

ABSTRACT

What is the problem.

Attendance taking in any organization is an important process. Often attendance taking process can be tiresome and can become a large process. In a class with large number of students this procedure can consume large amount of the crucial class time, which becomes mundane for both teachers and students. Nowadays Educational institutions are concerned about regularity of student attendance. This is mainly due to students' overall academic performance is affected by his or her attendance in the institute. Mainly there are two conventional methods of marking attendance which are calling out the roll call or by taking student sign on paper. They both were more time consuming and difficult. Hence, there is a requirement of computer-based student attendance management system which will assist the faculty for maintaining attendance record automatically.

How the problem can be solved.

To save the time wasted in taking manual attendance, We can think of some automated system which will save both the time and efforts of the teacher. This way proper maintenance and monitoring of attendance can be done. So the solution focuses on the automation of attendance taking system. Automation can be achieved by some system which can automatically detect and recognize student and carry on the attendance taking process. This can be an effective solution for the above manual attendance taking system.

Your suggested solution.

So herein we suggest an automatic attendance taking system which makes use of face detection and recognition system. So we aim to design and develop a system which maintains and keeps a record of the students attendance using face recognition and detection image processing. The system uses information and photographs of students extracted from Moodle database and updates the attendance table in Moodle after processing to keep a track of the students' attendance for different courses.

Tools and technologies.

1. Tensor Flow framework.
2. PHP.

3. HTML5.
4. Android.
5. Mysql.
6. Sqlite.
7. Moodle software.

App:

Our suggested solution for the above mentioned problem is done through an app that we built for the manual as well as automatic attendance taking. This app is connected with the Moodle database where the attendance table has been stored for the purpose of marking of attendance. We have a separate system for face detection and recognition which uses facenet algorithm. The student images are sent to the web server through this app and then the facenet algorithm play its role in face detection and recognition.

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CHAPTER – 1

INTRODUCTION

Maintenance and monitoring of attendance records plays a vital role in the analysis of performance of any organization. It is a mandatory part for any institution. Attendance of the student is very important for every college, university and school. Thus we aim to build an attendance marking application with the help of face detection and recognition technology and connecting it with the Moodle software which is being used by our department.

1.1. PREAMBLE

Nowadays Educational institutions are concerned about regularity of student attendance. This is mainly due to students' overall academic performance is affected by his or her attendance in the institute. Mainly there are two conventional methods of marking attendance which are calling out the roll call or by taking student sign on paper. They both were more time consuming and difficult. Hence, there is a requirement of computer-based student attendance management system which will assist the faculty for maintaining attendance record automatically.

Conventional methodology for taking attendance is by calling the name or roll number of the student and the attendance is recorded. This method could easily allow for impersonation and the attendance sheet could be stolen or lost. But there are many automatic methods available for this purpose i.e. biometric attendance. All these methods also waste time because students have to make a queue to touch their thumb on the scanning device.

To stay away from these losses, we will use an automatic method which is based on image processing. As a result, in order to solve these problems and avoid errors we suggest to computerize this process by providing an application which makes the entire attendance taking process handy and flexible.

1.2. PROBLEM STATEMENT

The manual attendance record system is not efficient and requires more time to arrange record and to calculate the average attendance of each student. Hence there is a requirement of a system that will solve the problem of student record arrangement and student average attendance calculation. So we aim to design and develop a system which maintains and keeps a record of the students attendance using face recognition and detection image processing. The system uses information and photographs of students extracted from Moodle database and updates the attendance table in Moodle after processing to keep a track of the students' attendance for different courses.

1.3. SCOPE OF OUR PROJECT

Traditional attendance taking mechanism was very tedious for the faculties especially when there are many students in the class and it had to be managed manually. So by using our application for taking the attendance simplifies this process for faculties to manage attendance sheets for many classes. Now the attendance will be managed on the Moodle server and can be used to extract the information regarding the attendance of the students easily.

1.4. GOALS AND OBJECTIVES

1. To design an application that provides the faculty with the option to take manual or automatic attendance.
2. To detect faces real time from the pictures captured by the faculty.
3. To recognize the detected faces by the use of a suitable algorithm.
4. To update the class attendance on the Moodle software deployed on the server after a successful match.
5. To design an architecture that constitutes the various components working successfully to keep a record of attendance of students enrolled in various courses.

1.5. RESEARCH METHODOLOGY

The proposed solution approach will define an application which will provide an interface to the teachers to mark the attendance of the students enrolled in their courses either manually or automatically using face detection and recognition in the Moodle database. The application will work in the offline mode as well once the tables of students is downloaded from the Moodle server and the attendance will temporarily be stored in the application itself until it is updated on the server when the application goes online.

The face detection and recognition technique which we propose to use here is the Tensor flow backed FaceNet implementation. The recognized students names' will be sent to the application and the faculty can further use the manual attendance facility for the marking the attendance of the students who are being marked as absent.

1.6. ORGANIZATION OF THE PROJECT REPORT

The main body of the report is preceded by detailed contents including lists of figures followed by units used in the report. This is followed by executive summary giving briefly the scope and objectives of the study, importance of the topic, methodologies, strategies and algorithms used to solve the problem.

Chapter 1 provides the introduction about the project, preamble, problem statement, goals and objectives, research methodology.

Chapter 2 discusses the background of the project which includes the area, available tools, hardware & software used in the project, research papers used, and their limitations.

Chapter 3 equips with holistic analysis of the project which includes the detailed problem statement, requirement analysis i.e. functional & non-functional requirements, feasibility study followed by various diagrams.

Chapter 4 deals with the design aspect of the project which encompasses various architectural diagrams along with information about various modules and various diagrams.

Chapter 5 deals with the implementation of the project and the technologies used to implement the project.

CHAPTER - 2

LITERATURE REVIEW

2.1. IMAGE PROCESSING

Image processing is the first part of this project to be able to extract the faces of students from the photographs captured and then detect the faces by comparing them with the faces of students in the database to mark the attendance.

It is a method to perform some operations on an image, in order to get an enhanced image or to extract some useful information from it. It is a type of signal processing in which input is an image and output may be image or characteristics/features associated with that image.

Nowadays, image processing is among rapidly growing technologies. It forms core research area within engineering and computer science disciplines too. Image processing is classified into two types. They are:

1. Analog image processing: Analog or visual techniques of image processing can be used for the hard copies like printouts and photographs. Image analysts use various fundamentals of interpretation while using these visual techniques. The image processing is not just confined to area that has to be studied but on knowledge of analyst.

Association is another important tool in image processing through visual techniques. So analysts apply a combination of personal knowledge and collateral data to image processing.

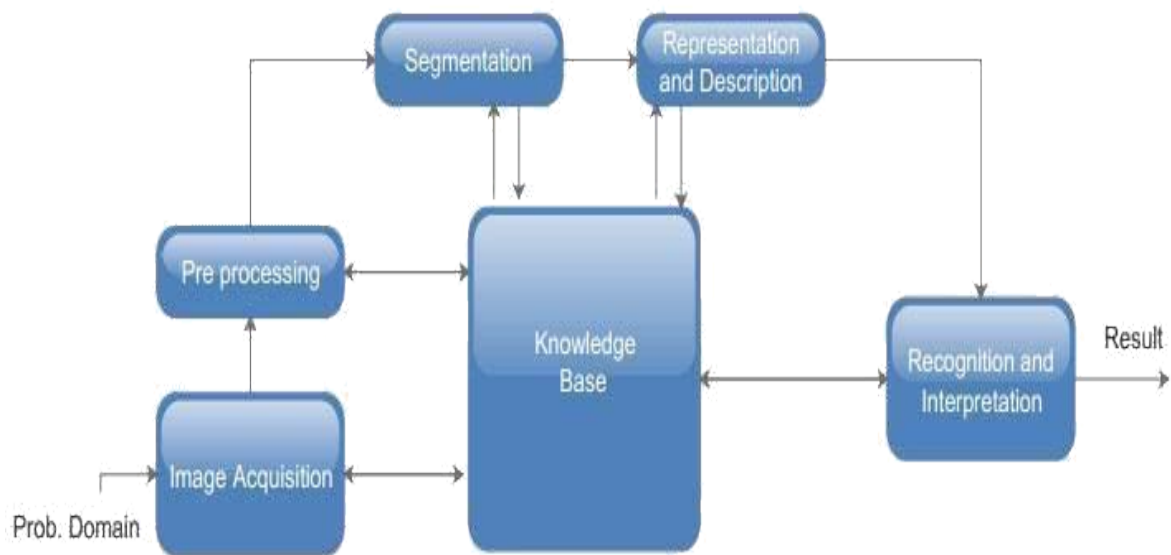
1. Digital image processing: Digital image processing techniques help in manipulation of the digital images by using computers. Thus our project requirement is digital image processing.

2.2. DIGITAL IMAGE PROCESSING

Fundamental steps in image processing are:

- Image acquisition: to acquire a digital image
- Image pre-processing: to improve the image in ways that increase the chances for success of the other processes.
- Image segmentation: to partitions an input image into its constituent parts.
- Image representation: to convert the input data to a form suitable for computer processing.

- Image description: to extract features that result in some quantitative information of interest or features that are basic for differentiating one class of objects from another.
- Image recognition: to assign a label to an object based on the information provided by its descriptors
- Image interpretation: to assign meaning to an ensemble of recognized objects.



2.3. FUNDAMENTALS

2.3.1 Face Detection

Face detection is the process of identifying and locating all the present faces in a single image or video regardless of their position, scale, orientation, age and expression. Furthermore, the detection should be irrespective of extraneous illumination conditions and the image and video content.

2.3.2 Face Recognition

Face Recognition is a visual pattern recognition problem, where the face, represented as a three dimensional object that is subject to varying illumination, pose and other factors, needs to be identified based on acquired images. Face Recognition is therefore simply the task of identifying an already detected face as a known or unknown face and in more advanced cases telling exactly whose face it is.



2.3.3 Difference between Face Detection and Face Recognition

Face detection answers the question, Where is the face? It identifies an object as a “face” and locates it in the input image. Face Recognition on the other hand answers the question who is this? Or whose face is it? It decides if the detected face is someone known or unknown based on the database of faces it uses to validate this input image. It can therefore be seen that face detections output (the detected face) is the input to the face recognizer and the face Recognition’s output is the final decision i.e. face known or face unknown.

2.4. FACE RECOGNITION

Although different approaches have been tried by several groups of people across the world to solve the problem of face recognition, no particular technique has been discovered that yields satisfactory results in all circumstances. The different approaches of face recognition for still images can be categorized in to three main groups namely:

Holistic Approach –In this, the whole face region is taken as an input in face detection system to perform face recognition.

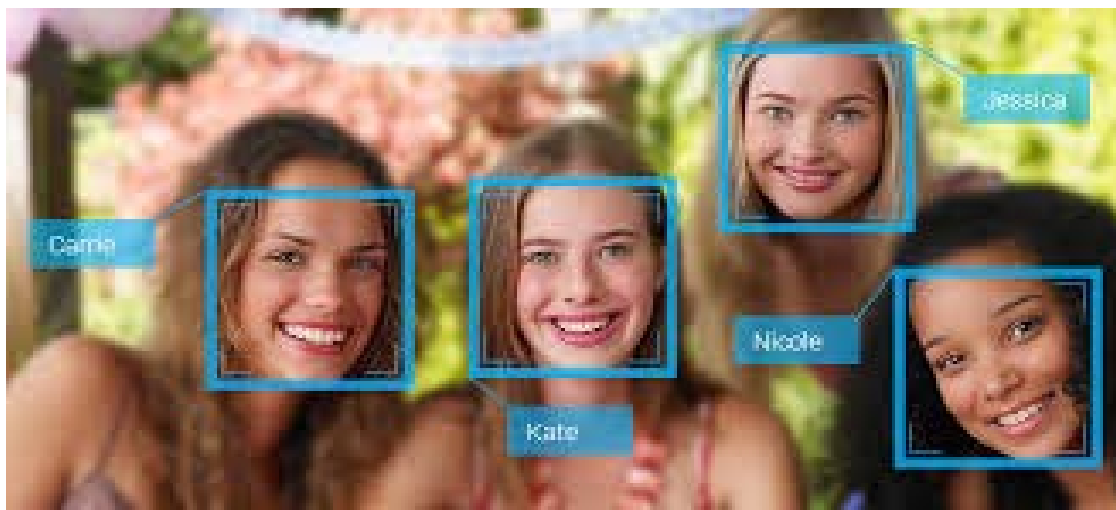
Feature-based Approach – in this approach, the local features on the face such as the nose and eyes are segmented and then fed to the face detection system to ease the task of face recognition.

Hybrid Approach –In hybrid approach, both the local features and the whole face are used as input to the detection system, this approach is more similar to the behaviour of human beings in recognizing faces.

There are two main types of face Recognition Algorithms:

- Geometric – this algorithm focuses at distinguishing features of a face
- Photometric – a statistical approach that distils an image into values and comparing the values with templates to eliminate variances.

