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**CUISINE AIDE FOR ANDROID**

**BY**

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**A REPORT**

**SUBMITTED TO**

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**in partial fulfilment of the requirements**

**for the degree of**

**BACHELOR OF COMMUNICATION AND NETWORKING (HONS)**

**Faculty of Information and Communication Technology**

**(Perak Campus) MAY 2016**

## **DECLARATION OF ORIGINALITY**

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Finally, I must say thanks to my parents and my family for their love, support, and continuous encouragement throughout the course.

## **ABSTRACT**

This project is a mobile application project. This project developed to provide better solution for user to make their life more convenience. This application will assist the user to figure out the best meal, location, and time constraint to have his or her meal by the matching function in the back end of the application. All the result or suggestion all based on the user preference and seek for the best matching through Artificial neural network supervised learning. The server was setup on Amazon web services, host by Bitnami hosting services and the client device used is an Android mobile phone. The need to connect between the server and mobile phone is internet connection.

All the needed to do is to connect to the internet and login to the mobile application, then insert the details and submit. The mobile application will pass the data to server and do the result matching to user. The mobile application also able to save all the user details and user search history for future reference and evaluation.

The mobile application was developed in Java for its widespread compatibility with a multitude of devices.

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## **LIST OF ABBREVIATION**

OS	Operating System
PHP	Hypertext Pre-processor
PC	Personal Computer
IOS	iPhone Operating System
USB	Universal Serial Bus
IP	Internet Protocol
FTP	File Transfer Protocol
SSH	Secure Shell
ETA	Estimate Time Arrival
SQL	Structured Query Language
IDE	Integrated Development Environment
SVM	Support Vector Machine
ANN	Artificial Neural Network

## **Chapter 1: Introduction**

### **1.1 Motivation and Problem Statement**

In our daily life, we may not be concern on how much time we spent having meals in restaurants. We only concerned about where to eat, what to eat and whether we can finish the meal in time or not. However, not every worker is given a long time like one and a half hours or one hour for having lunch or dinner. Some just got thirty minutes or forty minutes for having their lunch or dinner, they need to get back to do their work after that. This applies to the students too. Sometimes they might not have enough time for their meal because of traffic condition or the restaurant is fully booked, and ended up only having some snack or bread to satisfy their hunger. This may cause gastritis and affects body health.

An ideal meal assistant application should meet a few important points to be effective and user friendly. One of the crucial factors is to provide more restaurant and food recommendation. Besides that, the solution should not be targeted only at western food like burgers. We should also target Malay restaurants, Chinese restaurants and Indian restaurants, so that we can provide more choices to the users.

Unfortunately, most of the meal assistant applications in market don't meet the requirement. Thus, we aim to develop a meal assistant application solution without these flaws in order to provide a better solution to those who need help in having their meals in limited time.

### **1.2 Project Objective**

We wish to develop a meal assistant mobile application named Cuisine Aide for Android by using a smartphone and a laptop installed with Android Studio software.

The first objective of this project is to develop a mobile application that will assist the user to figure out the best meal, location, and time constraint to have his or her meal.

The second objective of this project is to suggest the best matching restaurant (through artificial intelligent) for the user to have his/her meal based on the preferences such as meal time, mood, food category, all inserted by the user.

The third objective is to evaluate the performance of the mobile application in terms of the accuracy, user friendliness and stability and reliability.

### **1.3 Project Scope**

This application is designed to suit the requirement of small and medium restaurants. By doing so, we can obtain the status of the restaurant and update it to the users, telling them whether the restaurant is busy or free to let the users have their meals at there within a limited time period. Besides that, we will also calculate the estimate time to reach the restaurant according to the traffic condition. With all the data gathered from the restaurants and users, this application will provide suggestions to the users which they can refer to in order to make a better decision at deciding where to have their meals.

The finalized version of this application will act as a virtual meal assistant to help busy workers or students in making decision on where and what to eat within a time period by referring user preference and provide suggestion through Artificial neural network supervised learning. This can benefit the users by saving their time in making decision.

This Android meal assistant application developed with Android Studio can help solve the problem stated above. An iOS version can be developed in the future as well. Therefore, it's worth investing effort in this project.

### **1.4 Expected Contributions from the Project**

The application developed for the project will benefit users in terms of reducing decision making time and strive for the maximum meals having times. By referring to the users' preferences and details inserted by them, the application can help the users choose their preferred foods by using Artificial neural network supervised learning. This opens up various possibilities for users to enjoy their meals in limited time since the time is used more efficiently.

### **1.5 Organisation of the Report**

In chapter 1, we will describe the motivation and problem statement, expected contribution from the project, objectives and scope of the project. In chapter 2, we will review the technologies of the project and review other related or similar applications. In chapter 3, we will discuss the

## Chapter 1 : Introduction

methodology of this project, which development model are suitable to use, system requirement, functional requirement, expected system testing, expected challenges, project milestone and estimated cost. In chapter 4, we will discuss the system design in this project. How the system flow of the project, functional modules of the project, database design and GUI design. In chapter 5, we will discuss the system implementation in this project. In chapter 6, we will perform the system evaluation and discussion. In the last chapter we will conclude the whole final year project.

## Chapter 2: Literature Review

### 2.1 Review of the Technologies

In mobile technology, Google’s Android and Apple’s iOS are the two most used operating system. Android is an open source operating system that is more customizable compare to iOS. It allows users to customize the operating system to be unique. iOS is an operating system developed and distributed exclusively for Apple products; the interface is based on the concept of direct manipulation.

#### 2.1.1 Firmware / OS

In this category we will compare Android and iOS.

Table 2.1.1.1 Comparison of Mobile Operating System

	<b>iOS</b>	<b>Android</b>
<b>Developer</b>	Apple Inc.	Google
<b>Initial release</b>	29 - July - 2007	23 - September - 2008
<b>Source model</b>	Closed	Open Source
<b>Customizable</b>	Theoretically can't, unless jailbreak	Can customize almost everything.
<b>Availability</b>	Available to all Apple product only	Available to many brands of phones, for example: Kindle Fire, LG, Samsung etc.
<b>OS family</b>	OS X, Unix	Linux
<b>Programming Language</b>	Objective-C, Swift Code	C, C++, Java
<b>Widgets</b>	No	Yes

#### 2.1.2 Database

In this category, we will compare the databases, which is MySQL, Oracle and SQLite.

Table 2.1.2.1 Comparison of Databases

	<b>MySQL[5]</b>	<b>Oracle[5]</b>	<b>SQLite[6]</b>
<b>Strength</b>	Great performance in leverage architecture applications.	Able to run in large OLTP (online transaction process) and VLDBs.	Embedded inside application. A self-contained, file-based database. Fast and efficient.
<b>Popularity</b>	Famous in small or medium sizes companies, project and web companies.	Popular in medium or large size of companies and medium or large projects.	Famous for embedded device which consists of a single file on the disk.
<b>Application Domains</b>	Web (MySQL), gaming, small or medium OLTP.	Medium or large OLTP, large businesses applications like EBS, Siebel etc.	Embedded application, Single user-local application.
<b>Development Environments</b>	PHP, Java, Perl and .NET	PHP, Java, APEX and .NET	PHP, Java, C++ and C#
<b>Partition</b>	Free with basic features.	A lots of choices with different of cost.	Free. Sqlite is in the public domain.
<b>Replicate</b>	Free, easy to setup and manage. Work greats with basic features.	A lots of choices with different of cost.	Free, easy to setup and manage. Work greats in emvedded device with basic features.
<b>Import and Export</b>	Easy and basic.	More features.	Easy and Basic.
<b>Management</b>	Provide open source solution and basic functionality. Cheaper compare to Oracle.	Grid Control, offers lots of functionality. Much more expensive.	Provide open source solution and basic functionality.



### 2.1.3 Programming Language

In this category we will compare the languages used to develop application in Android and iOS.

Table 2.1.3.1 Comparison of Programming Language

	<b>Java (Android)</b>	<b>Swift Code (Apple)</b>
<b>Language Principles</b>	Suitable to run anywhere, multithreading in high performance for concurrency dynamic.	Builds on Objective-C, modern language with functional, easy to learn and implement, safe and powerful.
<b>Usage for creating</b>	Android applications and large websites	Just for Apple iPhone and laptop applications
<b>Features</b>	Well-optimized Java Virtual Machine for running code.	Easy to try out code with Interactive Playgrounds and REPL.
<b>Trade Off</b>	Less flexibility because of the strict rules in catching errors.	Harder to debug because Swift Code are a new language.
<b>Hello World Program</b>	System.out.println("Hello world");	println("Hello world")

### 2.1.4 Artificial Intelligent Algorithms

In this category, two well known Artificial Intelligent supervised learning Algorithms were compared as in the following Table 2.1.4.1.

Table 2.1.4.1 Comparison of Artificial Intelligent Algorithms

	<b>ANN[7]</b>	<b>SVM[7]</b>
<b>Output</b>	Can have multiple outputs.	Only one output.
<b>Training</b>	n-ary classifiers can be trained in one go.	n-ary classifiers trained one by one.
<b>Performance</b>	Require high processing time if the neural network is large.	Training time for SVM scales quadratically in the number of

		examples.
<b>Usage</b>	Modelling, Simulation and Prediction.	Learning classification, Regression or Ranking function.
<b>Memory Consumption</b>	High memory for processing large data.	High memory for classification in many cases.
<b>Parametric Model</b>	Yes	No
<b>Noise Environments</b>	Work much more better compare to SVM in noise environment.	Doesn't work well in noise environment.
<b>Results</b>	Rarely achieve "perfect" classification. More on finding a very good (but not perfect) answer.	More accuracy compare to ANN. Will find a set of parameters that fits the data
	Have a pack of hidden layers with sizes $h_1$ through $h_n$ relying upon the quantity of features, in addition to inclination parameters, and those make up your model.	Consists of a set of support vectors, chose from the training set, with a weight for each. In the most pessimistic scenario, the quantity of support vectors is precisely the quantity of training sample and all in all its model size scales directly.

