Ministry of Higher Education

Misr Higher Institute for Commerce & Computers

Computer Science Department

Graduation Project

Lectures' e-Attendance

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2019-2020

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Acknowledgement

First and foremost, I have to thank my research supervisors,

[**Dr.bahaa shabana**]

Without their assistance and dedicated involvement in every step throughout the process, this paper would have never been accomplished. I would like to thank you very much for your support and understanding over these past four years

It has been a fantastic opportunity to gain a lot of experience in real time p3rojects,

Followed by knowing how to actually design and analyze real projects. So we would like to thank all the people who gave the opportunity to students like us. Special thanks to the graduate project unit for their efforts to provide us with all useful information and to clarify the way for students to implement all the educational periods in real time project design and analysis. Moreover, we are all professors and visiting industry in their exciting lectures which were of great benefit to all of us. We would like to express our deep gratitude to the supervisor of graduation project [**Dr.bahaa shabana**] for his patience and guidance during the semester.

In addition, we would like to express our sincere appreciation to us

Coordinator of the Department of computers and information [**eng.Ahmed Demoksy**] for his continuous guidance

Encouragement and support during the session. Furthermore, it is our duty to thank all members of the Test Committee for their generous discussions and encouragement.

Abstract

Technology becomes more preferred companions , smartphones are most popular with users. Our “scan me” program to speed up the process of taking attendance by university instructors would save lecturing time and hence enhance the educational process. Desktop application proposes a system that is based on a QR code, which is being displayed for students during or at the beginning of each lecture. The students will need to scan the code by android application in order to confirm their attendance.

The project explains the high-level implementation details of the proposed system. It also discusses how the system verifies student identity to eliminate false registrations. The attendance will be marked as 0 and 1, 0 for absent and 1 for present in the database of the particular student row in the table. The student attendance reports will be generated in our database for further use.

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Chapter 1
(Introduction)

1.1 introduction:

In most educational institutions, participation of students in learning process is regarded as a vital exercise for allowing knowledge transfer. This signifies the importance of having students to attend the scheduled lectures and classes. Conventional methods for recording student's attendance are still adopted by most colleges. One common method is by having students to manually sign the attendance sheet, which is typically passed around the classroom while a lecturer is giving the lecture. This approach could undoubtedly allow the students to cheat about their attendance, where a student may sign for an absent student. Besides, such attendance sheet could easily be misplaced or lost.

A stricter approach especially to prevent students cheating about their attendance is additionally tedious, where a lecturer calls out the individual names from the students list and validate the presence of every single student. Such manual methods of taking students attendance have been proven to be difficult and time consuming. Thus, there is a need for a semi-automated system that would eliminate all of these troubles Taking students' attendance by university instructors during each class is a time-consuming process especially when classes are big. Some faculty policies require this task to be performed by the instructor in each lecture.

In other words, out of the total hours that are assigned to a given course, which is typically forty-five hours per semester, up to eight hours may be lost to perform this process that usually takes around ten minutes per lecture. Statistics shows that 42% of smartphone users have an average age of 26 years old. Thus, with the widespread

of smartphones among university students, this paper addresses the problem of such a waste in the lecture time and proposes a system that offers to reduce it by almost 90%. The proposed solution offers a QR code for the students to scan it via a specific smartphone application. The code along with the student identity taken by the application will confirm the students' attendance. This way, the system will save not only time but also efforts that were supposed to be put by instructors during each lecture. It will speed up the process of taking attendance and leave much time for the lecture to be given properly.

The proposed system also takes care of preventing unauthorized attendance registration using multi-factor authentication. Smartphones are becoming more preferred companions to users than desktops or notebooks. Knowing that smartphones are most popular with users at the age around 26, using smartphones to speed up the process of taking attendance by university instructors would save lecturing time and hence enhance the educational process. This paper proposes a system that is based on a QR code, which is being displayed for students during or at the beginning of each lecture. The students will need to scan the code in order to confirm their attendance. The paper explains the high-level implementation details of the proposed system. It also discusses how the system verifies student identity to eliminate false registrations.

related approaches/work, there are many proposals for Automatic Attendance Systems in the literature and in the market. Most of them do focus on applications to be installed on the lecturer device, whether a smartphone or a laptop. In the section, we will mention briefly few of these proposals. software to be installed in the instructor's mobile telephone. It enables it to query students' mobile telephone via Bluetooth connection and, through transfer of students' mobile telephones' Media Access Control (MAC) addresses to the instructor's mobile telephone; presence of

the student can be confirmed. is another example on a proposal that uses real time face detection algorithms integrated on an existing Learning Management System (LMS). It automatically detects and registers students attending on a lecture. The system represents a supplemental tool for instructors, combining algorithms used in machine learning with adaptive methods used to track facial changes during a longer period of time.

On the other hand, the proposal uses fingerprint verification technique. They propose a system in which fingerprint verification is done by using extraction of minutiae technique and the system that automates the whole process of taking attendance. Since biometrics are concerned with the measurements of unique human physiological or behavioral characteristics, the technology has been used to verify the identity of users. It is becoming critical to be able to monitor the presence of the authenticated user throughout a session. Thus, another proposal, discusses a prototype system that uses facial recognition technology to monitor authenticated user or students. A neural network-based algorithm was implemented to carry out face detection, and an eigenface method was employed to perform facial recognition. The experimental results demonstrate the feasibility of near-real-time continuous user verification for high-level security information systems.

We noticed that most proposals do involve applications being used by the instructor during class. Hence, if the attendance system requires some action from the instructor, then the class time will be disturbed each time the instructor allows some late students into the class.

On the other hand, our proposal does require the instructor to do nothing extra beyond presenting the slides of the course to the students. Hence, students may register their presence at any time they wish during the class, while having in mind that registration times are recorded.

1.2 Overview:

The application is a ring between the Students and the Doctors Through which the absence of the student is recorded.

Each of student is going to login by a correct information (Id , Password), And Doctors is going to login by correct information (Username , Password).

Attendance Management System" is software developed for maintaining the attendance of the student on the daily basis in the collage. Here the doctors, who are handling the subjects, will be responsible to mark the attendance of the students. Each doctor will be given with a separate username and password based on the subject they handle. An accurate report based on the student attendance is generated here. This system will also help in evaluating attendance eligibility criteria of a student.

1.3 Problem Definition:

- Difficulty recording absentee of paper.
- waste both time and efforts.
- difficult to extract reports.
- less security.
- losing the paper. In that case we cannot calculate the attendance of students.
- Registration error where it is possible for the student to record a previous. lecture or register for another student absent.
- Doctors need to make an excel file to list the student's absence.

1.4 Objectives:

- Easy for recording absentee electronic.
- The absence is recorded at the same time.
- Save of both time and efforts.
- Easy to extract reports.
- More security.
- Quicker and more accurate.
- Easily use, inexpensive hardware for the system.
- Use mobile devices to help with the attendance tracking process.
- Use open source software to minimize development and maintenance costs.
- Installation is fast and simple.
- Attendance reports provide end users with the greatest flexibility for manipulating the collected attendance data.

1.5 Previous work:

Faculty of Information Technology Applied Science University, January 2014

Fadi Masalha, Nael Hirzallah

-this paper addresses the problem of such a waste in the lecture time

-The proposed system also takes care of preventing unauthorized attendance registration using multi-factor authentication.

University of Petroleum & Energy Studies, July 2017

Advantages:

-The student's attendance status will be analyzed and exported.

-Among the whole types of code scanning technology, QR Code Based Smart Attendance System is the most accurate.

Disadvantages:

- No providing missed class topics and notes available to students.

-Don't have a full control to professor with more secured and enhanced options.

Faculty of Information and Communication Technology, Universiti Teknikal Malaysia Melaka, 9, 2018

Advantages:

-Location-aware Event Attendance System using QR code and GPS technology is implemented.

-System was capable to take the student attendance by scanning the QR code.

-The GPS location, time login and logout were tracked to ensure full attendance.

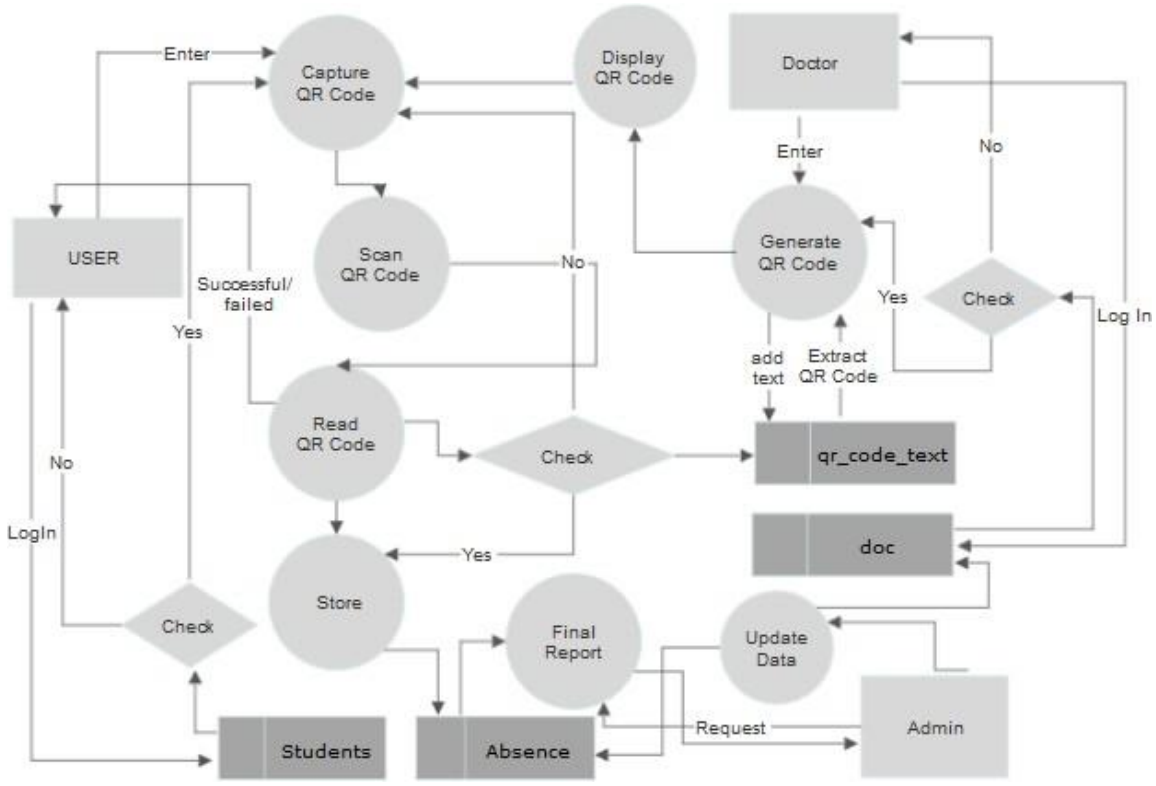
Disadvantages:

-This system can only support android application which makes it inconvenient for IOS users.

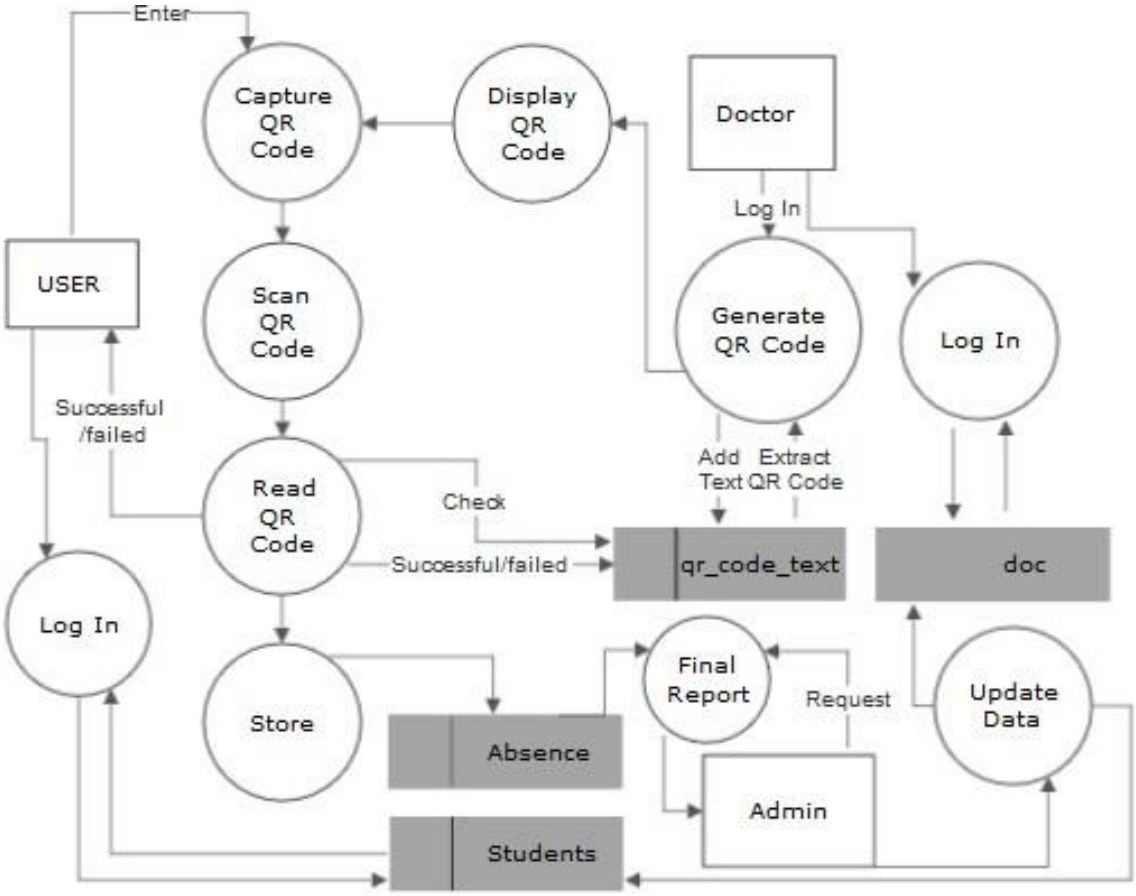
-System is only capable of tracking the location without calculating the distance to the event venue.

