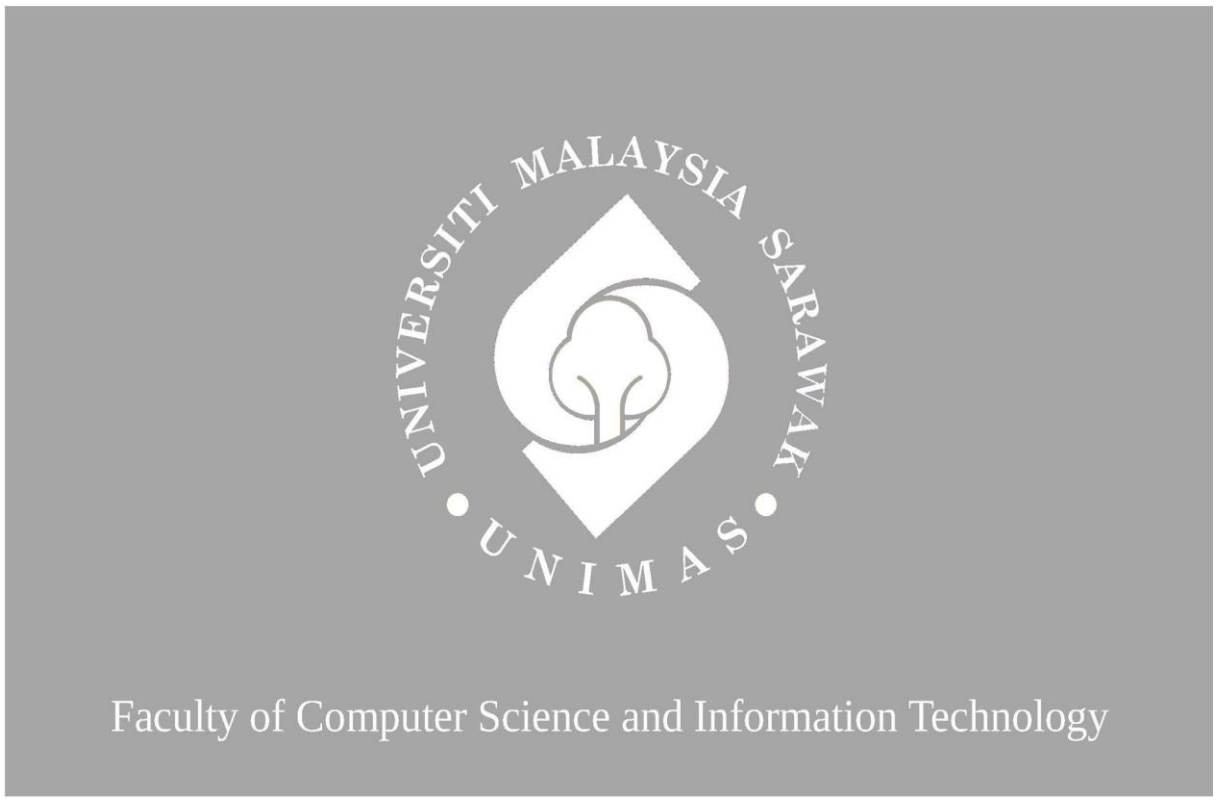

ONE-SHOT LEARNING FOR FACE RECOGNITION ATTENDANCE USING DEEP LEARNING

WONG MUN WAI

Bachelor of Computer Science with Honours (Computational Science)

2019

ONE-SHOT LEARNING FOR FACE RECOGNITION ATTENDANCE USING DEEP LEARNING

WONG MUN WAI

This project is submitted in partial fulfillment of the requirements for the degree of Bachelor of Computer Science with Honors

Faculty of Computer Science and information Technology
UNIVERSITI MALAYSIA SARAWAK
2019