It should however be noted that the existing face recognition techniques are not one hundred percent (100%) efficient just yet. Typical efficiencies range between 40% to 60%. So in our application we provided the option of taking manual attendance also. The computer-based facial recognition industry has made many useful advancements in the past decade; however, the need for higher accuracy remains. Through the determination and commitment of industry, government evaluations, and organized standards bodies, growth and progress will continue, raising the bar for face-recognition technology.



2.5. Deep learning and neural networks

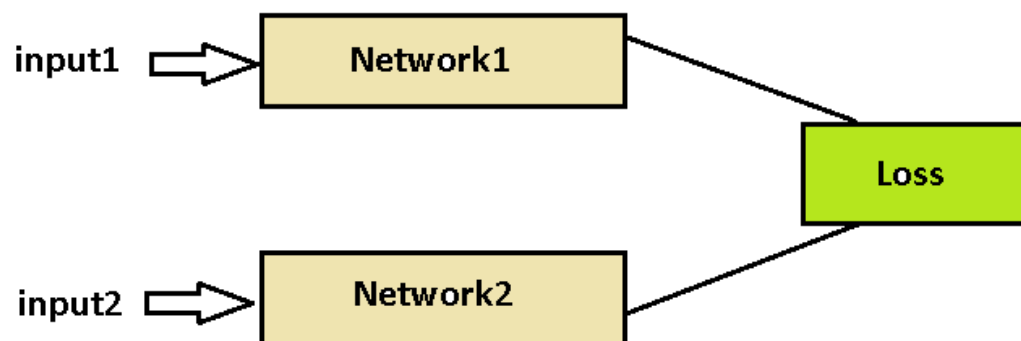
Face Recognition is becoming a new trend in the security authentication systems. Modern FR systems can even detect, if the person is alive or not while doing face recognition, preventing the systems being hacked by showing the picture of a real person. Like the Facebook implemented the auto-tagging technique. It identifies the person and tag him/her when ever you upload a picture. It is so efficient that, even when the person's face is occluded or the picture is taken in darkness, it tags accurately. All these successful face recognition systems are the results of recent advancements in the field of computer vision, which is backed by powerful deep learning algorithms. We have used one of such algorithms and implemented a real time face recognition system.

Face recognition can be done in two ways.

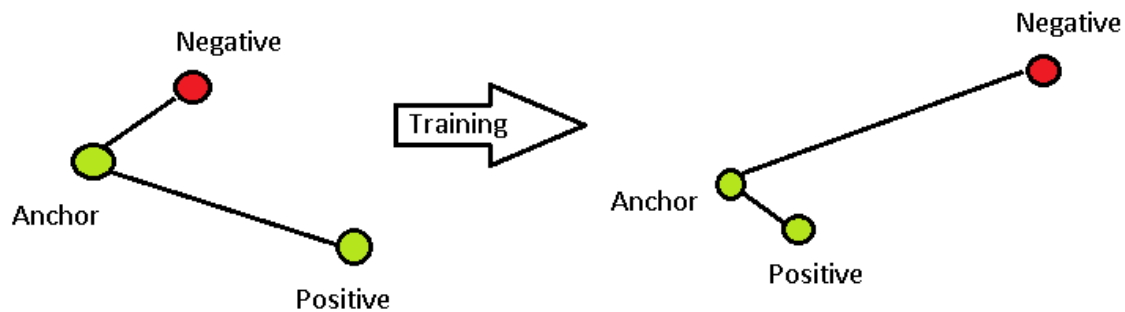
One way of doing this is by training a neural network model (preferably a ConvNet model), which can classify faces accurately. But for a classifier to be trained well, it needs millions of input data. Collecting that many images is not feasible. This method may not be suitable because every time new people come in and model needs to be trained So this method seldom works.

The best way of solving this problem is by opting one-shot learning technique. One-shot learning aims to learn information about object categories from one, or only a few, training images. The model still needs to be trained on millions of data, but the dataset can be any, but of the same domain. In one shot way of learning, we can train a model with any face datasets and use it for our own data which is very less in number. There are many publicly available face datasets like CASIA-Web Face, MS-Celeb-1M, AT&T faces dataset, etc which are having millions of face images. It can be used for newer people without retraining the model. This way of approach is called one shot learning.

One-shot learning can be implemented using a Siamese network. As the name indicates, its nothing but, two identical neural networks with exact same weights, but taking two distinct inputs. These networks are optimised based on the contrastive loss between their outputs. This loss will be small when the inputs to the networks are similar and large when inputs differ from each other. So in this way, optimised Siamese networks can differentiate between their inputs.



FaceNet is a one-shot model, that directly learns a mapping from face images to a compact Euclidean space where distances directly correspond to a measure of face similarity. Once this space has been produced, tasks such as face recognition, verification and clustering can be easily implemented using standard techniques with FaceNet embeddings as feature vectors (*from the original paper*). To train, they used triplets of roughly aligned matching / non-matching face patches. A triplet is nothing but a collection one anchor image, one matching image to the anchor image and one non-matching image to the anchor image. So the triplet loss minimizes the distance between an anchor and a positive, both of which have the same identity, and maximizes the distance between the anchor and a negative of a different identity.



FaceNet

FaceNet is a neural network that learns a mapping from face images to a compact Euclidean space where distances correspond to a measure of face similarity. That is to say, the more similar two face images are the lesser the distance between them.

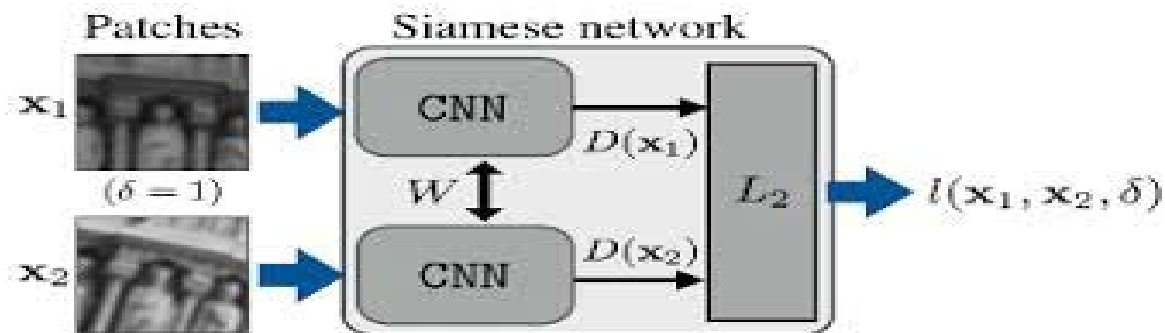
Triplet Loss

FaceNet uses a distinct loss method called Triplet Loss to calculate loss. Triplet Loss minimises the distance between an anchor and a positive, images that contain same identity, and maximises the distance between the anchor and a negative, images that contain different identities.

$$Loss = \sum_{i=1}^N \left[\|f_i^a - f_i^p\|_2^2 - \|f_i^a - f_i^n\|_2^2 + \alpha \right]_+$$

- **f(a)** refers to the output encoding of the anchor
- **f(p)** refers to the output encoding of the positive
- **f(n)** refers to the output encoding of the negative
- **alpha** is a constant used to make sure that the network does not try to optimise towards **f(a) - f(p) = f(a) - f(n) = 0**.
- [...] + is equal to **max(0, sum)**

SIAMESE NETWORK



FaceNet is a Siamese Network. A Siamese Network is a type of neural network architecture that learns how to differentiate between two inputs. This allows them to learn which images are similar and which are not. These images could be contain faces.

Siamese networks consist of two identical neural networks, each with the same exact weights. First, each network take one of the two input images as input. Then, the outputs of the last layers of each network are sent to a function that determines whether the images contain the same identity.

In FaceNet, this is done by calculating the distance between the two outputs.

2.6. Moodle

Other major part of this project is Moodle. It is where the students will be required to upload their photos. The system will perform the processing on these images to recognize and detect the faces of the students and mark the attendance. It will have a direct connectivity with the application on the phones of the teachers.

Moodle is a learning platform designed to provide educators, administrators and learners with a single robust, secure and integrated system to create personalized learning environments. The software can be downloaded onto our own web server .It is a simple interface, drag-and- drop features, and Moodle is easy to learn and use. Properties of Moodle which makes it feasible for this project:

Proven and trusted worldwide

Powering organizations large and small, including Shell, London School of Economics, State University of New York, Microsoft and the Open University.

Moodle's worldwide numbers of more than 90 million users across both academic and enterprise level usage makes it the world's most widely used learning platform. Therefore it is used by our institution to keep all the necessary information of the students.

Easy to use

Simple interface, drag-and-drop features, and well documented resources along with ongoing. Usability improvements make Moodle easy to learn and use. Thus it is easy to update, add and modify the tables in Moodle which make it a suitable platform to keep a track of the attendance of the students.

Always up-to-date

The Moodle project's open-source approach means that Moodle is continually being reviewed and improved on to suit the current and evolving needs of its users. Thus it keeps on updating and the system which will be designed will easily be deployed in sync with the updated Moodle version.

Moodle in your language

Moodle's multilingual capabilities ensure there are no linguistic limitations to learning online. The Moodle community has begun translating Moodle into more than 120 languages (and counting) so users can easily localize their Moodle site, along with plenty of resources, support and everywhere and by anyone.

Highly flexible and fully customizable

Because it is open-source, Moodle can be customized in any way and tailored to individual needs. Its modular set up and interoperable design allows developers to integrate external applications to achieve specific functionalities. This is the main advantage of using Moodle for this project. The tables for attendance record can be easily integrated into the system which holds all the information of the students.

Scalable to any size

From a few students to millions of users, Moodle can be scaled to support the needs of both small classes and large organizations. Because of its flexibility and scalability, Moodle has been adapted for use across education, business, non-profit, government, and community contexts. Thus we can store the record and photos of very large number of students and maintain attendance records efficiently.

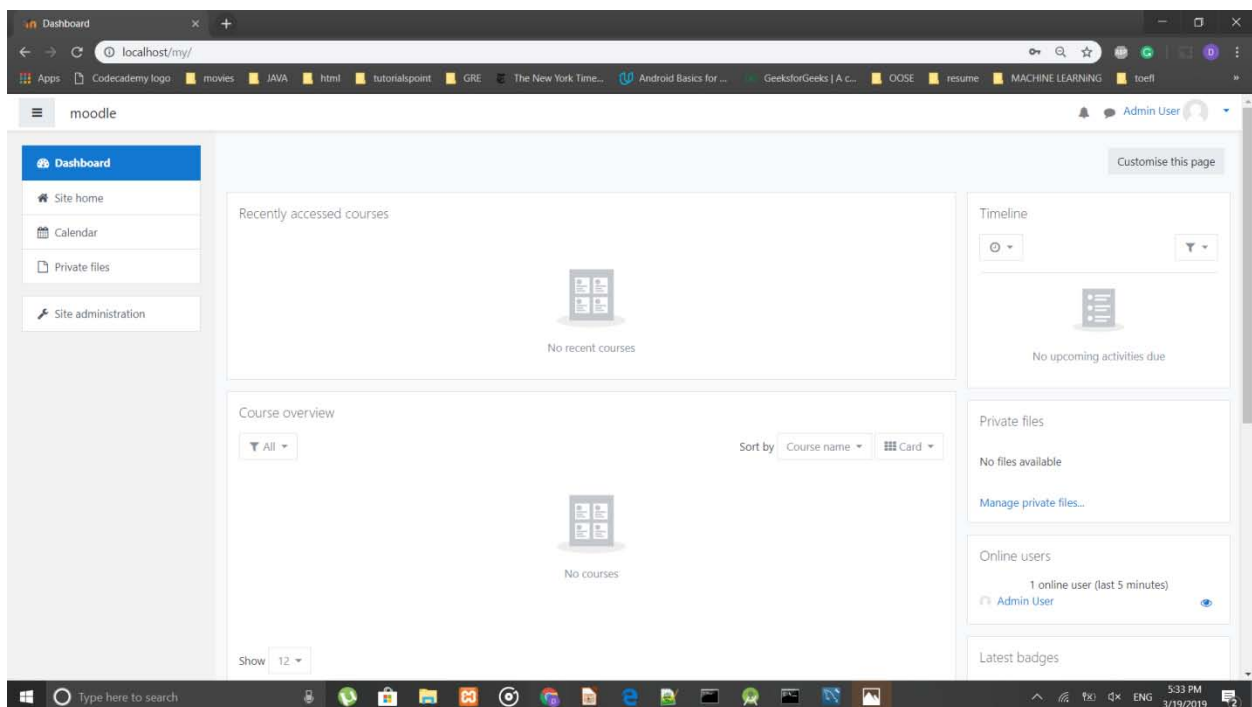
Robust, secure and private

Committed to safeguarding data security and user privacy, security controls are constantly being updated and implemented in Moodle development processes and software to protect against unauthorized access, data loss and misuse. Moodle can be easily deployed on a private secure cloud or server for complete control.