### 2.1.5 Summary of Technologies Review

Google's Android is the better choice because Android is available widely. Besides that, Android is open sourced and the development software Android Studio is available to all operating system, not to mention that it is free. On the other hand, iOS's development software is only available to Apple's operating system, OSX, and developers need to pay Apple development fees. Other than that, Swift language is a new programming language that's still not widely adopted, causing it to be difficult to find documentations. In database, MySQL is the better choice for this project because it's free and it's good in small scale project. Although SQLite extremely fast, efficient and suitable for embedded device. But SQLite is not suitable for this application

whereby multiple clients need to access and use the same database. MySQL provides high speed in read write for web services compared to Oracle. Although Oracle provides much more function but Oracle is more complex compared to MySQL and Oracle requires in-depth skills. For the Artificial Intelligent algorithm, ANN supervised learning would be chosen for this project. The neural network for ANN are flexible, ANN allow user to adjust the size of the neural network but need to sacrifice the accuracy of the desired output, unlike SVM if the example of the training set is large, it will consume a lot of memory of the embedded device and this will affect the stability of the application. Under no choice, to fit the neural network into an embedded device for this project, we need to reduce the size of neural network to reduce the memory consumption to fit the embedded device requirement. As long as the accuracy level of the ANN supervised learning desired output in a acceptable range, ANN supervised learning are suitable for implement into this project. On the other hand, this application is aiming to provide prediction for user, ANN can provide more than one output results to user by finding a very good (close to the mean squared prediction error rate) answer to the user to choose. Besides that, although sometime the prediction for ANN may be wrong but by accumulate all the data , ANN can learns from it and reprogramming is not needed. This will make the ANN more smart and the accuracy rate will be higher.

## **2.2 Review of the Existing Applications**

In this category we will review four similar mobile applications which are Burpple-Find Places to Eat, FoodPanda Order Food Delivery, OpenRice Malaysia and Penang Glutton's Corner.

### **2.2.1 Food Recommendation Application: Burpple-Find Places to Eat [2]**

Burpple is a user friendly Singapore-based food recommendation application. It provides a very nice UI design to user and the food recommendation is based on other users' recommendation. Users can post a photo of the food to the application and comment on it to suggest it to the other users. Besides that, it also allows users to tag the location of restaurant, date and time on the photo and share it to social networks like Facebook and Twitter. The whole concept is similar to Instagram. Take a photo, tag, post and comment. Users can also save the food and restaurant they are interested in into a wish list for future references.

In short, the application is quite good, but the features of the application are limited. The food recommendation of this application is only available in Kuala Lumpur and Singapore and this application is only a common food recommendation application without any specialty. The recommended food in the application is limited in terms of food categories. This application is not suitable for busy workers or students because it doesn't navigating services, users will need to search the location by themselves and it cannot track the restaurant's status.

### 2.2.2 Food Ordering Application: FoodPanda Order Food Delivery [3]

FoodPanda is a food ordering application for users preferred to stay in the office or school to have their meals. It provides more than 180 restaurants over 7 cities for food ordering. FoodPanda works like a middleman.

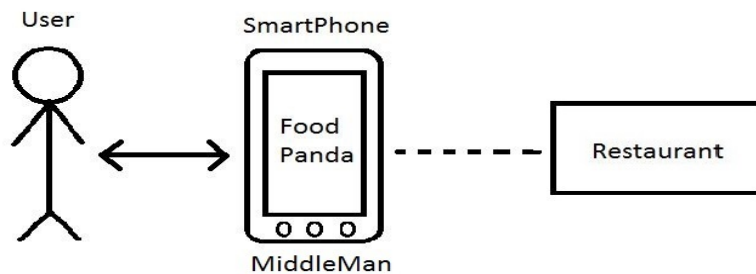


Figure 2.2.2.1 FoodPanda Order Delivery process

In FoodPanda, the users cannot order food directly from the restaurant; they have to order from FoodPanda instead. After FoodPanda confirms the order and payment, it will order the food from the restaurant on behalf on the users, and delivering it after it's done. The whole ordering process takes quite a long time, about 60 minutes on average. On some occasions, it'll even take up to 120 minutes because of the time needed to confirm the orders between FoodPanda and the restaurant. Because of this, FoodPanda is not recommended to busy workers and students who had only limited time for having their meals. Besides that, users must buy over a minimum amount of food in order for FoodPanda to deliver it to them.

### 2.2.3 Food and Restaurant Recommendation: OpenRice Malaysia [1]

OpenRice Malaysia is a dining guide application which provides more than 22,000 restaurants in Malaysia to the users. Users can search for restaurants, food types, and other by using related

keyword. OpenRice also provides GPS navigation to users and offers discount coupons for users using this application. Just like the other food recommendation applications, it also include sharing photo to the application, commenting on the food or restaurant, sharing the food or restaurant to family and friends by short message service or e-mail and adding restaurants into favourites list for future references.

Although it provides all the basic features of a food recommending application, it still gets a lot bad reviews because the application is buggy. Furthermore, due to the lackluster search function, the users are only able to obtain one or two results, among the 22000 restaurants available. Besides that, the lack of images of restaurants also causes the application to get a lot of bad reviews. This application is still not suitable for busy workers or students because it can't track the restaurant status.

#### **2.2.4 Food and Restaurant Recommendation: Penang Glutton's Corner [4]**

Penang Glutton's Corner is a food recommendation application for users staying in Penang or visitors wish to have a trip to Penang. This application provides only a very basic food recommendation, by categories or by time. For example, breakfast time between 7 a.m. to 11 a.m., lunch time between 11 a.m. to 3 p.m., etc. All the food is listed according to time slot, if the users wish to search for food in dinner time; they can click on the dinner time and look for food recommendation. The application do not have any filtering function, therefore if the users want to eat noodles, they will have to search through the list one by one. The recommended food is limited and some are repeated too. If users wish to visit the restaurant for having their meals, they will need to click on the photo and then click again on the restaurant to copy down the address, so that they can use the address to search for the restaurant with another application manually. This is very inconvenience for visitor who is not familiar to Penang.

This application only provides a few features, and the UI design is very simple. All the food is categorized by the time slots. Users need to search for interested food one by one and all the information about the food is fixed, not allowing the users to make any comment or review about the food. Hence, the users won't know whether the food is still available or not. Some of the information is outdated as well. This application is not suitable for busy workers or students because it only have limited features.

### 2.2.5 Summary

Table 2.2.5.1 Comparison of Reviewed Applications

	<b>Burpple- Find Places to Eat</b>	<b>FoodPanda Order Food Delivery</b>	<b>OpenRice Malaysia</b>	<b>Penang Glutton's Corner</b>	<b>Cuisine Aide for Android</b>
Restaurant/ Food recommendation	✓	✗	✓	✓	✓
Navigation	✗	✗	✓	✗	✓
Restaurant Status	✗	✗	✗	✗	✓

### 2.3 Concluding Remark

Most of the related applications provide the basic functions such as sharing to social network and food/restaurant recommendation. However, they do not provide restaurant status and navigation. We need to include those functions to help the busy users have an easier time find meals, which is why this project is conceived; to develop a meal assistant mobile application named Cuisine Aide for Android.

## Chapter 3: Methodology

### 3.1 System Development Models

A software development methodology is to split the project development work and activities into different stages or phases for better management and planning. In this category we will review three different types of system development model, which are waterfall development model, prototyping development model and incremental development model.

#### 3.1.1 Waterfall Development Model

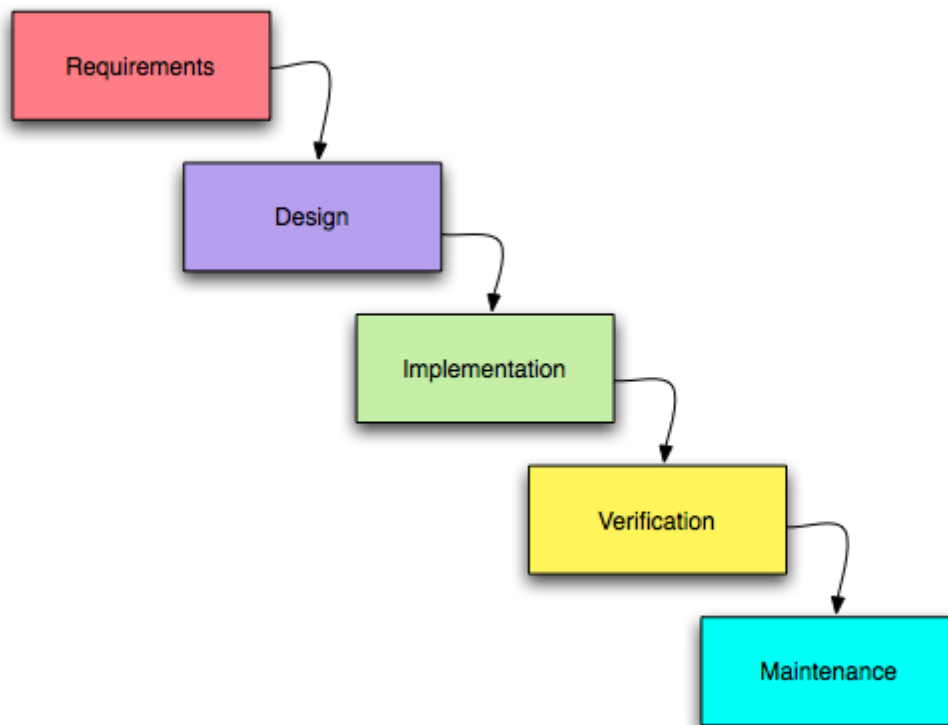


Figure 3.1.1.1 Waterfall Development Model Design

Waterfall development model splits the project into sequential stages or phases. The flow will look like a waterfall flowing downwards with some overlap. Waterfall is focus more on planning, scheduling, target dates, budgets, and implement in the whole system at once.

Waterfall development model are suitable for less experienced project team. The sequence of development steps helps the project team ensuring the reliability, quality and maintainability of the project with strict control.

### 3.1.2 Prototyping

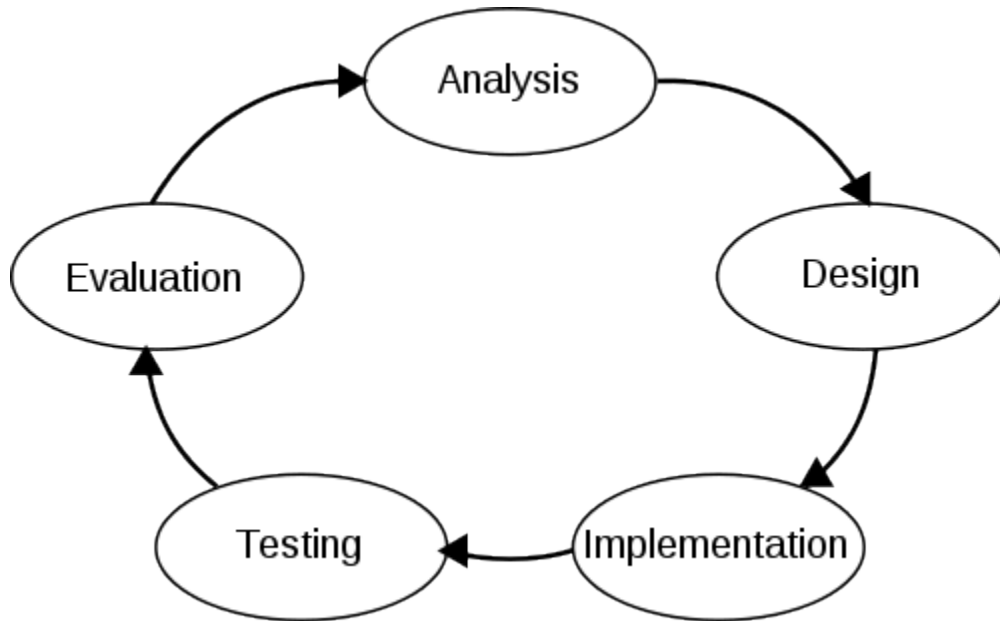


Figure 3.1.2.1 Prototyping Development Model Design

Prototyping development model is not a standalone methodology; it is a development approach of activities and the creation of prototypes. Prototyping splits the project into smaller segments for ease control and change during development process to reduce the project risk.