"ONE-SHOT LEARNING" UNTUK KEHADIRAN DENGAN PENGECAMAN WAJAH MENGGUNAKAN PEMBELAJARAN MENDALAM

WONG MUN WAI

Projek ini merupakan salah satu keperluan untuk

Ijazah Sarjana Muda Sains Komputer dan Teknologi

Maklumat

Fakulti Sains Komputer dan Teknologi Maklumat

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Abstract

Class Attendance is very important as it may directly affect the performance of students. Hence, a lot of universities and institutions require their students to attend at least 80% of each subject in order to pass or sit for final exam of that corresponding subject. There are a lot of ways used by universities and institutions to record students' attendance and each way has its own pros and cons. In this project, questionnaire is used to know whether the proposed system would be better compared to current QR code attendance system using in UNIMAS. The purpose of this project is to develop a face recognition for UNIMAS to replace the QR code which may consider more flaw compared to face recognition attendance system. Besides, an investigation and possible improvement on face recognition accuracy and detection speed will be done during this project to increase the overall performance of the face recognition.

Abstrak

Kehadiran Kelas amat penting kerana ia secara langsung mempengaruhi prestasi pelajar. Oleh itu, banyak universiti dan institusi memerlukan pelajar mereka untuk menghadiri sekurang-kurangnya 80% daripada setiap subjek untuk lulus atau duduk untuk peperiksaan akhir mengenai subjek yang sama. Terdapat banyak cara yang digunakan oleh universiti dan institusi untuk mencatat kehadiran pelajar dan setiap cara mempunyai kebaikan dan keburukannya sendiri. Dalam projek ini, soal selidik digunakan untuk mengetahui sama ada sistem yang dicadangkan akan lebih baik berbanding sistem kehadiran kod QR yang digunakan oleh UNIMAS. Tujuan projek ini adalah untuk membangunkan pengecaman wajah untuk UNIMAS untuk menggantikan kod QR yang boleh dipertimbangkan lebih banyak kecacatan berbanding dengan sistem kehadiran pengecaman wajah. Di samping itu, penyiasatan dan kemungkinan peningkatan ke atas ketepatan pengecaman wajah dan kelajuan pengesanan akan dilakukan semasa projek ini untuk meningkatkan prestasi keseluruhan system ini.

TABLE OF CONTENTS

Chapter 1: Introduction

1.0 Project Title

One Shot Learning for Face Recognition Attendance using Deep Learning

1.1 Introduction

Face recognition is a technology capable of identifying or verifying a person by analyzing patterns based on the person's facial features (Rouse, M. & Gillis, A., n.d.). Face recognition is mainly used for security purpose but, face recognition technology has potential for a wide range of application ("What is Facial Recognition? - Definition from Techopedia", n.d.). The most commonly used of way in face recognition is using the convolutional neural network which need a large training set and not convenient to retrain it when we add a picture of new person to the system. Hence, one-shot learning using Siamese neural network is another way in face recognition which only requires a small training set (D, F, 2017). One of the potential applications of one-shot learning for face recognition is taking attendance. Class attendance is a record of student appearing/present for a class. Based on UNIMAS's attendance policy, students must be attending at least 80% of the classes for a course to avoid getting barred from sitting final exam. This is because students are more likely to get higher marks in academics when their attendance rate is high and consistent. A research carried out in UiTM shown that class attendance is a factor that affects final performance of students (Md Noh, Nur Hidayah & Yusoff, Sarah., 2018).

1.2 Problem Statement

The effectiveness of attendance system may affect the attendance rate. Presently, most of the institutions are using hand-signed attendance sheet or scan QR code for attendance. Taking attendance by using attendance sheet or QR code may not very effective as there are many flaws or inconvenience in these systems. For example, by using attendance sheet lecturers must print out the sheet before class and pass to all the student for them to sign for attendance which in fact is quite inconvenience and not effective. By using QR code, lecturers must open the QR code on the screen in order to let student to scan for attendance. These may disturb the lecturers to start the lecture. Another problem of hand-signed attendance or scan QR code are students can help their friends to take attendance even their friends are not inside the class. Besides, student can also leave the classroom after sign/scan for their attendance. By using face recognition, it can detect student face for attendance when student come into the classroom without disturb the ongoing lecture.

1.3 Scope

The scope of this project is defined as below:

i. The targeted user for this attendance system is the lecturers and students of institutions/universities.

ii. The attendance system will record attendance using camera which run on a raspberry pi platform.

1.4 Objective

The aim of this project is to design and develop a face recognition system.