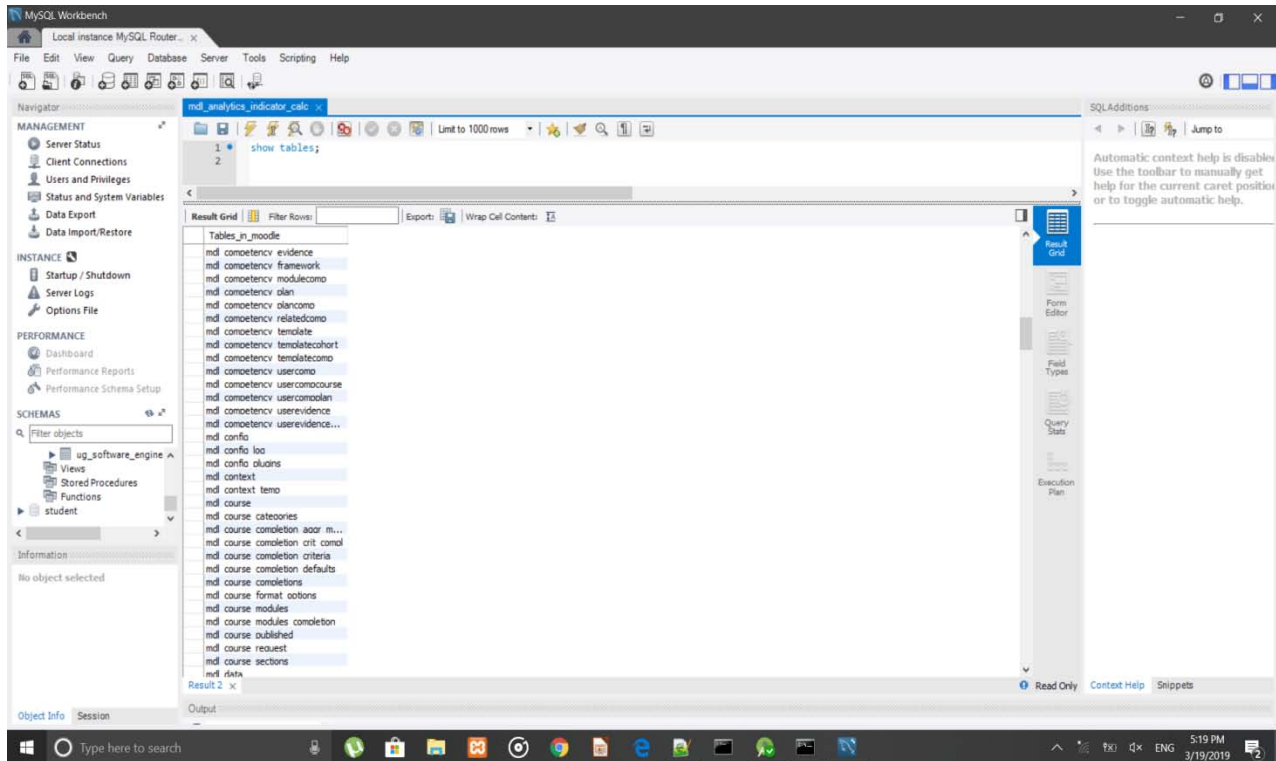
Use anytime, anywhere, on any device

Moodle is web-based and so can be accessed from anywhere in the world. With a default mobile-compatible interface and cross-browser compatibility, content on the Moodle platform is easily accessible and consistent across different web browsers and devices. Thus it can be easily be connected with the application in the phones of the faculties and used efficiently.

The Moodle software:



The tables in the Moodle database:



2.7. SQLITE DATABASE USED IN ANDROID

SQLite is a open-source SQL database that stores data to a text file on a device. Android comes in with built in SQLite database implementation.

SQLite supports all the relational database features. In order to access this database, you don't need to establish any kind of connections for it like JDBC, ODBC etc.

Database – Package

The main package is android.database.sqlite that contains the classes to manage your own databases

Database – Version

In order to create a database you just need to call this method open or CreateDatabase with your database name and mode as a parameter. It returns an instance of SQLite database which you have to receive in your own object. Its syntax is given below.

Database – Insertion

We can create table or insert data into table using execSQL method defined in SQLite Database class.

Database – Fetching

We can retrieve anything from database using an object of the Cursor class. We will call a method of this class called raw Query and it will return a result set with the cursor pointing to the table. We can move the cursor forward and retrieve the data.

TOOLS AND TECHNOLOGY USED

1. Tensor Flow framework.
2. PHP.
3. HTML5.
4. Android.
5. Mysql.
6. Sqlite.
7. Moodle software.

CHAPTER - 3

ANALYSIS

This chapter describes the problem statement of the project work in detail. It deals with the feasibility study covering technical, economical, operational and schedule feasibility, reliability, reusability, hardware and software specifications, use case analysis and activity flow.

3.1 DETAILED PROBLEM STATEMENT

Currently the most used method is manual attendance record system which is not very efficient and requires more time to arrange record and to calculate the average attendance of each student. It is also not very handy and flexible to use and maintain. Further it has chances of being misplaced and thus might end up being redundant and inconsistent.

Nowadays educational institutions are concerned about regularity of student attendance. This is mainly due to students' overall academic performance is affected by his or her attendance in the institute. Mainly there are two conventional methods of marking attendance which are calling out the roll call or by taking student sign on paper. They both were more time consuming and difficult. Hence, there is a requirement of computer-based student attendance management system which will assist the faculty for maintaining attendance record automatically.

To stay away from these losses, we will use an automatic method which is based on image processing. As a result, in order to solve these problems and avoid errors we suggest to computerise this process by providing an application which makes the entire attendance taking process handy and flexible.

Hence there is a requirement of a system that will solve the problem of student record arrangement and student average attendance calculation. So we aim to design and develop a system which maintains and keeps a record of the students attendance using face recognition and detection image processing. The system uses information and photographs of students extracted from Moodle database. Then the application updates the attendance table in Moodle after processing to keep a track of the students' attendance for different courses.

3.2 REQUIREMENT ANALYSIS

Information useful for designing this system is gathered, they are listed as follows:

- i. Research papers to understand our problems and its estimated solutions.
- ii. Need of the project in the current scenario.
- iii. Environment in which the project will be useful.

3.2.1 FUNCTIONAL REQUIREMENT

Setup: Teacher will need to install the app once in their mobile phones.

Download the course table: Teacher will download the course table from Moodle database for which he/she wants to take attendance for.

Take attendance using manual method: Teacher clicks on the manual attendance option and mark the attendance on the app manually.

Take attendance using automated method: Teacher clicks on the auto attendance icon and takes photographs.

Upload attendance in database: After taking the photographs, identified student's attendance will be marked in the database in Moodle.

3.2.2 NON-FUNCTIONAL REQUIREMENT

Performance-The app has to offer high performance with quick results of the identified students.

Scalability-The system should be able to handle the number of students in a class. It should respond properly even if there is a slight increase in the number of people.

Extensibility-Should support add-ons development.

Security-The security is maintained by having authenticated user login to this app.

Reliability- System should be reliable. Results are updated as soon as possible in the database so that the system remains reliable.

Flexibility- It provides the user with the flexibility to take either manual attendance or automatic attendance. Also the faculty can download the tables and use it to take attendance later even when net connectivity is not available

3.3 FEASIBILITY STUDY

This section studies the feasibility of project on various aspects. The study includes analysis of technical, economic, operational and schedule feasibility. The section studies the feasibility of project on various aspects.

3.3.1 Technical feasibility

Technical feasibility study is the complete study of the project in terms of input, processes, output, fields, programs and procedures. It is a very effective tool for long term planning and trouble shooting. The technical feasibility study should most essentially support the financial information of an organization.

3.3.2 Economic feasibility

Economic feasibility analysis is the most commonly used method for determining the efficiency of a new project. It is also known as cost analysis. It helps in identifying profit against investment expected from a project. Cost and time are the most essential factors involved in this field of study.

As the libraries open cv and other python libraries which we are going to use are freely available so cost incurred is none.

3.3.3 Operational feasibility

Operational feasibility refers to the measure of solving problems with the help of a new proposed system. It helps in taking advantage of the opportunities and fulfills the requirements as identified during the development of the project. It takes care that the management and the users support the project.

Application will be a simple one to use. Teachers will just have to take the photographs of the student and rest processing is done and the results will be displayed to the user.

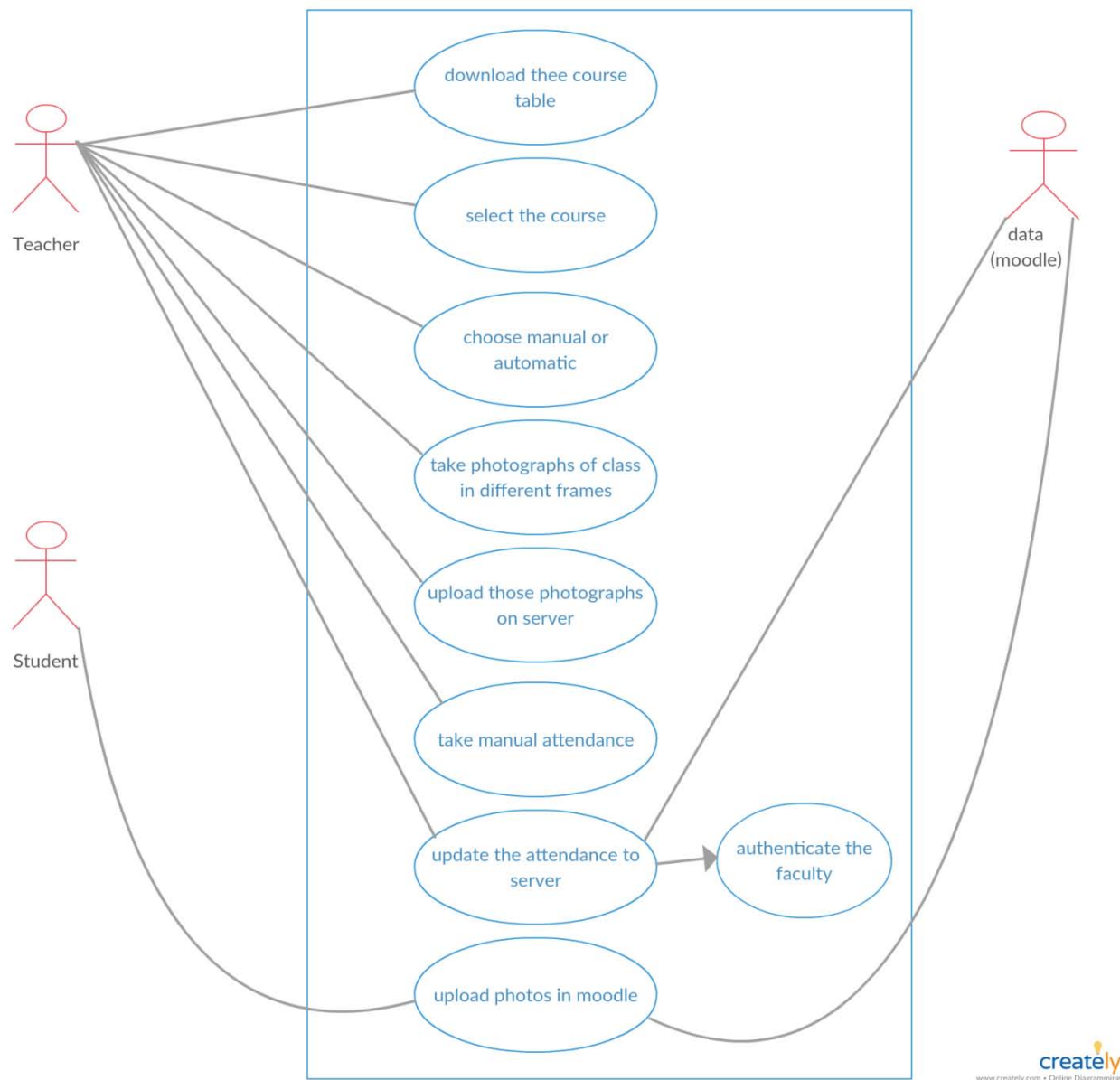
3.3.4 Schedule feasibility

In scheduling feasibility, an organization estimates how much time the project will take to complete. When these areas have all been examined, the feasibility study helps identify any constraints the proposed project may face, including: Internal Project Constraints: Technical, Technology, Budget, Resource, etc. It is being divided in two phases: 1 and 2.

The implementation of this system is expected to complete by March, 2019. Testing and debugging will also be completed in this time.

3.4 Use Case Analysis:

Use case analysis is done to understand the flow of the various functional modules of the system. It describes the provision provided to the user for accessing the system a functional ordering of different modules.

