.
		LOAD IMAGE CAPTURE IMAGE Output: <u>Tuna fish sandwich</u>	

	Serving Size	210)g
	Calories	43	8
		Ĺ	%DV
	Total Fat	16g	21
	Saturated Fat	2.8g	14
	Trans Fat	0g	-
	Cholesteroi	ZUMg	/
	Total Carbohydrate	42a	15%
	Dietary Fiber	429 1.5g	5%
	Total Sugars	3.2g	6
	Added Sugars	0g	-
	Protein	30g	-
	Vitamin C	Umg	0%
	Calcium	108mg	20%
	Food healthiness	: Moderat	e
Udon	← Foo	d	
	ph a		
	1000		and a
	1 1 1 200		1- 1
		ALL STREET	
	Sebre-		
		Ö	
	LOAD IMAGE Output: Udon Output: Udon	CAPTUR	EIMAGE
	LOAD IMAGE Output: Udon Output: Udon Serving Size	CAPTURI	E IMAGE
	LOAD IMAGE Output: Udon Output: Udon Serving Size Calories	CAPTUR	E IMAGE
	LOAD IMAGE Output: Udon Output: Udon Serving Size Calories	CAPTUR 600 25	EIMAGE g 0 %DV
	LOAD IMAGE Output: Udon Output: Udon Serving Size Calories	CAPTURI 600 25 7g	EIMAGE 0 %DV 9
	LOAD IMAGE Output: Udon Output: Udon Output: Udon Serving Size Calories Total Fat Saturated Fat	CAPTURI 600 25 7g 3.5g	E IMAGE 9 0 %DV 9 17
	LOAD IMAGE LOAD IMAGE Output: Udon Output: Udon Output: Udon Serving Size Calories Total Fat Saturated Fat Trans Fat Cholactered	CAPTURI CAPTURI 600 255 7g 3.5g 0g	g 0 %DV 9 177 - 0
	LOAD IMAGE LOAD IMAGE Output: Udon Output: Udon Output: Udon Serving Size Calories Total Fat Saturated Fat Trans Fat Cholesterol Sodium	CAPTUR CAPTUR 600 25 7g 3.5g 0g 0mg 880.2mg	g 0 %DV 9 17 - 0 28%
	LOAD IMAGE LOAD IMAGE Output: Udon Output: Udon Output: Udon Serving Size Calories Total Fat Saturated Fat Trans Fat Cholesterol Sodium	CAPTUR CAPTUR 60 25 7g 3.5g 0g 0mg 880.2mg 880.2mg	9 0 %DV 9 17 - 0 38%
	LOAD IMAGE LOAD IMAGE Output: Udon Output: Udon Output: Udon Serving Size Calories Total Fat Saturated Fat Trans Fat Cholesterol Sodium Total Carbohydrate Dietary Fiber	CAPTUR CAPTUR 600 255 7g 3.5g 0g 0g 0mg 8880.2mg 8880.2mg 42g 2q	9 0 %DV 9 17 - 0 38% 14%
	LOAD IMAGE Output: Udon Output: Udon Output: Udon Calories Total Fat Saturated Fat Trans Fat Cholesterol Sodium Total Carbohydrate Dietary Fiber Total Sugars	CAPTUR CAPTUR 600 255 79 3.59 09 0mg 880.2mg 880.2mg 42g 2g 2g	BIMAGE BIMAGE B B C C C C C C C C C C C C C C C C C
	LOAD IMAGE Output: Udon Output: Udon Output: Udon Serving Size Calories Total Fat Saturated Fat Trans Fat Cholesterol Sodium Total Carbohydrate Dietary Fiber Total Sugars Added Sugars	CAPTUR CAPTUR	g 0 %DV 9 17 - 0 38% 14% 7% 4 -
	LOAD IMAGE LOAD IMAGE Output: Udon Output: Udon Output: Udon Serving Size Calories Total Fat Saturated Fat Trans Fat Cholesterol Sodium Total Carbohydrate Dietary Fiber Total Sugars Added Sugars Protein	CAPTUR CAPTUR CAPTUR CAPTUR 0 0 0 0 0 0 0 0 0 0 0 0 0	g 0 %DV 9 17 - 0 38% 14% 7% 4 - 8%
	LOAD IMAGE LOAD IMAGE Output: Udon Output: Udon Output: Udon Serving Size Calories Total Fat Saturated Fat Trans Fat Cholesterol Sodium Total Carbohydrate Dietary Fiber Total Sugars Added Sugars Protein Vitamin C	CAPTURI CAPTUR	g 0 %DV 9 17 - 0 38% 14% 7% 4 - 8% 0%
	LOAD IMAGE LOAD IMAGE Output: Udon Output: Udon Output: Udon Serving Size Calories Total Fat Saturated Fat Trans Fat Cholesterol Sodium Total Carbohydrate Dietary Fiber Total Sugars Added Sugars Protein Vitamin C Iron	CAPTUR CAPTUR 60 25 7g 3.5g 0g 0mg 880.2mg 880.2mg 42g 2g 0g 42g 0g 42g 0g 42g 0g 0g 1.4mg 0mg	9 0 %DV 9 17 - 0 38% 14% 7% 4 - 8% 0% 8%

94	Waffle	← Food	 Able to detect the food correctly. Nutrition details and food healthings
		LOAD IMAGE	level (unhealthy) are displayed.
		Output:WaffleServing Size1 waffle (125g)Calories460Calories460MDV%DVCatarated Fat23.2gCholesterol87.5mgSodium957.5mgCholesterol87.5mgSodium957.5mgDietary Fiber3.1gAdded Sugars0gProtein10.9gAdded Sugars0gIron2.2mgIron2.2mgIron2.2mgSodium300mgOg2%Og300mgOg2% <t< th=""><th></th></t<>	
95	Wonton noodles	Food	 Able to detect the food correctly. Nutrition details and food healthiness level (unhealthy) are displayed.

	Coming Cine	1 h aud /7/	10>
	Serving Size	1 DOWI (74	i9g)
	Calories	631	9/ DV
	Total Fat	190	23
	Saturated Fat	4a	20
	Trans Fat	0.1g	-
	Cholesterol	127mg	42
	Sodium	2538mg	110%
	Total Carbohydrate	88g	32%
	Dietary Fiber	3.9g	14%
	Total Sugars	4.5g	10
	Added Sugars	290	26%
	Vitamin C	Omg	0%
	Vitamin C	4mg	22%
	Iron	4mg	23%
	Calcium	104mg	8%
Yakiniku	F F00	a	٩
			1
		6	
	San A	- Pak	5
		26	
		AMAY	
		CADTURE	IMAGE
	LOAD IMAGE	CAPTURE	IMAGE
	LOAD IMAGE Output: <u>Yakiniku</u> Food: Yakiniku	CAPTURE	IMAGE
	LOAD IMAGE Output: Yakiniku Food: Yakiniku Serving Size	CAPTURE	IMAGE
	LOAD IMAGE Output: Yakiniku Foog: Yakiniku Serving Size Calories	CAPTURE	IMAGE
	LOAD IMAGE Output: Yakiniku Food: Yakiniku Serving Size Calories	CAPTURE 133 33	IMAGE 2g 4 %DV
	LOAD IMAGE Output: Yakiniku FOOQ: Yakiniku Serving Size Calories Total Fat Saturated Fat	CAPTURE 133 333 21g 5.9g	IMAGE 2g 4 30
	LOAD IMAGE Output: Yakiniku Food: Yakiniku Serving Size Calories Total Fat Saturated Fat Trans Fat	CAPTURE 13: 333 21g 5.9g 0g	IMAGE 2g -4 -4
	LOAD IMAGE Output: Yakiniku FOOG: Yakiniku Serving Size Calories Total Fat Saturated Fat Trans Fat Cholesterol	CAPTURE 132 132 21g 5.9g 0g 76mg	IMAGE 2g 44 27 30 25
	LOAD IMAGE Output: Yakiniku FOOD: Yakiniku Serving Size Calories Total Fat Saturated Fat Trans Fat Cholesterol Sodium	CAPTURE 132 132 21g 5.9g 0g 76mg 1143mg	IMAGE 2g 4 30 27 30 25 50%
	LOAD IMAGE Output: Yakiniku FOOD: Yakiniku Serving Size Calories Total Fat Saturated Fat Trans Fat Cholesterol Sodium Total Carbohydrate	CAPTURE 133 133 21g 21g 5.9g 0g 76mg 1143mg 12g	IMAGE 2g 4 4 27 30 27 30 25 50% 4%
	LOAD IMAGE Output: Yakiniku POOD: Yakiniku Serving Size Calories Total Fat Saturated Fat Trans Fat Cholesterol Sodium Total Carbohydrate Dietary Fiber	CAPTURE	IMAGE 2g 44 27 27 30 25 50% 4% 4%
	LOAD IMAGE Output: Yakiniku Pooq: Yakiniku Serving Size Calories Total Fat Saturated Fat Trans Fat Cholesterol Sodium Total Carbohydrate Dietary Fiber Total Sugars Added Sugars	CAPTURE 13: 21g 5.9g 0g 76mg 1143mg 21g 12g 1143mg 21g 8.1g 0g	IMAGE 2g 4 27 30 25 50% 4% 4% 4% 18
	LOAD IMAGE Output: Yakiniku Poog: Yakiniku Serving Size Calories Total Fat Saturated Fat Trans Fat Cholesterol Sodium Total Carbohydrate Dietary Fiber Total Sugars Added Sugars	CAPTURE CAPTURE 132 333 21g 5.9g 0g 76mg 1143mg 21g 1143mg 21g 1143mg 21g 0g 25g	IMAGE 2g 4 27 30 25 50% 4% 4% 18
	LOAD IMAGE Output: Yakiniku FOOD: Yakiniku Serving Size Calories Total Fat Saturated Fat Trans Fat Cholesterol Sodium Total Carbohydrate Dietary Fiber Total Sugars Added Sugars Protein Vitamin C	CAPTURE CAPTUR	IMAGE 2g 4 30 27 30 25 50% 4% 4% 4% 18 18 - - - 0%
	LOAD IMAGE Output: Yakiniku FOOD: Yakiniku Serving Size Calories Total Fat Saturated Fat Trans Fat Cholesterol Sodium Total Carbohydrate Dietary Fiber Total Sugars Added Sugars Protein Vitamin C Iron	CAPTURE	IMAGE 2g 4 %DV 27 30 25 50% 4% 4% 18 0% 14%