The objectives of achieving the aim are as below:

i. To study the existing system and determine the problem and inconvenience for lecturers and students.
ii. To apply and improve on algorithm for face detection using one shot learning which improve on detection speed and accuracy.

1.5 Brief Methodology

Design science research methodology is selected as the methodology for this project. Design science research is an information technology research methodology focuses on development and performance of prototypes. Design science research typically involves the creation of prototype and design theory with intention of improving the current state of practice as well as existing research knowledge. This methodology is chosen because the capable of achieving knowledge and understanding of problem by creation of prototypes. Figure below shows the 6 phases of design science research methodology.

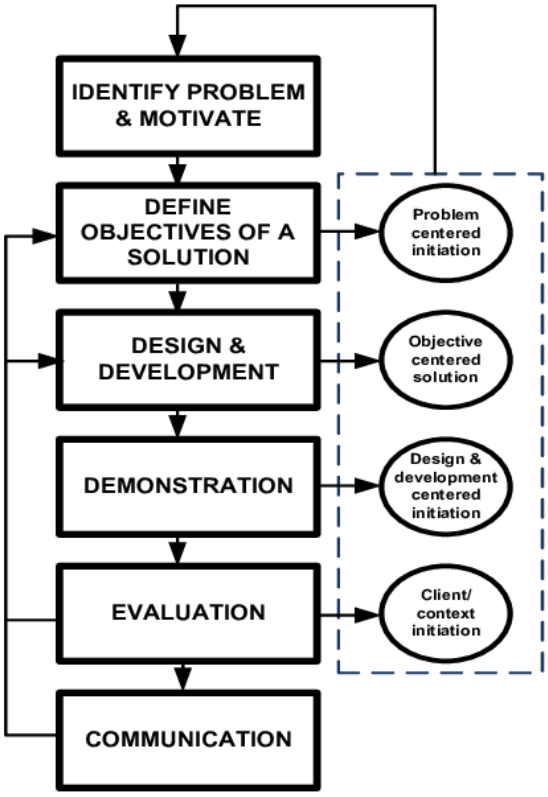

Figure 1: The 6-phase design and development research approach

1.5.1 Identify problem & motivate

In this phase, problem statement is identified by researcher. Researcher will consider criteria of the problem for evaluating the final output of research effort.

1.5.2 Define objectives of a solution

In this phase, researcher will define and design a solution/prototype. The requirements of the solution/prototype must meet in order to address the problem is defined.

1.5.3 Design & Development

The design is further developed and implemented in this phase. The prototype development will begin immediately. For the face recognition attendance system, python language will be used and implemented using a raspberry pi based platform.

1.5.4 Demonstration and Evaluation

When a working prototype is completed, it is necessary to demonstrate that the prototype developed meets the functionalities and requirements established for it during the design and development phase. Besides, another purpose of this phase is the validity of the prototype developed in the context of the problem described. The working prototype must applicable in the proposed context and can demonstrate some viable results in addressing the problem.

1.5.5 Communication

In this phase, a considerable amount of new knowledge is produced through the prototype and studies. The results and conclusions outcome from the prototype are closely related to the research questions driving the study. The finale of a research effort is typically the result of the prototype is enough to answer the problem of the research.

1.6 Significance of Project

The purpose of building one shot learning for face recognition attendance system is to increase the effectiveness and more convenience.

1.7 Project Schedule

Project Schedule is the listing of task of a project with the intended start and finish dates. The project schedule is important in ensuring project success. A project schedule has been created using Microsoft Project and a Gantt Chart is formed. The proposed project schedule spans two semesters, FYP1 for first semester and FYP2 for second semester. FYP1 started at 17th September 2019 and ends at 11th January 2020. FYP2 started at 28th January 2020 and ends at 23rd May 2020. The figure 2 and 3 below show Gantt Chart for FYP1 and FYP2, respectively.