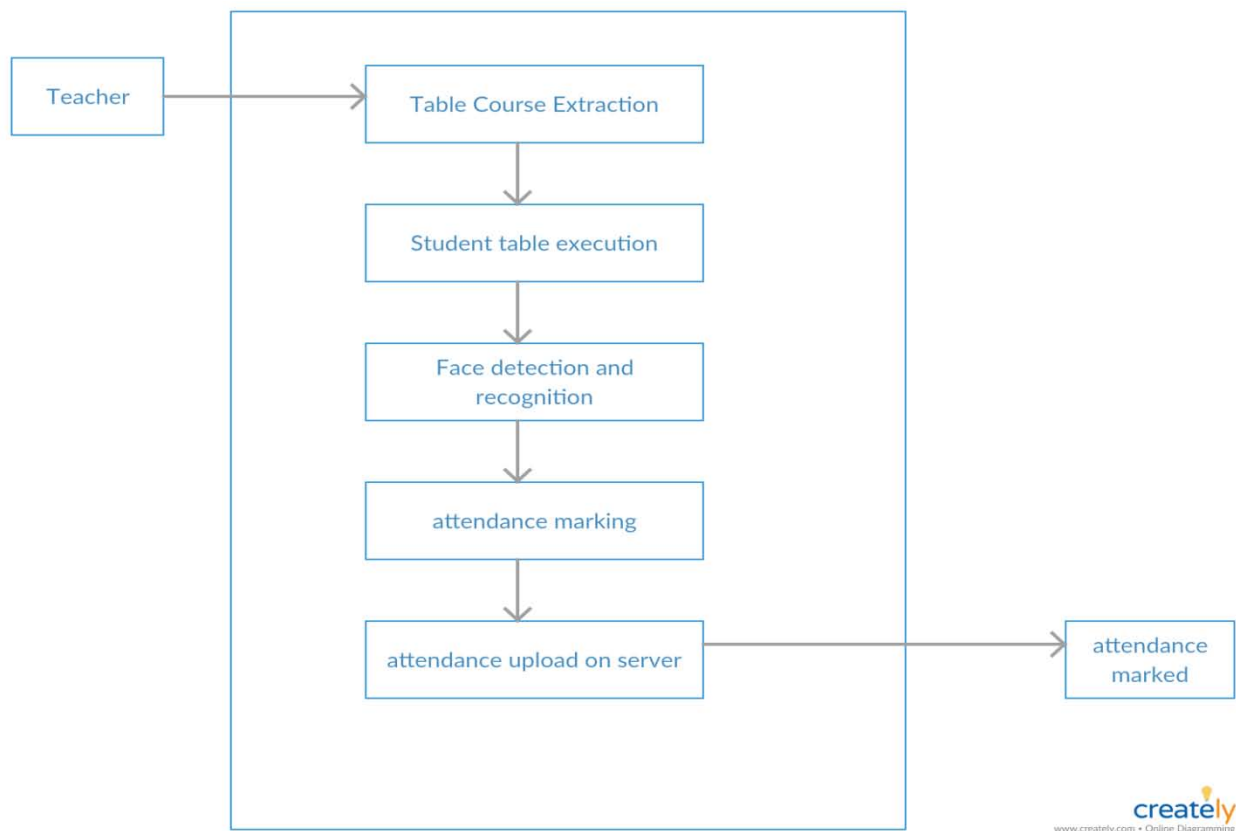


CHAPTER – 4

DESIGN

The chapter goes on to detail the design aspect of the project. This chapter includes various design diagrams along with their description. Using these design diagrams included in here, the system functions described in analysis phase will be modelled and implemented. These diagrams include Architecture, Data Flow diagrams and Activity diagram.

4.1. ARCHITECTURE DIAGRAM



Architecture diagram

4.1.1 Course table extraction

This module outputs the course corresponding to a particular semester. Output of this module gives the list of course table on the application.

4.1.2 Student table extraction

After the course table has been downloaded the course is selected and the students registered in that particular course are extracted. Output gives the list of students registered in the course whose attendance has to be taken.

4.1.3 Face recognition and detection

In this module the faces of the students sitting in the class are first detected and then recognized. The recognized students' attendance is marked in the application.

4.1.4 Attendance marking

The students who were shown as absent, according to the output of face detection and recognition module, are marked manually once again.

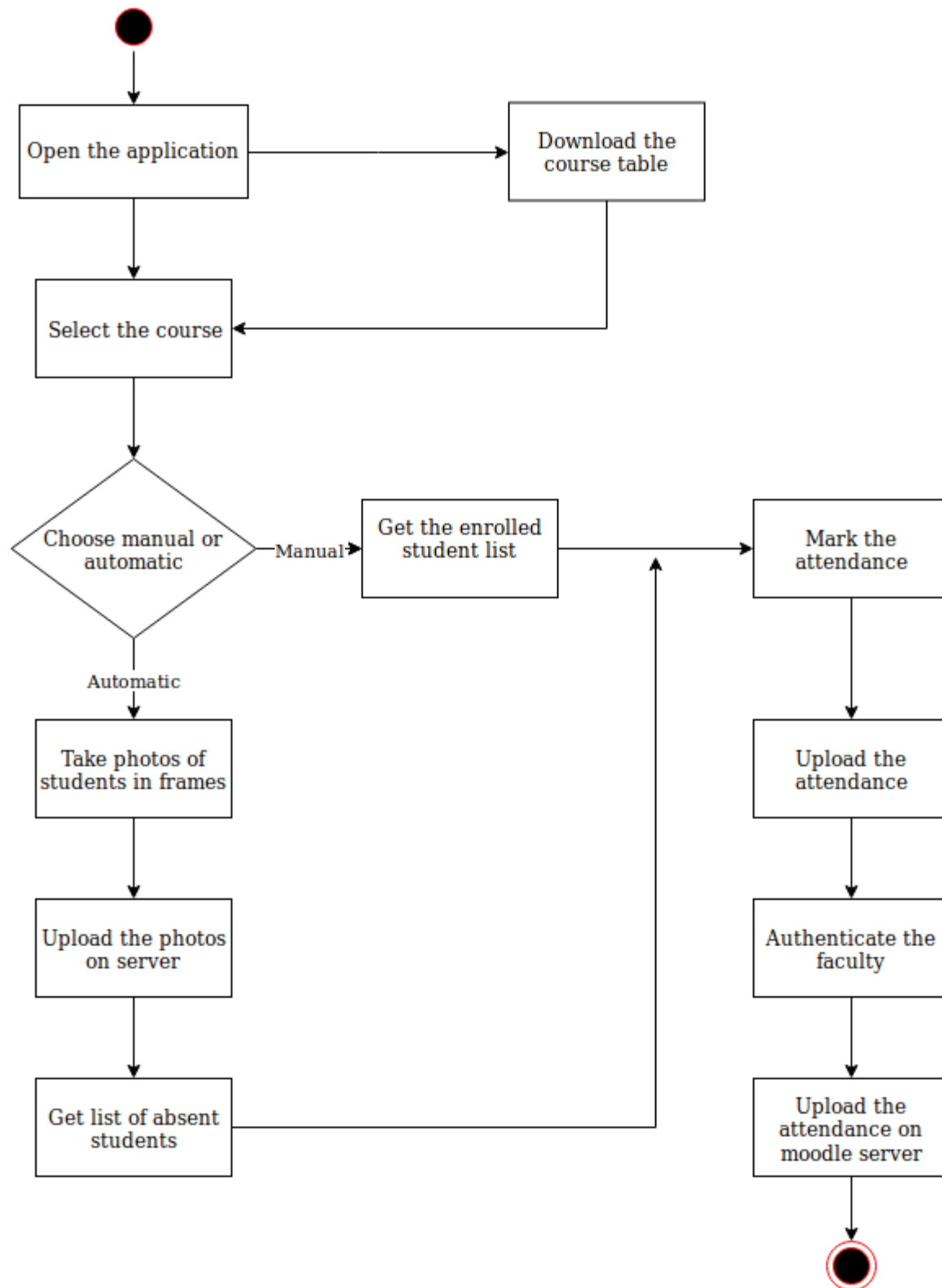
4.1.5 Attendance uploaded on server

The final attendance is uploaded on the server.

4.2. ACTIVITY DIAGRAM

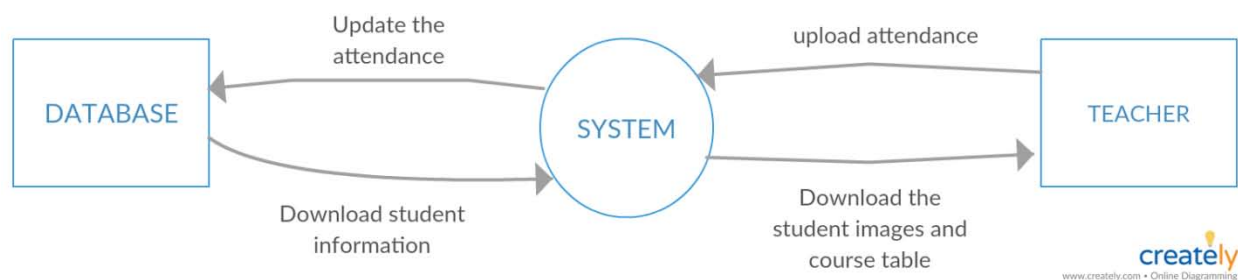
Activity diagram is another important diagram in UML to describe the dynamic aspects of the system. Activity diagram is basically a flowchart to represent the flow from one activity to another activity. The activity can be described as an operation of the system.

The user downloads the course table. After the course table has been downloaded the user selects the course for which he has to mark attendance. Student table corresponding to that course is downloaded on the application. Then attendance is to be marked. There are two options. Either manually or automatic. If user selects automatics then face detection and recognition module comes into play. After successful recognition the recognized students are marked present. The remaining student attendance is again taken manually, then the final attendance is uploaded on the server.



4.3. DATA FLOW DIAGRAM

A data flow diagram (DFD) maps out the flow of information for any process or system. It uses defined symbols like rectangles, circles and arrows, plus short text labels, to show data inputs, outputs, storage points and the routes between each destination. Data flowcharts can range from simple, even hand-drawn process overviews, to in-depth, multi-level DFDs that dig progressively deeper into how the data is handled. They can be used to analyze an existing system or model a new one. Like all the best diagrams and charts, a DFD can often visually “say” things that would be hard to explain in words, and they work for both technical and nontechnical audiences.