1.6 Entity Relationship Diagram (ERD):

For such a system to be useful . It must be able to carry out certain tasks. the system needs to be able to register the student's attendance by capture the QR Code by the application's camera then the application scans it to compare the text that the system generates from QR code with the text which was existing in database as shown below in (figure 1.1)



(figure 1.1 Design of project)



(figure 1.2 data flow diagram)

Chapter 2
(Tools)

2.1 Python:

Python is an interpreted, object-oriented, high-level programming language with dynamic semantics. Its high-level built in data structures, combined with dynamic typing and dynamic binding, make it very attractive for Rapid Application Development, as well as for use as a scripting or glue language to connect existing components together.

Python's simple, easy to learn syntax emphasizes readability and therefore reduces the cost of program maintenance. Python supports modules and packages, which encourages program modularity and code reuse. The Python interpreter and the extensive standard library are available in source or binary form without charge for all major platforms, and can be freely distributed.

Often, programmers fall in love with Python because of the increased productivity it provides. Since there is no compilation step, the edit-test-debug cycle is incredibly fast.

Debugging Python programs is easy: a bug or bad input will never cause a segmentation fault. Instead, when the interpreter discovers an error, it raises an exception.

When the program doesn't catch the exception, the interpreter prints a stack trace. A source level debugger allows inspection of local and global variables, evaluation of arbitrary expressions, setting breakpoints, stepping through the code a line at a time, and so on.

The debugger is written in Python itself, testifying to Python's introspective power. On the other hand, often the quickest way to debug a program is to add a few print statements to the source: the fast edit-test-debug cycle makes this simple approach very effective.

2.2 SQL Queries:

With the click of a few ‘Add comments’ import buttons, you can transfer comments text fields directly from other modules into the Summary Paragraph module. The text may then be copy and pasted to rearrange and compose a summary report for that cat key number. The unlimited text field also has a spellcheck feature that allows you to add terms to build your own custom dictionary.

- Easily transfer text fields directly from other modules via ‘Add comments’ import buttons.
- Copy and paste to rearrange and compose a report for that cat key number.
- Unlimited text field has handy spellcheck feature with customizable dictionary.
- Structured Query Language (SQL) Queries
- The Summary Paragraph module, and the individual cat key reports it creates, are currently the only way to generate reports through the Osteoware graphic user interface (GUI). In order to efficiently extract other aggregate data from the Structured Query Language (SQL) database you must install the Advantage Data Architect TM version 9.1, which is available as a freeware download from Sybase (see the link in the Downloads section), and use the SQL query features.

- It is beyond the scope of this website to provide a comprehensive SQL resource, however do not be intimidated. SQL is very easy to learn and is a powerful skill to possess. The following introductory web resources are available.

2.3 IntelliJ IDEA:

IntelliJ IDEA is an integrated development environment (IDE) written in Java for developing computer software. It is developed by JetBrains (formerly known as IntelliJ), and is available as an Apache 2 Licensed community edition,[4] and in a proprietary commercial edition. Both can be used for commercial development.

The first version of IntelliJ IDEA was released in January 2001, and was one of the first available Java IDEs with advanced code navigation and code refactoring capabilities integrated.

In a 2010 *InfoWorld* report, IntelliJ received the highest test center score out of the four top Java programming tools: Eclipse, IntelliJ IDEA, NetBeans and JDeveloper.[8]

In December 2014, Google announced version 1.0 of Android Studio, an open-source IDE for Android apps, based on the open source community edition of IntelliJ IDEA.[9] Other development environments based on IntelliJ's framework include AppCode, CLion, DataGrip, GoLand, PhpStorm, PyCharm, Rider, RubyMine, WebStorm, and MPS.

2.4 Android Studio:

Android Studio is the official integrated development environment (IDE) for Android application development.

It is based on the IntelliJ IDEA, a Java integrated development environment for software, and incorporates its code editing and developer tools. To support application development within the Android operating system, Android Studio uses a Gradle-based build system, emulator, code templates, and Github integration.

Every project in Android Studio has one or more modalities with source code and resource files. These modalities include Android app modules, Library modules, and Google App Engine modules.

Android Studio uses an Instant Push feature to push code and resource changes to a running application. A code editor assists the developer with writing code and offering code completion, refraction, and analysis. Applications built in Android Studio are then compiled into the APK format for submission to the Google Play Store. The software was first announced at Google I/O in May 2013, and the first stable build was released in December 2014.

Android Studio is available for Mac, Windows, and Linux desktop platforms. It replaced Eclipse Android Development Tools (ADT) as the primary IDE for Android application development. Android Studio and the Software Development Kit can be downloaded directly from Google.

2.5 Visual Studio Code:

Visual Studio Code is a source-code editor that can be used with a variety of programming languages,
including Java, JavaScript, Go, Node.js and C++.[14][15][16][17] It is based on the Electron framework,[18] which is used to develop Node.js Web applications that run on the Blink layout engine. Visual Studio Code employs the same editor component (codenamed "Monaco") used in Azure DevOps (formerly called Visual Studio Online and Visual Studio Team Services).

Instead of a project system, it allows users to open one or more directories, which can then be saved in workspaces for future reuse. This allows it to operate as a language-agnostic code editor for any language. It supports a number of programming languages and a set of features that differs per language. Unwanted files and folders can be excluded from the project tree via the settings. Many Visual Studio Code features are not exposed through menus or the user interface, but can be accessed via the command palette.

Visual Studio Code can be extended via extensions, available through a central repository. This includes additions to the editor and language support. A notable feature is the ability to create extensions that add support for new languages, themes, and debuggers, perform static code analysis, and add code linters using the Language Server Protocol.

Visual Studio Code includes multiple extensions for FTP, allowing the software to be used as a free alternative for web development. Code can be synced between the editor and the server, without downloading any extra software.

Visual Studio Code allows users to set the code page in which the active document is saved, the newline character, and the programming language of the active document. This allows it to be used on any platform, in any locale, and for any given programming language.

2.6 Xml:

XML stands for **E**xtensible **M**arkup **L**anguage. It is a text-based markup language derived from Standard Generalized Markup Language (SGML).

XML tags identify the data and are used to store and organize the data, rather than specifying how to display it like HTML tags, which are used to display the data. XML is not going to replace HTML in the near future, but it introduces new possibilities by adopting many successful features of HTML.

2.6.1 Why XML?

Maybe it is a little hard to understand, but XML does not DO anything. This note is a note to Tove from Jani, stored as XML:

```
<note>
  <to>Tove</to>
  <from>Jani</from>
  <heading>Reminder</heading>
  <body>Don't forget me this weekend! </body>
</note>
```

The XML above is quite self-descriptive:

- It has sender information.
- It has receiver information
- It has a heading
- It has a message body.

But still, the XML above does not DO anything. XML is just information wrapped in tags.

2.5.1.1 XML Does Not Use Predefined Tags:

The XML language has no predefined tags. The tags in the example above (like <to> and <from>) are not defined in any XML standard. These tags are "invented"

by the author of the XML document.HTML works with predefined tags like <p>, <h1>, <table>, etc. With XML, the author must define both the tags and the document structure.

2.5.1.2 XML is Extensible:

Most XML applications will work as expected even if new data is added (or removed).Imagine an application designed to display the original version of note.xml (<to> <from> <heading> <body>).Then imagine a newer version of note.xml with added <date> and <hour> elements, and a removed <heading>.The way XML is constructed, older version of the application can still work:

```
<note>
  <date>2015-09-01</date>
  <hour>08:30</hour>
  <to>Tove</to>
  <from>Jani</from>
  <body>Don't forget me this weekend!</body>
</note>
```

2.5.1.3 XML Simplifies Things:

- It simplifies data sharing
- It simplifies data transport
- It simplifies platform changes
- It simplifies data availability

Many computer systems contain data in incompatible formats. Exchanging data between incompatible systems (or upgraded systems) is a time-consuming task for web developers. Large amounts of data must be converted, and incompatible data is often lost.XML stores data in plain text format. This provides a software- and hardware-independent way of storing, transporting, and sharing data.XML also

makes it easier to expand or upgrade to new operating systems, new applications, or new browsers, without losing data.

With XML, data can be available to all kinds of "reading machines" like people, computers, voice machines, news feeds, etc. you can read more about xml in **Appendix D.**

2.7 API:

(Application Programming Interface)

2.7.1 What is an API?

API is the acronym for Application Programming Interface, which is a software intermediary that allows two applications to talk to each other. Each time you use an app like Facebook, send an instant message, or check the weather on your phone, you're using an API.

2.7.2 What Is an Example of an API?

When you use an application on your mobile phone, the application connects to the Internet and sends data to a server. The server then retrieves that data, interprets it, performs the necessary actions and sends it back to your phone. The application then interprets that data and presents you with the information you wanted in a readable way. This is what an API is - all of this happens via API.

To explain this better, let us take a familiar example. Imagine you're sitting at a table in a restaurant with a menu of choices to order from. The kitchen is the part of the "system" that will prepare your order. What is missing is the critical link to communicate your order to the kitchen and deliver your food back to your table.

That's where the waiter or API comes in. The waiter is the messenger – or API – that takes your request or order and tells the kitchen – the system – what to do. Then the waiter delivers the response back to you; in this case, it is the food.

2.7.3 What Is an Example of an API?

When you use an application on your mobile phone, the application connects to the Internet and sends data to a server. The server then retrieves that data, interprets it, performs the necessary actions and sends it back to your phone.

The application then interprets that data and presents you with the information you wanted in a readable way. This is what an API is - all of this happens via API. To explain this better, let us take a familiar example. Imagine you're sitting at a table in a restaurant with a menu of choices to order from. The kitchen is the part of the "system" that will prepare your order. What is missing is the critical link to communicate your order to the kitchen and deliver your food back to your table. That's where the waiter or API comes in. The waiter is the messenger – or API – that takes your request or order and tells the kitchen – the system – what to do. Then the waiter delivers the response back to you; in this case, it is the food. Here is a real-life API example. You may be familiar with the process of searching flights online. Just like the restaurant, you have a variety of options to choose from, including different cities, departure and return dates, and more.

Let us imagine that you're booking you are flight on an airline website. You choose a departure city and date, a return city and date, cabin class, as well as other variables. In order to book your flight, you interact with the airline's website to access their database and see if any seats are available on those dates and what the costs might be. However, what if you are not using the airline's website—a channel

that has direct access to the information? What if you are using an online travel service, such as Kayak or Expedia, which aggregates information from a number of airline databases? The travel service, in this case, interacts with the airline's API. The API is the interface that, like your helpful waiter, can be asked by that online travel service to get information from the airline's database to book seats, baggage options, etc. The API then takes the airline's response to your request and delivers it right back to the online travel service, which then shows you the most updated, relevant information.

2.7.4 What an API Also Provides Is a Layer of Security

Your phone's data is never fully exposed to the server, and likewise the server is never fully exposed to your phone. Instead, each communicates with small packets of data, sharing only that which is necessary—like ordering takeout. You tell the restaurant what you would like to eat, they tell you what they need in return and then, in the end, you get your meal.

APIs have become so valuable that they comprise a large part of many business' revenue. Major companies like Google, eBay, Salesforce.com, Amazon, and Expedia are just a few of the companies that make money from their APIs. What the "API economy" refers to is this marketplace of APIs. you can read more about api in **Appendix J.**

2.8 Networking:

The networks were used to connect the android application to the desktop application.

2.8.1 What Is Networking?

Networking is the exchange of information and ideas among people with a common profession or special interest, usually in an informal social setting.

2.8.2 How Networking Works:

Networking often begins with a single point of common ground. The most obvious is a professional affiliation, but some people find effective networking opportunities in a college alumni group, a church or synagogue social group, or a private club. For professionals, the best networking opportunities may occur at trade shows, seminars, and conferences, which are designed to attract a large crowd of like-minded individuals.

Networking helps a professional keep up with current events in the field, and develops relationships that may boost future business or employment prospects. Needless to say, it also provides opportunities to help other people find jobs, make connections and catch up on the news.

2.8.3 Online Networking:

Professional networking platforms such as LinkedIn provide an online location for people to engage with other professionals, join groups, post blogs, and share information. And, of course, they provide a place to post a resume that can be seen by prospective employers, to search for jobs, or to identify job candidates.

These days, a business-to-business customer pipeline can be developed almost entirely through the use of a social networking site. Online networking forum allows professionals to demonstrate their knowledge and connect with like-minded people.