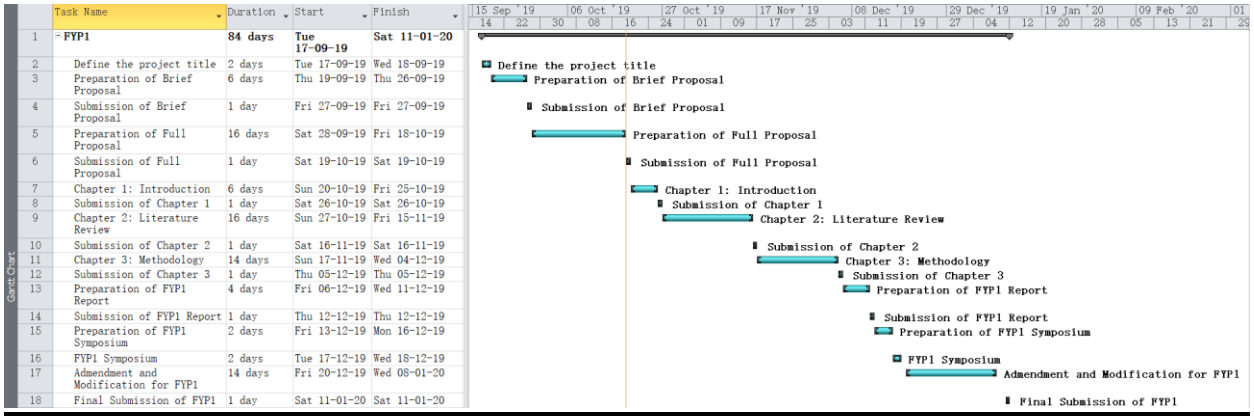

Figure 2: The Gantt Chart of the FYP1

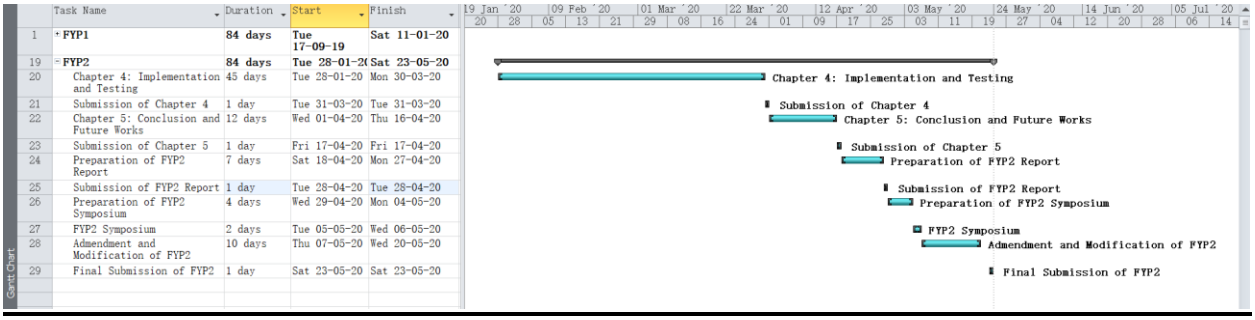

Figure 3: The Gantt Chart of the FYP2

1.8 Expected Outcome

The expected outcome of this project is a working prototype of the system that can recognize the face of student and register attendance for the student.

1.9 Project Report Outline

1.9.1 Chapter 1: Introduction

Chapter 1 describes the overview of the proposed project. The introduction, problem statement, scope, objective, brief methodology, significance of project, project schedule, expected outcome is stated in detail in this chapter for other to review. The problem statement discusses the flaw and issue faced of the current system and the objective state the purpose of the proposed project which may overcome the flaw and issue faced in current system. The brief methodology provides a brief discussion on the methodology chosen for complete this project. Significance of project state the benefit of the proposed project and the project schedule provide the plan and timeline of doing the proposed project. Last but not least, the expected outcome section describes the expected output that may obtained after completion of the proposed project.

1.9.2 Chapter 2: Literature Review

Chapter 2 discuss about the literature review done on other existing system which similar to the proposed project. This chapter also will discuss how the proposed project can beneficial over the existing system. The technology and skills used in the proposed project will also discuss in this chapter.

1.9.3 Chapter 3: Requirement Analysis and Design

Chapter 3 focus on the discussion of methodology applied on the proposed project. Besides, the requirement of the prototype is discussed and prepared the for implementation and testing phase.