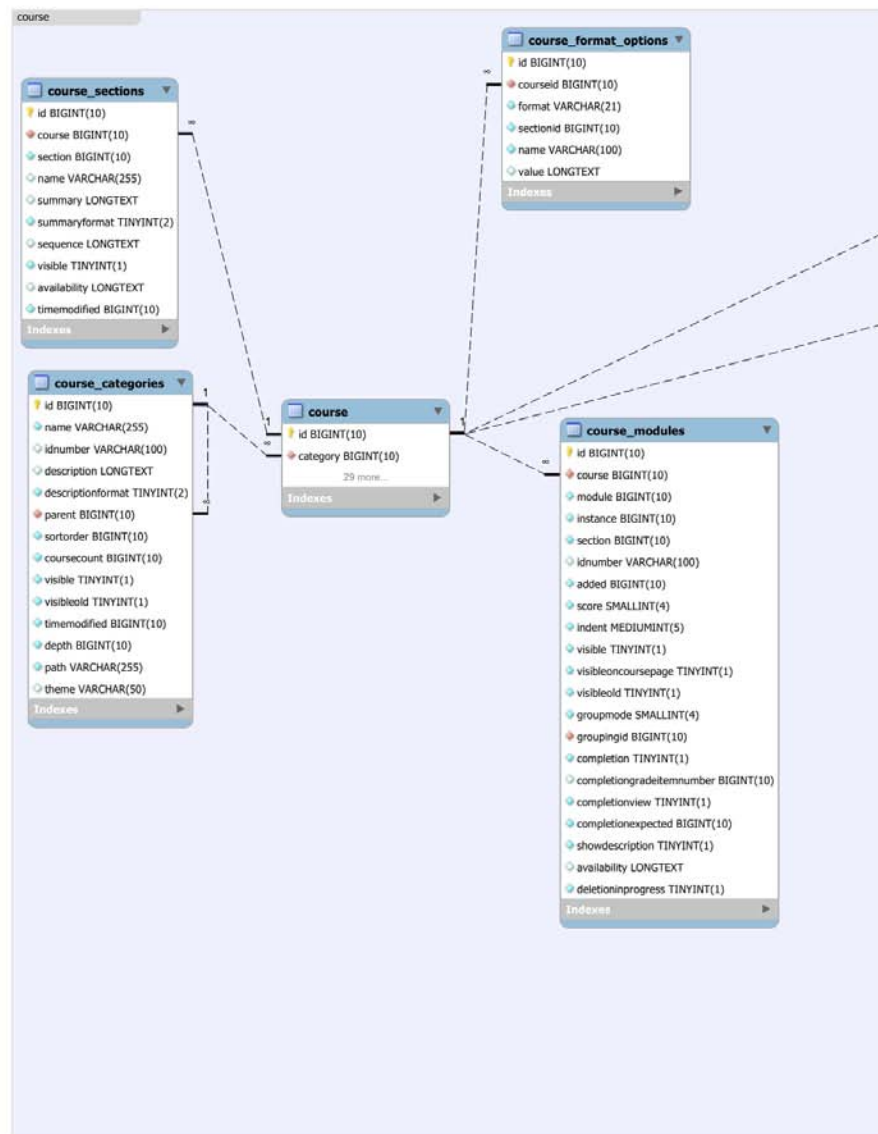


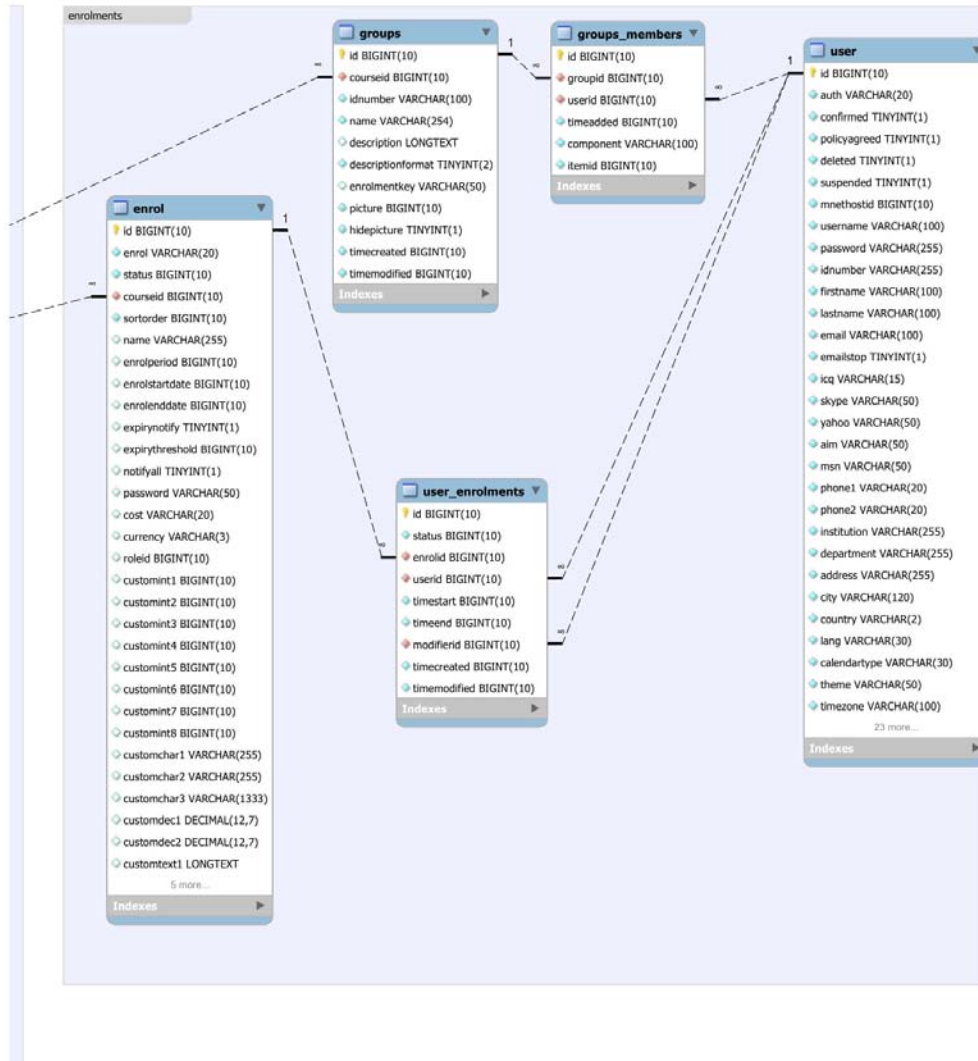
Data Flow Diagram Level 0

The following figure represents the data flow diagram for our system. It is a level 0 data flow diagram so it shows the basic functionality and connectivity of our system with database and the user. It is evident from the diagram that main task of the sytem is to download the student information and provide it to the application which can be used by teacher to mark the attendance and finally update it back in the database.

4.4 ENTITY RELATIONSHIP DIAGRAM

An entity relationship diagram (ERD) shows the relationships of entity sets stored in a database. An entity in this context is an object, a component of data. An entity set is a collection of similar entities. These entities can have attributes that define its properties.





CHAPTER – 5

IMPLEMENTATION

The implementation phase revolves around the development of the system modules and providing their description. The implementation also deals with providing the full logical view of the modules.

The description involves the scenarios in which the modules are used and how the interaction between them takes place.

5.1 Components

5.1.1 Backend Modules

The various modules running at the backend on the server and in the android are as follows:

1. token.php

This module is used to ensure that only the faculties have the permission to mark the attendance. The details of the authenticated faculties are stored in the token file on the server. This file is used when the faculty is required to be authenticated on the application end before uploading attendance in the table on the Moodle server. For it to run we need to enable the web services on the mobile phone.

2. uploadimages.php

This module is used to upload the images from the application on the server i.e. to get the captured images of the students for further processing through image detection and recognition.

3. postattend.php

This module is used to create a separate attendance table for each course during each session in the Moodle database. It is used to create a new table for a newly registered course whose attendance table is yet not created. Each course of each session thus has a separate attendance table for it.

4. posttest.php

This module is used to handle all the data connectivity with the database and the mobile application. It is used to handle the application interface, i.e. it is used to do the backend work on any action performed in the application. It is also used to save the attendance finally.

5. mainactivity.java

It is used to handle the post request sent. It is used to handle the android application like handling the button clicks and the further the server connectivity.

6. databasehelper.java

This module is used to handle the MVC architecture of the System. It is used to handle the SQLite.

The front end is handled by modules like contentmain.xml, activitymain.xml and other xml files.

The table in Moodle has the following schema:

Field	Type	Null	Key	Default	Extra
lectureno	int(11)	YES		HULL	
mobletableid	int(11)	YES		HULL	
ENTRYTIME	timestamp	NO		CURRENT_TIMESTAMP	
teachname	varchar(10)	YES		HULL	
totalattendance	int(11)	YES		HULL	
0801CE161063 MOHIT PATIDAR	int(11)	YES		0	
0801CE161022 ANKUSH KUMAR PATEL	int(11)	YES		0	
0801EE161048 SHREYA VISHNOI	int(11)	YES		0	
0801CE161021 ANIMESH VYAS	int(11)	YES		0	
0801EE161036 PRABHANSHU JAIN	int(11)	YES		0	
0801CE161078 PIYUSH RUSIA	int(11)	YES		0	
0801IP161048 SAKSHAM SARAF	int(11)	YES		0	
0801IP161011 AKSHAY ARYA	int(11)	YES		0	
0801CE161072 NIKITA GEDAM	int(11)	YES		0	
0801IP161042 PRATIK JOSHI	int(11)	YES		0	
0801IP161040 PRAFULL TRIPATHI	int(11)	YES		0	
0801EE161004 AJAY	int(11)	YES		0	
0801ME161012 ASTHA MITTAL	int(11)	YES		0	
0801EE161013 BALJINDER SINGH	int(11)	YES		0	
0801ME161056 SUYASH SHUKLA	int(11)	YES		0	
0801CE161120 VIPUL KUMAR RAI	int(11)	YES		0	
0801IP161044 RAJDEEP BISWAS	int(11)	YES		0	
0801EE161035 PAVAN RATHORIYA	int(11)	YES		0	
0801CE161082 PRIYA	int(11)	YES		0	
0801ME161028 MAYANK YASHLAHA	int(11)	YES		0	
0801BM161062 YOGESH KULHARE	int(11)	YES		0	
0801BM161013 BHARGAVI AHIRWAL	int(11)	YES		0	
0801EE161049 SHRUTI NIKOSE	int(11)	YES		0	
0801ME161046 ROHIT WASKALE	int(11)	YES		0	

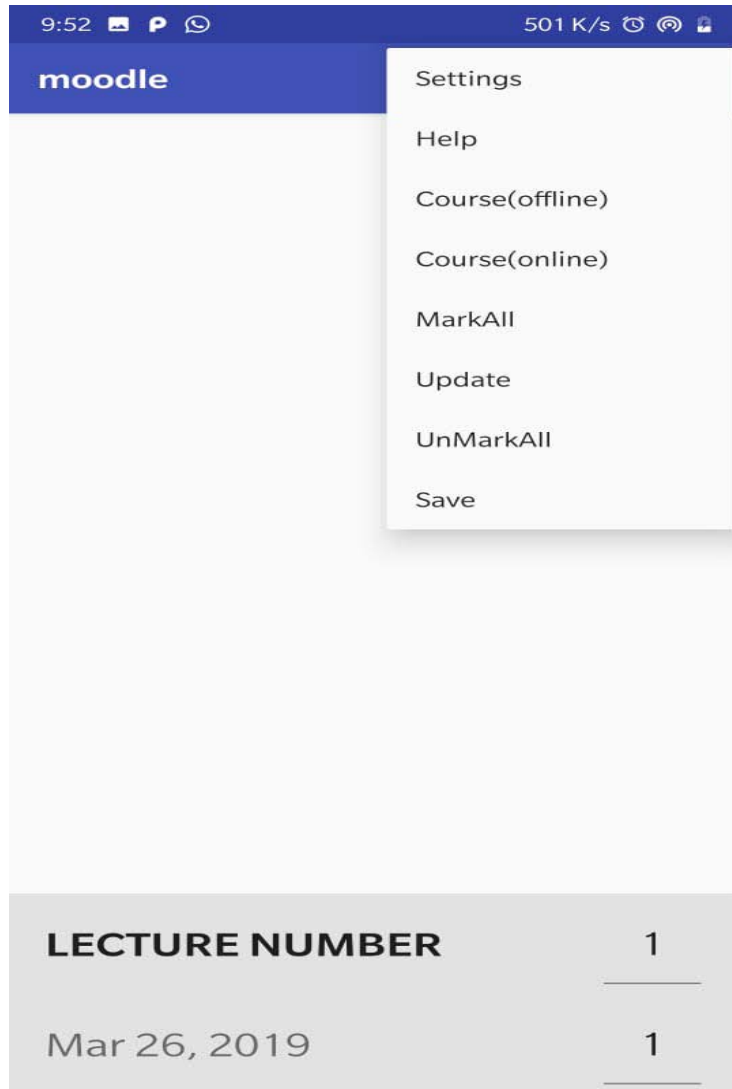
The name of the students along with their enrolment id is a column in the table along with other fields.

5.1.2 The Moodle Application

The other important part of the entire system is the Moodle application running on the android phone of the faculty. The Moodle application has the following functionalities:

1. The main application

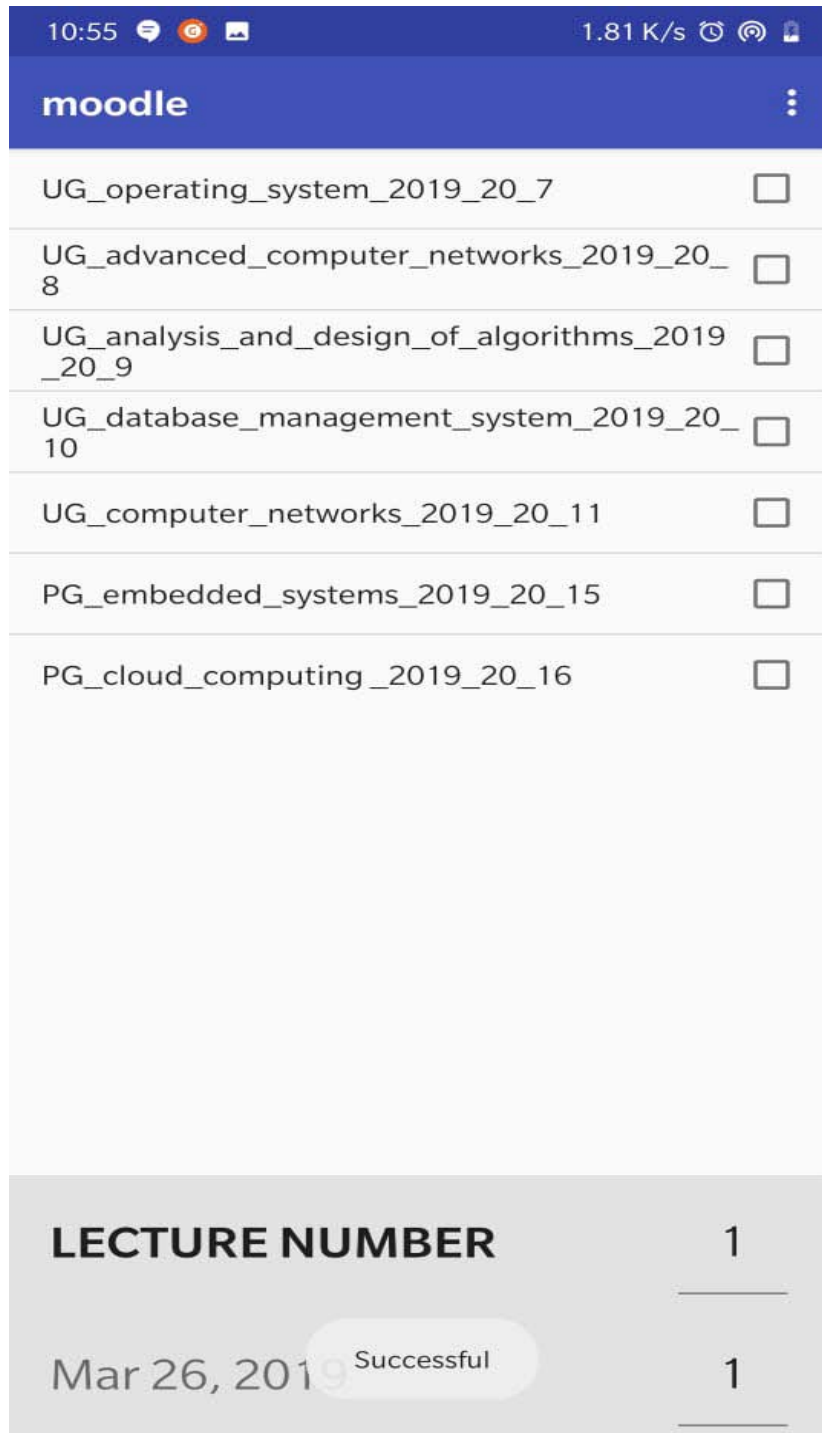
The main Moodle application looks like the following:



The lecture number is an id to uniquely identify the lecture of the respective faculty.

