Ministry of higher education,

Culture and science city at Oct6,

The Higher institute of computer Science & information systems

المعهد العالي لعلوم الحاسب ونظم المعلومات

Graduation Project:

Iot based clinical sensor data management

Assistant:

Eng / Aya Adel

Supervised by

Dr: Muhammad Torad

Project No: 4N2220 Academic Year :2021/2022

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Iot based clinical sensor data management

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Abstract

With the increase in the number of epidemics and the increase in the population and age, epidemics are spreading very quickly and claiming the lives of thousands of people, so it is important to use self-monitoring systems for patients, rather than smart sensors linked to the Internet of Things (IoT) that make self-monitoring of patients and the use of artificial intelligence technology to help and alleviate the congestion of waiting Patients to reduce the spread of disease in disease clusters as it becomes very important to implement more health care systems. The idea of this project came to follow and guide the patient from a distance so that the patient can be helped quickly and avoid the deterioration of his health and exacerbation of pain. He also did not have to resort to hospitals because of their overcrowding and high costs. IOT sensors measure the necessary inputs that a clinician needs to diagnose diseases, such as heart rate, blood pressure, blood sugar and other inputs needed to diagnose diseases. It is read by the application (user interface) programmed with Flutter technology, and sent to the doctor via databases. Then the doctor receives it through his own request, and the case is diagnosed through the data entered, and in the absence of the doctor, the response is made at the moment via the chatbot, and it is sent back to the application (user interface). After that the patient receives the data (diagnosis and treatment). The nurse, through her own request, monitors the patient's condition. In the event that the patient does not respond to treatment and the matter worsens, the nurse returns the patient's condition to the doctor for treatment and improvement of his condition.

Content

Chapter 1 12

1.1 Introduction 12

1.2 Problem statement 13

1.3 objective 14

1.5 Scope of the Project:- 14

1.6 MODULES: 15

1.6 .1 user module(patient): 15

1.6.2 Doctor module 15

1.6.3 Nurse module 15

1.7 Flutter and why they were used 16

1.8 Artificial Intelligence 16

1.8 .1 Machine learning 17

1.8 .2 What is Deep Learning? 18

Figure 1.1 Ai, machine learning, deep learning realationship 18

1.9Internet of things (IoT) 18

1.10 Project objectives: 19

chapter 2 23

2.1 data base 23

2.1.1 Research About Data in Health 23

Figure 2.1 (big data) 23

2.1.2 The importance of data in the health process 24

Figure 2.2 (Sources of big data used by industry professionals worldwide in 2016) 24

2.1.3 The Impact of Data Collection in Health 25

Figure 2.3 (Data Collection in Health) 25

2.1.4 Research Big Data in Healthcare - Challenges 25

Challenges Faced by Today's Healthcare Administrators 26

2.2 Flutter 28

2.2.1 International Journal of Trend in Scientific Research and Development (IJTSRD) 28

2.2.2 A Mobile Application for Keyword Search in Real-World Scenes 29

2.2.3 A Robust and Flexible Access Control Scheme for Cloud-IoT Paradigm with Application to Remote Mobile Medical Monitoring 30
2.3 AI 31
2.3.1 Phase-domain Deep Patient-ECG Image Learning for Zero-effort Smart Health Security 31
2.3.2 Deep learning-based ECG-free Cardiac Navigation for Multi-Dimensional and Motion-Resolved Continuous Magnetic Resonance Imaging 32
2.4 Iot (internet of things) 34
2.4.1 MED-IoT: A Medicine Confirmation System 34
2.4 .2 Elder Care System using IoT and Machine Learning in AWS Cloud 35
2.5 Design 36
2.5.1 Developing Apps for Researching the COVID-19 Pandemic with the TrackYourHealth Platform 36
2.5.2 Putting Fun into Function with QuizMed - an Interactive Medical Application 37
Chapter 3 40
3.1 –IOT 40
3.1.2-Why is the Internet of Things (IoT) so important? 40
3.1.3-What technologies have made IoT possible? 40
3.1.4-What is industrial IoT? 41
3.1.5 What are IoT applications? 42
3.1.6-What are some ways IoT applications are deployed? 43
3.1.7-What industries can benefit from IoT? 44
3.1.8-Sensors : 46
figufigure (3.2) Body Temperature 46
figure (3.1) Body Temperature 46
figure (3.3) ECG Heart rate sensor 47
figure (3.4) ECG Heart rate sensor 47
3.2 AI 48
3.2.1-What is Artificial Intelligence? 48
3.2.2-Why do we need Artificial Intelligence? 48
3.2.3- What are the types of AI? 48
3.2.4-What are the different domains/Subsets of AI? 49
3.2.5- What are the types of Machine Learning? 49