97	Yong tau foo	F000	• Able to detect the
	U U	Q	food correctly
			lood confectly.
			 Nutrition details and
			food healthiness
			level (healthy) are
			displayed.
		LOAD IMAGE CAPTURE IMAGE	
		Output: Yong tau foo	
		Food: Yong tau too	
		Serving Size 1 piece (54g)	
		Calories 67	
		Total Fat 4.1g 5	
		Saturated Fat 1g 5	
		Cholesterol 13mg 4	
		Sodium 126mg 5%	
		Total Carbohydrate 2.8g 1%	
		Dietary Fiber 0.6g 2%	
		Added Sugars Og -	
		Protein 4.8g -	
		Vitamin C Omg 0%	
		lion 0.5mg 3%	
		Food healthiness: Healthy	
98	Youtiao	← Food	• Able to detect the
			food correctly
			food confectly.
			 Nutrition details and
			food healthiness
			level (neariny) are
			displayed.
		LOAD IMAGE CAPTURE IMAGE	
		Output: Youtiao	
	<u> </u>	<u> </u>	

		Food: Youtiao				
		Serving Size	1 otick (E6a)		
		Calories 161				
		Calories		%DV		
		Total Fat	6.4a	8		
		Saturated Fat	0.7g	3		
		Trans Fat	0g			
		Cholesterol	1.7mg	1		
		Sodium	396mg	17%		
		Dietary Fiber	0.7g	3%		
		Total Sugars	0.1g	0		
		Added Sugars	Og	-		
		Protein	3.5g	-		
		Vitamin C	0mg	0%		
		Calaium	1.4mg	8%		
		Calcium	Tuzing	0%		
		Food healthine	ss: Health	v		
99	Zhajiangmian	← F00	a		-	Able to detect the
		-		Q		
						food correctly.
		ed House Spice	<	>	-	Nutrition details and
		-				ruurnon details and
		Care C	Ter's	\mathbf{X}		food healthiness
		A Street	GA.			
		A State	100	15		level (healthy) are
			200			displayed
		AL OF	3XD			displayed.
		AVE:	The los			
		and Marcolle State				
				-		
		LOAD IMAGE	CAPTURE	IMAGE		
		Output: Zhaijang	mian			
		Food: Zhoijongm	ion			
		FUUL. Zhajiangin	Idii			
		Serving Size	25	0g		
		Calories	26	53		
				%DV		
		Total Fat	9g	12		
		Saturated Fat	1.1g	6		
		Cholesterol	12mg	4		
		Sodium	98mg	4%		
		Total Carbohydrate	e 35g	13%		
		Dietary Fiber	3.9g	14%		
		Total Sugars	5.8g	10		
		Protein	11a	22%		
		Vitamin C	0mg	0%		
		Iron	1.7mg	9%		
		Calcium	35mg	3%		
		Food healthine	ss: Health	у		

100	Zongzi	 Food Load IMAGE Output: Zongzi Food: ZOHZI 	FOOD Q CAPTURE IMAGE			Able food co Nutriti food level (display	to orre on unh /ed.	detect ctly. details healthi ealthy)	the and ness are
		Serving Size 1	piece (44	41g)					
		Calories	759						
				%DV					
		Total Fat	37g	47					
		Saturated Fat	8.8g	44					
		Cholesterol	408mg	136					
		Sodium	1451mg	63%					
		Total Carbohydrate	74a	27%					
		Dietary Fiber	2.5g	9%					
		Total Sugars	2.9g	6					
		Added Sugars	Og	-					
		Protein	32g	-					
		Vitamin C	0mg	0%					
		Iron	3.1mg	17%					
		Calcium	72mg	6%					
		Food healthiness	: Unhealth	у					

Table 6.1: Table of food testing

The food recognition model [17] is tested using 100 food images from different categories including desserts, Western and Asian dishes. The model is able to recognize food from both uploaded and captured food images. A variety of food are tested such as desserts (pancake, waffle, macaron, mooncake, cheesecake, chocolate brownie etc.), Western food (pizza, sandwich, hamburger, spaghetti, lasagna, fried chicken etc.), Asian food including Malaysian cuisines (char kway teow, dimsum, nasi lemak, asam pedas, satay etc.), Japanese cuisines (omurice, onigiri, sushi, udon, takoyaki etc.) and Korean cuisines (bibimbap, kimchi, gimbap etc.).

Out of the 100 food images, 89 food images are correctly detected while 11 are incorrectly recognized as other food names. The model is found to be capable of detecting both Western and Asian food. However, it is not effective in recognizing certain Malaysian cuisines such as bubur cha cha (*No. 9 in Table 6.1*), nasi kandar (*No. 60 in Table 6.1*), rojak (*No. 77 in Table 6.1*) and roti canai (*No. 77 in Table 6.1*). In addition, the food recognition model struggled to identify some cakes such as fruit cake (*No. 36 in Table 6.1*), layer cake (*No. 51 in Table 6.1*), marble cake (*No. 55 in Table 6.1*) and tiramisu (*No. 90 in Table 6.1*). Noodle-type dishes are also not well differentiated by the model, such as hokkien mee (*No. 41 in Table 6.1*), pan mee (*No. 67 in Table 6.1*) and laksa (*No.49 in Table 6.1*) which is identified as udon.

In order to determine the accuracy of the model, it is required to calculate precision, recall and F1-score. Precision is needed to evaluate the accuracy of the model's positive predictions. Recall is used as a measure of the model's ability to detect instances. F1-score indicates the performance of the model. So, below is the formula for calculating precision, recall and F1-score:

- Precision = TP / (TP + FP)
- Recall = TP / (TP+FN)
- F1-score = 2*(Precision*Recall) / (Precision + Recall)

TP is true positive which indicates food that are correctly detected as their food name, FP is false positive which indicates food that are incorrectly detected as other food name and FN is false negative which indicates food image is detected as a non-food instance.

Based on the testing result above,

- TP (true positive) = 89
- FP (false positive) = 11
- FN (false negative) = 0

Using the formula above,

Precision = 89 / (89 + 11)= 0.89 (89%) **Recall** = 89 / (89 + 0)= 1.0

Bachelor of Computer Science (Honours)

Faculty of Information and Communication Technology (Kampar Campus), UTAR

Hence, the model shows a high accuracy of detection and better performance based on the testing data as the values of evaluation metrics are high.

6.2 System Testing

Below is the list of developed functions in the mobile application that are tested:

No.	Functions	No. of test cases	Ability to function
1	Register account, Login, Reset password	7	✓
2	Home dashboard	3	\checkmark
3	Add record	5	✓
4	Food detection & nutrition details with healthiness level displayed	4	~
5	Reminder on notification	4	\checkmark
6	Monthly statistics	2	✓
7	Report generator	2	✓
8	History records	4	✓
9	FCM push notification	1	✓
10	Logout	2	\checkmark

Table 6.2: List of developed functions that are tested

Function 1: Register account, Login, Reset password

- **Test Case 1:** To test login with an unregistered account, and it should be unsuccessful to login into the mobile application.
- Test Plan 1: Enter email (kexin01@1utar.my), password (123456) and click "Login".
- Test Result 1: It shows login error and no user record is found, which is correct as expected output.