- Courses offline

It is used to save the list of courses for further use in absence of connectivity with the Moodle database on the server.



- The list of students

Once a particular course is selected, the list of students appears as follows:

10:55 4.27 K/s	
moodle	
0801ME161003_AMRATESH_BOHARE	<input type="checkbox"/>
0801CE161014_AKSHAT_SHUKLA	<input type="checkbox"/>
0801CE161016_ALOK_SHARMA	<input type="checkbox"/>
0801CE161020_ANANT_JAIN	<input type="checkbox"/>
0801BM161001_AAKASH_KHARATE	<input type="checkbox"/>
0801CE161007_ABHISHEK_SINGH_SIKARWAR	<input type="checkbox"/>
0801EE161005_AKANSHA_SINGH	<input type="checkbox"/>
0801CE161018_AMAN_BAISHANDER	<input type="checkbox"/>
0801ME161002_ADARSH_SINGH	<input type="checkbox"/>
0801IP161004_ADITI_SAXENA	<input type="checkbox"/>
0801CE161006_ABHISHEK_PATEL	<input type="checkbox"/>
0801EE161001_AARSH_PATHAK	<input type="checkbox"/>
0801EE161002_ABHASHRI_DESHMUKH	<input type="checkbox"/>
LECTURE NUMBER	1
Mar 26, 2019 Successful	1

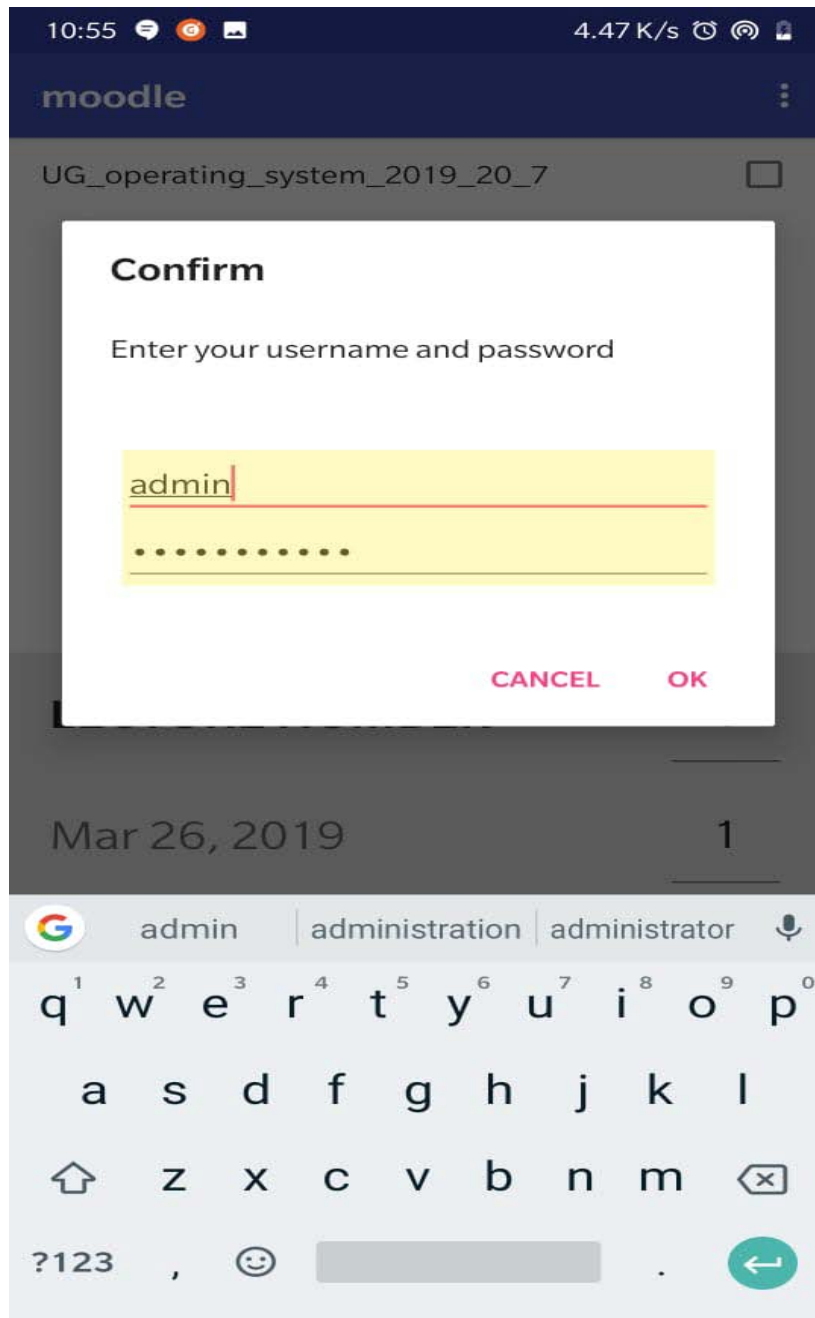
Further options can be selected to perform various operations on the list of students like MarkAll, UnmarkAll etc.

The screenshot shows the Moodle mobile app interface. At the top, the status bar displays the time 10:55, signal strength, and battery level. The app header shows the time 7:40 K/s and various icons. The main content area displays a list of students with their IDs and names. A context menu is open over the list, showing options: Settings, Help, Course(offline), Course(online), MarkAll, Update, UnMarkAll, Save, and Upload Image. Below the list, there is a section for 'LECTURE NUMBER' and 'Mar 26, 2019', both with a value of 1.

Student ID	Student Name	Mark
0801ME161003_AMRATES		
0801CE161014_AKSHAT_S		
0801CE161016_ALOK_SHA		
0801CE161020_ANANT_JA		
0801BM161001_AAKASHH		
0801CE161007_ABHISHEK		
0801EE161005_AKANSHA		
0801CE161018_AMAN_BA		
0801ME161002_ADARSH_SINGH		<input type="checkbox"/>
0801IP161004_ADITI_SAXENA		<input type="checkbox"/>
0801CE161006_ABHISHEK_PATEL		<input type="checkbox"/>
0801EE161001_AARSH_PATHAK		<input type="checkbox"/>
0801EE161002_ABHASHRI_DESHMUKH		<input type="checkbox"/>
LECTURE NUMBER		1
Mar 26, 2019		1

- Upload

This feature is used to upload the attendance table on the server and mark the attendance in the respective course table in Moodle. But before getting the permission to upload the faculty needs to be authenticated to be a registered faculty who has the permission to upload the attendance.



- Upload images

It is used to upload the captured images of the students on the Moodle server once the application is connected with the Moodle server and then the images are further processed using face recognition and detection to mark the attendance in the Moodle table.

- Save

It is used to save the list of students in the application and it can be edited further until it is uploaded in the Moodle database.

Webpage to access attendance data for students and teachers:

Exporting Page

Student Data

Select Course Select base to select students [CSV Export](#)

Name
UG_operating_system_2019_20_7
UG_advanced_computer_networks_2019_20_8
UG_analysis_and_design_of_algorithms_2019_20_9
UG_database_management_system_2019_20_10
UG_computer_networks_2019_20_11
PG_embedded_systems_2019_20_15
PG_cloud_computing_2019_20_16

Report Page

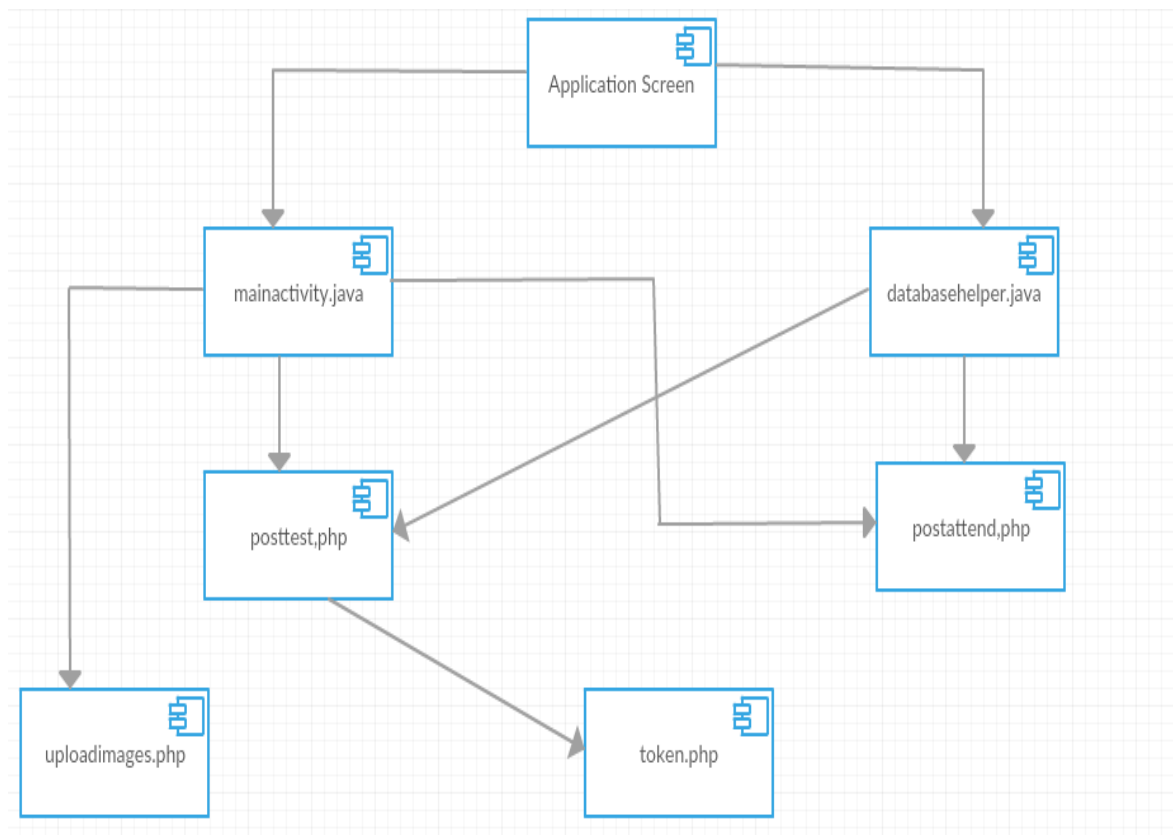
Student Data

Select Course [CSV Download](#)

Name
UG_operating_system_2019_20_7
UG_advanced_computer_networks_2019_20_8
UG_analysis_and_design_of_algorithms_2019_20_9
UG_database_management_system_2019_20_10
UG_computer_networks_2019_20_11
PG_embedded_systems_2019_20_15
PG_cloud_computing_2019_20_16

5.2 Component Diagram

This diagram is used to visualize organization and relationships among components in the system. It describes the components used to make the functionalities of the system. It is used to visualize the physical components in the system. These components are files, packages etc.



CHAPTER – 6

CONCLUSION

Automated attendance system has been envisioned for the purpose of reducing the errors that occur in the traditional attendance taking systems. The aim of this system is to automate the attendance taking process and make it useful for the institution. This method is more secure, reliable and available for use. There is no need for an additional hardware to be installed, it can be constructed using the android phone of the faculties and the Moodle running on the server of the department.

The system is easy to use and helpful for the attendance taking process. The working of the system starts with downloading the course table, then the student table and finally marking the attendance and uploading it on the Moodle server thus making it easy to use.

Thus it can be concluded that a reliable, secure fast and efficient system has been developed replacing a manual and unreliable system. This system can be implemented for better results regarding the management of attendance and leaves. The system will save time reduce the amount of work the administration has to do and will replace the stationery material with electronic apparatus and reduces the amount of human resources required for the purpose. Hence a system with expected results has been developed but there is still room for improvement.