3.2.6-Which programming language is used for AI? 49
3.2.7-How is machine learning related to AI? 50
3.2.8-What are the different components of the Expert System? 50
3.2.9-Which programming language is not generally used in AI, and why? 50
3.2.10- How is artificial intelligence used in medicine? 50
3.2.11-What Is Logistic Regression? 52
3.3 DESIGN 55
3.3.1- What is Adobe XD? 55
Figure 3.5 (Adobe XD's design interface) 55
3.3.2- UI or User Interface Design: 56
3.3.3 - WHY IS UI DESIGN IMPORTANT FOR BUSINESSES? 56
3.3.4 MAIN PRINCIPLES OF A GOOD USER INTERFACE:- 56
3.3.5- BENEFITS OF A WELL-DESIGNED UI DESIGN:- 57
3.4-FLUTTER 58
3.4.1- What is Dart and why does Flutter use it? 59
3.4.2- What is a widget? 59
3.4.3-What is an App state? 59
3.4.4- Differentiate Stateless Widget and StatefulWidget? 60
Figure 3.6 (stateless vs stateful) 60
3.4.5- Differentiate between Hot Restart and Hot Reload? Hot Reload 60
3.4.6-Differentiate between required and optional parameters in Dart? 61
3.4.7-What are the keys in Flutter and when to use them? 61
3.4.8- What are packages and plugins in Flutter? 61
3.4.9-What is the release mode and when do you use it? 61
3.4.10-Why do we pass functions to widgets? 62
3.4.11- What are the advantages of Dart in programming? 62
3.5-DATABASE 64
3.5.1 - What Is a Database? 64
3.5.2 - What are databases used for? 64
3.5.3- Types of databases 64
3.5.4- Workbench Program? 65
3.5.5- What is SQL used for? 65

3.5.6-Types of SQL Statements? 65
Figure 3.7 (database Workbench) 66
3.5.8 Connecting between flutter and database? 66
3.5.9- UML Design 67
3.5.10 - UML Approach: 68
3.5.11- USE CASE DIAGRAM: 69
Figure 3.8 (use case duagram) 70
3.5.13-Employment diagram 70
Figure 3.10 (Employment diagram) 71
3.5.14-Sequence diagram: 71
Figure 3.11 (Sequence diagram) 71
Chapter 4 73
4.1 Iot 73
4.1.1 Result & Observations 73
Figure 4.1 (result of ECG) 73
4.1.2 IoT based ECG Monitoring with AD8232 ECG Sensor & ESP8266 73
esp8266 WiFi serial monitor result: 74
Figure 4.2 (result of tempreture) 74
4.2 flutter 75
4.2.1 flutter and database flowchart for application sample of activity and layout 75
4.2.2 What is a flowchart? 77
Figure 4.3 (flowchart) 78
4.2.3 What is Activity Diagram? 79
Figure 4.4 (activity diagram) 79
4.2.4 Authorization, Authentication 80
4.3 Deep learning Flowchart of proposed ml system and discussion 83
4.3.1 Resamble Data 83
figure 4.5 (Data Before Resamble) 83
Figure 4.6 (data after Resamble) 83
4.3.2 -Types Of Beats 84
figure (4.7) Type Of Beats 84
4.3.3-Result of Training Model 84

Figure 4.8 (Accuracy Vs Epoch Graph) 85
Figure 4.9 (of Loss Vs Epoch Graph) 85
4.3.4 A flowchart 86
Figure 4.10 (Flowchart of CNN algorithm) 86
4.4 Overall system overview and integration between previous mentioned topics 87
Chapter 5 90
5.1 Conclusion 90
5.2 Future works 91
References 92

" إدارة بيانات أجهزة الاستشعار السريرية القائمة على إنترنت الأشياء"