Figure 8.0a: Test case 1 for function 1

- **Test Case 2:** To test register account with a bad format of email, and it should be unsuccessful to register.
- Test Plan 2: Enter email (kexin01), password (123456) and click "Register".
- Test Result 2: It shows registration error, which is correct as expected output.



Figure 8.0b: Test case 2 for function 1

- **Test Case 3:** To test register account with correct email format, and it should be successful to register and redirect user to the home dashboard.
- Test Plan 3: Enter email (kexin01@1utar.my), password (123456) and click "Register".
- **Test Result 3:** Successfully registered an account and redirect to home dashboard, which is correct as expected output.



Figure 8.0c: Test case 3 for function 1

- **Test Case 4:** To test login with incorrect password, and it should be unsuccessful to login.
- Test Plan 4: Enter email (kexin01@1utar.my), password (567890) and click "Login".
- **Test Result 4:** It shows login error and invalid password, which is correct as expected output.



Figure 8.0d: Test case 4 for function 1

- **Test Case 5:** To test login with correct email and password, and it should be successful to login and go to home dashboard.
- Test Plan 5: Enter email (kexin01@1utar.my), password (123456) and click "Login".
- **Test Result 5:** Successfully login and redirect to home dashboard, which is correct as expected output.



Figure 8.0e: Test case 5 for function 1

- **Test Case 6:** To test login with Google sign-in method, and it should be successful to login and go to home dashboard.
- Test Plan 6: Click "Google Sign In".
- **Test Result 6:** Successfully login and redirect to home dashboard, which is correct as expected output.



Figure 8.0f: Test case 6 for function 1
- **Test Case 7:** To test reset password, and user should be receiving email and able to change the account password.
- **Test Plan 7:** Provide email (kexin01@1utar.my) in the Reset Password interface and click "Send".
- **Test Result 7:** Email is received and able to reset the password, which is correct as expected output.

	\leftarrow	¥		\square	:	🕑 bgbr	o-cbe92.fireb	aseapp.com	n//auth/action	o ()
-M/•	Reset your pa BGBP accoun	ssword t ^{Inbox}	for		☆	Rese	et your p	assword	1	
ВСВР	BGBP 11:16 F to me ~	PM		4	:	fo r ke New pa 66666	xin01@1u ssword 56	tar.my		8
Reset Password Stave the second with hink provided to the second with neuron with the second withe second with the second withe second with t	Hello, Follow this link to reset kexin01@1utar.my acc https://bgbp-cbe92.fire mode-resetPassword8 Z2Jq3pMzgs7ewdlu8A HyUkxh0AAAGHs9YJE(XT8tUUkb20IY2XXDF0 If you didn't ask to rese ignore this email. Thanks, Your BGBP team	your BGBP ount. baseapp.co coobCode=[IP5d1_ 2&apiKey=A kqNEZaBP} t your pass	passwo m//ar 0-8r5v10 lizaSyCo c1E&lan word, yo	ord for y uth/acti fLAU_ kk_ g=en u can	our				SAV	E
1 and the second	← Reply ≪	n Reply all	A	Forwa	ard					
	Available add-ons:			(9	\leftarrow	\rightarrow	合	1	÷

Figure 8.0g: Test case 7 for function 1

Function 2: Home dashboard

- **Test Case 1:** To test if selecting the date which contains records, the dashboard will be showing a line chart for blood glucose level and bar charts for blood pressure levels.
- Test Plan 1: Choose date (2022-12-05) from date picker.
- **Test Result 1:** Line graph and bar charts are displayed in the home dashboard. The function is working well.



Figure 8.1a: Test case 1 for function 2

- **Test Case 2:** To test if selecting the date which does not contain any records, the dashboard will not be showing line chart for blood glucose level and bar charts for blood pressure levels.
- Test Plan 2: Choose date (2023-04-24) from date picker.
- **Test Result 2:** A toast message "No data is found for this day" is displayed and no charts are displayed in the home dashboard. The function is working well.



Figure 8.1b: Test case 2 for function 2

- **Test Case 3:** To test if selecting the date which contains blood glucose data that has exceeded the limit (10.5), the dashboard will be showing an alert message dialog box.
- Test Plan 3: Choose date (2022-12-23) from date picker.
- Test Result 3: An alert message is displayed. The function is working well.



Figure 8.1c: Test case 3 for function 2

Function 3: Add record

- **Test Case 1:** To test if leaving all textboxes blank, the record will not be saved into database.
- Test Plan 1: Leave all textboxes empty and click "Save".
- **Test Result 1:** A toast message "Please fill in data" is displayed and the function did not save any records into database. The function is working well.

Digi Wi-Fi 🏧 🔐 😤	竣 🕅 ≉47% ■□+ 12:11				
← Ad	Add Record				
DATE	TIME				
Enter Date	Enter Time				
BLOOD GLUCOS	E (mmol/L)				
Between 3.0 to	o 15.0				
SYSTOLIC (mml	Hg)				
Between 100	to 180				
DIASTOLIC (mm	iHg)				
Between 60 to	120				
CATEGORY					
Before breakfas	st				
REMARKS*					
Enter remark i	fany				
Plea	SAVE se fill in data				

Figure 8.2a: Test case 1 for function 3

- **Test Case 2:** To test if entering incorrect range for blood glucose data, the record will not be saved into database.
- Test Plan 2: Enter (2) for blood glucose data, enter other data and click "Save".
- **Test Result 2:** An error message that mentioning "Cannot less than 3.0 or exceed 15.0" is displayed and the function did not save the record into database. The function is working well.

Digi Wi-Fi 🗰 📶 🔶	\$\ \$	47% 💷) 12:1		
Add Record				
DATE	TIME			
2023-04-25	0.12			
BLOOD GLUCOS	E (mmol/L)			
2				
SYSTOLIC Canne	ot less than 3.0 or	exceed 15.0		
120				
DIASTOLIC (mm	nHg)			
80				
CATEGORY				
Others				
REMARKS*				
Enter remark i	f any			
ы	SAVE			
\triangleleft	0 🗆			

Figure 8.2b: Test case 2 for function 3

- **Test Case 3:** To test if entering incorrect range for systolic data, the record will not be saved into database.
- Test Plan 3: Enter (50) for systolic data, enter other data and click "Save".
- **Test Result 3:** An error message that mentioning "Cannot less than 100 or exceed 180" is displayed and the function did not save the record into database. The function is working well.

Digi Wi-Fi 🕬	al 🗟	😺 🕅 巻47% 💷) 12:1			
÷	Add Record				
DATE	T	IME			
2023-04	-25 0).12			
BLOOD GI	LUCOSE (m	mol/L)			
5					
SYSTOLIC	C (mmHg)				
50					
DIASTOL	Cannot less	than 100 or exceed 180			
80					
CATEGOR	Y				
Others					
REMARKS	S*				
Enter rer	mark if any	/			
	S/	AVE			
<	0				

Figure 8.2c: Test case 3 for function 3

- **Test Case 4:** To test if entering incorrect range for diastolic data, the record will not be saved into database.
- Test Plan 4: Enter (150) for diastolic data, enter other data and click "Save".
- **Test Result 4:** An error message that mentioning "Cannot less than 60 or exceed 120" is displayed and the function did not save the record into database. The function is working well.

Digi Wi-Fi 🗰 📶 😤	☞ 🕅 🟶 47% 💷) 12	:13		
Add Record				
DATE	TIME			
2023-04-25	0.12			
BLOOD GLUCOS	E (mmol/L)			
SYSTOLIC (mmH	lg)			
122				
DIASTOLIC (mml	Hg)			
CATEGOR Canno Others	ot less than 60 or exceed 1:	20		
REMARKS*				
Enter remark if	any			
8	SAVE			
4	0 🗆			

Figure 8.2d: Test case 4 for function 3

- **Test Case 5:** To test if entering all data in the textboxes except remarks, the record will be stored into database.
- Test Plan 5: Select date, time from date time picker, enter relevant data (5, 122, 85) for blood glucose and blood pressure readings, select category (Others) from spinner and click "Save".
- **Test Result 5:** The function has successfully saved the record into database. The function is working well.

afi 🚥 🔐 🕾 🖏 🕸 🕅 🏄	47% 💶 I 12:14	Digi Wi-Fi 🔤 🔐 🤶	: † N
Add Record		← А	dd Record
TIME		DATE	TIME
-25 0.12	_	Enter Date	Enter Tin
JCOSE (mmol/L)		BLOOD GLUCO	DSE (mmol/L)
		Between 3.0	to 15.0
(mmHg)		SYSTOLIC (m	mHg)
		Between 10	0 to 180
C (mmHg)		DIASTOLIC (m	ımHg)
		Between 60	to 120
,		CATEGORY	
		Others	
*		REMARKS*	
iark if any	_	Enter remark	k if any
SAVE		(-1	SAVE Record saved
0 П		<	0

Figure 8.2e: Test case 5 for function 3

Function 4: Food detection & nutrition details with healthiness level displayed

- **Test Case 1:** To test the food image uploaded from device can be detected and the relevant food nutrition details with healthiness level are displayed.
- Test Plan 1: Click "Load Image" and choose food image from device.
- **Test Result 1:** The food name is output and showing its nutrition details and healthiness level. The function is working well.