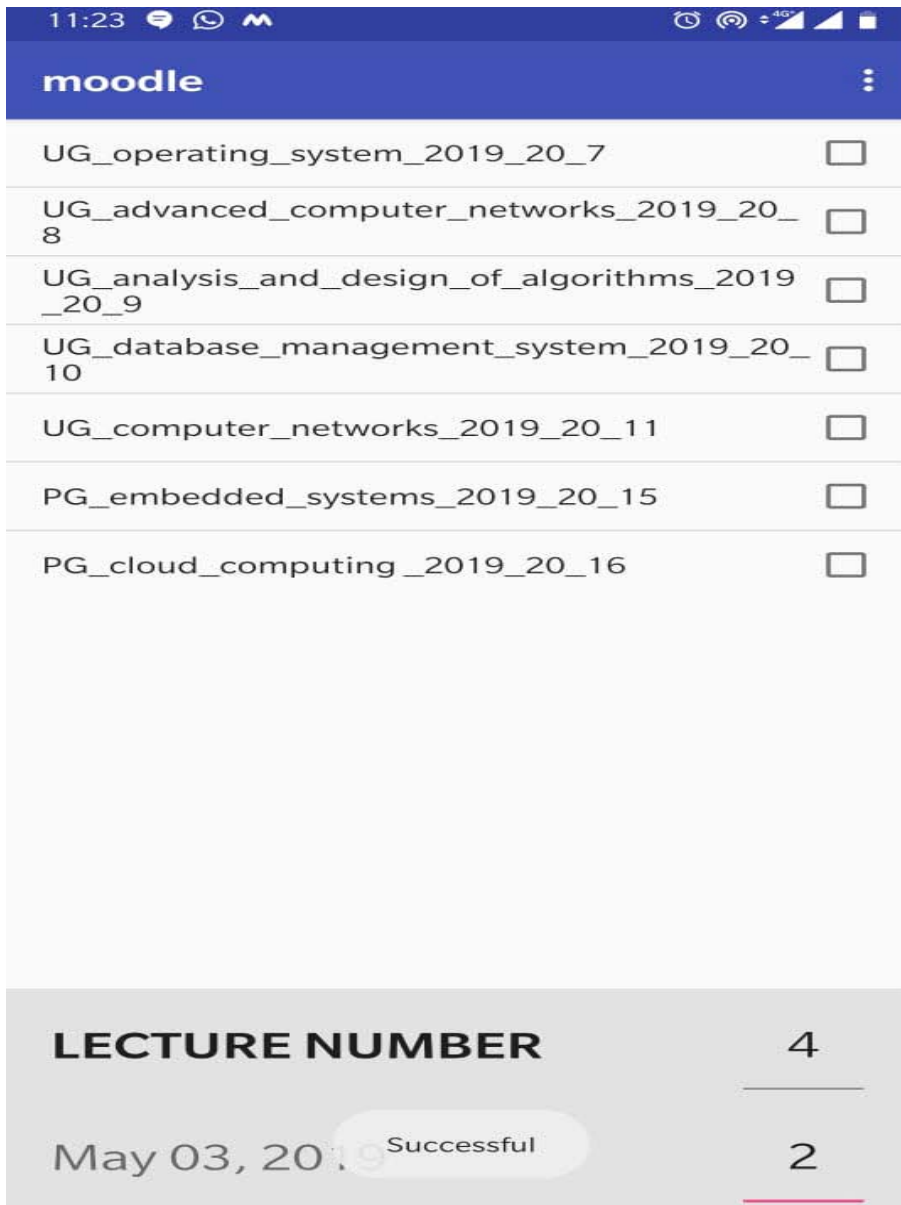
REFERENCES

- https://docs.moodle.org/dev/Database_Schema
- <http://www.examulator.com/er/>
- https://docs.moodle.org/36/en/Step-by-step_Installation_Guide_for_Ubuntu
- <https://scikit-learn.org/stable/modules/generated/sklearn.preprocessing.Binarizer.html>
- <https://youtu.be/dLrWDUPkpIg>
- <https://hackernoon.com/building-a-facial-recognition-pipeline-with-deep-learning-in-tensorflow-66e7645015b8>
- <https://www.androidhive.info/2014/12/android-uploading-camera-image-video-to-server-with-progress-bar/>
- <https://www.androidhive.info/2013/09/android-working-with-camera-api/>

APPENDIX

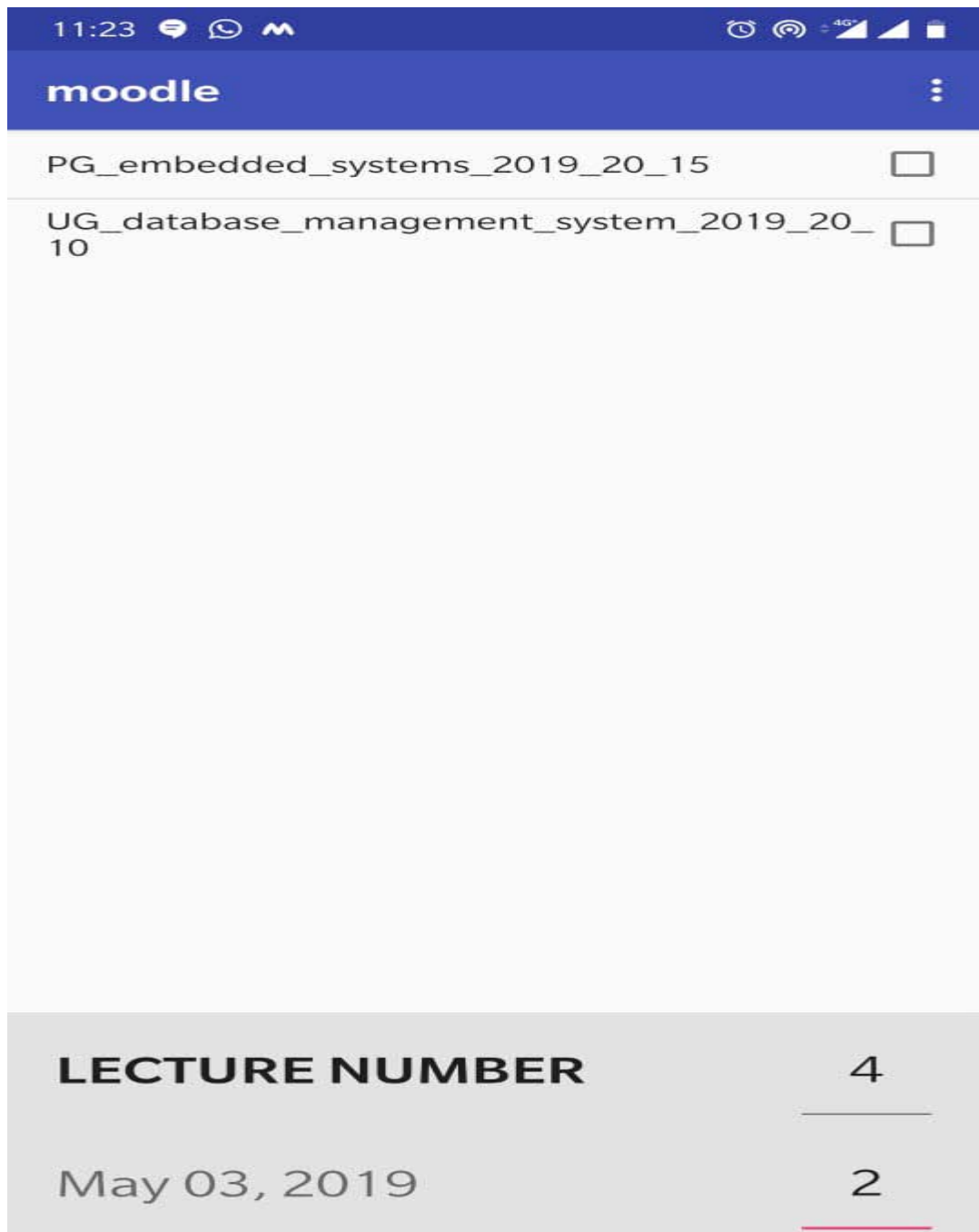
This is the attendance marking application which works using the function described below.

1. Courses (Online)



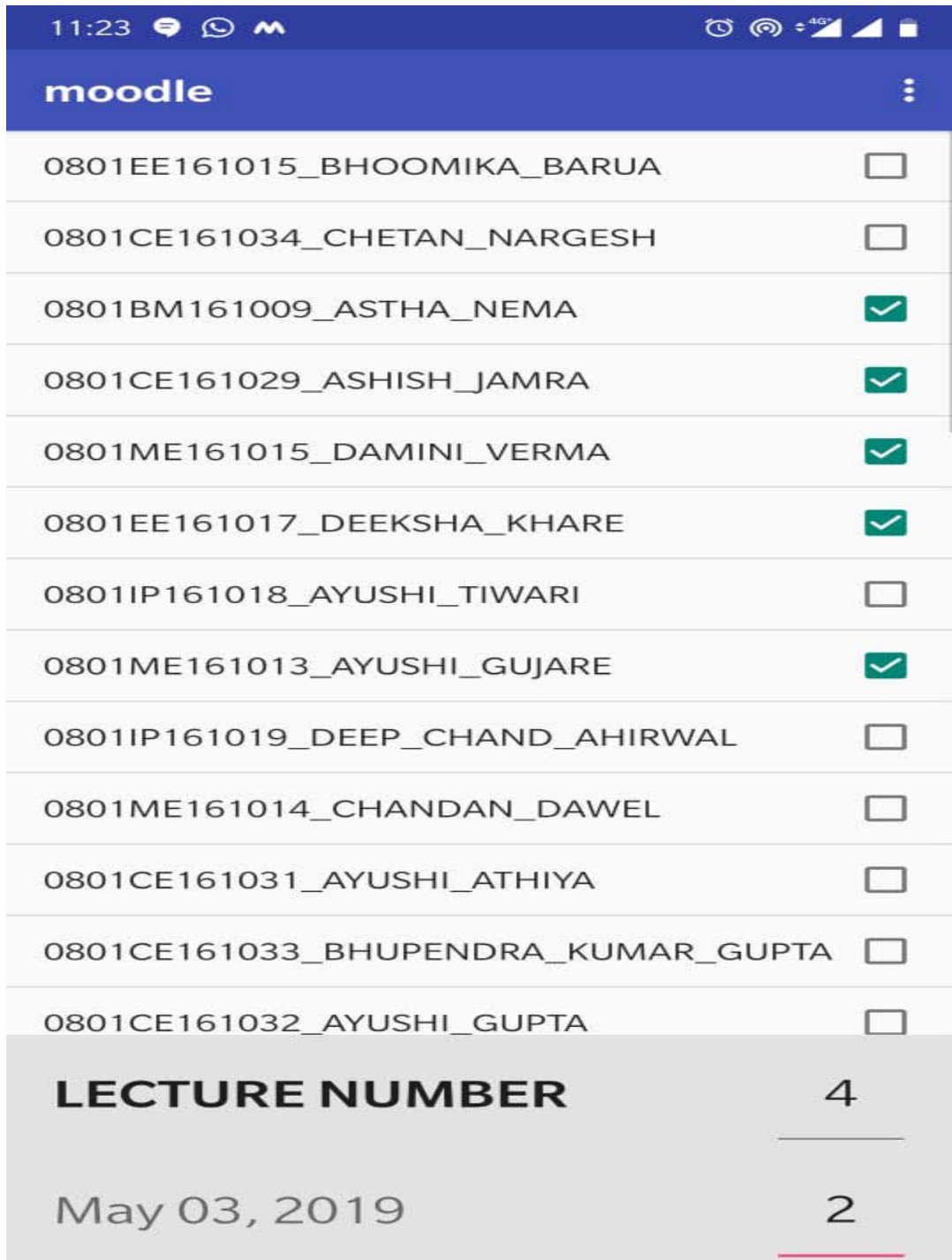
When you click on this tab, the list of all the courses available will be displayed to you for the purpose of downloading. You can click the checkbox of the course that you have to download. The downloaded courses will then be displayed to you in the courses offline tab.

2. Courses(offline)



The list of downloaded course will be displayed here that you have downloaded by clicking on the checkbox on the courses online tab.