LinkedIn is the largest professional network, but there are many others. Some cater to particular subsets of people, such as Black Business Women Online. Others

have a different focus, such as MeetUp, which encourages its members to meet in person off-site. Lunch meet is just what it sounds like: It's a mobile app that identifies folks in your field who are available locally for a meet-up.

2.9 XAMPP:

We use xampp with our desktop application:

2.9.1 What is "xampp"?

XAMPP is a free and open source cross-platform web server solution stack package developed by Apache Friends, consisting mainly of the Apache HTTP Server, MariaDB database, and interpreters for scripts written in the PHP and Perl programming languages. XAMPP stands for Cross-Platform (X), Apache (A), MariaDB (M), PHP (P) and Perl (P). It is a simple, lightweight Apache distribution that makes it extremely easy for developers to create a local web server for testing and deployment purposes. Everything needed to set up a web server – server application (Apache), database (MariaDB), and scripting language (PHP) – is included in an extractable file. XAMPP is also cross-platform, which means it works equally well on Linux, Mac and Windows. Since most actual web server deployments use the same components as XAMPP, it makes transitioning from a local test server to a live server extremely easy as well.

2.10 image processing:

Image processing 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 basically includes the following three steps:

- Importing the image via image acquisition tools;
- Analyzing and manipulating the image;
- Output in which result can be altered image or report that is based on image analysis.

There are two types of methods used for image processing namely, analogue and digital image processing. Analogue 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. Digital image processing techniques help in manipulation of the digital images by using computers. The three general phases that all types of data have to undergo while using digital technique are pre-processing, enhancement, and display, information extraction.

2.11 QR Code:

QR code (abbreviated from Quick Response Code) is the trademark for a type of matrix barcode (or two-dimensional bar code) first designed for the automotive industry in Japan.

Bar codes are optical machine-readable labels attached to items that record information related to the item. It was initially patented; however, its patent holder

has chosen not to exercise those rights. Recently, the QR Code system has become popular outside the automotive industry due to its fast readability and greater storage capacity compared to standard UPC barcodes.

The code consists of black modules (square dots) arranged in a square grid on a white background. The information encoded may be made up of four standardized types ("modes") of data (numeric, alphanumeric, byte / binary, Kanji) or, through supported extensions, virtually any type of data. A QR code, as shown in **(Figure2.2)** is read by an imaging device, such as a camera, and formatted algorithmically by underlying software using Reed-Solomon error correction until the image can be appropriately interpreted. Data is then extracted from patterns present in both horizontal and vertical components of the image. The QR features are listed in table 1. Figure shows a sample of an unencrypted QR code that will be needed by the proposed system.

(Figure2.2 QR Code)

Chapter 3
(Data Base)

3.1 Data:

In simple words data can be facts related to any object in consideration.

For example, your name, age, height, weight, etc. are some data related to you.

A picture, image, file, pdf etc. can also be considered data.

3.2 Database:

Database is a systematic collection of data. Databases support storage and manipulation of data. Databases make data management easy. Let's discuss few examples. An online telephone directory would definitely use database to store data pertaining to people, phone numbers, other contact details, etc. Your electricity service provider is obviously using a database to manage billing, client related issues, to handle fault data, etc. Let's also consider the facebook. It needs to store, manipulate and present data related to members, their friends, member activities, messages, advertisements and lot more. We can provide countless number of examples for usage of databases.

SQL: Structured Query Language, a language used in programming and designed for managing data held in a relational database management system (RDBMS), or for stream processing in a relational data stream management system (RDSMS).

MySQL: an open-source relational database management system (RDBMS), also the most popular one.

SQLite: a relational database management system which is not client-server based. It's doesn't need a server to setup and run.

In short, MySQL and SQLite are the systems , SQL is the language being used in those systems. SQLite is a more lightweight, single-user and server-less system.

3.3 MySQL and SQLite:

Where high-security features are required for data access. For websites that work on MySQL despite some constraints. It's a scalable tool that is easy to manage. There are some pretty major differences between SQLite and MySQL. As we mentioned above, SQLite is server less whereas MySQL is not. Therefore, if portability is of a concern, go with SQLite. This makes the transfer of all your database data much more efficient as it is stored in a single file. Furthermore, if your application requires that you write to disk locally you may also want to use SQLite.

However, if you require scalability in terms of the number of database queries required, MySQL is the better choice. If you want any real degree of concurrency or require higher levels of security as well as user permissions management, MySQL wins over SQLite.

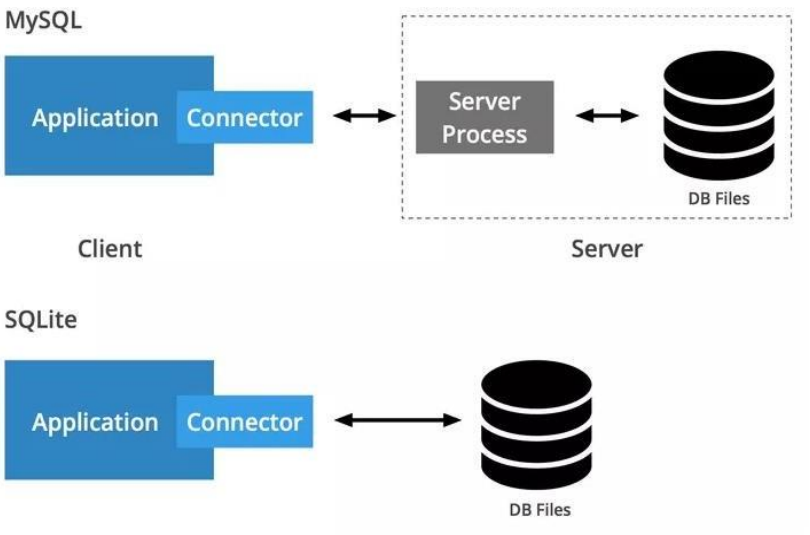


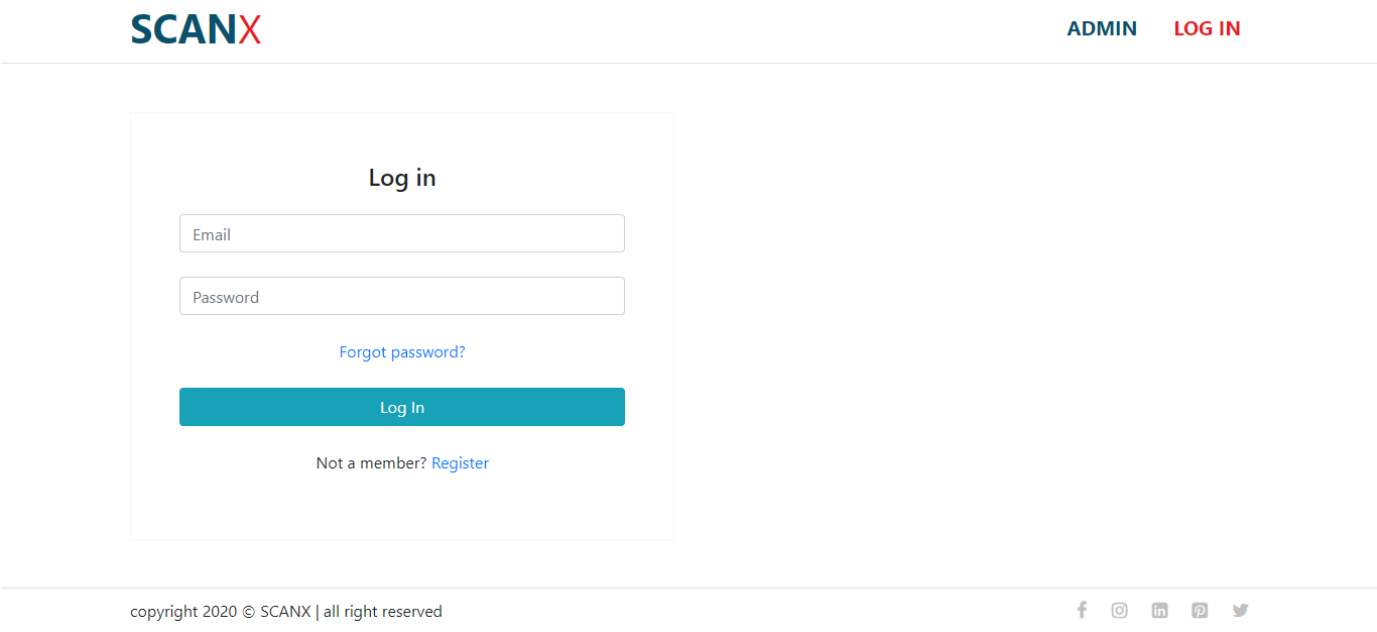
Figure (3.1 MySQl vs. SQLite)

Chapter 4
(System Implementation)

User Interface (UI): In information technology, the user interface (UI) is everything designed into an information device with which a person may interact. This can include display screens, keyboards, a mouse and the appearance of a desktop. It is also the way through which a user interacts with an application or a website.

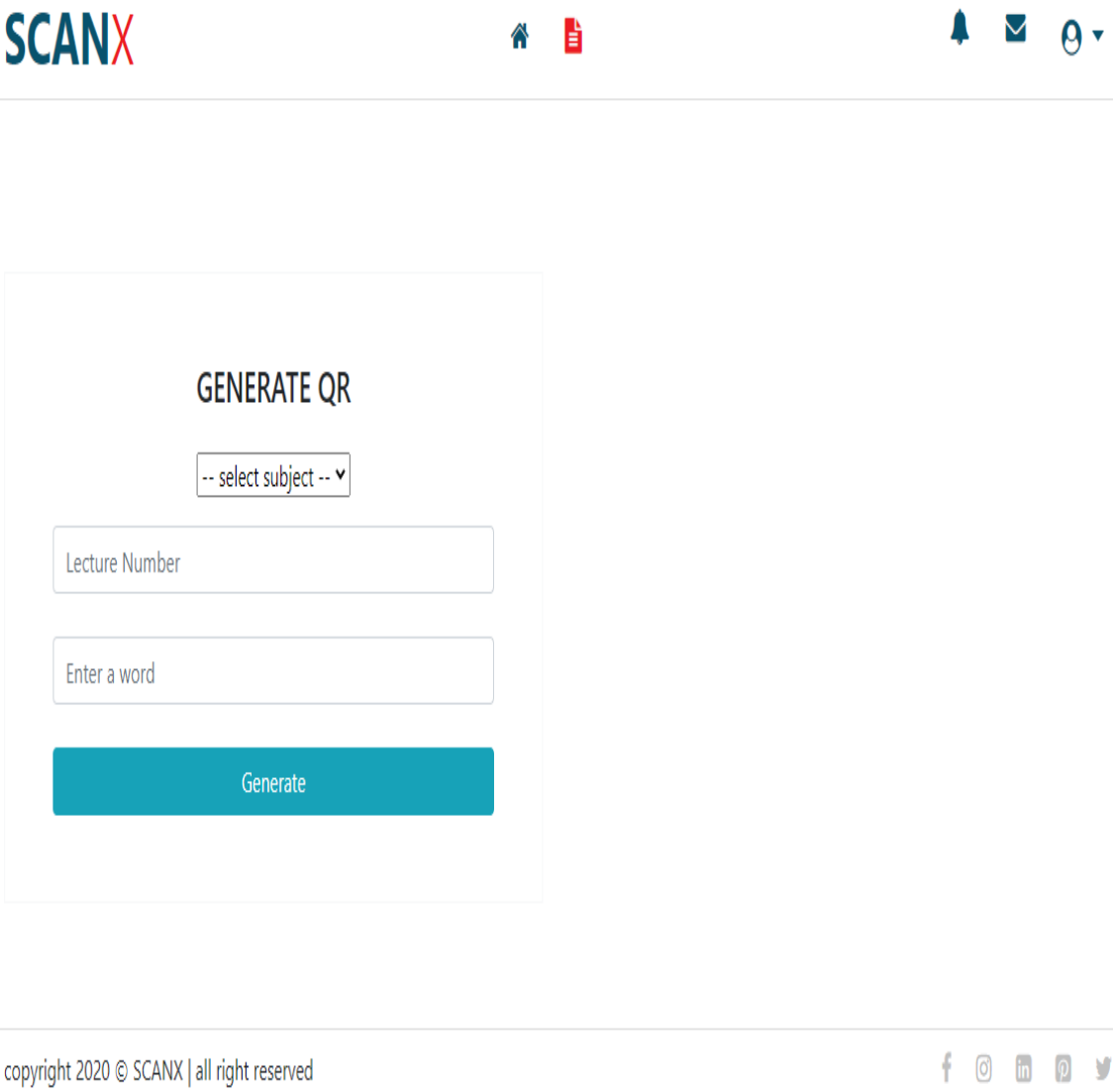
4.1 Web Application UI:

Login screen allows each doctor to login his account attendance System has a big Database which has a lot of doctor's accounts.



(Figure 4.1 Login screen)

Choose subject and insert the number of lectures , insert also a word and click on “Generate” to generate the QR code .