1.9.4 Chapter 4: Implementation and Testing

Chapter 4 focus on the details of implementation of the proposed prototype or system, which include the prototype. This chapter also discuss the testing and collect of data from the prototype and the result report based on the data.

1.9.5 Chapter 5: Conclusion and Future Work

Chapter 5 provides the conclusion based on the result outcome of the prototype and report as well as provide the outline of the future work of the project.

Chapter 2: Literature Review

2.1 Overview of Objective

The One-Shot Learning for Face Recognition Attendance using Deep Learning system is proposed to fulfill the following objectives upon completion:

a) To study the existing system and determine the problem and inconvenience for lecturers and students.
b) To apply and improve on algorithm for face detection using one shot learning which improve on detection speed and accuracy.

2.2 Reviews on Similar Existing System

There existing systems have been chosen to discuss and review in this section, which are:

1. UNIMAS NOW
2. Attendance Taker
3. Manually sign attendance sheet

2.2.1 UNIMAS NOW

UNIMAS Now is a mobile application which allows students and staffs of UNIMAS to read about their information, discover UNIMAS event & announcement. Besides, one of the functions of UNIMAS Now is that student can take class attendance by QR code.

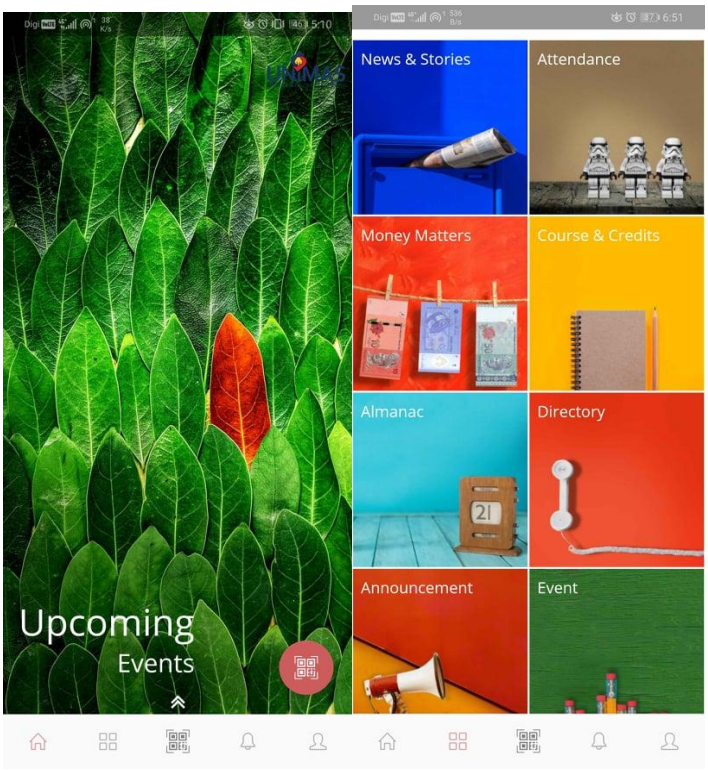

Figure 2.0 Home page and function page of UNIMAS now

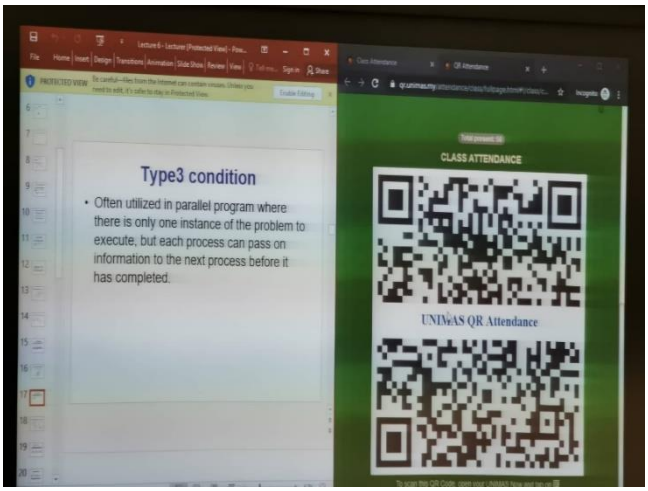

Figure 2.1 example of QR code for specific class

The UNIMAS Now application consists of few parts: homepage, function list, QR scanner, notification and Personal information as shown in figure 2.0.