Figure 8.3a: Test case 1 for function 4

- **Test Case 2:** To test the food image captured from device can be detected and the relevant food nutrition details with healthiness level are displayed.
- Test Plan 2: Click "Capture Image" and take food photo.
- **Test Result 2:** The food name is output and showing its nutrition details and healthiness level. The function is working well.



Figure 8.3b: Test case 2 for function 4

- **Test Case 3:** To test the generated output can be linked to Google search by clicking the food name to view its nutrition information.
- Test Plan 3: Click "Capture Image", take a food photo and click on the food name.
- **Test Result 3:** The food name is output but there is no available food database. Google search is linked to show its nutrition details after clicking the food name.



Figure 8.3c: Test case 3 for function 4

- **Test Case 4:** To test the search feature for viewing food nutrition information and healthiness level.
- Test Plan 4: Enter food name, find from the list and click the food name.
- **Test Result 4:** The relevant food nutrition details and healthiness level are shown. The function is working well.

	Digi Wi-Fi 🛲 🚛 🛜 🧿 🕥	窗 🕅 参77% 💷) 6:32	Digi Wi-Fi 🕅 🚮 😤 🗘 🛇	@₿*77%	6:32
	ц	×	Food Nutritic	on Details	
	Coconut rice		Food: Fried rice		
1	Fried rice		Serving Size	1 howl (22	7a)
	Hainanese chicken rice		Colorioo	1 DOWI (22)	<u>'y)</u>
			Calories	411	01 DV
	Onion ring				%DV
			Total Fat	12g	15
			Saturated Fat	2.5g	12
			Trans Fat	Og	<u> </u>
			Cholesterol	40.9mg	14
			Sodium	1150.9mg	50%
			Total Carbohydrate	64g	21%
		right	Dietary Fiber	2g	7%
	+ ei ii	ngnt	Total Sugars	2g	4
	1 2 3 4 5 6	7 8 9 0	Added Sugars	Og	-
	% ^ ~ I I]	< > { }	Protein	13g	26%
	q w e r t y	u i o p	Vitamin C	9.1mg	10%
	@ # & * · a s d f a	+ = () h i k I	Iron	2.7mg	15%
			Calcium	79.5mg	6%
	Image: Application of the second s	b n m 🛛	Food healthines	s: Moderate	
			0		

Figure 8.3d: Test case 4 for function 4

Function 5: Reminder on medication

- **Test Case 1:** To test if leaving all textboxes blank, the medication record will not be saved into database and the reminder will not be generated.
- Test Plan 1: Leave all textboxes empty and click "Add".
- **Test Result 1:** A toast message "Please fill in data" is displayed and the function did not save any records into database and did not generate the reminder as well. The function is working well.



Figure 8.4a: Test case 1 for function 5

- **Test Case 2:** To test if entering details into all textboxes provided, the medication record will be saved into database and the reminder will be received by user.
- **Test Plan 2:** Fill in details (test1, turn on reminder, date, time, allow repetition for every 2 minutes) and click "Add".
- **Test Result 2:** The function has successfully saved the record into database and generated the reminder. Reminder message can be received every 2 minutes. The function is working well.



Figure 8.4b: Test case 2 for function 5

- Test Case 3: To test if the modification of record can be performed in the feature.
- Test Plan 3: Change from "mec1" to "mec2", click "Save" and confirm to modify by clicking "Yes".
- Test Result 3: It is successfully edited. The function is working well.



Figure 8.4c: Test case 3 for function 5

- Test Case 4: To test if the deletion of record can be performed in the feature.
- Test Plan 4: Confirm to delete by clicking "Yes".
- Test Result 4: It is successfully deleted. The function is working well.



Figure 8.4d: Test case 4 for function 5

Function 6: Monthly statistics

- **Test Case 1:** To test if the selected month which do not contain any records will not display any graphs and statistics for both blood glucose and blood pressure levels.
- Test Plan 1: Select month from date picker (February \rightarrow 2023-02).
- **Test Result 1:** A toast message "No data is found for this month" is displayed and no charts are shown in the interface, as well as the values of zero are displayed for the lowest, highest and average readings. The function is working well.

Dig Wi-Fi 📷 🔐 중. 😻 🔃 \$94% 🖦 1:38	Digi Wi-Fi 🛅 🔐 📚 🍪 🖏 🕸 94% 🖦 1:38
← Monthly Statistics	← Monthly Statistics
2023-02	Blood Pressure Statistic
Blood Glucose Statistic	
	No chart data available.
No chart data available.	
	Systolic:
Lowest Highest Average	Lowest Highest Average
0.0 0.0 0.0	0 0 0
No data is found for this month	Diastolic:
	Lowest Highest Average

Figure 8.5a: Test case 1 for function 6

- **Test Case 2:** To test if the selected month which contain records will display a scatter chart with statistics for blood glucose level and also a multi-line chart with statistics for blood pressure level.
- Test Plan 2: Select month from date picker (December \rightarrow 2022-12).
- **Test Result 2:** Scatter chart, multi-line chart and statistics for both blood glucose and blood pressure levels of the month are shown in the interface. The function is working well.



Figure 8.5b: Test case 2 for function 6

Function 7: Report generator

- **Test Case 1:** To test if the selected date range and category which do not contain any records will not generate PDF report into the device.
- **Test Plan 1:** Select date range from date picker (from 2023-03-01 to 2023-03-31), select category (Before breakfast) and click "Download".
- **Test Result 1:** A toast message "No data available" is displayed and no PDF report is generated. The function is working well.

Digi Wi-Fi 🚾 🔐 😚	ŝ	谜 🕅 券63% 💌 8:23				
← Repo	ort Genei	rator				
Fill in the details below to download a report:						
2023	-03-01					
2023	-03-31					
Select Category:	Before br	eakfast 💌				
DO	WNLOAD	⊻				
N	o data availab	le				
\triangleleft	0					

Figure 8.6a: Test case 1 for function 7

- **Test Case 2:** To test if the selected date range and category which contain records will generate PDF report into the device.
- Test Plan 2: Select date range from date picker (from 2022-12-01 to 2022-12-31), select category (All) and click "Download".
- **Test Result 2:** A PDF report is generated into the device's internal storage with the correct data. The function is working well.

Digi Wi-Fi 🚥 📶 ରି 📽 🖨 🕒 🛛 🍪 🕅 🕸 77% 💷 6:35	C	Digi Wi-Fi 🏧 🔐 🗟 🕊 🛛 🛇	☞ 🕅 券77% 🔳	0 6:35	Dig	i Wi-Fi wiifi ,	al ≅ ≇ 0 (9 X	₺ 🕅 券 77%	6:35
← Report Generator	\leftarrow	Internal storage	Q	:	\leftarrow	2023-	04-20 1	8:	0	A :
Fill in the details below to download a report:	Catego	ories > Internal storage 🔅	×							
1	L	2023-04-20 18:35:18	.pdf	5						
2022-12-01		2023/4/20 18:35:34 2.1	5 KB	-			BGBP F	EPORT		
	L	2023-04-14 19:25:45	.pdf				proce officient as pr	ood Pressile Records		
2022-12-31		2023/4/14 19:26:15 2.1	5 KB	_	DATE	TIME	BLOOD GLUCOSE	SYSTOLIC (mmHs)	DIASTOLIC	CATEGORY
Select Category: All		2023-04-05 15:10:41	ndf		2022 12 04	0.30	(mmol/L)	110		Reference
ociect outegoly. All	A	2023/4/5 15:10:48 1 48	KB		2022.12.05	10.15	45	120	50	After breakfast
	-	2023/4/3 13:10:40 1:40	ND .		2022.12.06	10.30	4.5	120	80	After breakfast
					2022-12-06	14.00	4.6	120	80	After lunch
	L	2023-03-22 00:12:14	.pdf	-	2022-12-07	8.08	4.2	120	80	Before breakfast
DOWNLOAD 🛨	-	2023/3/22 00:12:33 2.3	1 KB		2022-12-23	12.48	10.5	125	85	Before lunch
					2022-12-23	12.53	8	120	80	Others
		2023-03-22 00:07:58	ndf		2022-12-23	12.56	11.1	129	86	Others
	A	2022/2/22 00:09:12 2 2	1 KB		2022-12-26	15.16	4.5	120	80	After lunch
	٨	2023-03-22 00:06:33 2023/3/22 00:06:42 1.5	pdf 6 KB							BGBP
	r	Sample.pdf 2023/3/21 23:46:36 1.8	2 КВ							
	?	QTAudioEngine 2021/9/23 16:02:23 280	B							
	e vCard	00001.vcf 2019/10/26 14:56:43 0	В		ILTO Report					Pp-1
		libs		>						
\triangleleft \bigcirc \Box		0				\triangleleft	C)		

Figure 8.6b: Test case 2 for function 7

Function 8: History records

- **Test Case 1:** To test if after applied date range and category filter, the feature is able to display the relevant records.
- Test Plan 1: Select date from date picker (from 2023-04-01 to 2023-04-20), select category (All) and click 'Apply'.
- **Test Result 1:** Able to display the correct records based on the filters applied. The function is working well.