Prototyping is very useful in solving unclear objectives of project, development and validate user requirements, experiment and comparing design and investigate performance.



### 3.1.3 Incremental Development Model

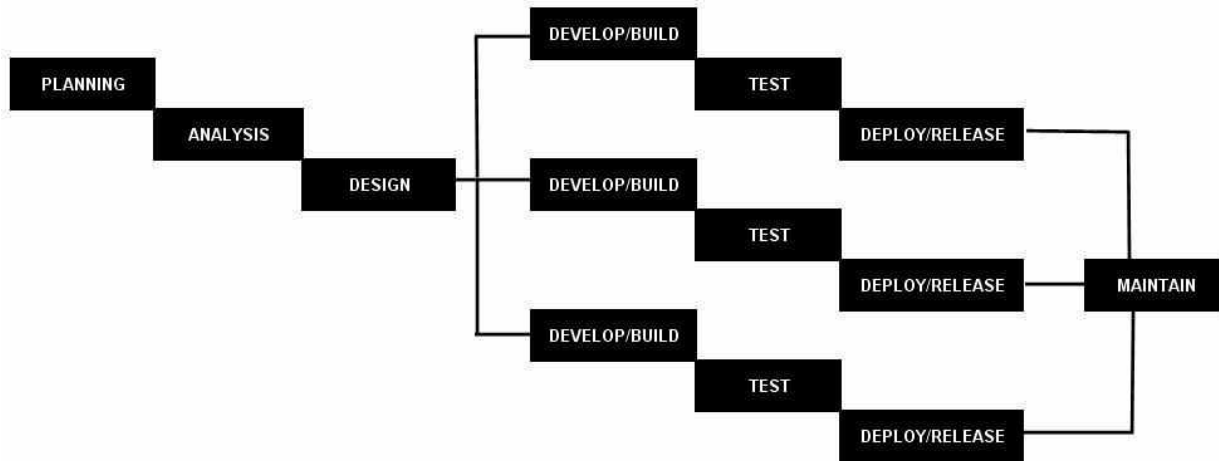


Figure 3.1.3.1 Incremental Development Model Design

Incremental development model is a combination of linear and iterative system development methodologies. Same as prototyping, Incremental development model splits the project into smaller segments for ease of control and change during development process to reduce the project risk. Besides that, Incremental includes a mini waterfall for small part of the project in the development model before proceeding to the next stages.

Incremental provides a moderate control to the project team to manage their project. This also helps to mitigate risk and integration in the early stage of the project.

### 3.1.4 Selected Model

Prototyping will be the best choice in this project because prototyping can identify the difficulty of the functions and the missing functionality rapidly. Besides that, prototyping provides an innovating and flexible design compared to other development models, users can also change their design, function or objective easily compare to other development models. For example, users may add new objective when the project is already in the design phase. Prototyping is an appropriate methodology for projects with many users and functions.

When compared to the others, although waterfall provides a strict control but this may cause an inflexible and slow development flow, which is costly for the project. Waterfall identifies all the specification of requirements in the early stage, but the users' needs might not be clear in the early stage. This may cause difficulty in changing direction when users' requirements were changed when the project is already on progress.

Incremental reduces inherent project risk but by utilizing mini waterfall, the project needs to go through the mini waterfall before moving to the next Incremental. This may cause lack of consideration of business requirements and problems.

### **3.2 System Requirement**

This project requires multiple hardware and software to develop the mobile application.

#### **3.2.1. Hardware**

The hardware utilised in the project includes a smartphone with Google Android operating system, a laptop or PC installed with Android studio.

#### **3.2.2. Software**

The software utilised in the project includes Google Android operating system, Android studio develop mobile application, Putty to connect to the cloud server, FileZilla a FTP client to push PHP file to the web host server and Notepad++ for program PHP code.

### **3.3 Functional Requirement**

The functional requirements of this project include:

Registration and login function to store all the user preferences and history

Navigation function to navigate the user to the restaurant location in case the user is not familiar with the location of the restaurant.

Searching and matching function to provide the user with an accurate and reliable result based on user's preferences via Artificial neural network supervised learning.

### 3.4 Project Milestone

Table 3.6.1 Project Milestone

<b>Task Name</b>	<b>Start Date</b>	<b>End Date</b>	<b>Duration</b>
<b>Final Year Project I Prototype</b>	<b>05-30-16</b>	<b>08-30-16</b>	<b>67d</b>
<b>Understand the mobile application flow</b>	<b>05-30-16</b>	<b>06-03-16</b>	<b>5d</b>
<b>Search function (through artificial intelligent)</b>	<b>06-06-16</b>	<b>07-08-16</b>	<b>25d</b>
planning	06-06-16	06-10-16	5d
analysis	06-13-16	06-16-16	4d
coding	06-17-16	07-08-16	16d
<b>Setup cloud hosting and database</b>	<b>07-11-16</b>	<b>07-15-16</b>	<b>5d</b>
<b>Mapping Function</b>	<b>07-18-16</b>	<b>08-03-16</b>	<b>13d</b>
<b>Implementation</b>	<b>08-04-16</b>	<b>08-10-16</b>	<b>5d</b>
<b>Testing</b>	<b>08-11-16</b>	<b>08-18-16</b>	<b>6d</b>
<b>UI Design</b>	<b>08-19-16</b>	<b>08-26-16</b>	<b>6d</b>
<b>Final Test</b>	<b>08-29-16</b>	<b>08-30-16</b>	<b>2d</b>

### 3.5 Estimated Cost

Table 3.7.1 Project Estimated Cost

<b>Items</b>	<b>For Final Year Project Development</b>	<b>For Commercialisation Usage</b>
<b>Android</b>	Free	Free
<b>Amazon Web Services</b>	Free (Using Trial Version)	500 MYR / per year
<b>Total</b>	0 MYR	500 MYR / per year

### 3.6 Concluding Remark

The final year project uses prototyping development mode. Prototyping provides a flexible design to the project; user can modify the function or the objectives easily when the project is in progress compare to other development model.

### Chapter 3 : Methodology

To develop the mobile application, there are several hardware and software which can support developing Android mobile application such as an Android operating system smartphone, a laptop or pc for android studio software and etc.

The functional requirements in this project include login and registration function, navigation function, searching and matching function.

The project milestone used to track the project management in this project. This project had reached the entire milestone; all the tasks in the project are on track. The Estimated costs for final year project development are free, because the webhosting we are using trail version in this project and the hardware are using own hardware. For commercialisation usage user need to subscribe the web hosting service to host database.

## Chapter 4: System Design

### 4.1 System Architecture

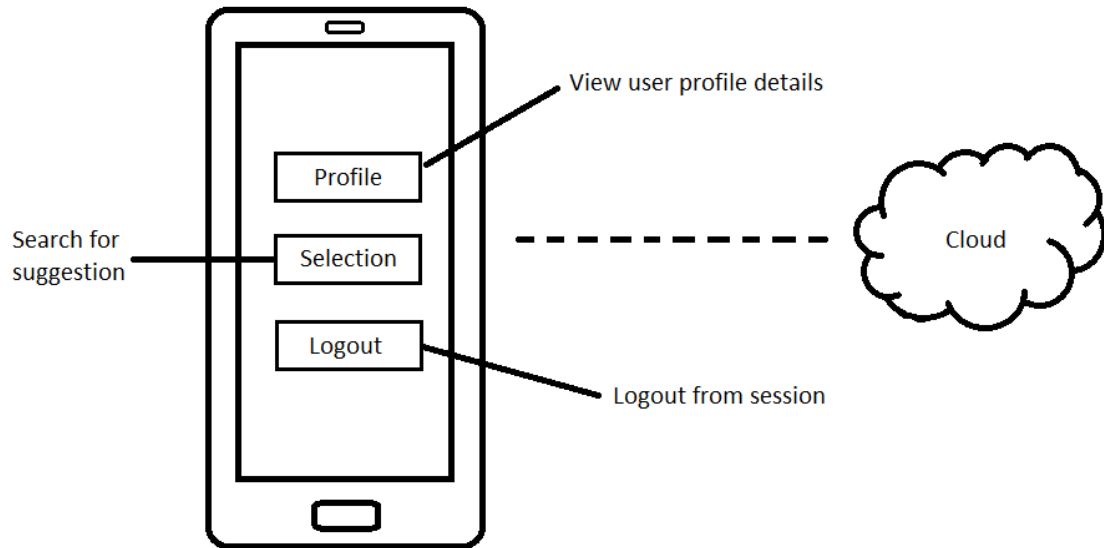


Figure 4.4.4 System Architecture Design

### 4.2 Functional Modules in System

There are five function modules in this project, profile function, login and registration function, searching function, mapping function and storage function.

Profile function, user can view their profile details and preference in this function and make a change in this function. Other than that, user can save the favourite food into user profile, user can go straight to profile and select the favourite food and navigate to the restaurant. This may help user save a lot of time in term of searching.

Login and Registration function is use to track and save user preference and history record in the database. Saving user preference and history record may help the mobile application to track the user habit for a better and more accuracy suggestion to user.

Searching function, in this function user can insert their meal having time, select their current mood, select the food category, food types, insert the number of person and budget, the system will find out the best matching based on the user preference and data inserted through Artificial neural network supervised learning. This can help user to decide where and what to eat when they got only limited time to have their meal.

Mapping function, in searching function the mobile application will suggest the suitable food and restaurant to user. If the users decide to pick a restaurant, this function will track the user current location and navigate the user to the restaurant via Google map.

Storage function, this function works on the back end of the mobile application. Storage function is to store all the data of user, food, restaurants and user history into cloud database. All the search result will be queried from the database to find out the best matching result. All function will work with the storage function in order to read and write data from or to database.