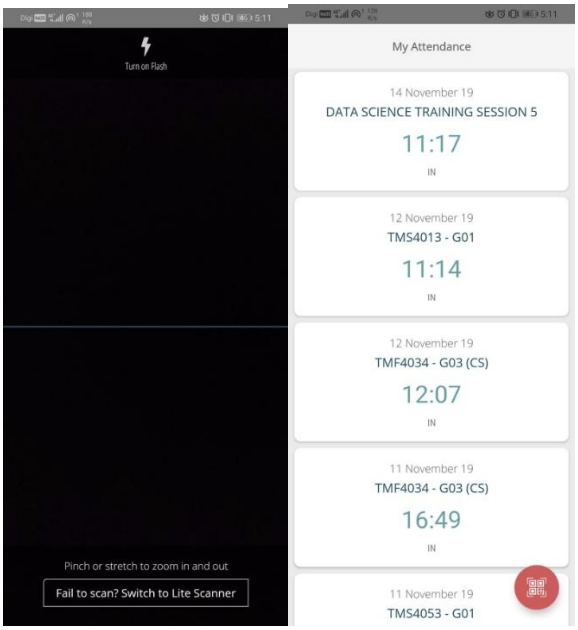

Figure 2.2 QR Scanner of UNIMAS now and attendance record

In order to take attendance, students can use the QR scanner of the UNIMAS now application as shown in the first image figure 2.2 to scan the QR code displayed by lecturer for taking attendance. The QR code will change every 6 seconds to prevent cheating. After that, student can check and make sure for the attendance record taken as shown in second image of figure 2.2.

Pros:

- Easy to use by open the application and use QR scanner for taking attendance
- Can prevent student from cheating by capture QR code and send to their friend
- Student can check for the past attendance record

Cons:

- Lecturer must open the QR code which may interrupt the lecture
- Student must have a mobile with camera in order to scan the QR code

- Student must have internet connection to take attendance
- Cannot check for the percentage of attendance for specific subject