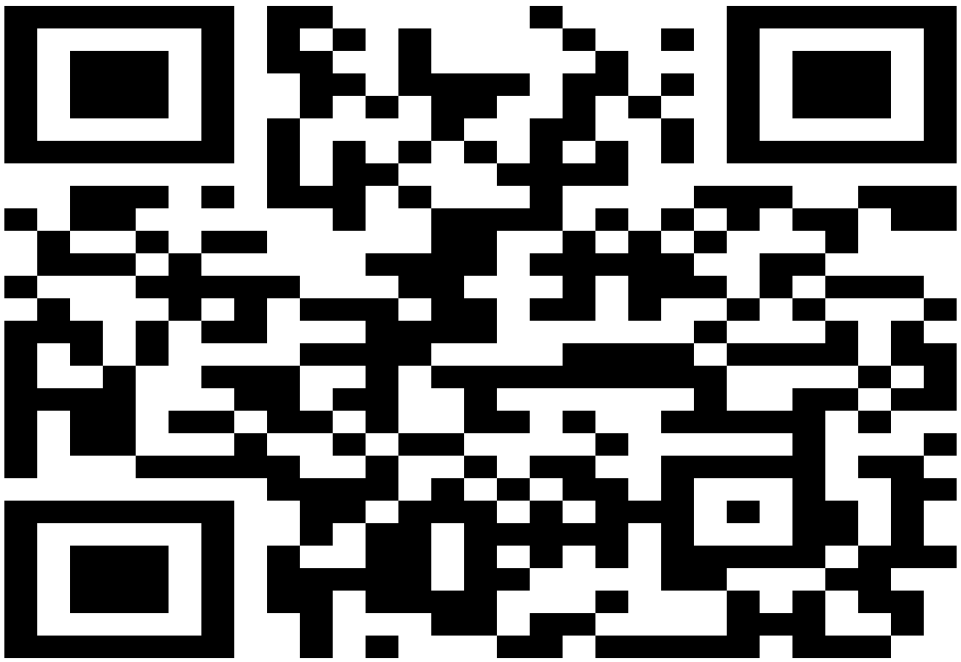


(Figure 4.2 Home screen)

QR code (abbreviated from Quick Response Code): is the trademark for a type of matrix barcode (or two-dimensional barcode) first designed in 1994 for the automotive industry in Japan.

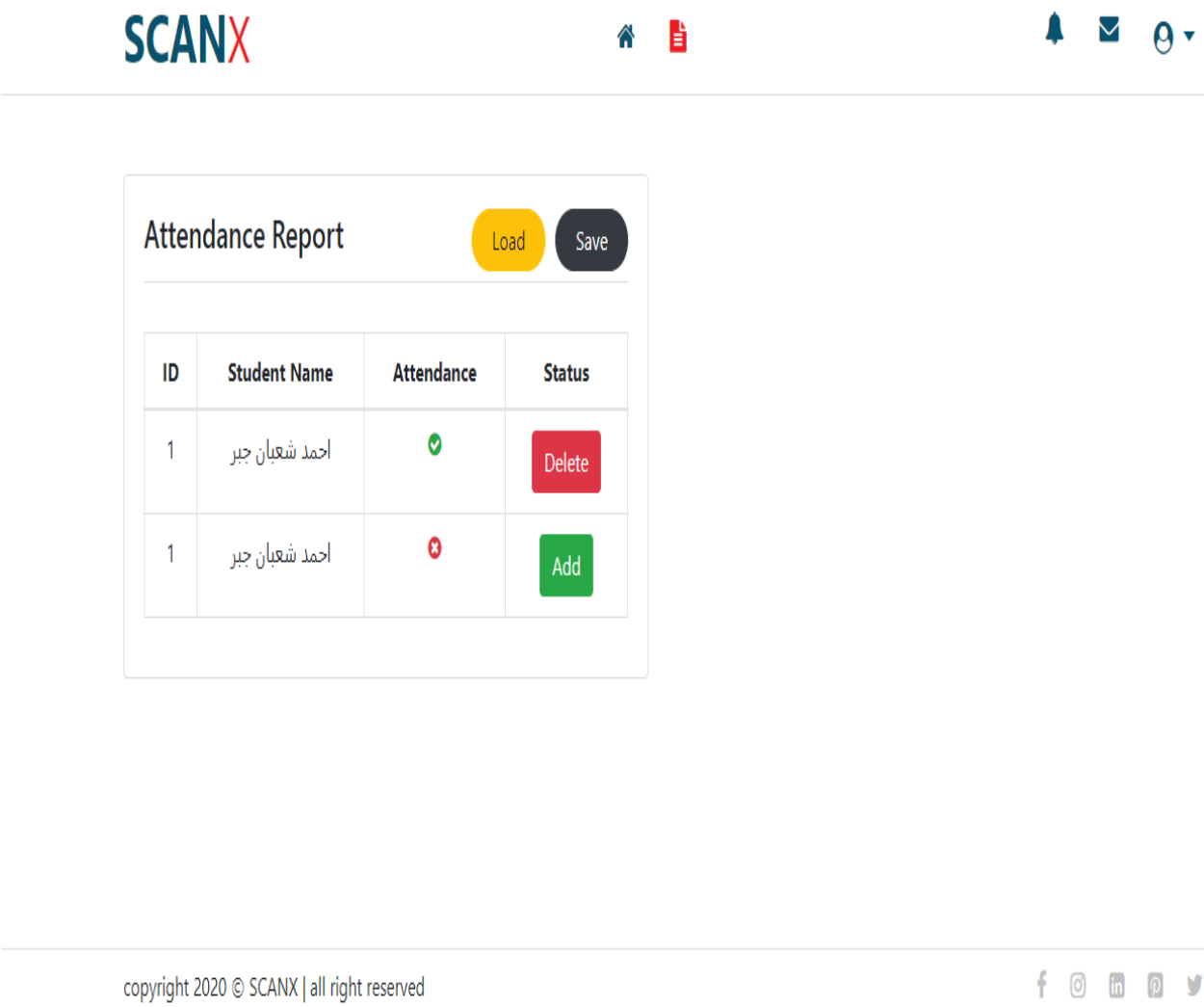
QR code screen is the Encrypted code which doctors make it.

When the doctor click on generate the QR code will appear on the QR screen and the student can scan it by using their mobile phones.



(Figure 4.3 QR Code screen)

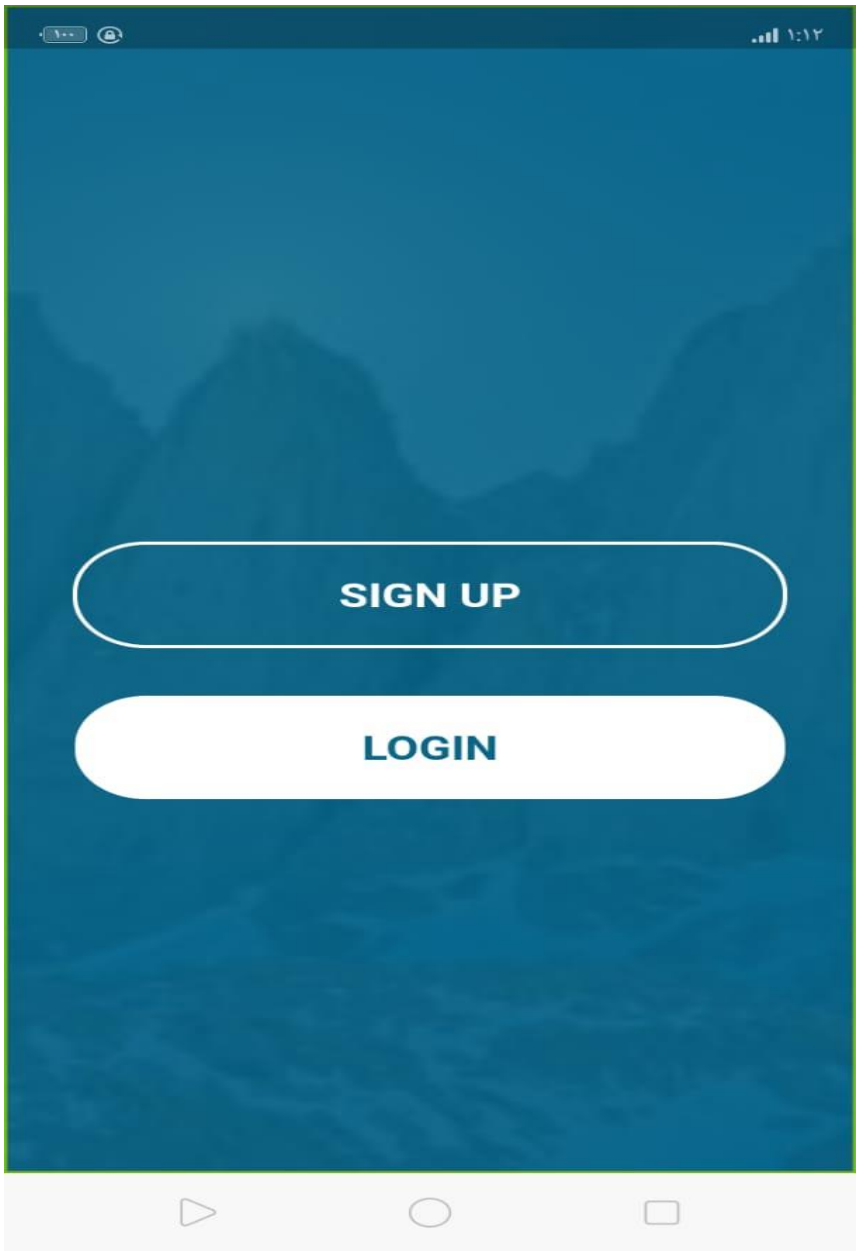
In this screen when the load button is pressed, the students present are displayed and the students Absentees are displayed.



(Figure 4.4 Report Screen)

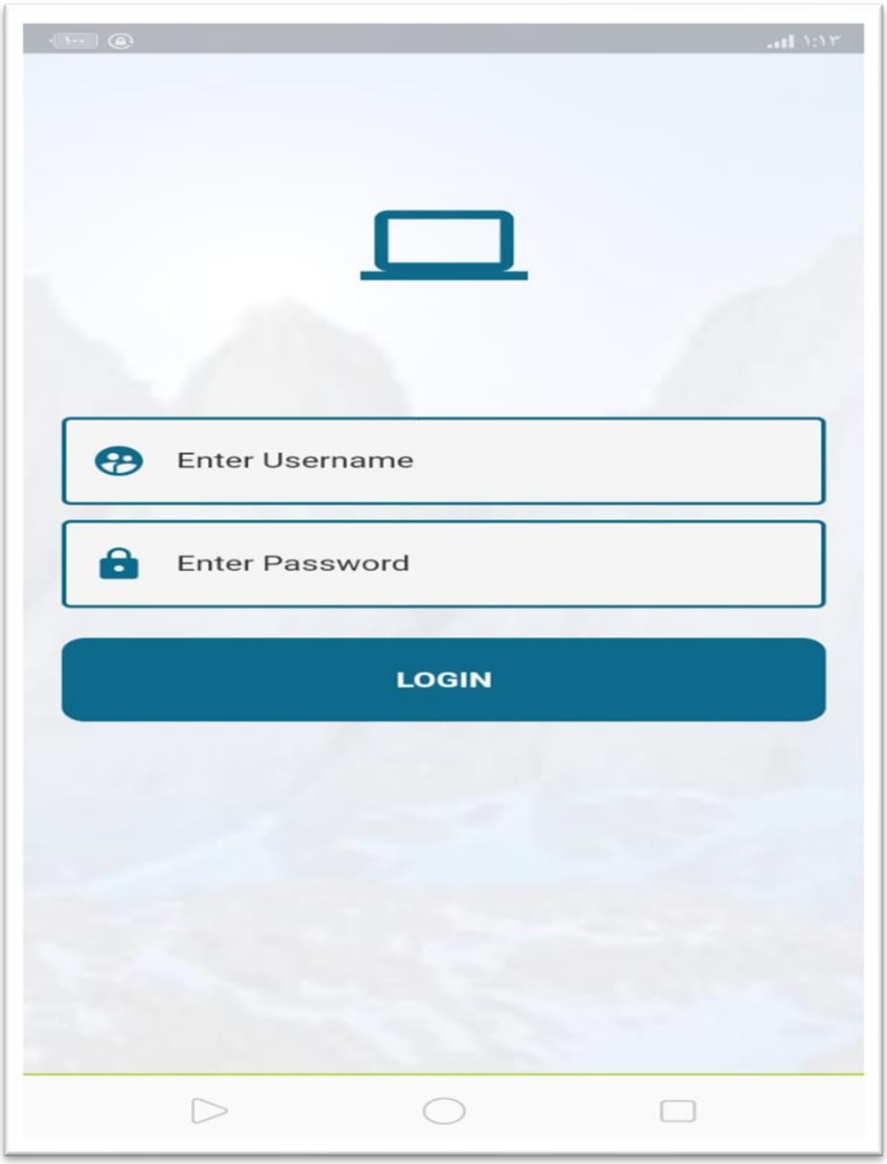
4.2 Flutter UI:

This page is existed before log in page or home page to make the student signup if he never login the app before or login if he had before.