### 4.3 System Flow

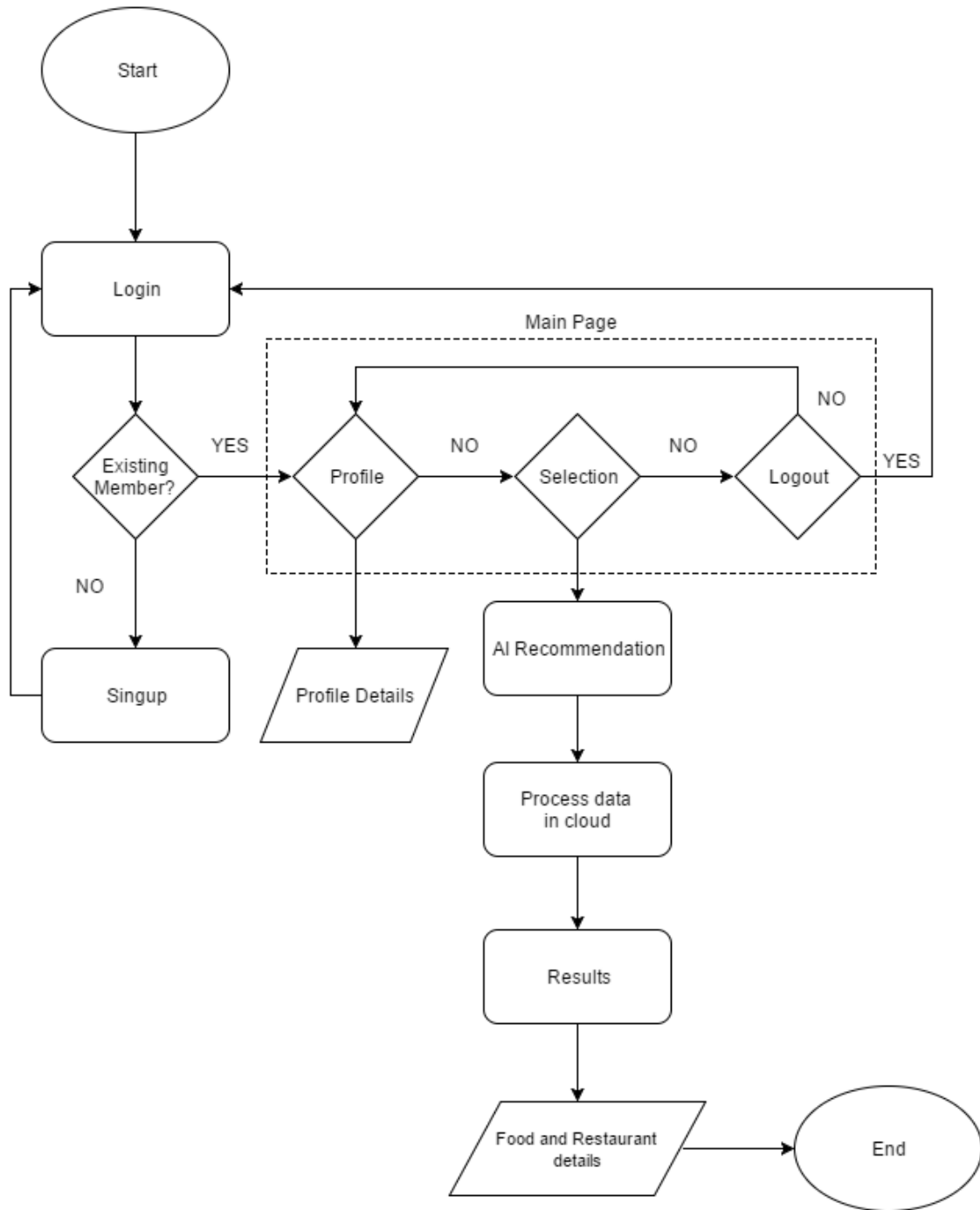


Figure 4.3.1 System Flow Design

The flowchart shows what the results outcome based on the user preference through Artificial neural network supervised learning. The application required user to register as member to use it. After user login to the system, user will redirect to the main page of the system. There are two activity (Profile and Selection) and one function (Logout) in main page. User can view their personal details in profile activity. In the selection activity, the system is designed to let user to insert their preference and provide recommendation to the user based on the user inserted preference through Artificial neural network supervised learning. The system also store the user selection history, user can easily trace back their top history selection. The output (food and restaurant details) is then fed back to user. User can select logout function to redirect back to the login page.

#### 4.4 Database Design

The database design in this project included 8 tables.

##### Database Tables

###### 4.4.1.1 Categories Table

Table 4.4.1.1.1 Categories Table

Name	Type	Null	Default	Extra
categories_ID	int(5)	No	None	AUTO_INCREMENT
categories_name	varchar(20)	No	None	

###### 4.4.1.2 Foods Table

Table 4.4.1.2.1 Foods Table

Name	Type	Null	Default	Extra
foods_id	int(3)	No	None	AUTO_INCREMENT
foods_name	varchar(30)	No	None	
categories_FK	int(3)	No	None	
food_types_FK	int(3)	No	None	
ai_id	int(3)	No	None	



#### 4.4.1.3 Mood Table

Table 4.4.1.3.1 Mood Table

<b>Name</b>	<b>Type</b>	<b>Null</b>	<b>Default</b>	<b>Extra</b>
mood_ID	int(3)	No	None	AUTO_INCREMENT
mood_name	varchar(20)	No	None	

#### 4.4.1.4 Restaurant Table

Table 4.4.1.4.1 Restaurant Table

<b>Name</b>	<b>Type</b>	<b>Null</b>	<b>Default</b>	<b>Extra</b>
restaurant_ID	int(3)	No	None	AUTO_INCREMENT
restaurant_name	varchar(20)	No	None	
location	varchar(100)	No	None	
total_table	int(3)	No	None	
table_available	int(3)	No	None	
a_meal_time	int(3)	No	None	
working_hour	varchar(20)	No	None	

#### 4.4.1.5 History Table

Table 4.4.1.5.1 History Table

<b>Name</b>	<b>Type</b>	<b>Null</b>	<b>Default</b>	<b>Extra</b>
history_ID	int(3)	No	None	AUTO_INCREMENT
time	int(5)	No	None	
mood	varchar(20)	No	None	
food_type	varchar(100)	No	None	
person	int(2)	No	None	
id	int(3)	No	None	
food	varchar(20)	No	None	
categories	varchar(20)	No	None	

**4.4.1.6 User Table**

Table 4.4.1.6.1 User Table

<b>Name</b>	<b>Type</b>	<b>Null</b>	<b>Default</b>	<b>Extra</b>
id	int(11)	No	None	AUTO_INCREMENT
unique_id	varchar(23)	No	None	
name	varchar(50)	No	None	
email	varchar(100)	No	None	
encrypted_password	varchar(80)	No	None	
salt	varchar (10)	No	None	
created_at	datetime	YES	NULL	
updated_at	datetime	YES	NULL	

**4.4.1.7 Food and Restaurant Relation Table**

Table 4.4.1.7.1 Food and Restaurant Table

<b>Name</b>	<b>Type</b>	<b>Null</b>	<b>Default</b>	<b>Extra</b>
j_food_restaurant_id	int(3)	No	None	AUTO_INCREMENT
foods_FK	int(3)	No	None	
restaurant_FK	int(3)	No	None	
price	double	No	None	
image	varchar(200)	No	None	

**4.4.1.8 Food Types Table**

Table 4.4.1.8.1 Food Types Table

<b>Name</b>	<b>Type</b>	<b>Null</b>	<b>Default</b>	<b>Extra</b>
food_types_id	int(3)	No	None	AUTO_INCREMENT
food_types_name	varchar(20)	No	None	
categories_FK	int(3)	No	None	