2.2.2 Attendance Taker

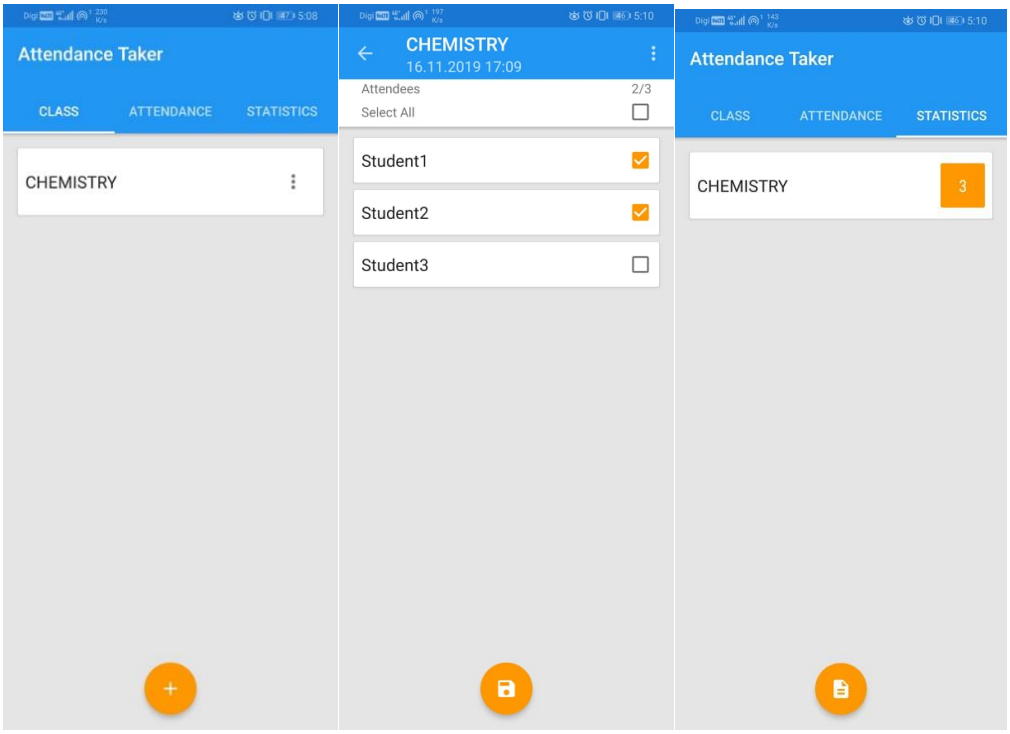

Figure 2.3 Screenshot of Attendance Taker Application

Attendance Taker is a mobile application which allows teacher to record the attendance of their students. The Attendance Taker application consists of three parts: Class, Attendance and Statistics as shown in figure 2.3. In order to record attendance, teacher can add a subject by clicking the add button located at the bottom of the application as shown in the first interface of figure 2.3. The second interface of figure 2.3 shows the listing of students in that class and teacher can select the attended students and click the save button. The third interface of figure 2.3 is to allow teacher to view the attendance statistic of each student in each class.

Pros:

- User friendly and easy to use
- No need internet connection
- Can see the statistics and percentage of attendance of student based on subject

Cons:

- Data/Record is stored inside mobile where other people cannot see
- Data/Record lost when mobile broken down
- Teacher need to waste time on doing a roll call to know who is present during class

2.2.3 Scan Attendance Manager

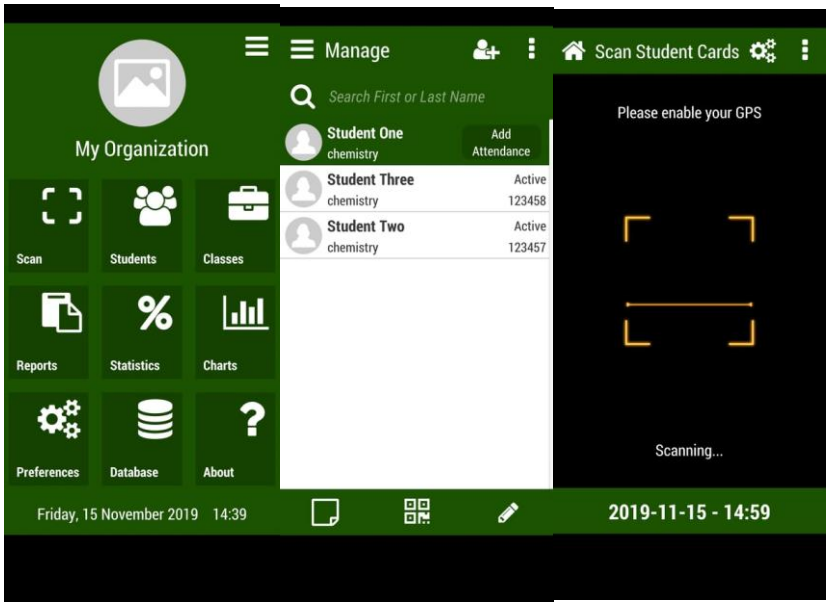

Figure 2.4 Screenshot of Smart Attendance Manager

Smart Attendance Manager is a mobile application that allows teacher to record the attendance of students. The first interface in figure 2.4 shows the hoe page of Scan Attendance

Manager. In this application, each student has his/her own student card which included a unique QR code. Teacher can simply scan the QR code of students using the built-in scanner in Smart Attendance Manager to take attendance or teacher can manually add attendance of students using the apps. Teacher also can see the statistic of overall and each class in Scan Attendance Manager.

Pros:

- No need internet connection
- Able to export and import data using database file

Cons:

- Students must queue up to let teacher to scan their QR code

2.2.4 Comparison between the existing system

Functionalities	Existing System			Proposed System
	UNIMAS Now	Attendance Taker	Scan Attendance Manager	
Technique Used	QR code	Manual	QR code	Face Recognition
Automated Attendance	Yes	No	Yes	Yes
Manual Attendance	Yes	Yes	Yes	Yes
View Attendance	Yes	No	Yes	Yes