Figure 8.7a: Test case 1 for function 8

- **Test Case 2:** To test if after applied date range and category filter which do not contain any records, the feature will not display any records in the interface.
- Test Plan 2: Select date from date picker (from 2023-03-01 to 2023-03-16), select category (After lunch) and click 'Apply'.
- **Test Result 2:** The feature did not display the records and only show a toast message "No data exists". The function is working well.



Figure 8.7b: Test case 2 for function 8

- Test Case 3: To test if the modification of record can be done in the feature.
- **Test Plan 3:** Select the specific record, change value (from 80 to 84), click "Update" and click "Yes" to confirm.
- Test Result 3: The record has been successfully edited, the feature is working well.

	Digi Wi-Fi 🔤 🔐 🛠 🗭 😒 🐞 🕅 🗞 76% 🔲 i 6:36
Modify/Delete Record	Modify/Delete Record
DATE TIME	DATE TIME
2023-04-20 18.27	2023-04-20 18.27
BLOOD GLUCOSE (mmol/L)	BLOOD GLUCOSE (mmol/L)
4.6	4.6
SYSTOLIC (mmHg)	SYSTOLIC (mmHg)
120	120
DIASTOLIC (mmHg)	DIASTOLIC (mmHg)
80	84
CATEGORY	CATEGORY
Before dinner	Before dinner
REMARKS*	REMARKS*
Enter remark if any	Enter remark if any
=> UPDATE DELETE	=> OPDATE DELETE
Digi Wi-Fi 🏧 📶 ରି 单 🗘 🙆 🐼 🕲 *76% 🗩 6:36	Dgi Wi-Fi 🚥 내 ର 🕊 🗗 🕒 🛛 🐼 🕅 ※76% 🗩 6:36
Modify/Delete Record	← View History Records
	2023-04-01 2023-04-20
	Select Category: All
2023-04-20 18.27	
2023-04-20 18.27	
2023-04-20 18.27 BLOOD GLUCOSE (mmol/L)	APPLY Y
2023-04-20 18.27 BLOOD GLUCOSE (mmol/L) 4.6	APPLY T Date: 2023-04-05 Time: 15.09
2023-04-20 18.27 BLOOD GLUCOSE (mmol/L) 4.6	APPLY T Date: 2023-04-05 Time: 15.09 Glucose level: 5.5 Systemic level: 120
2023-04-20 18.27 BLOOD GLUCOSE (mmol/L) 4.6 Edit Record	APPLY Y Date: 2023-04-05 Time: 15.09 Glucose level: 5.5 Systolic level: 120 Diastolic level: 80
2023-04-20 18.27 BLOOD GLUCOSE (mmol/L) 4.6 Edit Record Are you sure to update this record?	APPLY Y Date: 2023-04-05 Time: 15.09 Glucose level: 5.5 Systolic level: 120 Diastolic level: 80
2023-04-20 18.27 BLOOD GLUCOSE (mmol/L) 4.6 Edit Record Are you sure to update this record?	APPLY T Date: 2023-04-05 Time: 15.09 Glucose level: 5.5 Systolic level: 120 Diastolic level: 80 Date: 2023-04-20 Time: 18.27
2023-04-20 18.27 BLOOD GLUCOSE (mmol/L) 4.6 Edit Record Are you sure to update this record? NO YES CALEGORY	APPLY Y Date: 2023-04-05 Time: 15.09 Glucose level: 5.5 Systolic level: 120 Diastolic level: 80 Date: 2023-04-20 Time: 18.27 Glucose level: 4.6
2023-04-20 18.27 BLOOD GLUCOSE (mmol/L) 4.6 Edit Record Are you sure to update this record? NO YES CATEGORY Before dinner	APPLY T Date: 2023-04-05 Time: 15.09 Glucose level: 5.5 Systolic level: 120 Diastolic level: 80 Date: 2023-04-20 Time: 18.27 Glucose level: 4.6 Systolic level: 4.6 Systolic level: 120 Diastolic level: 84
2023-04-20 18.27 BLOOD GLUCOSE (mmol/L) 4.6 Edit Record Are you sure to update this record? NO YES CATEGORY Before dinner REMARKS*	APPLY Y Date: 2023-04-05 Time: 15.09 Glucose level: 5.5 Systolic level: 120 Diastolic level: 80 Date: 2023-04-20 Time: 18.27 Glucose level: 4.6 Systolic level: 120 Diastolic level: 84
2023-04-20 18.27 BLOOD GLUCOSE (mmol/L) 4.6 Edit Record Are you sure to update this record? ND YES CATEGORY Before dinner REMARKS* Enter remark if any	APPLY T Date: 2023-04-05 Time: 15.09 Glucose level: 5.5 Systolic level: 120 Diastolic level: 80 Date: 2023-04-20 Time: 18.27 Glucose level: 4.6 Systolic level: 4.6 Systolic level: 120 Diastolic level: 84
2023-04-20 18.27 BLOOD GLUCOSE (mmol/L) 4.6 Edit Record Are you sure to update this record? NO YES CATEGORY Before dinner REMARKS* Enter remark if any	APPLY T Date: 2023-04-05 Time: 15.09 Glucose level: 5.5 Systolic level: 120 Diastolic level: 80 Date: 2023-04-20 Time: 18.27 Glucose level: 4.6 Systolic level: 120 Diastolic level: 120 Diastolic level: 84
2023-04-20 18.27 BLOOD GLUCOSE (mmol/L) 4.6 Edit Record Are you sure to update this record? NO YES CATEGORY Before dinner REMARKS* Enter remark if any F= UPDATE DELETE	APPLY Y Date: 2023-04-05 Time: 15.09 Glucose level: 5.5 Systolic level: 120 Diastolic level: 80 Date: 2023-04-20 Time: 18.27 Glucose level: 4.6 Systolic level: 120 Diastolic level: 120 Diastolic level: 84
2023-04-20 18.27 BLOOD GLUCOSE (mmol/L) 4.6 Edit Record Are you sure to update this record? NO YES CATEGORY Before dinner REMARKS* Enter remark if any JUPDATE DELETE	APPLY Y Date: 2023-04-05 Time: 15.09 Glucose level: 5.5 Systolic level: 120 Diastolic level: 80 Date: 2023-04-20 Time: 18.27 Glucose level: 4.6 Systolic level: 120 Diastolic level: 84
2023-04-20 18.27 BLOOD GLUCOSE (mmol/L) 4.6 Edit Record Are you sure to update this record? NO YES CATEGORY Before dinner REMARKS* Enter remark if any UPDATE DELETE	APPLY T Date: 2023-04-05 Time: 15.09 Glucose level: 5.5 Systolic level: 120 Diastolic level: 80 Date: 2023-04-20 Time: 18.27 Glucose level: 4.6 Systolic level: 120 Diastolic level: 84
2023-04-20 18.27 BLOOD GLUCOSE (mmol/L) 4.6 Edit Record Are you sure to update this record? NO YES CATEGORY Before dinner REMARKS* Enter remark if any J UPDATE DELETE	APPLY T Date: 2023-04-05 Time: 15.09 Glucose level: 5.5 Systolic level: 120 Diastolic level: 80 Date: 2023-04-20 Time: 18.27 Glucose level: 4.6 Systolic level: 120 Diastolic level: 84

Figure 8.7c: Test case 3 for function 8

- Test Case 4: To test if the deletion of record can be done in the feature.
- Test Plan 4: Select the specific record, click "Delete" and select "Yes".
- Test Result 4: The record has been successfully removed, the feature is working well.