### 4.4.2 Entity Relationship Diagram

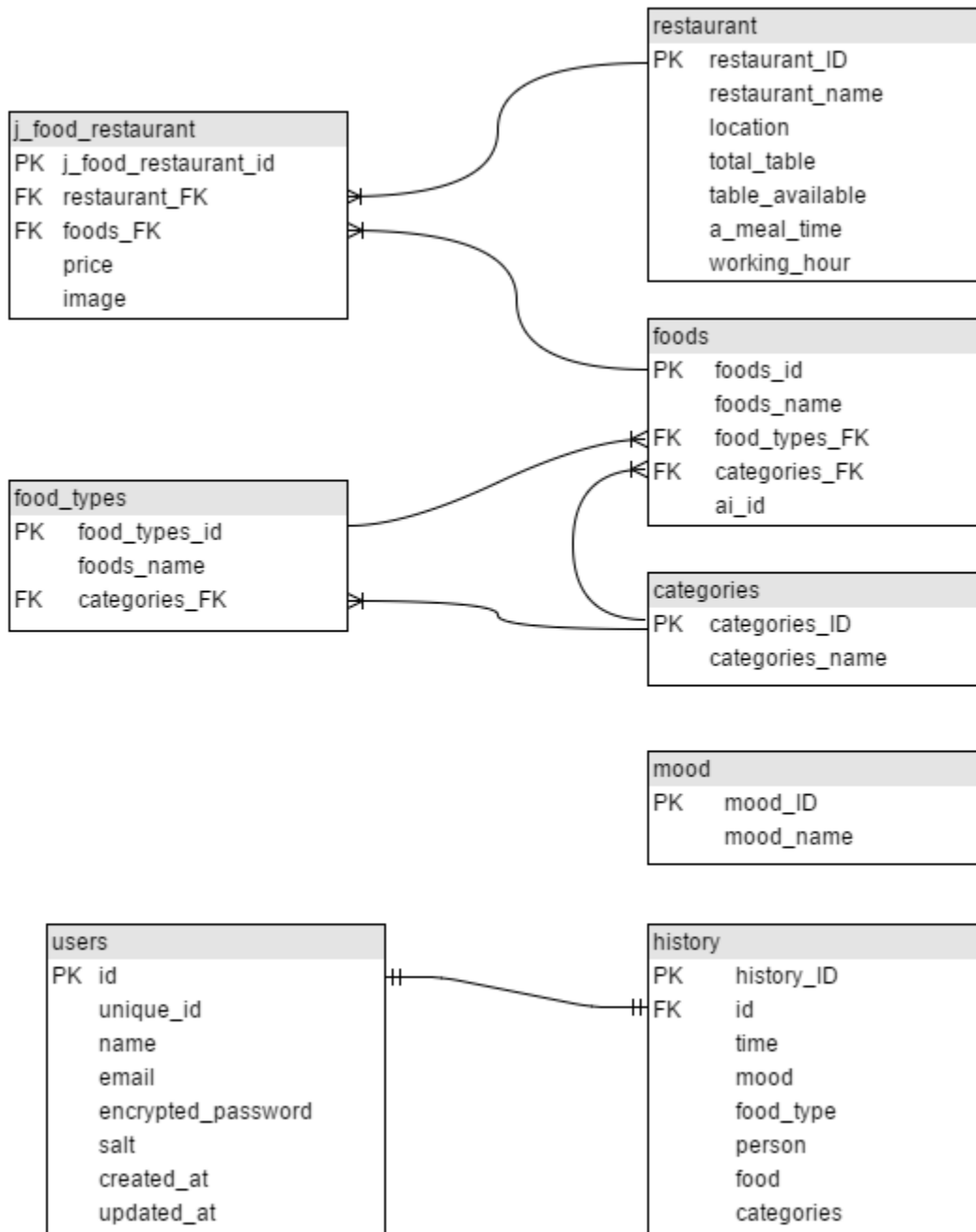


Figure 4.4.2.1 Entity Relationship Diagram Design

4.5 Use Case Diagram

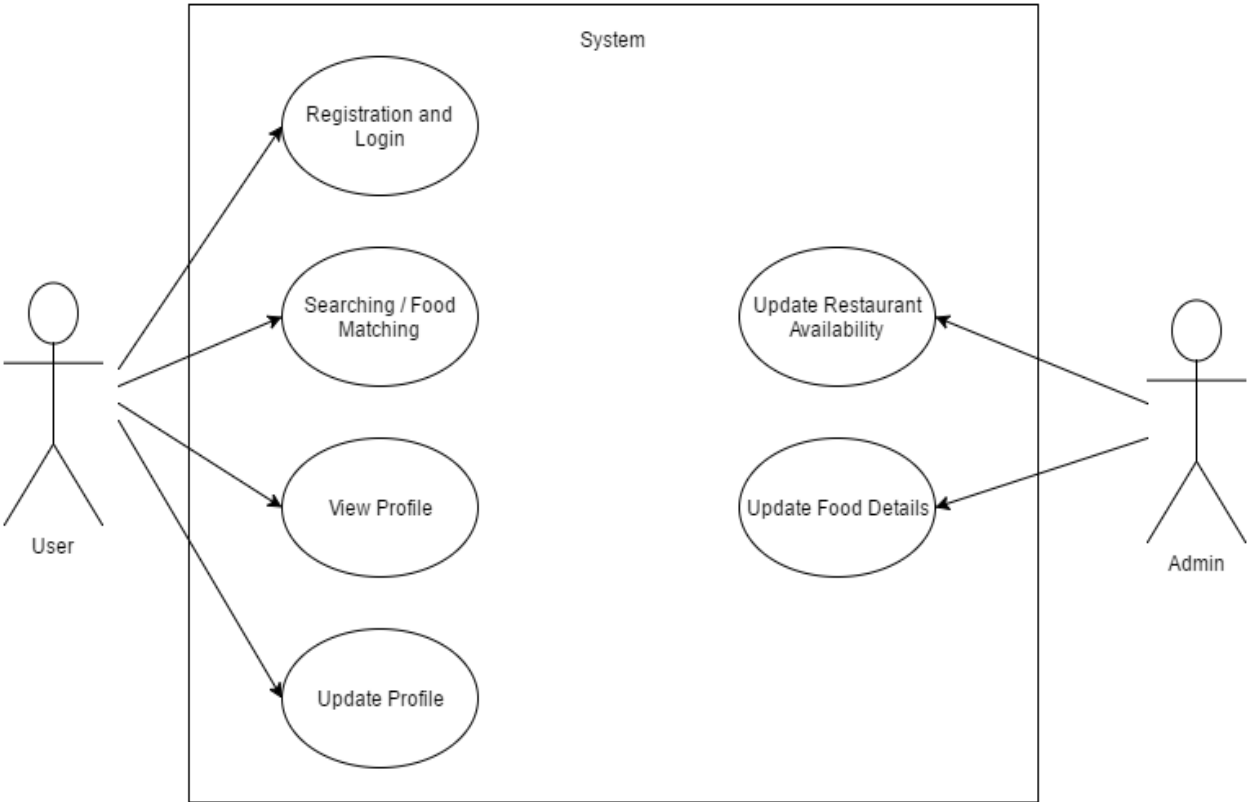


Figure 4.5.1 Use Case Diagram Design

### 4.6 GUI Design

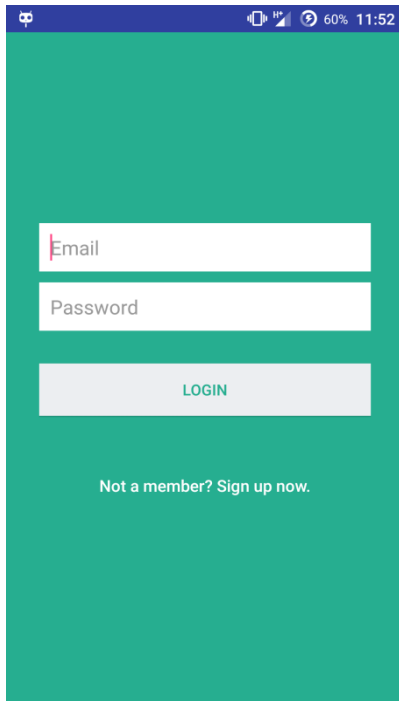


Figure 4.6.1 Login Page Design

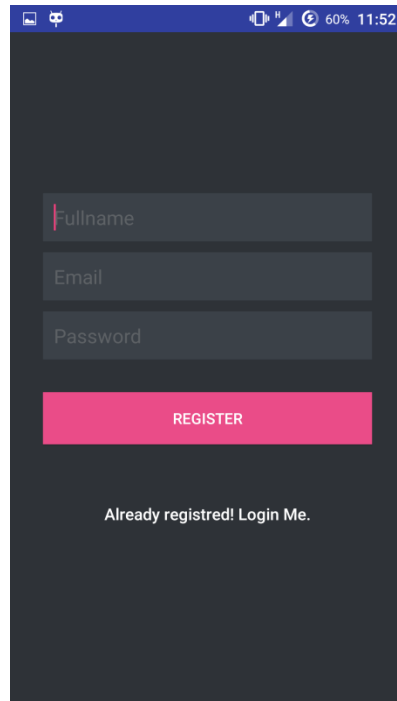


Figure 4.6.2 Registration Page Design

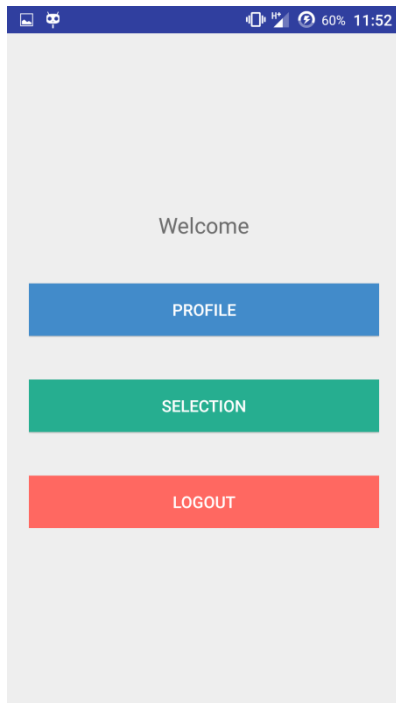


Figure 4.6.3 Main Page Design

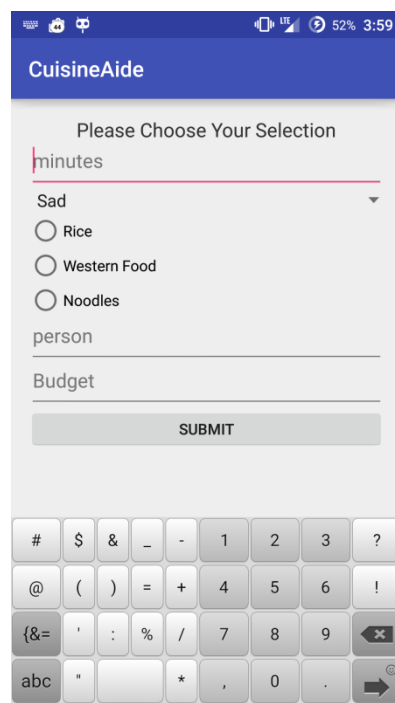


Figure 4.6.4 Selection Page Design



Figure 4.6.5 Result Page Design I

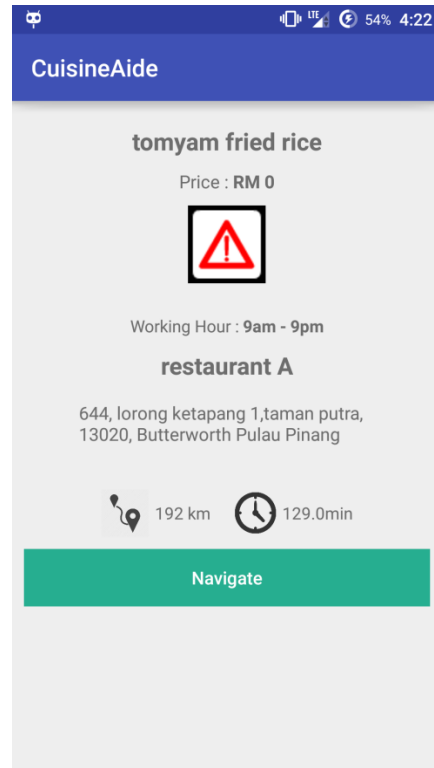


Figure 4.6.6 Result Page Design II

Images above show the GUI design in this project. In Selection Page Design, the number in the list view shows the number of count of the previous selected mood and categories. In Result Page Design, food name, restaurant name, table available, working hour, price and ETA will be shows. In the final result page, navigate button are available to let user navigate to the restaurant via Google map. The exclamation mark shown at the result page is because the photo haven't inserted into the database.

#### **4.7 Concluding Remark**

In this chapter we talked about the system design of the project. Since this is a software project so the system architecture will be a smartphone. There will be five functional modules in this project; it included profile function, login and registration function, searching function, mapping function and storage function. All functional modules are needed in this project in order to develop a smart mobile application for user. Diagram 4.3.1 shows the system flow of the whole project. In Database Design category, all the tables in the database are shown in a table form in this proposal and the relation of the all table also shown with entity relationship diagram in category 4.4.2. The GUI design of the mobile application just partially done, still got a lots need to be enhanced in order to achieve the target of user friendliness of the application.