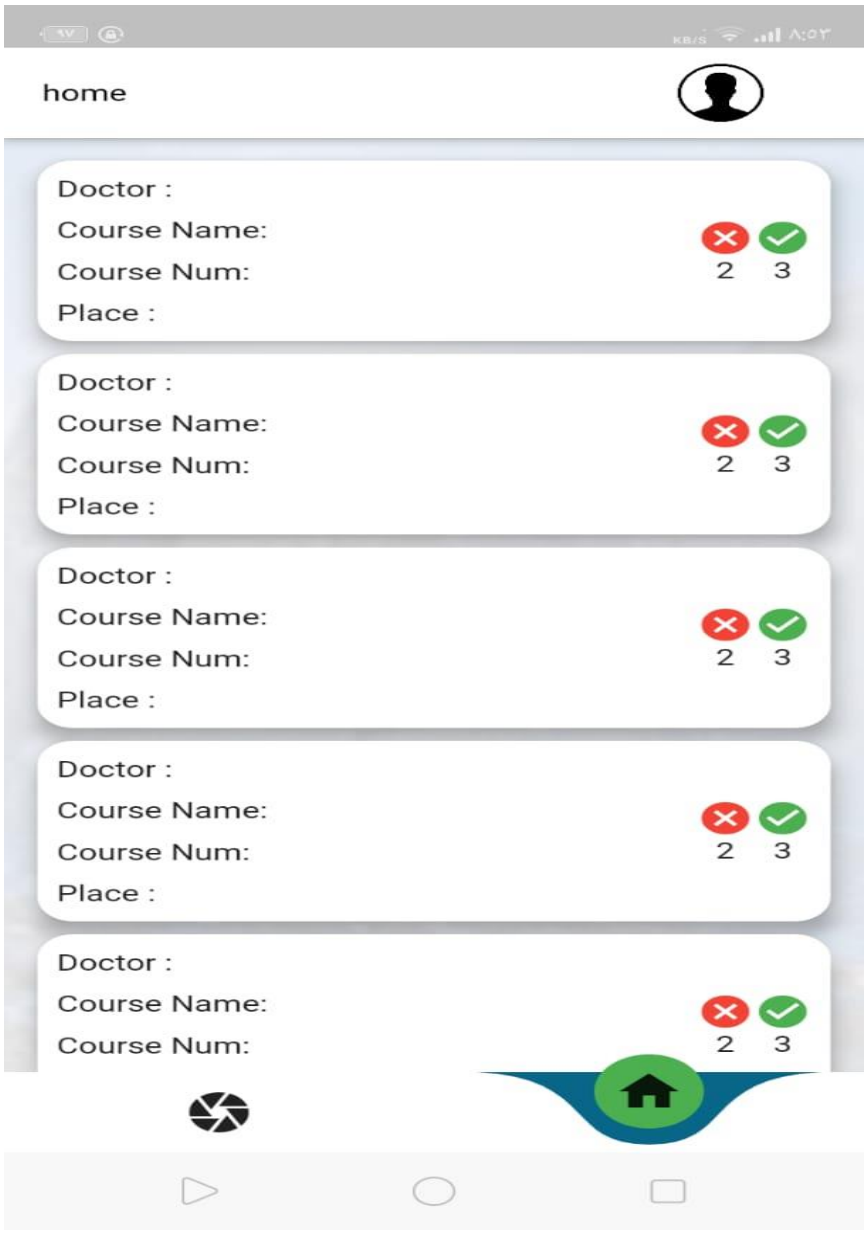
(Figure 4.5 Logo screen)

On this screen, Students can log in by their id and password which is token by data base administrator.



(Figure 4.6 Login screen)

This page allows students to know the course name , place and how many times they attended before .



(Figure 4.7 Home Page)

(Figure 4.8 Scanning Page)

When students capture QR code then the system scan it and compare it with the QR code exist in data base then they are the same it is successful.

Chapter 5

(Conclusion)

5.1 Conclusion:

When the students register their attendance, a report with the student's names and numbers will appear to the doctor at the same moment.

Appendix A
(QR code)

A QR code (quick response code) is a type of 2D bar code that is used to provide easy access to information through a smartphone

Example of a QR code

In this process, known as mobile tagging, the smartphone's owner points the phone at a QR code and opens a barcode reader app which works in conjunction with the phone's camera. The reader interprets the code, which typically contains a call to action such as an invitation to download a mobile application, a link to view a video or an SMS message inviting the viewer to respond to a poll. The phone's owner can choose to act upon the call to action or click cancel and ignore the invitation.

Static QR codes, the most common type, are used to disseminate information to the general public. They are often displayed in advertising materials in the environment (such as billboards and posters), on television and in newspapers and magazines. The code's creator can track information about the number of times a code was scanned and its associated action taken, along with the times of scans and the operating system of the devices that scanned it.

Dynamic QR code, (sometimes referred to as unique QR codes) offer more functionality. The owner can edit the code at any time and can target a specific

individual for personalized marketing. Such codes can track more specific information, including the scanners names and email address, how many times they scanned the code and, in conjunction with tracking codes on a website, conversion rates.

The technology for QR codes was developed by Densa-Wave, a Toyota subsidiary. The codes were originally used for tracking inventory.

Here are a few examples of QR codes in current use:

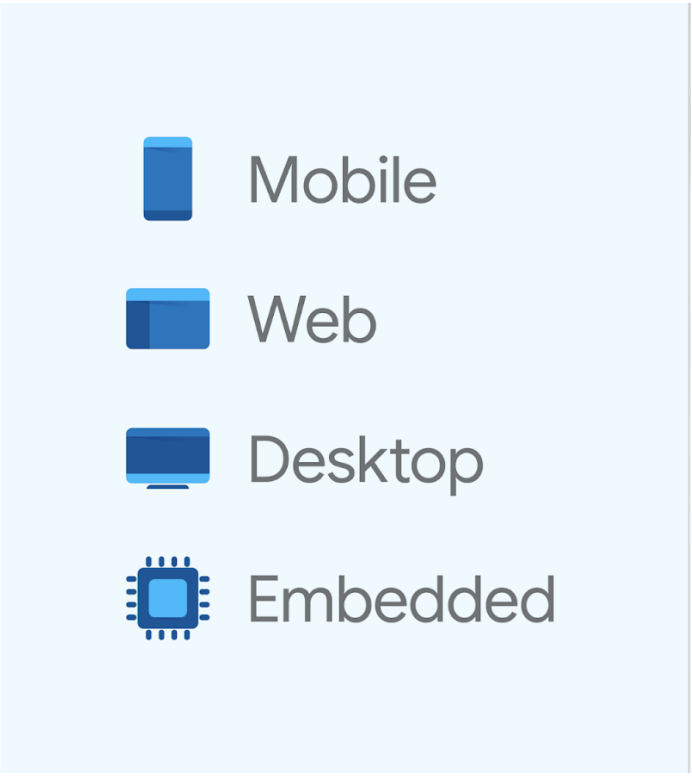
- QR codes on business cards link to the individual's full resume or website.
- A Starbucks promotion featured a QR code-enabled scavenger hunt involving hints accessed through QR codes in the stores.
- Quiring Monuments in Seattle puts QR code on gravestones to connects people to an online obituary or a website about the deceased.
- In Florida, the J.N. "Ding" Darling National Wildlife Refuge puts QR codes on signs to connect people to informational videos about wildlife along the trails.

Appendix B

(Flutter)

Flutter is an open-source UI software development kit created by Google. It is used to develop applications for Android, IOS, Linux, Mac, Windows, Google Fuchsia and the web from a single codebase.

What is flutter?



Flutter is a free and open-source mobile UI framework created by Google and released in May 2017. In a few words, it allows you to create a native mobile application with only one codebase. This means that you can use one programming language and one codebase to create two different apps (for IOS and Android).

Flutter consists of two important parts:

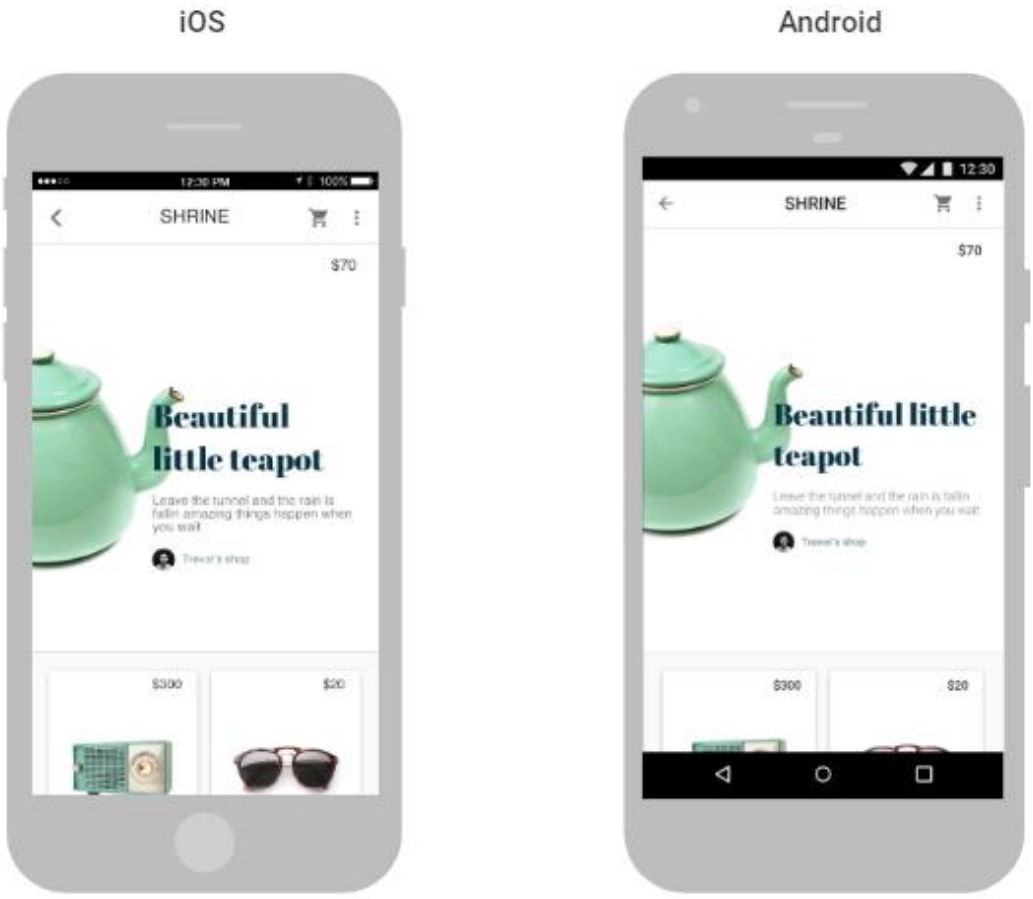
- An SDK (Software Development Kit): A collection of tools that are going to help you develop your applications. This includes tools to compile your code into native machine code (code for IOS and Android).
- A Framework (UI Library based on widgets): A collection of reusable UI elements (buttons, text inputs, sliders, and so on) that you can personalize for your own needs.

To develop with Flutter, you will use a programming language called Dart. The language was created by Google in October 2011, but it has improved a lot over these past years.

Dart focuses on front-end development, and you can use it to create mobile and web applications.

If you know a bit of programming, Dart is a typed object programming language. You can compare Dart's syntax to JavaScript.

Why Flutter?



- Simple to learn and use

Flutter is a modern framework, and you can feel it! It’s way simpler to create mobile applications with it. If you have used Java, Swift, or React Native, you'll notice how Flutter is different.

.

What I love about Flutter is that you can create a real native application without a bunch of code.

- Quick compilation: maximum productivity

Thanks to Flutter, you can change your code and see the results in real-time. It's called Hot-Reload. It only takes a short amount of time after you save to update the application itself.

Significant modifications force you to reload the app. But if you do work like design, for example, and change the size of an element, it's in real-time!

- Ideal for startup MVPs

If you want to show your product to investors as soon as possible, Flutter is a good choice.

Here are my top 4 reasons to use it for your MVP:

- It's cheaper to develop a mobile application with Flutter because you don't need to create and maintain two mobile apps (one for IOS and one for Android).
- One developer is all you need to create your MVP.
- It's per formant – you won't notice the difference between a native application and a Flutter app.
- It's beautiful – you can easily use widgets provided by Flutter and personalize it to create a valuable UI for your customers (you can find examples of applications made with Flutter below).

- Good documentation

It's important for new technology to have good documentation. But it's not always the case that it has it!

You can learn a lot from Flutter's documentation, and everything is very detailed with easy examples for basic use cases. Each time I've had a problem with one of my widgets in my code, I have been able to check the documentation and the answer was there.

Features of Flutter:

Google Flutter offers easy and simple methods to start building beautiful apps, with its rich set of Material Design and Cupertino (IOS) widgets and behaviors. Your users will love the app's natural look and feel because Flutter implements platform-specific scrolling, navigational patterns, fonts, and more. You'll feel powerful and productive with Flutter's functional-reactive framework and the extremely fast hot reloads on devices and emulators.

Here are 6 features of the cross-platform mobile app development framework:

1. Hot Reload

The changes made by the developers can be seen instantaneously with Hot Reload. This feature is super-handy for developers as it makes the changes visible in the app itself. As the changes made are visible within seconds, developers can fix the bugs in no time.

The team can experiment with new features and improvise them continuously. Thus, this feature enables developers and designers to have complete freedom and boosts their creativity further.

2. Cross-Platform Development

CPD saves time, energy and money. With Flutter, you need to write the code once, maintain and can use that for two apps. The need has gone for developing a different code for a different platform. With Flutter, you can try developing for the Fuchsia platform which is a trial OS in process at Google.

3. Accessible Native Features and SDKs

Your app development process gets easy and delightful through Flutter's native codes, third-party integrations, and platform APIs. Therefore, you can easily access the native

features and SDKs on both Android and IOS platforms and reuse the widely-used programming languages such as Kotlin and Swift.