Figure 8.7d: Test case 4 for function 8

Function 9: Firebase Cloud Messaging (FCM) push notification

- Test Case 1: To test if a scheduled push notification will be sent to user.
- **Test Plan 1:** Observe notification in the device at 3pm (GMT+08:00).
- Test Result 1: Able to receive the reminder FCM push notification.



Figure 8.8: Test result 1 for function 9

Function 10: Logout

- Test Case 1: To test if the user remains in the system when choose not to log out.
- Test Plan 1: Click 'Logout' and select 'No'.
- **Test Result 1:** Able to remain in the system after selecting 'No' in confirmation dialog box as shown in figure below. The function is working well.

← More Options	← More Options
Reminder on Medication	Reminder on Medication
Monthly Statistics	Monthly Statistics
Report Generator	Report Generator
Logout 2 Are you sure to logout?	History Records
NO YES	Logout
< 0 □	

Figure 8.9a: Test result 1 for function 10

- **Test Case 2:** To test if the account can be successfully signed out and redirect user to login interface.
- Test Plan 2: Click 'Logout' and select 'Yes'.
- **Test Result 2:** Able to logout after selecting 'Yes' in confirmation dialog box and redirect back to login interface as shown in figure below. The function is working well.



Figure 8.9b: Test result 2 for function 10

Based on the system testing conducted, all the functionalities developed for the mobile application are working properly. Hence, the objectives of the project have been successfully achieved. The mobile platform has been developed to check and monitor blood glucose and blood pressure levels and the food recognition technology has been implemented to display food nutrition details and food healthiness level. The application is also enhanced with several additional features such as reminder on medication, report generator and etc.

6.3 Challenges and Issues

This project is utilized Firebase Realtime Database to store multiple set of data such as medication records, blood glucose records and food nutrition information. The main limitation of this project is related to the storage space provided by Firebase database as it only offers up to 1GB of data storage for the no-cost plan. Therefore, there is a limited amount of storage available for the food database which contains various type of food nutrition details as well as for other records that need to be saved into the Firebase database. This may cause problems in the future when the amount of data in the Firebase database have exceeded the available storage space. The mobile application may not be able to store additional data such as updating new nutrition details of new food and error may occur when user is trying to save records into the database.

Furthermore, another limitation of the project is the availability of Asian food databases. As the food nutrition data sources in this project are mainly from USDA Food Data Central and Nutritionix, these databases are having limited information on Asian food nutrition. Both sources are mostly focused on Western food nutrition information. Hence, the nutrition details for Asian food like Malaysian cuisine such as 'lemang' and 'roti jala', are unavailable from the databases. This lead to an incomplete of nutrition information for a variety of Asian food in this project.

Besides, the food recognition model used in the project has several limitations. It is not efficient in detecting different types of noodles such as 'hokkien mee', 'mee goreng', 'pan mee' and etc., as well as desserts such as cakes and bread. The model has difficulty in differentiating between various types of cakes, such as marble cake, fruit cake, layer cake and tiramisu. Its accuracy is limited when detecting multiple dishes in a single food image. It is also incapable of detecting beverage or drinks (desserts) such as bubble tea, 'bubur cha cha', green bean soup and so on and it cannot identify fruits as well. Moreover, the model struggles to identify some types of Asian food, such as Malaysian dishes like 'roti canai', 'roti paratha', 'nasi biryani', 'nasi kandar', 'laksa' and 'rojak'. However, the model is still able to detect Asian food well such as 'char kway teow', 'chicken curry', 'nasi lemak', 'dumpling' and so on although the model is mainly capable of detecting Western dishes.

Chapter 7 Conclusion and Recommendation

7.1 Conclusion

BGBP is a self-management mobile application mainly designed for diabetic. This is to allow diabetes patients to monitor and keep track on their blood glucose level and improve their awareness on the nutrition intake from food. This application consists of several functions such as adding blood glucose and blood pressure record, monitor both levels in graph-view, food recognition feature with nutrition facts label displayed, reminder on medication, generate report, view monthly statistics and history records.

User is able to view the line-chart and bar-chart for daily blood glucose and blood pressure level, as well as enable zooming and scrolling on the graphs. Firebase software is mainly utilized to develop this application for storing and retrieving all the records. Besides, user is allowed to input data in the add-form provided as well as checking the past records in list-view. Any modification and deletion of records will be updated instantly in Firebase Realtime Database. Moreover, this mobile application has included some Android built-in functions such as DatePickerDialog, TimePickerDialog, AlarmManager, BroadcastReceiver and so on for the reminder on medication feature. Push notification will be sent to remind user to take medicine.

In addition, user is able to view the overall blood glucose level per day through the scatter chart and blood pressure level in a multi-line graph in the application. The information of the lowest, highest and average readings for the specific month are also provided. User is allowed to download PDF report into device that acts as future reference for medical consultation. Most importantly, by using food recognition technology, the mobile application displays the relevant nutrition information such as total sugars, saturated fat, protein and etc. with the food healthiness level provided along. This increases user's awareness of nutrition intake and also helps in encouraging healthier food consumption.

7.2 **Recommendations and Future Work**

To deal with the limitation of storage space in the project that is mentioned earlier, Firebase Cloud Firestore can be utilized for storing food database only, which consisting various types of food nutrition information such as calories, total fat, saturated fat, total sugars, each %DV and etc. Cloud Firestore is another service provided by Firebase and it is highly scalable compared to Realtime Database. As the food database is considered as large amounts of structured data, hence this service can be useful for handling the food database and it also provides flexible data model and automatic scaling function. The limit of storage space provided by Cloud Firestore for the no-cost plan is 1GiB, which is slightly larger than Realtime Database. It offers a "pay-as-you-go" pricing model which is only pay for the additional resources that are used after exceeding the free capacity.

Besides, to deal with the Asian food nutrition information, this project can be considered to collaborate with Food Science experts and dietitians to work on it. It is because they have rich knowledge on food nutrition and expertise in it. Hence, this can help to obtain more comprehensive nutrition details and ensure completeness of information in the food database. Also, users of the application can also help in contributing the information by giving feedback on the missing food details. Another approach to increase the food nutrition details into the food database is to implement web scraping technique. This can be done during the process when the user is redirected to Google quick search, showing the relevant food nutrition information if there is no food details available in the existing food database. The information from Google search results can be obtained by using web scraping technique and extract it to write into the existing food database to increase its coverage.

In order to have a more advanced food recognition model, developing a custom model can be considered. For instance, focus on training the model with a dataset of Asian food images. Not only that, fruits and drinks dataset can also be included as well. So that the custom food recognition model can be highly specialized for the project's usage. Lastly, there is a potential future enhancement for this project which is to integrate with CGM (continuous glucose monitoring) devices into the mobile application. This can bring convenience to users as it is able to capture the blood glucose level measurements automatically to the mobile application

and users do not need to manually input the data anymore. However, this function will require extra effort in developing and partnership with the device manufacturers.

REFERENCES

- [1] L. Barhum and B. Sissons, "Diabetes and hypertension: Connection, Complications, risks," *Medical* News Today. [Online]. Available: https://www.medicalnewstoday.com/articles/317220. [Accessed: 22-Aug-2022].
- [2] "What is diabetes?," Centers for Disease Control and Prevention, 07-Jul-2022. [Online]. Available: https://www.cdc.gov/diabetes/basics/diabetes.html. [Accessed: 24-Aug-2022].
- [3] S. Veazie, K. Winchell, J. Gilbert, R. Paynter, I. Ivlev, K. Eden, K. Nussbaum, N. Weiskopf, J.-M. Guise, and M. Helfand, "Mobile health applications for self-management of diabetes," 2018.
- [4] "The First-ever Malaysian Diabetes Index Survey Uncovers Awareness Gaps on Diabetes Amongst Malaysians," *AstraZeneca*, 15-Jun-2021. [Online]. Available: https://www.astrazeneca.com/country-sites/malaysia/press-releases/the-first-evermalaysian-diabetes-index-survey-uncovers-awareness.html. [Accessed: 22-Aug-2022].
- [5] A. S. Bhagavathula, E. A. Gebreyohannes, T. M. Abegaz, and T. B. Abebe, "Perceived obstacles faced by diabetes patients attending University of Gondar Hospital, Northwest Ethiopia," *Frontiers in Public Health*, vol. 6, 2018.
- [6] MS International, "Diabetes diary blood glucose tracker apps on Google Play," Google Play.
 [Online]. Available: https://play.google.com/store/apps/details?id=com.msint.bloodsugar.tracker&hl=en&gl =US. [Accessed: 06-Jul-2022].
- [7] Azumio, Inc., "Glucose buddy diabetes tracker apps on Google Play," Google Play.
 [Online]. Available: https://play.google.com/store/apps/details?id=com.skyhealth.glucosebuddyfree&hl=en &gl=US. [Accessed: 06-Jul-2022].