## Chapter 5: System Implementation

### 5.1 Hardware Setup

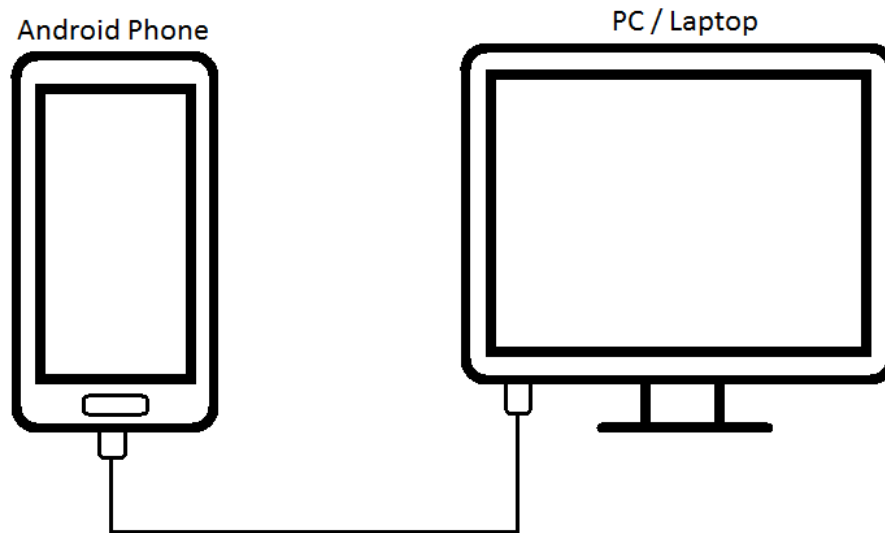


Figure 5.1.1 Hardware Setup Diagram

In hardware setup we just need to connect an android OS mobile phone with a personal computer or laptop via USB to micro USB wire for application debugging and apk installation.

### 5.2 Software Setup

In software setup, we need to install several software to develop the application.

- a) We need install Android Studio IDE into laptop or personal computer to develop the mobile application.
- b) We also need install Notepad++ for program PHP code.
- c) After setting up Amazon web services, we need to install Putty to connect to ther server.
- d) Lastly we need to install FileZilla to push PHP file to the web host server.



### 5.3 Setting and Configuration

For settings and configuration, we need to setup a cloud for the application to store data.

#### Configuration for Amazon Web Services.

- Step 1 : Register with Amazon Web Services (<https://aws.amazon.com/>).
- Step 2 : Register with Bitnami (<https://bitnami.com/>). In this project we are using Bitnami Hosting to deploy and manage our Amazon Cloud Server.
- Step 3 : Connects Bitnami with Amazon Web Services. Obtain the security credentials from Amazon Web Service account, then login to Bitnami Cloud Hosting and select create a new server enter the security credentials. The Bitnami and Amazon Web Services will be connected.
- Step 4 : Provision an Amazon Web Services Cloud Server. Select the server type, disk size, server location and operating system in Bitnami Hosting page. After that, assign an IP address to the server. The Amazon Web Services will be running and able to access it through web browser.
- Step 5 : Download the .ppk file which contains the SSH access credentials you will need to connect to the server.

#### Configuration for Putty.

- Step 1 : Open Putty and enter the host name or IP address for the cloud server into the “the "Host Name (or IP address)" field”.
- Step 2 : Go the Connection category → SSH → Tunnels section, create a secure tunnel for the phpMyAdmin application by forwarding source port "8888" to destination port "localhost:80".
- Step 3 : Go to Connection category → SSH → Auth section, select the private key file .ppk file saved in the previous step for authentication.
- Step 4 : Go to Connection category → Data section, enter “bitnami” into the "Auto-login username" field as username.

Step 5 : Open the SSH session, access phpMyAdmin through the secure SSH tunnel you created, by browsing to `http://127.0.0.1:8888/phpmyadmin`.

### Configuration for FileZilla.

Step 1 : In FileZilla configuration settings, Select the Connection → SFTP section. Select the “Add keyfile” button to select the private key file for your server.

Step 2 : Select File → Site Manager → New Site, enter the server host name or IP address and user name. Select "SFTP" as the protocol and "Normal" as the logon type.

Step 3 : Select the “Connect” button to connect to the cloud server and begin an SFTP session. Now we can upload project application PHP file to the remote directory by dragging and dropping the files from the local server to the cloud server.

## 5.4 System Operation

### Front End

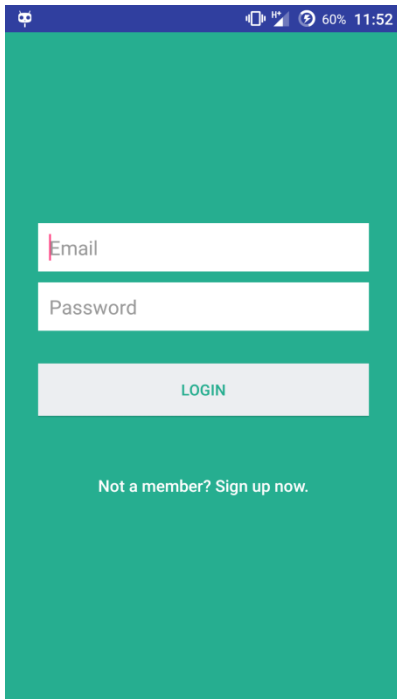


Figure 5.4.1 Login Page

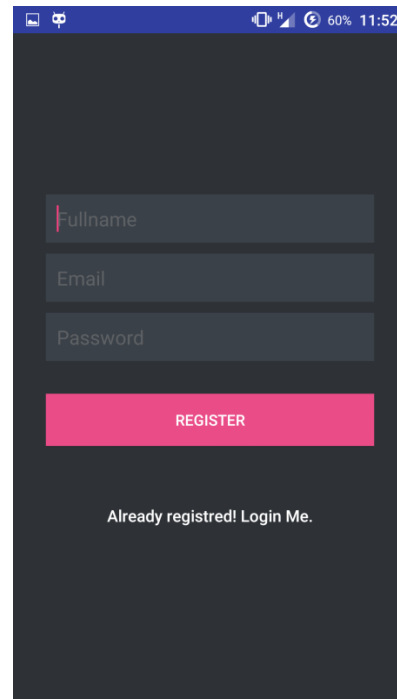


Figure 5.4.2 Register Page

Login to the application or register as a member if not a member yet.

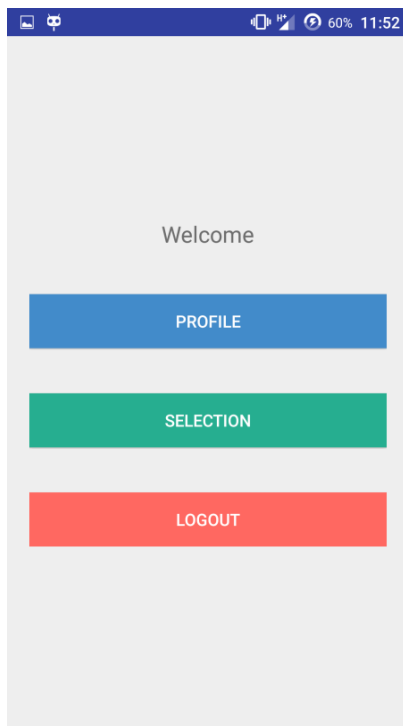


Figure 5.4.3 Main Page

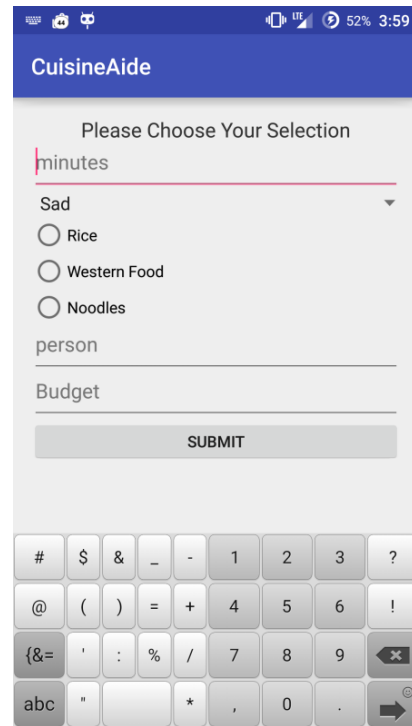


Figure 5.4.4 Selection Page

In the Main Page, choose the second choice selection and enter into selection page. Insert and pick all the preference and click submit to get recommendation from the application in the result page. In this example we will insert 300 minutes, mood = sad, category = rice and food type = fried rice, 1 person and 50 ringgit budget.



Figure 5.4.5 Result Page I

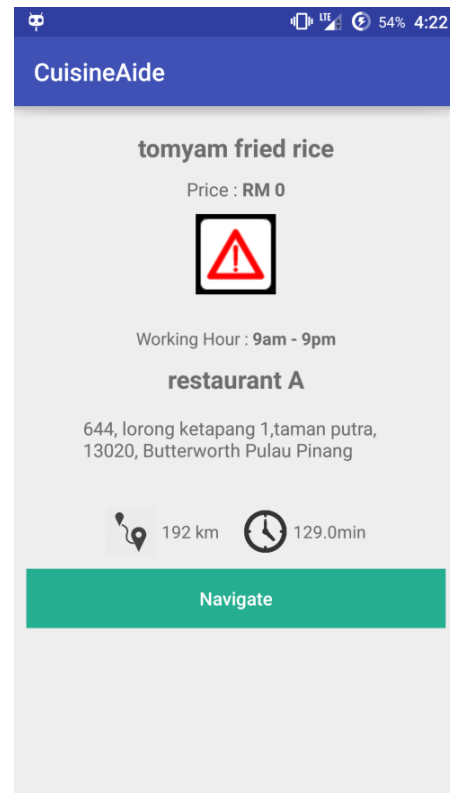


Figure 5.4.6 Result Page II

The first result page show all the recommendation from the application. User can pick the one he or she is interested in and navigate to the second result page. User can click the navigation button to navigate to the restaurant via Google Map if he or she doesn't know where the restaurant is located.