4. Minimal Code

Flutter is developed using Dart programming language. Dart uses JIT and AOT compilation that helps improve the overall startup time, functioning and accelerates the performance. JIT enhances the development system with the hot reload function. It refreshes the UI without putting in the effort to building a new one.

5. Widgets

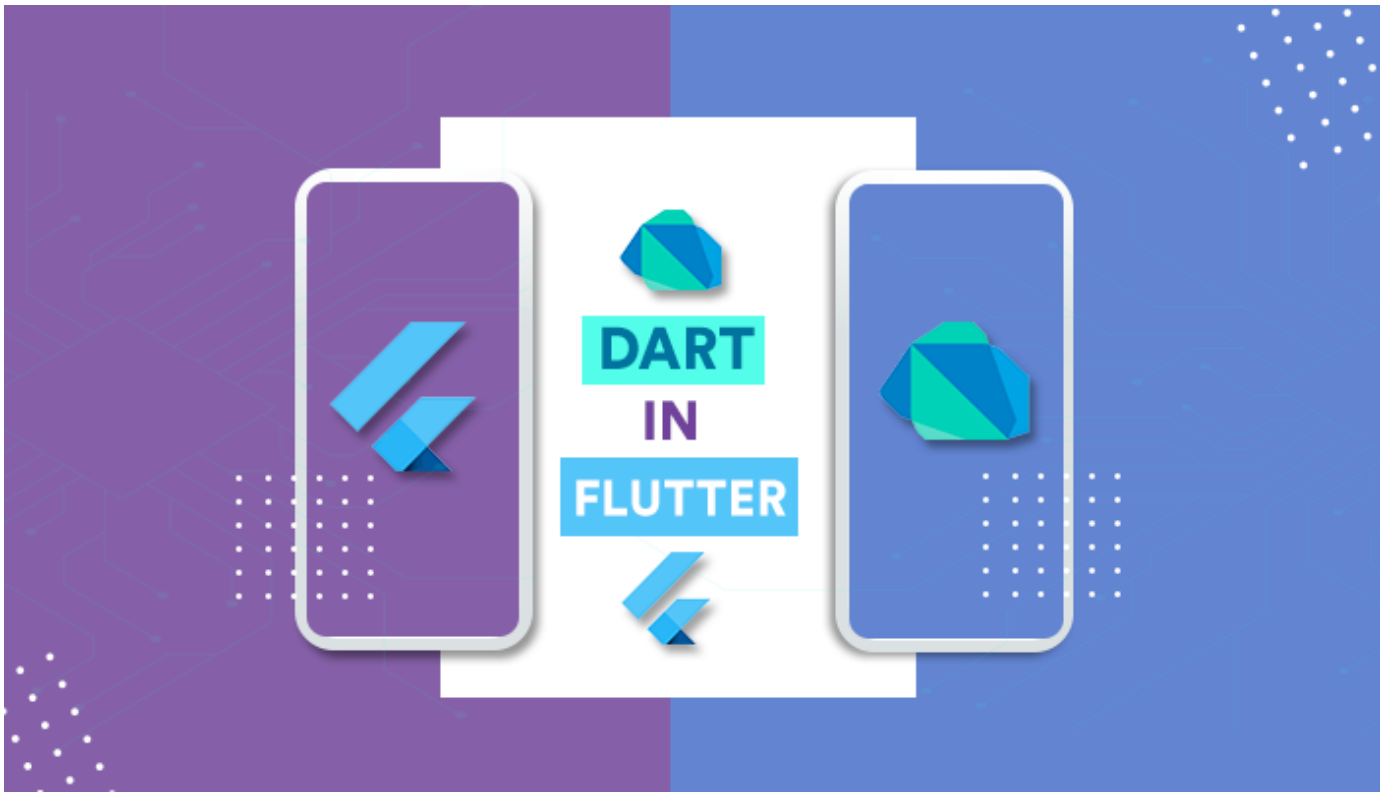
In Flutter, the widgets are given an upper hand. It is capable of developing customizable and complex widgets. Most importantly, Flutter has all the sets of widgets from Material Design and Cupertino pack and it helps to provide a glitch-free experience in this case over and above all the other platforms.

6. Native Feel and Features

Flutter enables you to use your existing code Java, Obj-C and Swift to gain the key to native features which are platform specific. Camera and Geolocation are features connected with the use of native languages and offers you the convenience of working in the native language and, it provides access to the native features of both IOS and Android platforms.

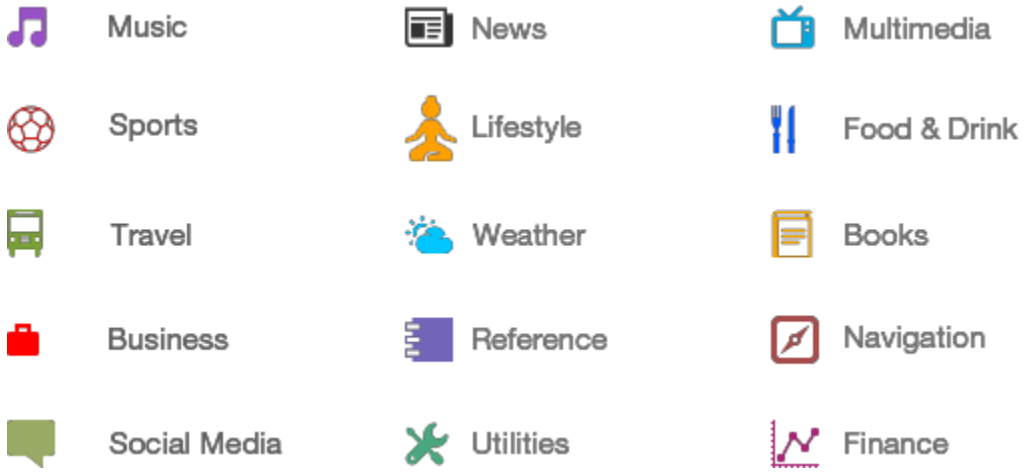
Flutter Applications:

Flutter uses **Dart** programming language which was introduced by Google in 2011 and is rarely used by developers. **Dart** syntax is easy to understand for JavaScript or **Java** developers as it supports most of the object-oriented concepts.



Categories of Flutter applications:

There are many flutter applications in the market. The top categories are −



History of Flutter:

The first version of Flutter was known as codename "Sky" and ran on the Android operating system. It was unveiled at the 2015 Dart developer summit, with the stated intent of being able to render consistently at 120 frames per second.[8] During the keynote of Google Developer Days in Shanghai, Google announced Flutter Release Preview 2 which is the last big release before Flutter 1.0. On December 4, 2018, Flutter 1.0 was released at the Flutter Live event, denoting the first "stable" version of the Framework. On December 11, 2019, Flutter 1.12 was released at the Flutter Interactive event.[9]

On May 6, 2020, the Dart SDK in version 2.8 and the Flutter in version 1.17.0 were released, where support was added to the Metal API, improving performance on IOS devices (approximately 50%), new Material widgets, and new network tracking tools.

Flutter Libraries:

Animation

The Flutter animation system. [...]

Cupertino

Flutter widgets implementing the current IOS design language. [...]

Foundation

Core Flutter framework primitives. [...]

Gestures

The Flutter gesture recognizers. [...]

Material

Flutter widgets implementing Material Design. [...]

Painting

The Flutter painting library. [...]

Physics

Simple one-dimensional physics simulations, such as springs, friction, and gravity, for use in user interface animations. [...]

Rendering

The Flutter rendering tree. [...]

Scheduler

The Flutter Scheduler library. [...]

Semantics

The Flutter semantics package. [...]

Services

Platform services exposed to Flutter apps. [...]

Widgets

The Flutter widgets framework. [...]

Application Framework:

The Application Framework layer provides many higher-level services to applications in the form of Java classes. Application developers are allowed to make use of these services in their applications.

The Android framework includes the following key services −

- **Activity Manager** − Controls all aspects of the application lifecycle and activity stack.
- **Content Providers** − Allows applications to publish and share data with other applications.
- **Resource Manager** − Provides access to non-code embedded resources such as strings, color settings and user interface layouts.
- **Notifications Manager** − Allows applications to display alerts and notifications to the user.
- **View System** − An extensible set of views used to create application user interfaces.

Appendix C

(Dart)

Dart is an open-source, general-purpose, object-oriented programming language with C-style syntax developed by **Google in 2011**. The purpose of Dart programming is to create a frontend user interfaces for the web and mobile apps. It is under active development, compiled to native machine code for building mobile apps, inspired by other programming languages such as Java, JavaScript, C#, and is Strongly Typed. Since Dart is a compiled language so you cannot execute your code directly; instead, the compiler parses it and transfer it into machine code.

It supports most of the common concepts of programming languages like classes, interfaces, functions, unlike other programming languages. Dart language does not support arrays directly. It supports collection, which is used to replicate the data structure such as arrays, generics, and optional typing.

Is Dart really flexible?

Dart is a very flexible programming language in that you can write the code and then run it anywhere without any limitations whatsoever.

- Mobile apps written in Dart with Flutter are cross-platform native apps; so they can run on both Android, IOS (like React Native, Xamarin, etc.). You can even write web apps and that code can run on any browser. From a developer's perspective, the language's flexibility and portability matter a lot. After all, who doesn't want to be able to write some code and run it on as many platforms as possible?

- Coding in Dart feels natural once you are familiar with the general Object Oriented principles. Still, fully functional programming is 100% achievable in Dart. Asynchronous programming with async/await and “Future” in Dart is consistent and harmonious. If you are a unit tester, then good news for you, because Dart has built-in support for unit testing; no need to add new libraries or frameworks.
- JavaScript follows a type-less philosophy because according to JS, type-less means flexibility. But devs often say that too much flexibility will kill your software. Sometimes you want to work with types, while sometimes not. And with Dart, you can do it — if you want. With Dart, you get the best of both worlds, plus you can switch to the other world when necessary.

Dart platforms:

You can use Dart to write simple scripts or full-featured apps. Whether you’re creating a mobile app, web app, command-line script, or server-side app, there’s a Dart solution for that.

Flexible compiler technology lets you run Dart code in different ways, depending on your target platform and goals:

- **Dart Native**: For programs targeting devices (mobile, desktop, server, and more), Dart Native includes both a Dart VM with JIT (just-in-time) compilation and an AOT (ahead-of-time) compiler for producing machine code.
- **Dart Web**: For programs targeting the web, Dart Web includes both a development time compiler (dart devc) and a production time compiler (dart2js).

1. Dart Native (VM JIT and AOT)

Dart Native enables running Dart code compiled to native ARM or X64 machine code for mobile, desktop, and server apps.

2. Dart Web (JavaScript)

Dart Web enables running Dart code on web platforms powered by JavaScript. With Dart Web, you compile Dart code to JavaScript code, which in turn runs in a browser — for example, V8 inside Chrome,

- Dart has great tooling support.

Dart has rich tooling support. Almost every major Text Editor and IDE has great support for the Dart language. You can use heavy IDEs like Webstorm, IntelliJ IDEA, and Android Studio, or use simple editors like VS Code, Sublime text, VIM, Emacs, Atom, etc. So you are free to choose whatever Editor you are comfortable with.

- Dart is a robust language.

Dart as a language, is very robust. Having been created by Google, its primary purpose was to leverage C-based Object Oriented Programming languages like C#, and Java. As it is also a general-purpose programming language, it compiles fast and is concise.

Dart is an open source, purely object-oriented, optionally typed, and a class-based language which has excellent support for functional as well as reactive programming.

Unlike C# or Java, Dart is not bloated at all. In fact, it's a relatively simple, modern and highly efficient language to work with. It's is a compiled language like C, so it's way faster than Java anyway. Dart is also approximately 2x faster than JavaScript. It's type-safe and compiled with both AOT and JIT compilers.

From a language point of view, Dart is pretty robust. It's fast, reliable, efficient and as it's used quite heavily by a tech giant, adoption in the community is soaring high.

– Dart ensures productivity.

Apart from being simple, Dart takes productivity pretty seriously. Who doesn't want to get more done with less code?

Primarily, the clean, intuitive, concise and simple syntax makes the Dart language very productive. Also, the built-in support for strong type checking makes it a very suitable language for large projects with a big team of developers. Dart also has a large collection of libraries and frameworks packed with it. You won't have to recreate the wheel every time you want to implement a new feature. This saves a lot of time. Plus, all you need to do is drop in some code from the documentation and you are good to go. This makes you productive.

Language-wise, even though Dart is fully object-oriented, you can make use of it as a fully functional one. Also, there's no weird catch to it, as there's in JavaScript. Therefore, you can do both object-oriented and functional programming with the same language.

- Dart Threads:

Dart isn't actually single threaded. You can create another **thread** by creating another Isolate. However, within an Isolate the **Dart** code runs on a single **thread** and separate Isolates don't share memory. They can only communicate by messages.