[8] H2 Inc., "Health2Sync - diabetes care - apps on Google Play," Google Play. [Online]. Available:

https://play.google.com/store/apps/details?id=com.h2sync.android.h2syncapp&hl=en &gl=US. [Accessed: 06-Jul-2022].

- [9] Sirma Medical Systems, "Diabetes:M blood sugar diary apps on Google Play," Google Play.
 Play.
 [Online].
 Available:
 https://play.google.com/store/apps/details?id=com.mydiabetes&hl=en&gl=US.
 [Accessed: 06-Jul-2022].
- [10] apptech_Infotech, "MySugar: Track blood sugar, blood pressure apps on Google Play," Google Play. [Online]. Available: https://play.google.com/store/apps/details?id=com.appworld.bloodglucosetracker&hl =en&gl=US. [Accessed: 07-Jul-2022].
- [11] Leap Fitness Group, "Blood pressure monitor apps on Google Play," Google Play. [Online]. Available: https://play.google.com/store/apps/details?id=bloodpressuremonitor.bloodpressureapp .bpmonitor&hl=en&gl=US. [Accessed: 07-Jul-2022].
- [12] Health & Fitness AI Lab, "Blood pressure diary apps on Google Play," Google Play.
 [Online]. Available: https://play.google.com/store/apps/details?id=com.bluefish.bloodpressure. [Accessed: 07-Jul-2022].
- [13] E. Molodkin, "Undermyfork: Diabetes app apps on Google Play," Google Play. [Online]. Available:

https://play.google.com/store/apps/details?id=com.undermyfork.diabetes&hl=en&gl= US. [Accessed: 08-Jul-2022].

- [14] No Sugar Company Limited, "No sugar in me apps on Google Play," Google Play. [Online]. Available: https://play.google.com/store/apps/details?id=com.nosugar&hl=en&gl=US. [Accessed: 09-Jul-2022].
- [15] V. K. G., P. Vutkur, and V. P., "Food classification using transfer learning technique," Global Transitions Proceedings, vol. 3, no. 1, pp. 225–229, 2022.
- [16] N. Jamil, S. R. Roslan, R. Hamzah, and I. Ramli, "Food recognition of Malaysian meals for the management of Calorie Intake," International Journal of Advanced Trends in Computer Science and Engineering, vol. 8, no. 1.6, pp. 355–360, 2019.

Bachelor of Computer Science (Honours)

Faculty of Information and Communication Technology (Kampar Campus), UTAR

- [17] Tensorflow hub. [Online]. Available: https://tfhub.dev/google/litemodel/aiy/vision/classifier/food_V1/1. [Accessed: 21-Nov-2022].
- [18] USDA Fooddata Central. [Online]. Available: https://fdc.nal.usda.gov/index.html. [Accessed: 13-Apr-2023].
- [19] "Nutritionix Database," *Nutritionix*. [Online]. Available: https://www.nutritionix.com/database/common-foods. [Accessed: 13-Apr-2023].
- [20] Center for Food Safety and Applied Nutrition, "The lows and highs of Percent Daily Value on the label," U.S. Food and Drug Administration. [Online]. Available: https://www.fda.gov/food/new-nutrition-facts-label/lows-and-highs-percent-dailyvalue-new-nutrition-facts-label. [Accessed: 14-Apr-2023].

APPENDIX

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y3T3

Study week no.: 1 & 2 Student Name & ID: Chew Ke Xin (19ACB03038)

Supervisor: Dr Chai Meei Tyng

Project Title: BGBP – A Mobile Application For Diabetic Self-Management

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

- 1) History Record feature: add new filter option (allow user to select category options)
- 2) Add new feature on home dashboard (suggested by moderator during FYP1 presentation) -alert message to user if the daily blood glucose has exceeding value of 10.5 reading

2. WORK TO BE DONE

Implement 'Monthly Statistics' feature.

3. PROBLEMS ENCOUNTERED

4. SELF EVALUATION OF THE PROGRESS

Need to rush for other functions implementation.

,	
tyng	
<u> </u>	
Supervisor's signature	

Ohe

Student's signature
(Project II)

Study week no.: 3

Trimester, Year: Y3T3

Student Name & ID: Chew Ke Xin (19ACB03038)

Supervisor: Dr Chai Meei Tyng

Project Title: BGBP – A Mobile Application For Diabetic Self-Management

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

1) Monthy Statistics feature:

-set DatePickerDialog and try to retrieve data from database

-try insert into DataPoint to plot charts for both blood glucose and blood pressure readings

-tried few types of graphs and decided to use scatter chart for showing overall blood glucose data per day and use multi-line graph for blood pressure data

-code for finding the lowest, highest and calculation of average readings

2. WORK TO BE DONE

_

Develop food recognition with nutrition details function

3. PROBLEMS ENCOUNTERED

4. SELF EVALUATION OF THE PROGRESS

Project implementation is on track.

Supervisor's signature

Openo

Student's signature

(Project II)

Trimester, Year: Y3T3

Study week no.: 4 & 5 Student Name & ID: Chew Ke Xin (19ACB03038)

Supervisor: Dr Chai Meei Tyng

Project Title: BGBP – A Mobile Application For Diabetic Self-Management

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

1) Setup food database in Firebase database

-plan for data structure with a total of 27 attributes needed

2) Design UI for nutrition table with showing those attributes and their %DV

3) Import the food recognition model into Android Studio and design the interface (allow capture photo and load image from device)

4) Try to test the model with various type of food to get output (food name)

2. WORK TO BE DONE

Extract food nutrition details from data sources and write into own database

3. PROBLEMS ENCOUNTERED

Found that the model is not very effective in detecting all types of Asian food (some Malaysian cuisine), differentiating variety of cakes.

4. SELF EVALUATION OF THE PROGRESS

A bit slow in progressing 'Food' feature.

<u>tyng</u> Supervisor's signature

Openo

Student's signature

(Project II)

Study week no.: 6, 7, 8 & 9

Trimester, Year: Y3T3

Student Name & ID: Chew Ke Xin (19ACB03038)

Supervisor: Dr Chai Meei Tyng

Project Title: BGBP – A Mobile Application For Diabetic Self-Management

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

- 1) extract food database from USDA and Nutritionix database and write into own database -browse through internet to get the common food list and Asian food list
- 2) thinking alternative methods to get access into database if the model cannot detect the food -did a combination of food recognition technology and also manual input in this feature -redesign and added new interface (list-view and search function)

-did another method: redirect user to Google quick search (to deal with unavailable food results in database)

- 3) did research on how to determine the food healthiness level
 - -research on %DV and study on that
- 4) find more food nutrition details to add into own database

2. WORK TO BE DONE

Implement 'Report Generator' function

3. PROBLEMS ENCOUNTERED

_

4. SELF EVALUATION OF THE PROGRESS

Project implementation is on track.

Supervisor's signature

Student's signature

Bachelor of Computer Science (Honours) Faculty of Information and Communication Technology (Kampar Campus), UTAR

(Project II)

Study week no.: 10

Trimester, Year: Y3T3

Student Name & ID: Chew Ke Xin (19ACB03038)

Supervisor: Dr Chai Meei Tyng

Project Title: BGBP – A Mobile Application For Diabetic Self-Management

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

1) Report Generator feature:

-implement with itextpdf library

-design the interface (date range and category filter)

-code for pdf margin, style, alignment etc.

-encounter issue in writing into PDF cells

-the file can be downloaded into device, but it shows empty table although it has successfully retrieve data from database

2. WORK TO BE DONE

Find out the issue that it cannot be written into pdf cells.

3. PROBLEMS ENCOUNTERED

The pdf report generated in the device shows empty table.

4. SELF EVALUATION OF THE PROGRESS

On track but need to debug the issue as soon as possible.

<u>tyng</u> Supervisor's signature

Chero

Student's signature

(Project II)

Trimester, Year: Y3T3

ar: Y3T3 Study week no.: 11

Student Name & ID: Chew Ke Xin (19ACB03038) Supervisor: Dr Chai Meei Tyng

Project Title: BGBP – A Mobile Application For Diabetic Self-Management

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

1) Report Generator feature:

-found out bug/error in writing data into ArrayList

-it always pass empty arraylist into function that is used to created pdf table

-solve the issue and re-code the structure to obtain data from database to pass it as a parameter into function

-add try-catch block into the code

2. WORK TO BE DONE

Finalize all features in the mobile application and start to write FYP report.

3. PROBLEMS ENCOUNTERED

_

4. SELF EVALUATION OF THE PROGRESS

Project implementation is on track.