يهدف المشروع الي المساعدة والتخفيف من ازدحام المرضى المنتظرين للحد من انتشار المرض في تجمعات المرض حيث يصبح من المهم جدًا تنفيذ المزيد من أنظمة الرعاية الصحية . جاءت فكرة هذا المشروع لمتابعة وإرشاد المريض من مسافة بعيدة حتى يمكن مساعدة المريض بسرعة وتجنب تدهور صحته وتفاقم الألم. كما أنه لم يضطر إلى اللجوء إلى المستشفيات بسبب اذدحامها وارتفاع تكاليفها. تقيس مستشعرات إنترنت الأشياء المدخلات الضرورية التي يحتاجها الطبيب لتشخيص الأمراض ، مثل معدل ضربات القلب وضغط الدم وسكر الدم والمدخلات الأخرى اللازمة لتشخيص الأمراض. تتم قراءته بواسطة التطبيق (واجهة المستخدم) المبرمج بتقنية فلاتر ، وإرسالها إلى الطبيب عبر قواعد البيانات. ثم يستلمها الطبيب من خلال طلبه الخاص ، ويتم تشخيص الحالة من خلال البيانات المدخلة ، وفي حالة عدم وجود الطبيب يتم الرد في الوقت الحالي عبر شات بوت ، ويتم إرساله مرة أخرى إلى التطبيق (واجهة المستخدم)). بعد ذلك يتلقى المريض البيانات (التشخيص والعلاج). الممرضة بناء على طلبها تراقب حالة المريض. في حالة عدم استجابة المريض للعلاج وتفاقم الأمر ، تقوم الممرضة بإعادة حالة المريض إلى الطبيب للعلاج وتحسين حالته.

CHAPTER ONE
INTRODUCTION

Chapter 1

1.1 Introduction

Hospital organizations have been facing difficulties and challenges in balancing limited resources and costs to provide their demand for services. Medical research has the effect in introduction of modern medical techniques and medicines, which usually causes the increase of consumed costs. Increasing costs of healthcare systems have the growing demands on the public budgets, and also the patients' expenditures. Many countries start to seek the alternative sources of financing of healthcare systems, because the traditional systems of healthcare insurances are no more sufficient for covering of expansive healthcare services costs. In face of these tendencies, many hospitals are under pressure to become more cost efficient. In this situation attention to the acceptable accounting and costing systems is paid, in order to improve the efficiency of existing operations. So Hospital Management System is an organized computerized system designed and programmed to deal with day to day operations and management of the hospital activities. The program can look after inpatients, outpatients, records, database treatments, status illness, billings in the pharmacy and labs. It also maintains hospital information such as ward id, doctors in charge and department administering. The major problem for the patient nowadays to get report after consultation , many hospital managing reports in their System but it's not available to the patient when he / she is outside. In this project we are going to provide the extra facility to store the report in the database and make available from anywhere in the world. The project Hospital Management system includes registration of patients, storing their Details into the system and also computerized billing in the pharmacy and labs. The Software has the facility to give a unique id for every patient and stores the details of every patient and the staff automatically. It includes a search facility to know the current

status of each room. User can search availability of a doctor and the details of a patient using the id The Hospital Management System can be entered using a username and password. It is Accessible either by an administrator or receptionist. Only they can add data into the Database. The data can be retrieved easily. The interface is very user-friendly. The data are well protected for personal use and makes the data processing very fast. Hospital Management System is powerful flexible and easy to use and is designed and developed to deliver real conceivable benefits to hospitals. Hospital Management System is designed for multispecialty hospitals to cover a wide Range of hospital administration and management processes. It is an integrated end-toned Hospital Management System that provides relevant information across the hospital to support effective decision making for patient care hospital administration and Critical financial accounting in a seamless flow. Hospital Management System is a software product suite designed to improve the Quality and management of hospital management in the areas of clinical process analysis and activity-based costing. Hospital Management System enables you to develop your Organization and improve its effectiveness and quality of work. Managing the key Processes efficiently is critical to the success of the hospital helps you manage your Processes.

1.2 Problem statement

Lack of immediate retrievals: - The information is very difficult to retrieve and to find particular information like to find out about the patient's history the user has to go through various registers. This results in in convenience and wastage of time Lack of immediate information storage: - The information generated by various transactions takes time and efforts to be stored at Right place. Lack of prompt updating: - Various changes to information like patient details or immunization details of child are difficult to make as paper work is involved.