Example:

```
library threading.example.example_interleaved_execution;

import "dart:async";

import "package:threading/threading.dart";
```

```
Future main() async {
  await runFutures();
  await runThreads();
}

Future runFutures() async {
  print("Futures (linear execution)");
  print("----------------");
  var futures = <Future>[];
  var numOfFutures = 3;
  var count = 3;
  for (var i = 0; i < numOfFutures; i++) {
    var name = new String.fromCharCode(65 + i);
    var thread = new Future(() async {
      for (var j = 0; j < count; j++) {
        await new Future.value();
        print("$name: $j");
      }
    });

    futures.add(thread);
  }

  await Future.wait(futures);
}

Future runThreads() async {
  print("Threads (interleaved execution)");
  print("----------------");
  var threads = <Thread>[];
  var numOfThreads = 3;
  var count = 3;
  for (var i = 0; i < numOfThreads; i++) {
    var name = new String.fromCharCode(65 + i);
    var thread = new Thread(() async {
      for (var j = 0; j < count; j++) {
        await new Future.value();
        print("$name: $j");
      }
    });

    threads.add(thread);
    await thread.start();
  }

  for (var i = 0; i < numOfThreads; i++) {
    await threads[i].join();
  }
}
```

Appendix D

XML (Extensible Markup Language)

Extensible Markup Language (XML) is used to describe data. The XML standard is a flexible way to create information formats and electronically share structured data via the public Internet, as well as via corporate networks.

XML code, a formal recommendation from the World Wide Web Consortium (W3C), is similar to Hypertext Markup Language (HTML). Both XML and HTML contain markup symbols to describe page or file contents. HTML code describes Web page content (mainly text and graphic images) only in terms of how it is to be displayed and interacted with.

XML data is known as self-describing or self-defining, meaning that the structure of the data is embedded with the data, thus when the data arrives there is no need to pre-build the structure to store the data; it is dynamically understood within the XML. The XML format can be used by any individual or group of individuals or companies that want to share information in a consistent way. XML is actually a simpler and easier-to-use subset of the Standard Generalized Markup Language (SGML), which is the standard to create a document structure.

The basic building block of an XML document is an element, defined by tags. An element has a beginning and an ending tag. All elements in an XML document are contained in an outermost element known as the root element. XML can also support nested elements, or elements within elements. This ability allows XML to support hierarchical structures. Element names describe the content of the element, and the structure describes the relationship between the elements.

An XML document is considered to be "well formed" (that is, able to be read and understood by an XML parser) if its format complies with the XML specification, if it is properly marked up, and if elements are properly nested. XML also supports the ability to define attributes for elements and describe characteristics of the elements in the beginning tag of an element.

For example, XML documents can be very simple, such as the following:

```
<?xml version="1.0" standalone="yes"?>

<conversation>

<greeting>Hello, world!</greeting>

<response>Stop the planet, I want to get off!</response>

</conversation>
```

Applications for XML are endless. For example, computer makers might agree upon a standard or common way to describe the information about a computer product (processor speed, memory size, and so forth) and then describe the product information format with XML code. Such a standard way of describing data would enable a user to send an intelligent agent (a program) to each computer maker's Web site, gather data, and then make a valid comparison.

XML's benefits sometimes appeared revolutionary in scope shortly after it was introduced. However, as a concept, it fell short of being revolutionary. It also fell short of being the panacea. The over-application of XML in so many areas of technology diminished its real value, and results in a great deal of unnecessary confusion. Perhaps most damaging is the predictable behavior of many vendors that

look to recast XML using their own set of proprietary extensions. Although some want to add value to XML, others seek only to lock in users to their products.

XML's power resides in its simplicity. It can take large chunks of information and consolidate them into an XML document - meaningful pieces that provide structure and organization to the information.

XML Usage:

A short list of XML usage says it all −

- XML can work behind the scene to simplify the creation of HTML documents for large web sites.
- XML can be used to exchange the information between organizations and systems.
- XML can be used for offloading and reloading of databases.
- XML can be used to store and arrange the data, which can customize your data handling needs.
- XML can easily be merged with style sheets to create almost any desired output.
- Virtually, any type of data can be expressed as an XML document.

Appendix E
(MySQL)

MySQL is an Oracle-backed open source relational database management system (RDBMS) based on Structured Query Language (SQL). MySQL runs on virtually all platforms, including Linux, UNIX and Windows. Although it can be used in a wide range of applications, MySQL is most often associated with web applications and online publishing.

MySQL is an important component of an open source enterprise stack called LAMP. LAMP is a web development platform that uses Linux as the operating system, Apache as the web server, MySQL as the relational database management system and PHP as the object-oriented scripting language. (Sometimes Perl or Python is used instead of PHP.)

Originally conceived by the Swedish company MySQL AB, MySQL was acquired by Sun Microsystems in 2008 and then by Oracle when it bought Sun in 2010. Developers can use MySQL under the GNU General Public License (GPL), but enterprises must obtain a commercial license from Oracle.

Today, MySQL is the RDBMS behind many of the top websites in the world and countless corporate and consumer-facing web-based applications, including Facebook, Twitter and YouTube.

How MySQL works?

MySQL is based on a client-server model. The core of MySQL is MySQL server, which handles all of the database instructions (or commands). MySQL server is available as a separate program for use in a client-server networked environment and as a library that can be embedded (or linked) into separate applications.

MySQL operates along with several utility programs which support the administration of MySQL databases. Commands are sent to MySQL Server via the MySQL client, which is installed on a computer.

MySQL was originally developed to handle large databases quickly. Although MySQL is typically installed on only one machine, it is able to send the database to multiple locations, as users are able to access it via different MySQL client interfaces. These interfaces send SQL statements to the server and then display the results.

Core MySQL features:

MySQL enables data to be stored and accessed across multiple storage engines, including InnoDB, CSV, and NDB. MySQL is also capable of replicating data and partitioning tables for better performance and durability. MySQL users aren't required to learn new commands; they can access their data using standard SQL commands.

Getting started with MySQL tutorial for beginners:

MySQL is written in C and C++ and accessible and available across over 20 platforms, including Mac, Windows, Linux and UNIX. The RDBMS supports large databases with millions records and supports many data types including signed or unsigned integers 1, 2, 3, 4, and 8 bytes long; FLOAT; DOUBLE; CHAR; VARCHAR; BINARY; VARBINARY; TEXT; BLOB; DATE; TIME; DATETIME; TIMESTAMP; YEAR; SET; ENUM; and OpenGIS spatial types. Fixed- and variable-length string types are also supported.

For security, MySQL uses an access privilege and encrypted password system that enables host-based verification. MySQL clients can connect to MySQL Server using several protocols, including TCP/IP sockets on any platform. MySQL also supports a number of client and utility programs, command-line programs and administration tools such as MySQL Workbench.

MySQL vs SQL:

Before 2016, the main difference between MySQL and SQL was that the former could be used on multiple platforms, whereas the latter could only be used on Windows. Microsoft has since expanded SQL to support Linux, a change which went into effect in 2017. When MySQL is installed via Linux, its package management system requires custom configuration to adjust security and optimization settings.

MySQL also allows users to choose the most effective storage engine for any given table, as the program is able to utilize multiple storage engines for individual tables. One of MySQL's engines is InnoDB. InnoDB was designed for high availability. Because of this, it is not as quick as other engines. SQL uses its own

storage system, but it does maintain multiple safeguards against loss of data. Both systems are able to run in clusters for high availability.

SQL Server offers a wide variety of data analysis and reporting tools. SQL Server Reporting Services is the most popular one and is available as a free download. There are similar analysis tools for MySQL available from third-party software companies**,** such as Crystal Reports XI and Actuate BIRT.

Compatibility with other services:

MySQL was designed to be compatible with other systems. It supports deployment in virtualized environments, such as Amazon RDS for MySQL, Amazon RDS for MariaDB and Amazon Aurora for MySQL. Users can transfer their data to a SQL Server database by using database migration tools like AWS Schema Conversion Tool and the AWS Database Migration Service.

SQLite Database:

SQLite is an 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 – Creation:

In order to create a database you just need to call this method openOrCreateDatabase 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

```
SQLiteDatabase mydatabase = openOrCreateDatabase("your database name",MODE_PRIVATE,null);
```

Apart from this, there are other functions available in the database package , that does this job. They are listed below

Sr.No	Method & Description
1	**openDatabase(String path, SQLiteDatabase.CursorFactory factory, int flags, DatabaseErrorHandler errorHandler)** This method only opens the existing database with the appropriate flag mode. The common flags mode could be OPEN_READWRITE OPEN_READONLY
2	**openDatabase(String path, SQLiteDatabase.CursorFactory factory, int flags)** It is similar to the above method as it also opens the existing database but it does not define any handler to handle the errors of databases
3	**openOrCreateDatabase(Stringpath,SQLiteDatabase.CursorFactoy factory)** It not only opens but create the database if it not exists. This method is equivalent to openDatabase method.

4	**openOrCreateDatabase(File file, SQLiteDatabase.CursorFactory factory)** This method is similar to above method but it takes the File object as a path rather than a string. It is equivalent to file.getPath()

Database – Insertion:

we can create table or insert data into table using execSQL method defined in SQLiteDatabase class. Its syntax is given below

```
mydatabase.execSQL("CREATE TABLE IF NOT EXISTS TutorialsPoint(Username VARCHAR,Password VARCHAR);");
mydatabase.execSQL("INSERT INTO TutorialsPoint VALUES('admin','admin');");
```

This will insert some values into our table in our database. Another method that also does the same job but take some additional parameter is given below

Sr.No	Method & Description
1	**execSQL(String sql, Object[] bindArgs)** This method not only insert data , but also used to update or modify already existing data in database using bind arguments

Database – Fetching:

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

```
Cursor resultSet = mydatbase.rawQuery("Select * from TutorialsPoint",null);
resultSet.moveToFirst();
```

```
String username = resultSet.getString(0);
String password = resultSet.getString(1);
```

There are other functions available in the Cursor class that allows us to effectively retrieve the data. That includes

Database - Helper class:

For managing all the operations related to the database, a helper class has been given and is called SQLiteOpenHelper. It automatically manages the creation and update of the database. Its syntax is given below

```
public class DBHelper extends SQLiteOpenHelper {

   public DBHelper(){

      super(context,DATABASE_NAME,null,1);

   }

   public void onCreate(SQLiteDatabase db) {}

   public void onUpgrade(SQLiteDatabase database, int oldVersion, int newVersion) {}
```

Appendix F
(Python Programming)

Python is a powerful multi-purpose programming language created by Guido van Rossum. It has simple easy-to-use syntax, making it the perfect language for someone trying to learn computer programming for the first time. This is a comprehensive guide on how to get started in Python, why you should learn it and how you can learn it. However, if you have knowledge of other programming languages and want to quickly get started with Python, visit Python tutorial page.

What is Python (Programming)? - The Basics

Before getting started, let's get familiarized with the language first.

Python is a general-purpose language. It has wide range of applications from Web development (like: Django and Bottle), scientific and mathematical computing (Orange, SymPy, NumPy) to desktop graphical user Interfaces (Pygame, Panda3D).

The syntax of the language is clean and length of the code is relatively short. It's fun to work in Python because it allows you to think about the problem rather than focusing on the syntax.

Reasons to Choose Python as First Language:

- **Simple Elegant Syntax**
  Programming in Python is fun. It's easier to understand and write Python code. Why? The syntax feels natural. Take this source code for an example:

```
a = 2
b = 3
sum = a + b
print(sum)
```

Even if you have never programmed before, you can easily guess that this program adds two numbers and prints it.

- **Not overly strict**

  You don't need to define the type of a variable in Python. Also, it's not necessary to add semicolon at the end of the statement.
  Python enforces you to follow good practices (like proper indentation). These small things can make learning much easier for beginners.

- **Expressiveness of the language**

  Python allows you to write programs having greater functionality with fewer lines of code. Here's a link to the source code of Tic-tac-toe game with a graphical interface and a smart computer opponent in less than 500 lines of code. This is just an example. You will be amazed how much you can do with Python once you learn the basics.

- **Great Community and Support**

  Python has a large supporting community. There are numerous active forums online which can be handy if you are stuck. Some of them are:

  Learn Python subreddit

  Google Forum for Python

  Python Questions - Stack Overflow

Run Python on Your Operating System:

You will find the easiest way to run Python on your computer (Windows, Mac OS X or Linux) in this section.

Install and Run Python in Mac OS X

Install and Run Python in Linux (Ubuntu)

Install and Run Python in Windows

1-Go to Download Python page on the official site and click Download Python 3.6.0 (You may see different version name).

2-When the download is completed, double-click the file and follow the instructions to install it. When Python is installed, a program called IDLE is also installed along with it. It provides graphical user interface to work with Python.

3-Open IDLE, copy the following code below and press enter.

```
print("Hello, World!")
```

4-To create a file in IDLE, go to File > New Window (Shortcut: Ctrl+N).

5-Write Python code (you can copy the code below for now) and save (Shortcut: Ctrl+S) with .py file extension like: hello.py or your-first-program.py

```
print("Hello, World!")
```

6-Go to Run > Run module (Shortcut: F5) and you can see the output. Congratulations, you've successfully run your first Python program.

Appendix G
(Digital Image Processing)

Signal processing is a discipline in electrical engineering and in mathematics that deals with analysis and processing of analog and digital signals, and deals with storing, filtering, and other operations on signals. These signals include transmission signals, sound or voice signals, image signals, and other signals etc.

Out of all these signals, the field that deals with the type of signals for which the input is an image and the output is also an image is done in image processing. As its name suggests, it deals with the processing on images. It can be further divided into analog image processing and digital image processing.

Analog image processing:

Analog image processing is done on analog signals. It includes processing on two dimensional analog signals. In this type of processing, the images are manipulated by electrical means by varying the electrical signal. The common example include is the television image. Digital image processing has dominated over analog image processing with the passage of time due its wider range of applications.

Digital image processing:

The digital image processing deals with developing a digital system that performs operations on a digital image.