A1 1.0	
1100	
V/	

<u>tyng</u> Supervisor's signature

Student's signature

POSTER

UNIVERSITI TUNKU ABDUL RAHMAN Faculty of Information and Communication Technology



BGBP

A mobile application for diabetic self-management

Nowadays, the number of diabetic in Malaysia is increasing drastically. This might lead to severe effects on health such as cardiovascular diseases, kidney failure, stroke and etc. Hence, the implementation of diabetic self-management mobile app is very beneficial in order to keep track on the blood glucose and blood pressure levels as well as to help in controlling the diet. +



%DV

OBJECTIVES

To provide a mobile platform for checking and monitoring blood glucose and blood pressure level.

- To implement the food recognition feature in diabetic self-management mobile application. (Nutrition facts label such as protein, cholesterol, sugar and etc. from the meal pictures will be displayed for improving user's awareness.)
- · To develop an improved diabetic selfmanagement application with food recognition technology and reminder on medication feature.



14

Bachelor of Computer Science (Honours) Faculty of Information and Communication Technology (Kampar Campus), UTAR

PLAGIARISM CHECK RESULT

Document Viewer			
Turnitin Originality Report			
Processed on: 25-Apr-2023 04:18 +08 10: 1955058764 Word Count: 10310 Submitted: 2	Similarity Index	Similarity by Source	2%
FYP2 report By Ke Xin Chew	2%	Publications: Student Papers:	196 196
include quoted include bibliography exclude small matches mode: [quickview (classic) report 🗸 print] downloa	d		
<1% match (Internet from 11-Feb-2023) https://www.researchgate.net/publication/282741510 Automatic Lecture Transcription Based on Discriminative Da	ta Selection for Light	ly Supervised Acoustic I	Model Training
<1% match (Internet from 29-Oct-2021) https://www.researchgate.net/publication/334743331_RICE_PLANT_DISEASE_CLASSIFICATION_USING_TRANSFER_L	EARNING OF DEEP C	ONVOLUTION NEURAL N	IETWORK
<1% match (Internet from 01-Aug-2017) https://www.gpo.gov/fdsys/okg/FR-2016-05-27/pdf/2016-11867.pdf			
<1% match (student papers from 22-Mar-2023) Submitted to Middle East College of Information Technology on 2023-03-22			
<1% match (Internet from 03-Feb-2023) https://mdpi-res.com/d_attachment/nutrients/nutrients-13-02850/article_deploy/nutrients-13-02850-v4.pdf?version=	1631502039		
<1% match (student papers from 09-Jan-2023) Submitted to Kingston University on 2023-01-09			
<1% match (Internet from 21-Nov-2022) http://uilis.unsyiah.ac.id			
<1% match (student papers from 02-Sep-2022) Submitted to Universiti Tunku Abdul Rahman on 2022-09-02			
<1% match (Internet from 30-Jul-2010) http://www.diabetes.org.uk			
<1% match (Internet from 18-Jan-2023) https://orbilu.uni.lu/bitstream/10993/53842/1/paper.pdf			
<1% match ("Food Labeling Compliance Review", Wiley, 2003) <u>"Food Labeling Compliance Review", Wiley, 2003</u>			
<1% match (Internet from 17-Jan-2023) http://eprints.utar.edu.my			
<1% match (Internet from 15-Jan-2023) https://github.com/Onurcan-Keskin/exovideo			
<1% match (Internet from 20-Feb-2022) http://www.4joursdedunkergue.org			
<1% match (Zhimian Zhang, Haipeng Wang, Feng Xu, Ya-Qiu Jin. "Complex-Valued Convolutional Neural Network and IEEE Transactions on Geoscience and Remote Sensing, 2017) This Theore Universe Meno, Sens Yu, Yo Qiu Na, Chernel Valued Convolutional Network and the Application	Its Application in Polar	imetric SAR Image Classi	fication", -
Zimman Zhang, naipeng Wang, reng Xu, ra-yu Jin. Complex-valued Convolutional Neural Network and its Application Transactions on Geoscience and Remote Sensing, 2017	n in Polarimetric SAR I	mage classification, IEE	
<1% match (Internet from 03-Dec-2019) https://androidgits.blogspot.com/2018/04/show-horizontal-progress-like-instagram.html			

Based on [1], hypertension often arises along with diabetes. Both of these diseases share common risk factors such as unhealthy diet and obesity. It is also found that people with diabetes are having the higher rate of getting hypertension too. Both of the diseases might lead to severe effects on health such as kidney failure, stroke and etc. Hence, managing both <u>blood glucose</u> and <u>blood ressure levels</u> can <u>help to reduce the risk</u> of cardiovascular diseases. Having a proper diet plan that limiting sugar and unhealthy food is also considered essential for diabetic and hypertension patients. Type 1 diabetes is usually diagnosed in children and teens and it is caused by autoimmune reaction while for type 2 diabetes is diagnosed in adults [2]. The only treatment for type 1 diabetes is to rely on insulin pumps and the treatment for type 2 diabetes is to consume oral hypoglycemic medications [3]. Patients with type 1 diabetes are required to monitor glycemic control daily and also control blood pressure and cholesterol [3]. Nowadays, the number of diabetic in Malaysia is increasing drastically. There are around 3.9 million of Malaysia citizens are having diabetes and the rate had increased from 13.4% (2015) to 18.3% (2019) according to a survey [4]. Therefore, the implementation of diabetic self- management mobile application is very beneficial in order to keep track on users' blood

Universiti Tunku Abdul Rahman

Form Title : Supervisor's Comments on Originality Report Generated by Turnitin for Submission of Final Year Project Report (for Undergraduate Programmes)

Form Number: FM-IAD-005Rev No.: 0Effective Date: 01/10/2013Page No.: 1of 1

FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY

Full Name(s) of Candidate(s)	Chew Ke Xin
ID Number(s)	19ACB03038
Programme / Course	Bachelor Of Computer Science (Honours)
Title of Final Year Project	BGBP – A Mobile Application For Diabetic Self-Management

Similarity	Supervisor's Comments (Compulsory if parameters of originality exceeds the limits approved by UTAR)
Overall similarity index:2 %	
Similarity by sourceInternet Sources:2Publications:1Student Papers:1	
Number of individual sources listed of more than 3% similarity: <u>0</u>	
Parameters of originality required and limits approved by UTAR are as Follows: (i) Overall similarity index is 20% and below, and	

(ii) Matching of individual sources listed must be less than 3% each, and

(iii) Matching texts in continuous block must not exceed 8 words

Note: Parameters (i) - (ii) shall exclude quotes, bibliography and text matches which are less than 8 words.

<u>Note</u> Supervisor/Candidate(s) is/are required to provide softcopy of full set of the originality report to Faculty/Institute

Based on the above results, I hereby declare that I am satisfied with the originality of the Final Year Project Report submitted by my student(s) as named above.

tyng

Signature of Supervisor

Signature of Co-Supervisor

Name: Chai Meei Tyng

Name: _____

Date: ____25 April 2023

Date: _____

Bachelor of Computer Science (Honours)

Faculty of Information and Communication Technology (Kampar Campus), UTAR



UNIVERSITI TUNKU ABDUL RAHMAN

FACULTY OF INFORMATION & COMMUNICATION TECHNOLOGY (KAMPAR CAMPUS)

CHECKLIST FOR FYP2 THESIS SUBMISSION

Student Id	19ACB03038
Student Name	Chew Ke Xin
Supervisor Name	Dr Chai Meei Tyng

TICK $()$	DOCUMENT ITEMS
	Your report must include all the items below. Put a tick on the left column after you have
	checked your report with respect to the corresponding item.
	Front Plastic Cover (for hardcopy)
	Title Page
	Signed Report Status Declaration Form
	Signed FYP Thesis Submission Form
	Signed form of the Declaration of Originality
	Acknowledgement
	Abstract
	Table of Contents
\checkmark	List of Figures (if applicable)
\checkmark	List of Tables (if applicable)
	List of Symbols (if applicable)
	List of Abbreviations (if applicable)
	Chapters / Content
	Bibliography (or References)
\checkmark	All references in bibliography are cited in the thesis, especially in the chapter
	of literature review
\checkmark	Appendices (if applicable)
\checkmark	Weekly Log
\checkmark	Poster
\checkmark	Signed Turnitin Report (Plagiarism Check Result - Form Number: FM-IAD-005)
\checkmark	I agree 5 marks will be deducted due to incorrect format, declare wrongly the
	ticked of these items, and/or any dispute happening for these items in this
	report.

*Include this form (checklist) in the thesis (Bind together as the last page)

I, the author, have checked and confirmed all the items listed in the table are included in my report.

Opena

(Signature of Student) Date: 24/04/2023

Bachelor of Computer Science (Honours)

Faculty of Information and Communication Technology (Kampar Campus), UTAR