3. List of students

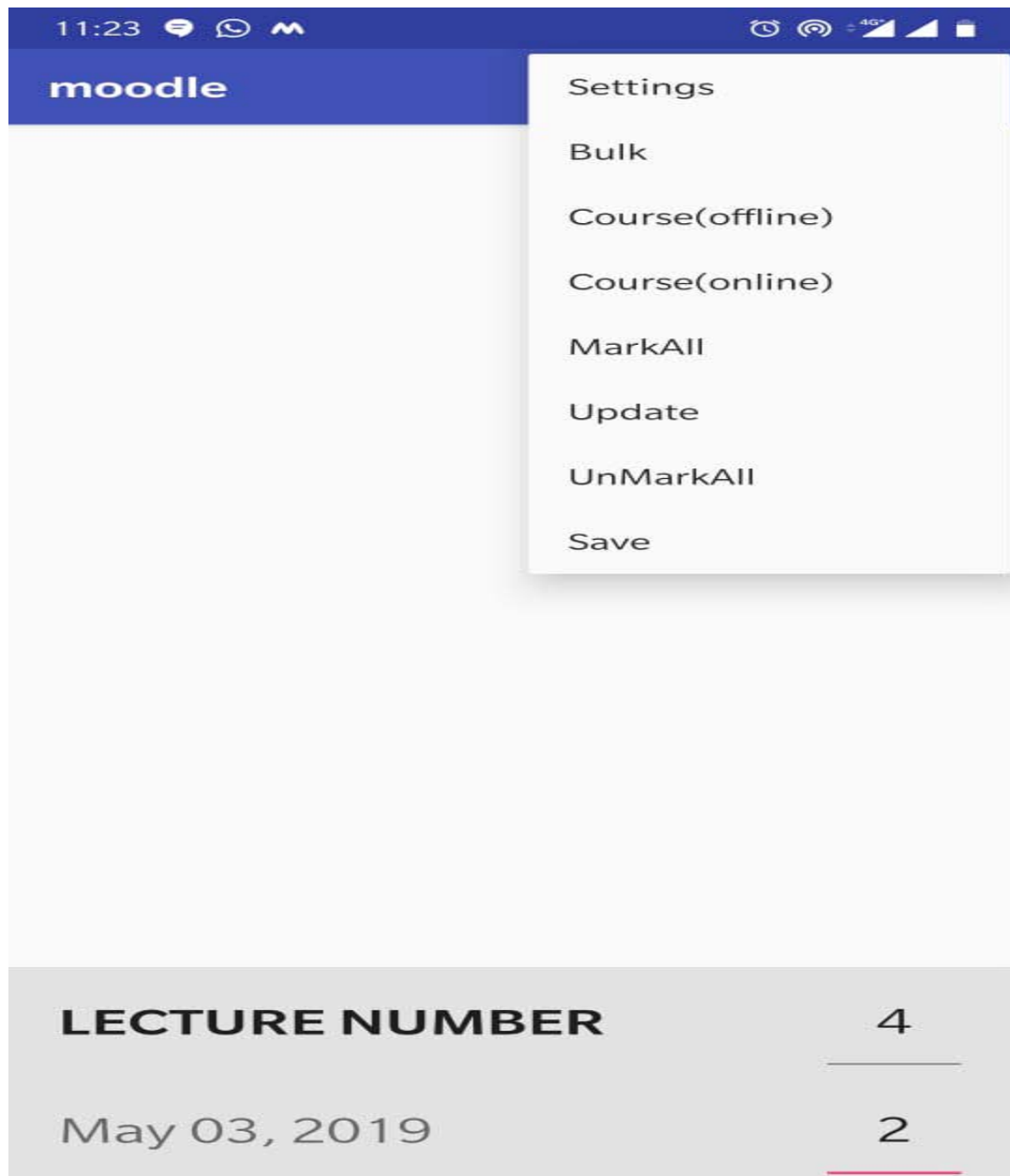


The screenshot shows a mobile application interface for Moodle. At the top, there is a status bar with the time 11:23 and various icons. Below it is a blue header with the word "moodle" and a menu icon. The main content is a list of students with their IDs and names, followed by a checkbox or checkmark for attendance. At the bottom, there is a grey section with "LECTURE NUMBER" set to 4 and the date "May 03, 2019" with a value of 2.

0801EE161015_BHOOMIKA_BARUA	<input type="checkbox"/>
0801CE161034_CHETAN_NARGESH	<input type="checkbox"/>
0801BM161009_ASTHA_NEMA	<input checked="" type="checkbox"/>
0801CE161029_ASHISH_JAMRA	<input checked="" type="checkbox"/>
0801ME161015_DAMINI_VERMA	<input checked="" type="checkbox"/>
0801EE161017_DEEKSHA_KHARE	<input checked="" type="checkbox"/>
0801IP161018_AYUSHI_TIWARI	<input type="checkbox"/>
0801ME161013_AYUSHI_GUJARE	<input checked="" type="checkbox"/>
0801IP161019_DEEP_CHAND_AHIRWAL	<input type="checkbox"/>
0801ME161014_CHANDAN_DAWEL	<input type="checkbox"/>
0801CE161031_AYUSHI_ATHIYA	<input type="checkbox"/>
0801CE161033_BHUPENDRA_KUMAR_GUPTA	<input type="checkbox"/>
0801CE161032_AYUSHI_GUPTA	<input type="checkbox"/>
LECTURE NUMBER	4
May 03, 2019	2

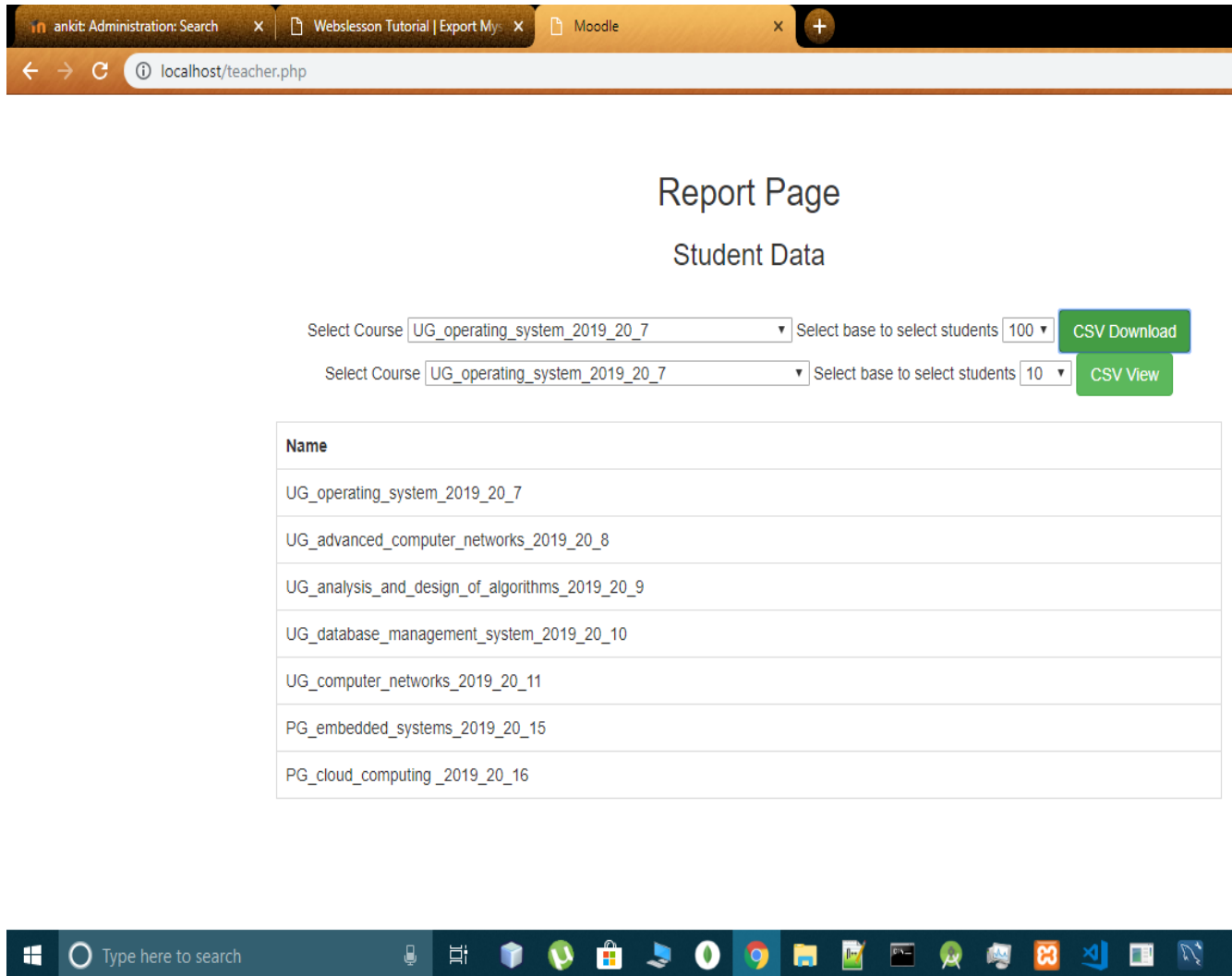
After selecting a particular course, the list of the enrolled students will be displayed as above for attendance marking.

4. Save and update



After marking the attendance you need to click on the save tab to save the attendance currently marked. Here the lecture number is to be entered by the teacher corresponding the number of lectures he is going to take in a day. Later you can also change the saved attendance but before updating. Once you click on update attendance will be final and will be updated in moodle database. Mark all option is used when teacher need to mark all the students and unmark all when teacher needs to unmark the attendance.

5. Web page to view details of student attendance from moodle database.



Report Page

Student Data

Select Course Select base to select students [CSV Download](#)

Select Course Select base to select students [CSV View](#)

Name
UG_operating_system_2019_20_7
UG_advanced_computer_networks_2019_20_8
UG_analysis_and_design_of_algorithms_2019_20_9
UG_database_management_system_2019_20_10
UG_computer_networks_2019_20_11
PG_embedded_systems_2019_20_15
PG_cloud_computing_2019_20_16

Here select the course for which you have to view the student information. And there are 2 options, first is the information can be displayed on the webpage itself and the next is it can be downloaded in csv format.

The CSV format:

The screenshot shows a Microsoft Excel spreadsheet with the following data:

	A	B	C	D	E	F	G	H	I	J	K	L
1	lectureno	1	1	2	9	9	91	2	3	4		
2	mobiletableid											
3	ENTRYTIME	26-03-19 01:59	26-03-19 02:09	26-03-19 10:34	26-03-19 10:34	03-05-19 10:52	03-05-19 11:01	03-05-19 11:03	03-05-19 11:06	03-05-19 11:06		
4	teachername	admin	goyalankit	goyalankit	goyalankit	admin	admin	admin	admin	admin	Total	
5	totalattendance	1	1	1	6	9	9	2	2	2	33	
6	0801EE161038_PRAKASH_KUMAR	1	1	1	6	9	9	0	0	0	27	
7	0801ME161037_PRIYA_MAHOUR	1	1	0	6	9	9	2	2	2	32	
8	0801CE161083_RAHUL_KUMAR_GAUR	1	1	1	0	9	9	2	2	2	27	
9	0801ME161039_PRIYANSHU_TIWARI	1	1	1	6	9	9	2	2	2	33	
10	0801IP161043_PREM_KUMAR_SINGH	0	0	0	6	9	9	2	2	2	30	
11	0801ME161036_PRASHANT_PATHAK	0	0	0	6	9	9	2	2	2	30	
12	0801ME161035_PRANJAL_CHOUDHAR	0	0	0	6	9	9	2	2	2	30	
13	0801BM161001_AAKASH_KHARATE	0	0	0	0	9	9	2	2	2	24	
14	0801CE161081_PRAVESH_KUMAR_MIS	0	0	0	6	0	9	2	2	2	21	
15	0801ME161043_RAMESHWAR	0	0	0	0	0	9	2	2	2	15	
16	0801CE161080_PRATIBHA_KALAM	0	0	0	0	0	9	2	2	2	15	
17	0801EE161043_RAVI_BHUSHAN_SHAR	0	0	0	0	0	9	2	2	2	15	
18	0801BM161042_RAVI_ALAWE	0	0	0	0	0	9	2	2	2	15	
19	0801ME161038_PRIYANKA_JUKATIYA	0	0	0	0	0	9	2	2	2	15	
20	0801CE161001_AADARSH_BASOTIA	0	0	0	0	0	9	2	2	2	15	
21	0801ME161034_PRAGYA_DWIVEDI	0	0	0	0	0	9	2	2	2	15	
22	0801IP161041_PRAKHAR_PORWAL	0	0	0	6	0	9	2	2	2	21	
23	0801ME161042_RAMANUJ_ACHARYA	0	0	0	0	0	9	2	2	2	15	

The webpage format:

The screenshot shows a web browser displaying a table with the following data:

lectureno	1	1	
mobiletableid			
ENTRYTIME	2019-03-26 02:08:22	2019-04-28 16:07:35	
teachername	goyalankit	admin	Total
totalattendance	1	5	6
0801ME161003_AMRATESH_BOHARE	1	5	6
0801CE161014_AKSHAT_SHUKLA	1	5	6
0801CE161016_ALOK_SHARMA	1	5	6
0801CE161020_ANANT_JAIN	1	5	6
0801BM161001_AAKASH_KHARATE	1	5	6
0801CE161007_ABHISHEK_SINGH_SIKARWAR	1	5	6
0801EE161005_AKANSHA_SINGH	1	5	6
0801CE161018_AMAN_BAISHANDER	0	5	5
0801ME161002_ADARSH_SINGH	0	5	5
0801IP161004_ADITI_SAXENA	0	5	5
0801CE161006_ABHISHEK_PATEL	0	5	5
0801EE161001_AARSH_PATHAK	0	5	5
0801EE161002_ABHASHRI_DESHMUKH	0	5	5

Also you can view the list of students within a particular range of attendance:

Exporting Page

Student Data

Select Course Select base to select students [CSV Export](#)

Name
UG_operating_system_2019_20_7
UG_advanced_computer_networks_2019_20_8
UG_analysis_and_design_of_algorithms_2019_20_9
UG_database_management_system_2019_20_10
UG_computer_networks_2019_20_11
PG_embedded_systems_2019_20_15
PG_cloud_computing_2019_20_16