Image:

An image is nothing more than a two-dimensional signal. It is defined by the mathematical function f(x,y) where x and y are the two co-ordinates horizontally and vertically.

The value of f(x,y) at any point is gives the pixel value at that point of an image.

The above figure is an example of digital image that you are now viewing on your computer screen. But actually, this image is nothing but a two-dimensional array of numbers ranging between 0 and 255.

128	30	123
232	123	321
123	77	89
80	255	255

Each number represents the value of the function f (x, y) at any point. In this case the value 128, 230,123 each represents an individual pixel value. The dimensions of the picture are actually the dimensions of this two dimensional array.

Relationship between a digital image and a signal:

If the image is a two-dimensional array then what does it have to do with a signal? In order to understand that, we need to first understand what is a signal?

Signal:

In physical world, any quantity measurable through time over space or any higher dimension can be taken as a signal. A signal is a mathematical function, and it conveys some information.

A signal can be one dimensional or two dimensional or higher dimensional signal. One dimensional signal is a signal that is measured over time. The common example is a voice signal.

The two-dimensional signals are those that are measured over some other physical quantities. The example of two-dimensional signal is a digital image. We will look in more detail in the next tutorial of how a one dimensional or two-dimensional signals and higher signals are formed and interpreted.

Relationship:

Since anything that conveys information or broadcast a message in physical world between two observers is a signal. That includes speech or (human voice) or an image as a signal. Since when we speak, our voice is converted to a sound wave/signal and transformed with respect to the time to person we are speaking to. Not only this, but the way a digital camera works, as while acquiring an image from a digital camera involves transfer of a signal from one part of the system to the other.

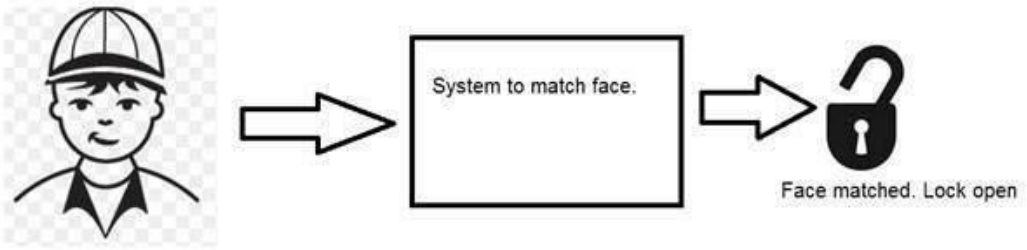
How a digital image is formed:

Since capturing an image from a camera is a physical process. The sunlight is used as a source of energy. A sensor array is used for the acquisition of the image. So, when the sunlight falls upon the object, then the amount of light reflected by that object is sensed by the sensors, and a continuous voltage signal is generated by the amount of sensed data. In order to create a digital image, we need to convert this data into a digital form. This involves sampling and quantization. (They are discussed later on). The result of sampling and quantization results in a two-dimensional array or matrix of numbers which are nothing but a digital image.

Overlapping fields:

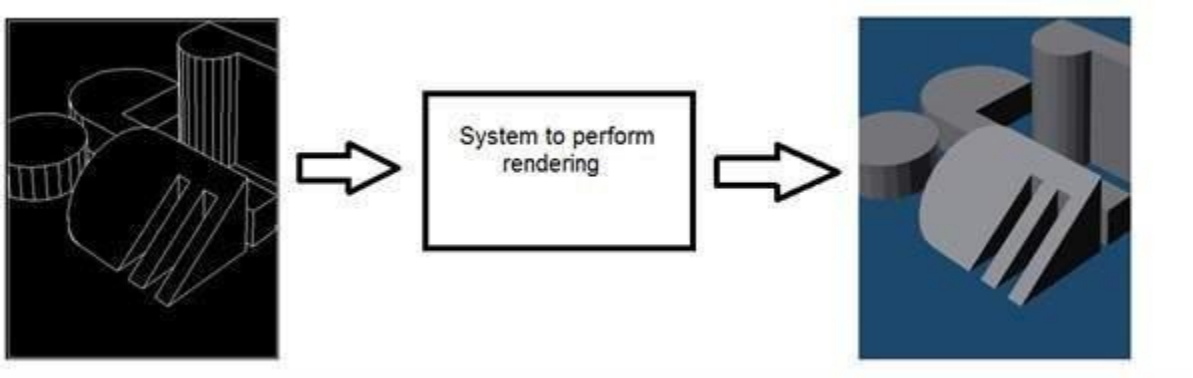
Machine/Computer vision

Machine vision or computer vision deals with developing a system in which the input is an image and the output is some information. For example: Developing a system that scans human face and opens any kind of lock. This system would look something like this.



Computer graphics

Computer graphics deals with the formation of images from object models, rather than the image is captured by some device. For example: Object rendering. Generating an image from an object model. Such a system would look something like this.



Artificial intelligence

Artificial intelligence is more or less the study of putting human intelligence into machines. Artificial intelligence has many applications in image processing. For example: developing computer aided diagnosis systems that help doctors in interpreting images of X-ray, MRI etc. and then highlighting conspicuous section to be examined by the doctor.

Signal processing

Signal processing is an umbrella and image processing lies under it. The amount of light reflected by an object in the physical world (3d world) is pass through the lens of the camera and it becomes a 2d signal and hence result in image formation. This image is then digitized using methods of signal processing and then this digital image is manipulated in digital image processing.

Appendix H
(XAMPP)

XAMPP:

XAMPP stands for Cross-Platform (X), Apache (A), MariaDB (M), PHP (P) and Perl (P). Since XAMPP is simple, lightweight Apache distribution it is extremely easy for developers to create a local web server for testing and deployment purposes. Everything you needed is to set up a web server – server application (Apache), database (MariaDB), and scripting language (PHP). XAMPP works equally well on Linux, Mac, and Windows.

The installation process of XAMPP in windows PC:

XAMPP has been designed to be the easiest way to install and run a development server. There are numerous other WAMP packages available, but XAMPP is one of the most complete on offer. In addition to Apache, MySQL, and PHP, XAMPP includes other really useful tools such as the phpMyAdmin database administration tool, FileZilla FTP server, Mercury mail server, Perl programming language, and JSP server Tomcat.

XAMPP can also install an administration site as the home page of the server. From which you can undertake all manner of administrative tasks, such as checking the server status and security, launch tools like phpMyAdmin and Webalizer analytics.

Steps to install XAMPP On Windows:

Step 1:

In the web browser, you can easily download XAMPP from http://www.apachefriends.org/

Step 2:

The XAMPP file is downloaded. The exe file has to be executed. Now click on the downloaded file.

Step 3:

Once the file is executed, a setup window appears. In the setup file to select the required components needed. For eg (if you want to install WordPress on XAMPP, the required components are MySQL, Apache, PHPMyAdmin).

Step 4:

Next step is to choose the folder where the file is to be located. It is recommended to choose the default C drive and then click next button.

Step 5:

Once the next button is clicked, the installation process is been shown.

Step 6:

The installation process is been completed, click on finish button.

Step 7:

Now your XAMPP icon appears on start menu or desktop. By clicking on the XAMPP icon you can run the XAMPP software.

Step 8:

Once the XAMPP software opens, you have to select the required components. For WordPress to run on XAMPP the required components might me apache and MySQL. You have to click on the start button.

Appendix I
(API)

An application program interface (API) is code that allows two software programs to communicate with each other. An API defines the correct way for a developer to request services from an operating system (OS) or other application and expose data within different contexts and across multiple channels. In the early days of Web 2.0, the concept of integrating data and applications from different sources was called a mashup.

Any data can be shared with an application program interface. APIs are implemented by function calls composed of verbs and nouns. The required syntax is described in the documentation of the application being called. For example, on a real estate website, one API might be used to publish available real estate properties by geography, while a second API provides the visitor with current interest rates and third API brings in a mortgage calculator.

Exposing data with an API can improve the customer experience because it provides greater functionality and scope of services within a single application or other digital property. By anticipating the customer's needs as they relate to searching for real estate, for example, the company that publishes the website is not only increasing the value it delivers to users, it is also opening up opportunities for new business partnerships with related service providers.

How APIs work?

APIs are made up of two related elements. The first is a specification that describes how information is exchanged between programs, done in the form of a

request for processing and a return of the necessary data. The second is a software interface written to that specification and published in some way for use.

The software that wants to access the features and capabilities of the API is said to call it, and the software that creates the API is said to publish it.

Three basic types of APIs:

APIs take three basic forms: private, public and partner.

Private APIs, or internal APIs, are published internally for use by the company's developers to improve its own products and services. Private APIs are not exposed to third parties.

Public APIs, or open APIs, are published publicly and can be used by any third-party. There are no restrictions on these APIs.

Partner APIs can only be used by specific parties with whom the company agrees to share data. Partner APIs are used within business relationships, often to integrate software between partnering companies.

APIs may be further classified as local, web, or program APIs:

Local APIs are the original form, from which the name came. They offer OS or middlewareservices to application programs. Microsoft's .NET APIs, the TAPI (Telephony API) for voice applications, and database access APIs are examples of the local API form.

Web APIs are designed to represent widely used resources like HTML pages and are accessed using a simple HTTP protocol. Any web URL activates a web API. Web APIs are often called REST (representational state transfer) or RESTful because the publisher of REST interfaces doesn't save any data

internally between requests. As such, requests from many users can be intermingled as they would be on the internet.

Program APIs are based on remote procedure call (RPC) technology that makes a remote program component appear to be local to the rest of the software. Service oriented architecture (SOA) APIs, such as Microsoft's WS-series of APIs, are program APIs.

Why API design matters

Traditionally the applications that publish APIs have to be written in a programming language, but because APIs are increasingly generalized, additional validation of an API's structure is important.

Good API design is critical for successful API use, and software architects spend considerable time reviewing all the possible applications of an API and the most logical way for it to be used.

The data structures and parameter values are of particular importance because they must match between the caller of an API and its publisher.

Benefits of Using APIs:

There are many benefits of using APIs. Because APIs are essentially a set of rules, Private APIs can improve internal development processes by standardizing how developers write application code. Using the same rules and formats can make code more streamlined and transparent. Standardization also facilitates collaboration between developers as they build software components with the intent to integrate with APIs. This, in turn, can support feature development and reduce time to market.

Public and partner APIs offer a variety of business benefits. By allowing third-parties to leverage their data (even in a limited sense, as with Partner APIs),

companies increase their brand exposure. Companies can grow their customer database and even increase their conversion rate by aligning their services with other trusted brands. Companies can also monetize their APIs so that they become a line of revenue unto themselves. This is a common tactic for online payment gateways like PayPal. Companies that use PayPal's APIs are willing to pay for the ability to use a trusted payment system.

Why APIs are important for business?

The web, software designed to exchange information via the internet and computing have all combined to increase the interest in APIs in general and services in particular.

Software that was once custom-developed for a specific purpose is now often written referencing APIs that provide broadly useful features, reducing development time and cost and mitigating the risk of errors.

APIs have steadily improved software quality over the last decade, and the growing number of web services exposed through APIs by cloud providers is also encouraging the creation of cloud-specific applications, internet of things (IoT) efforts and apps to support mobile devices and users.

REST and the web:

Although applications that call APIs have traditionally been written in programming languages, the internet and the cloud are changing that. Web APIs can be called through any programming language, but can also be accessed by webpages created in HTML or application generator tools.

The increased role the web plays in our lives and business activities has resulted in an explosion in the REST model and the use of simple programming tools, or even no programming at all, for API access.

API examples in the developer community:

Operating systems and middleware tools expose their features through collections of APIs usually called "toolkits," and two different sets of tools that support the same API specifications are interchangeable to programmers, which is the basis for compatibility and interoperability claims. Microsoft's .NET API specifications are the basis for an open source Linux equivalent middleware package now supported by Microsoft, for example.

The internet is currently the primary driver for APIs, and companies like Facebook, Google and Yahoo publish APIs to encourage developers to build on their capabilities. These APIs have given us everything from new internet features that browse the sites of other services, to mobile device apps that offer easy access to web resources.

New features, such as content delivery, augmented reality and novel applications of wearable technology, are created in large part though these APIs.

APIs trends in the cloud:

Cloud computing introduces new capabilities in dividing software into reusable components, connecting components to requests and scaling the number of copies of software as demand changes.

These cloud capabilities have already begun to shift the focus of APIs from simple RPC-programmer-centric models to RESTful web-centric models, and even to what is called "functional programming" or "lambda models" of services that can be instantly scaled as needed in the cloud.

APIs as services:

The trend to think of APIs as representing general resources has changed terminology. Whereas APIs are expected to be used as a general tool by many applications and users, they are said to be services, and will normally require more controlled development and deployment.

SOA and microservices are examples of service APIs. Services are the hottest trend in APIs, to the point where it's possible that all APIs in the future will be seen as representing services.

API testing:

Like all software, APIs have to be tested. The purpose of testing is validation of the published APIs against the specifications, which users of those APIs will use in formatting their requests.

This testing is usually done as a part of application lifecycle management (ALM), both for the software that publishes the APIs and for all the software that uses them. APIs also have to be tested in their published form to ensure that they can be accessed properly.

API management:

API management is a step beyond what's normally associated with software development. It's the set of activities associated with publishing the API for use, making it possible for users to find it and its specifications and regulating access to the API based on owner-defined permissions or policies.

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