Error prone manual calculation: -_Manual calculations are error prone and take a lot of time this may result in incorrect Information. For example calculation of patient's bill based on various treatments. Preparation of accurate and prompt reports:_-This becomes a difficult task as information is difficult to collect from various register

1.3 objective

- User friendly
- Simple fast
- Low cost and effective
- It deals with

1.5 Scope of the Project:-

Information about Patients is done by just writing the Patients name, age and gender. Whenever the Patient comes up his information is stored freshly. Bills are generated by recording price for each facility provided to Patient on a separate sheet and at last they all are summed up. Diagnosis information to patients is generally recorded on the document, which contains Patient information. It is destroyed after some time period to decrease the paper load in the office Immunization records of children are maintained in pre-formatted sheets, which are kept in a file Information about various diseases is not kept as any document. Doctors themselves do this job by remembering various medicines.

1.6 MODULES:

The entire project mainly consists of 3 modules, which are

- User module (patient)
- Doctor module
- Nurse module

1.6 .1 user module(patient):

- View prescription details
- View medication from doctor
- View operation history
- Manage own profile

1.6.2 Doctor module

- Manage patient account opening and updating
- Create and manage appointment with patient
- Create prescription for patient
- Provide medication for patients
- Issue for operation of patients and creates operation report
- Manage own profile

1.6.3 Nurse module

- Provide medication according to patient prescription
- Keep record of patient operation
- Manage own profile

1.7 Flutter and why they were used

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 t 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. Flutter was programmed by 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 any body know a bit of programming, Dart is a typed object programming language. You can compare Dart's syntax to JavaScript.

1.8 Artificial Intelligence

The term Artificial Intelligence (AI) was coined by John McCarthy in 1956 during a conference held on this subject. However, the possibility of machines being able to simulate human behavior and actually think was raised earlier by Alan Turing who developed the Turing test in order to differentiate humans from machines. Since then, computational power has grown to the point of instant calculations and the ability evaluates new data, according to previously assessed data, in real time.

Today, AI is integrated into our daily lives in many forms, such as personal assistants (Sari, Alexi, Google assistant etc.), automated mass transportation, aviation and computer gaming. More recently, AI has also begun to be incorporated into medicine to improve patient care by speeding up processes and achieving greater accuracy, opening the path to providing better healthcare overall.

Radiological images, pathology slides, and patients' electronic medical records (EMR) are being evaluated by machine learning, aiding in the process of diagnosis and treatment of patients and augmenting physicians' capabilities. Herein we describe the current status of AI in medicine, the way it is used in the different disciplines and future trends.

1.8 .1 Machine learning

Following visible successes on a wide range of predictive tasks, machine learning techniques are attracting substantial interest from medical researchers and clinicians. We address the need for capacity development in this area by providing a conceptual introduction to machine learning alongside a practical guide to developing and evaluating predictive algorithms using freely-available open source software and public domain data.

Supervised Learning

Supervised learning starts with the goal of predicting a known output or target. In machine learning competitions, where individual participants are judged on their performance on common data sets, recurrent supervised learning problems include handwriting recognition (such as recognizing hand written digits), classifying images of objects (e.g., is this a cat or a dog?), and document classification (e.g., is this a clinical trial about heart failure or a financial report?). Notably, these are all tasks that a trained person can do well and so the computer is often trying to approximate human performance. Supervised learning focuses on classification, which involves choosing among subgroups to best describe a new instance of data, and prediction, which involves estimating an unknown parameter (such as the temperature in San Francisco tomorrow afternoon).

What might be some examples of supervised learning in medicine? Perhaps the most common example seen by a cardiologist is the automated interpretation of the ECG, where pattern recognition is performed to select from a limited set of diagnoses (i.e., a classification task). In radiology, automated detection of a lung nodule from a chest x-ray would also represent supervised learning. In both these cases, the computer is approximating what a trained physician is already capable of doing with high accuracy.

Supervised learning is often used to estimate risk. The Framingham Risk Score for coronary heart disease may in fact be the most commonly used instance of supervised learning in medicine. Such risk models exist across medicine, and include guiding antithrombotic therapy in atrial fibrillation and implantation of automated implantable defibrillators in hypertrophic cardiomyopathy. In modeling

risk, the computer is doing more than merely approximating physician skills but finding novel relationships not readily apparent to human beings.

1.8 .2 What is Deep Learning?

Deep Learning is a part of machine learning as we can see in figure (0.1), that deals with algorithms inspired by the structure and function of the human brain. It uses artificial neural networks to build intelligent models and solve complex problems. We mostly use deep learning with unstructured data.