### Back End

```
number = intent.getExtras().getInt("number");
price = intent.getExtras().getInt("price");
currentLatitude = intent.getExtras().getDouble("currentLatitude");
currentLongitude = intent.getExtras().getDouble("currentLongitude");
latitude = String.valueOf(currentLatitude);
longitude = String.valueOf(currentLongitude);
origin = latitude + "," + longitude;
aiinput = moodid + "," + categoryid + "," + foodid + "," + 0;
```

Figure 5.4.7 Get the selection inserted by user

In the back end of the selection process, first the application will get all the preference inserted by the user and pass to the Artificial neural network supervised learning to process.

```

for(int i = 0; i<1; i++){
    ligne = ainput;
    trame = ligne.split(",");
    for(int j=0;j<trame.length-1;j++){
        matrizin[i][j] = Double.parseDouble(trame[j]);
    }
}
/* present a test pattern and compute the neural network output */
netanswer(matrizin[i]);
System.out.print(i+": ");
for(int j=0;j<OUTPUTS;j++){
    System.out.print("Out["+j+"]="+test4[j]+\n");
    System.out.print(test4);
}

void netanswer(double[] afer) {
    int i,j;
    double totin;
    for(i=0;i<INPUTS;i++)
        x[i] = afer[i];
    for(j=0;j<HIDDEN;j++) {
        totin = 0;
        for(i=0;i<INPUTS;i++)
            totin = totin + x[i]*test1[i][j];
        test3[j] = sigm(totin);
    }
    for(j=0;j<OUTPUTS;j++) {
        totin = 0;
        for(i=0;i<HIDDEN;i++)
            totin = totin + test3[i]*test2[i][j];
        test4[j] = sigm(totin);
    }
}
}

```

Figure 5.4.8 Artificial neural network supervised learning

```

I/System.out: 0: Out[0]=0.4339297849206099,
I/System.out: [D@185a81d9Out[1]=0.6633315253588674,
I/System.out: [D@185a81d9Out[2]=0.03411393997984524,
I/System.out: [D@185a81d9Out[3]=4.104522317966603E-5,

```

Figure 5.4.9 Desired Output of Artificial neural network supervised learning

1,1,1,0,0	1,1,2,0,1	1,1,3,0,1	1,2,1,0,3	1,2,2,0,0	1,2,4,0,3
2,2,1,0,2	2,2,2,0,1	2,2,5,0,0	3,1,1,0,1	3,3,2,0,3	3,3,3,0,0
4,2,1,0,0	4,2,2,0,1	4,2,4,0,2	4,2,3,0,1	5,1,2,0,0	5,3,3,0,0
5,3,2,0,4	5,3,1,0,3	7,1,4,0,2	7,3,2,0,0	7,3,1,0,1	7,3,3,0,2

Table 5.4.1 Artificial neural network supervised learning training set

Figure 5.4.8 show how Artificial neural network supervised learning process the input inserted by the user based on the Table 5.4.1 training set (The first number represent mood, second number represent category, third number represent food type, fourth number represent nothing (added in to let the input number equal to the output number) and the last number represent desired output) and produce desired output in Figure 5.4.9. Figure 5.4.9 show the desired output of the possibility of the result based on the user preference.

```

public void postData() {
    class PostDataJSON extends AsyncTask<String, Void, String> {

        @Override
        protected String doInBackground(String... params) {
            HttpClient httpClient = new DefaultHttpClient();
            HttpPost httpPost = new HttpPost("http://cuisineaideforandroid.bitnamiapp.com/php/results2.php");
            JSONObject json = new JSONObject();

            try
            {
                // JSON data:
                json.put("idtosort", idToSort);
                json.put("userid", userid);
                json.put("time", time);
                json.put("moodType", moodType);
                json.put("foodType", foodTypeid);
                json.put("category", category);
                json.put("number", number);
                json.put("price", price);
            }
        }
    }
}

```

Figure 5.4.10 PostData to PHP via async task

After getting the desired output from the neural network, the application will store all the data into json array and post the data to PHP by using async task.

```

$json = $_SERVER['HTTP_JSON'];

$data = json_decode($json);
$idtosort = $data->idtosort;
$userid = $data->userid;
$time = $data->time;
$mood = $data->moodType;
$foodTypeid = $data->foodType;
$categories = $data->category;
$person = $data->number;
$price = $data->price;

$response = array();
$response["results"] = array();

$query = "select distinct f.foods_name, ft.food_types_name, r.restaurant_name, r.total_table, r.table_available, r.location, r.working_hour, jfr.price,
jfr.image,r.restaurant_ID,f.foods_id,r.a_meal_time from foods f, food_types ft, j_food_restaurant jfr, restaurant r where f.food_types_FK = '$foodTypeid' and f.food_types_FK
= ft.food_types_id and f.foods_id = jfr.foods_FK and jfr.restaurant_FK = r.restaurant_ID and jfr.price < '$price' order by field(f.ai_id, $idtosort)";

if($result = $mysqli->query($query)) {
    while($row = $result->fetch_array(MYSQLI_ASSOC)) {
        $tmp = array();
        $tmp["foods_name"] = $row["foods_name"];
        $tmp["food_types_name"] = $row["food_types_name"];
        $tmp["restaurant_name"] = $row["restaurant_name"];
        $tmp["total_table"] = $row["total_table"];
        $tmp["table_available"] = $row["table_available"];
        $tmp["restaurant_ID"] = $row["restaurant_ID"];
        $tmp["price"] = $row["price"];
        $tmp["a_meal_time"] = $row["a_meal_time"];
        $tmp["working_hour"] = $row["working_hour"];
        $tmp["location"] = $row["location"];
        $tmp["image"] = $row["image"];
    }
}

```

Figure 5.4.11 PHP file

The PHP file will start running the SQL query after getting all the data from the application through asyncTask. After getting all the result return by the SQL query, the result will be store into an array and send back to the application.

```

public void showList() {
    try
    {
        for (int i = 0; i < res.length(); i++) {

            JSONObject c = res.getJSONObject(i);
            String foods_name = c.getString(TAG_FOOD_NAME);
            String restaurant_name = c.getString(TAG_RESTAURANT_NAME);
            String image = c.getString(TAG_IMAGE);
            String working_hour = c.getString(TAG_WORKINGHOUR);
            String restaurant_address = c.getString(TAG_RESTAURANTADD);
            String food_types_name = c.getString(TAG_FOOD_TYPES_NAME);
            int total_table = c.getInt(TAG_TOTALSEAT);
            int table_available = c.getInt(TAG_SEATAVAIL);
            int restaurant_ID = c.getInt(TAG_RESTAURANTID);
            int price = c.getInt(TAG_PRICE);
            String a_meal_time = c.getString(TAG_AVERAGEMEALTIME);
            destination = c.getString(TAG_RESTAURANTADD);
        }
    }
}

```

Figure 5.4.12 Get result from PHP file

```

ArrayList<Integer> indexToBeRemove = new ArrayList<>();

if (count == hashsetList.size()) {
    for (int a = 0; a < resultslist.size(); a++) {
        //System.out.print(Integer.valueOf(resultslist.get(a).get(TAG_AVERAGEMEALTIME)));
        //int average = Integer.valueOf(resultslist.get(a).get(TAG_AVERAGEMEALTIME));
        if ( (Integer.valueOf(resultslist.get(a).get(TAG_DURATION)) * 2) +
            (Integer.valueOf(resultslist.get(a).get(TAG_AVERAGEMEALTIME))*60) > (time * 60)) {
            indexToBeRemove.add(a);
        }
    }

    for (int i = 0; i<indexToBeRemove.size();i++){
        resultslist.remove(indexToBeRemove.get(i)-i);
    }

    for (int i = 0; i < resultslist.size(); i++) {
        int duration = Integer.valueOf(resultslist.get(i).get(TAG_DURATION));
        double minute = duration / 60;
        resultslist.get(i).put(TAG_DURATION, String.valueOf(minute) + "min");
    }

    adapter = new ResultViewAdapter(ShowActivity.this, resultslist);
    list = (ListView) findViewById(R.id.ListView);
    list.setAdapter(adapter);
}

```

Figure 5.4.13 Filtration process

After getting all the result from the PHP file, a for loop function is ran to load all the results from the array and do the filtration process. The application will based on the user inserted time to do the filter ((ETA x 2) + (average meal time in the restaurant) cannot greater than user inserted time). If the (ETA x 2) + (average meal time in the restaurant) greater than user inserted time, the result will be remove. After the filtration process is done, all the valid result will then pass to an adapter and show to the user.

## 5.5 Concluding Remark

In this chapter we talked about the System Implementation of the project. Since this is a software project so the Hardware Setup will be very simple. In Software Setup we need to install several softwares to program the application. For the Setting and Configuration, we need to setup Amazon Web Services, configure the Putty and FileZilla software to host the application in Amazon Cloud. System Operation shows how the front end and the back end of the application works.



## **Chapter 6: System Evaluation and Discussion**

### **6.1 System Testing and Performance Metrics**

The performance metrics for this project will be the accuracy of the results process by ANN supervised learning and the stability and reliability of the application.

#### Result Accuracy

The application will be tested in term of the accuracy of the result. The accuracy of the result is important because this able to improve the decision making of the user and improve the ANN supervised learning process. If result accuracy levels are low, the decisions of user it influences are likely to be poor. The ANN supervised learning maximum Mean Square Error to stop training in this application had set to 0.2, so the accuracy of the result in this project should be atleast 80% accuracy.

This performance metric will be test by inserting 10 actual cases defined in the ANN training pattern in ANN supervised learning and 10 grey cases which doesn't exist in the ANN training pattern. All the results outcome will be recorded in a table and the accuracy of the result will be calculated by the output of the application and the expected output from the user.

#### Stability and Reliability

The application will be tested in term of the stability and reliability of the application. Stability is about how many failures occurs; whether that is showed as unforeseen or unintended conduct, clients getting mistakes, or a calamitous failure that cuts a framework down. The less failure occurred, the steadier the application is. Reliability is a factor of quality, but a distinct measurement for determining the probability of failure as programs are developed or enhanced. extent to which an experiment, test, or any measuring procedure yields the same result on repeated trials.

The stability and reliability will be tested by inserting the 10 same actual case and 10 different case. All the results outcome will be recorded to give a measure of stability and reliability.

## 6.2 Testing Setup and Result

<b>Input</b>	<b>Desired Output</b>	<b>Expected Desired Output</b>
1,1,2,0	1	1
1,2,2,0	0	0
2,2,1,0	2	2
2,2,5,0	0	0
3,3,2,0	3	3
4,2,1,0	0	0
4,2,4,0	2	2
5,3,3,0	0	0
7,3,1,0	1	1
7,3,3,0	2	2

Table 6.2.1 Testing results for 10 actual cases defined in ANN training set.

Table 6.2.1 show the testing result for the 10 actual cases. All the desired output for the ANN and the expected desired output are match. The system testing for the 10 actual cases are passed.

<b>Input</b>	<b>Desired Output</b>	<b>Expected Desired Output</b>
9,1,1,0	1	1
10,2,4,0	0	2
8,3,1,0	1	1
7,1,2,0	0	0
6,2,2,0	0	0
5,2,5,0	2	2 or 0
3,3,3,0	0	0
2,1,3,0	1	0
1,2,3,0	0	0 or 1
4,3,2,0	0	0

Table 6.2.2 Testing results for 10 grey cases doesn't exist in ANN training set.

Table 6.2.2 show the testing result for the 10 grey cases. 80% the desired output for the ANN and the expected desired output are matched. The system testing accuracy match with the accuracy rate of the ANN supervised learning error rate. The system testing for the 10 grey cases are passed. Noted that the author for all the testing are Loo Chun Khee. The testing case for 10 grey cases are based on author preference. Every user preference maybe different.

While testing the result accuracy performance metrics, the stability and the reliability of the application were also tested. The whole result accuracy performance metric was tested by inserting 20 sample cases and every case was tested twice. So the total tested case were 40 cases. The result of the first test 20 cases and the next test 20 case are same. The application output are reliable. All the cases were tested under a good internet connection, the performance of the application worked without delay. The application was also tested under an average internet connection and a slow internet connection, the performance of the application still work under the internet connection in average and slow condition but the processing time will took longer compare to internet connection under good condition. The application meet the requirement of stability.

### **6.3 Project Challenges**

The expected challenges in this project are the user friendliness of the application. In order to design a user friendly application, we need to meet certain requirements, such as attracting the users with contrasting colour so the navigation for the application can be easily guide the user to use the interface. Use icons instead of word to guide user in the application. Compatibility of older devices to ensure the application can be use by old version and latest version of Android operating system.

Beside user friendliness, the accuracy of the matching function is another expected challenge in this project. Since we are creating a smart application for smart phone user, the matching function must be smart enough. In this project we need to refer to the user preference or data inserted by user to suggest accurate best route and the available restaurant to the user. To make it smart, we need to include an Artificial Intelligence work in the back-end application to provide the suggestion to the user based on the user preference.

After including the ANN supervised learning into the application, evaluating the performance of the mobile application in terms of the accuracy will be the next big challenge. The error rate for the ANN supervised learning cannot be set too low, otherwise the program will be in a infinity loop. But if the error rate is too high the accuracy of the program will be low. Other than that, other settings of the ANN supervised learning are very important too. For example, the learning rate and momentum for the neural network. All of the settings must be defined correctly, if any one of them is too low or too high the program will fall into an infinity loop.

## **6.4 SWOT**

### Strengths

The strength of the project can benefit users (busy workers or students) who's only got limited meal time in terms of reducing decision making time and strive for the maximum meals having times. The application can act as virtual meal assistant to provide foods recommendation based on the user preference through ANN supervised learning. The neural network will based on the training set defined earlier and refer to the users' preferences and details inserted by them to process and provide the best foods recommendation. The accuracy is close to 80% to the user. This will be the biggest competitive advantages compete to other similar mobile application.

On the other hand, ANN can be powerful if it kept on accumulate user selection and include it into the training set. This will increase the prediction of human behavior accuracy rate by learning from the user selection behavior.

### Weaknesses

The weaknesses of the project would be the lack of booking function to the restaurants. Most user prefers a booking function because booking function can help user save more time without waiting for the meal preparation. Other than that, ANN supervised learning providing more than one output results to user by finding a very good (close to the mean squared prediction error rate) answer to the user to choose but the prediction can be wrong sometimes. There are always some grey cases exist in the environment.

### Opportunities

The standard meal time for every worker is usually one hour. Sometimes the workers may only have thirty minutes or forty minutes for having their lunch or dinner, they need to get back to their work after that. Sometimes they might not have enough time for their meal because of traffic condition or the restaurant is fully booked. This condition always happened in hectic city like Kuala Lumpur or Penang.

This also happen to students in the universities and colleges. Especially those who are studying in the cities where they also suffer for the traffic, parking, and restaurant availability issues.

This will be the opportunity for the project. Our aim is to help those workers and in terms of reducing decision making time and strive for the maximum meals having times.

This application has the potential to be applied to all working people and also students. According to Department of Statistics Malaysia (<https://www.statistics.gov.my/index.php>), total population of Malaysia in year 2016 estimated at 31.7 million persons. Working age population, from 15 years old to 64 years old occupied 69.4 %, which is 21.99 million persons may be the potential user for this application.

Not only in Malaysia, this application has the potential to be applied to all working people and also students around the worlds. For the example, in China. The population count in China is ranked number 1 in global. According to Worldometers (<http://www.worldometers.info/world-population/china-population/>) the population if China in year 2016 estimated to be 1.38 billion and the working age population, from 15 years old to 64 years old occupied 67.9%, which is 0.9 billion. If this project successful expanded to China, 0.9 billion persons may be the potential user for this application.

### Threats

This application requires close cooperation with restaurant owners and operators. By getting the restaurant details, the applications can utilise the user preferences and the restaurant details to perform filtration process in order to provide recommendation for the user. Cooperation with many restaurants will provide more choice to the users. While this is good for the users, but on the other hand, if all restaurants start to compete with each other and they may try to submit fake data (for example, provide invalid table availability), and this will be the threats of the project.

## 6.5 Objectives Evaluation

The first objective for this project is fully achieved, the application are able to assist the user to figure out the best meal (through ANN supervised learning), location navigation (via Google Map), and time constraint to have his or her meal.

This project is able to suggest the best matching restaurant (through artificial intelligent) for the user to have his or her meal based on the preferences such as meal time, mood, food category, all inserted by the user with 80% accuracy rate. So the second objective for this project is fully achieved as well.

The last objective is to evaluate the performance of the mobile application in terms of the accuracy, user friendliness and stability and reliability. After testing the performance metics of the application, the expected results and desired output from the application are matched, no error and crash found in the system testing. The third objective for this project is fully achieve.

## 6.6 Concluding Remark

In this chapter we talked about the System Evaluation and Discussion of the project. The performance metrics of this project will be the result accuracy and system stability and reliability. The performance metric for result accuracy are tested by inserting 10 actual cases defined in the ANN training set and 10 grey case that doesn't exist in the training set. The expected result and the desired output are a matched for the 10 actual cases. The accuracy rate for the expected result and the desired output for the 10 grey case is 80%. The system testing accuracy rate match with the accuracy of the ANN supervised learning error rate. The performance metric for system stability and reliability also tested by inserting 20 sample cases. No error and crashes for the system when tested with 40 cases. User friendliness, the accuracy of matching and the setting for the ANN (learning rate,error rate and momentum) will be the expected challenges for this project. The strengths of the project can reducing decision making time and strive for the maximum meals having times and ANN can act as virtual meal assistant to assist user for decision making. The weaknesses of the project are there is no booking function for user and the prediction ANN sometimes can be wrong. In Malaysia there are 21.99 million persons under working age population, this project can help

those workers and in terms of reducing decision making time and strive for the maximum meals having times, this will be the opportunities for this project. Cooperation with many restaurants will provide more choices to the users, if all restaurants start to compete with each other and they may try to submit fake data (for example, provide invalid table availability), and this will be the a threat to the project.

## **Chapter 7: Conclusion and Recommendation**

### **7.1 Conclusion**

To conclude, this project consists of creating a marketable android application to assist busy worker who stay in hectic city like KL or student studying in university or college with hectic student life. The module of this project includes searching function to search for the best matching restaurant and food suggestion within a limited time given for having meals, mapping function to navigate the user from departure location to destination, login and registration function to store the user detail and user search record, profile function to show the user details in the application and storage function to store all the user data, user history record, food and restaurant details. This is a convenient mobile application that benefits busy person like workers and students.

### **7.2 Recommendation**

In this project, the Artificial neural network supervised learning training process is done by running manually in another isolated program. The project will get the output of the training process and include in the mobile application. Future improvement on the project can be done by collecting all the user behavior and integrated the Artificial neural network supervised learning training process into cloud, let the Artificial neural network supervised learning training process train on cloud automatically a few months once and update to the mobile application automatically. Beside that, another improvement can be done to strengthen the design of the application by collecting feedback from users.



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**APPENDIX-A ANN Training Set**

Mood	Category	Food Type	NULL	Desired Output
1	1	1	0	0
1	1	2	0	1
1	1	3	0	1
1	2	1	0	3
1	2	2	0	0
1	2	4	0	3
2	2	1	0	2
2	2	2	0	1
2	2	5	0	0
3	1	1	0	1
3	3	2	0	3
3	3	3	0	0
4	2	1	0	0
4	2	2	0	1
4	2	4	0	2
4	2	3	0	1
5	1	2	0	0
5	3	3	0	0
5	3	2	0	2
5	3	1	0	3
7	1	4	0	2
7	3	2	0	0
7	3	1	0	1
7	3	3	0	2

Mood	
1	Happy
2	Sad
3	Sick
4	Low carbs
5	Dizzy
6	Angry
7	Empty
8	Cincai
9	Moody
10	complicated

Category		Food Type		Foods	
Rice	1	Chinese	1	Bak Kut Teh	0
				Chicken Rice	1
				Duck Rice	2
				Economic Rice	3
		Malay	2	Nasi Lemak	0
				Nasi Berlauk	1
				Nasi Dagang	2
				Nasi Kerabu	3
		India	3	Curry Eice	0
				Butter Chicken Rice	1
				Kheer	2
				Rajasthani Thali	3
		Fried Rice	4	Nasi Goreng Kampung	0
				Tomyam Fried Rice	1
				Nyonya Fried Rice	2
				Ikan Billis Fried Rice	3

Western Food	2	Chicken	1	Grill Chicken Chop	0
				Mushroom Chicken Chop	1
				Black Pepper Chicken Chop	2
				Hainan Chicken Chop	3
		Lamb	2	Lamb Shanks	0
				Lamb Rib Chop	1
				Black Pepper Lamb	2
				Lamb Chop	3
		Fish	3	Fish n Chip	0
				Steamed Salmon	1
				Black Pepper Fish	2
				Grill Salmon	3
		Beef	4	Beef Bacon	0
				Grill Beef	1
				Beef Steak	2
				Hainan Beef Steak	3
		Spaghetti	5	Tomato Spaghetti	0
				Cabonara Spaghetti	1
				Mushroom Spaghetti	2
				Black Pepper Spaghetti	3
Noddles	3	Fried	1	Cantonense Soy Sauce	0
				Chinese Fried	1
				Mee Goreng Kampung	2
				India Fried Noodle	3
		Soup	2	Tomyam Mee	0
				Chicken Noodle	1
				Vegetable Noodle	2
				Hokkien Mee	3
		dry	3	Wan Tan Mee	0

				Keow Teow Dry	1
				Pan Mee	2
				Hokkien Dry	3