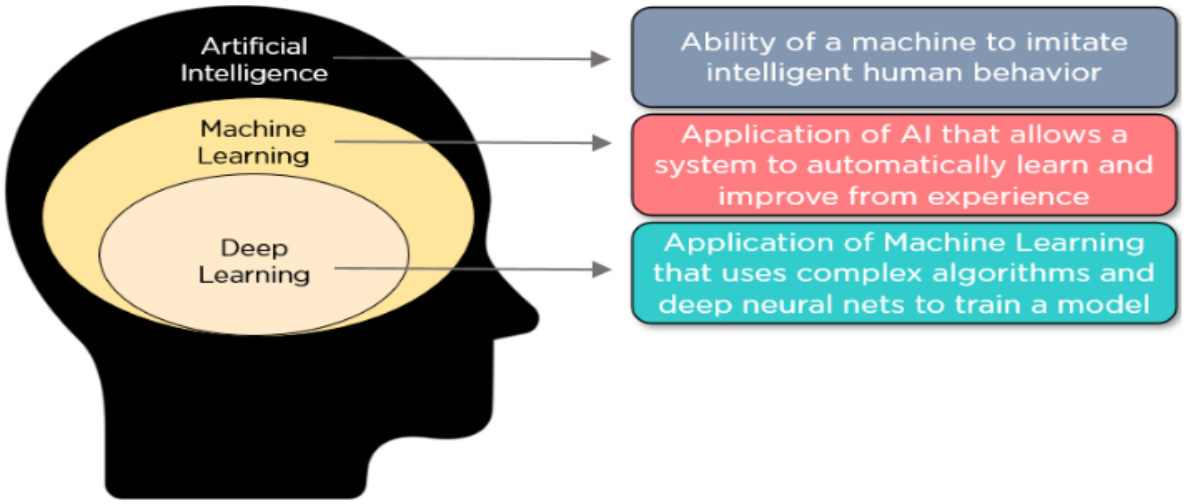


Figure 1.1 Ai, machine learning, deep learning realationship

Let's now look understand the basics of neural networks in this Deep Learning with Python article.

1.9Internet of things (IoT)

Internet of Things (IoT) offers a seamless platform to connect people and objects to one another for enriching and making our lives easier. This vision carries us from compute-based centralized schemes to a more distributed environment offering a vast amount of applications such as smart wearable's, smart home, smart mobility, and smart cities. In this paper we discuss applicability of IoT in healthcare and medicine by presenting a holistic architecture of IoT eHealth ecosystem. Healthcare is becoming increasingly difficult to manage due to insufficient and less effective healthcare services to meet the increasing demands of rising aging population with chronic diseases. We propose that this requires a

transition from the clinic-centric treatment to patient-centric healthcare where each agent such as hospital, patient, and services are seamlessly connected to each other. This patient-centric IoT eHealth ecosystem needs a multi-layer architecture: (1) device, (2) fog computing and (3) cloud to empower handling of complex data in terms of its variety, speed, and latency. This fog-driven IoT architecture is followed by various case examples of services and applications that are implemented on those layers. Those examples range from mobile health, assisted living, e-medicine, implants, early warning systems, to population monitoring in smart cities. We then finally address the challenges of IoT eHealth such as data management, scalability, regulations, interoperability, device–network–human interfaces, security, and privacy.

1.10 Project objectives:

- To promote Egypt and improve the health condition and reduce cases on intensive care and analysis and examination centers
- The data is encrypted to keep the patient's information confidential because it is possible that the patient is one of the people with authority such as the minister and the president, so if this news is known, the state will have problems
- One of our goals is for this application to reach the largest number of people and this is done through the work of the mobile application due to the great technological expansion that the country is going through, and this is what President Abdel Fattah Al-SISI said at the World Youth Conference.
- This also helps reduce hospital congestion.
- One of our goals is also to take information and receive a larger number of cases than the first in order to reach an increase in the number of the most recovering cases.
- Also one of our goals is that when heart rate changes occur frequently and occur soon or even before early electrographic or clinical change. The change can indicate the timing of the onset of a seizure and the specific rate pattern may be useful for diagnosing seizures and automatic seizure detection. Electrocardiogram abnormalities occur frequently and frequently in several episodes of the patient himself.

- One of our objectives is to use new technologies, which have become widely known over the past 10 years, to the emergence of a full range of hopes for an innovative solution to the pressing problems of the global economy. The key element of innovation is a complex algorithm for managing a distributed ledger - block chain. Interest in block chain in the world is provided through the main points of the "classic" laptop system: independent multi-transaction verification (processes) to verify their authenticity, concealment of the identity of the encrypted parties in the transaction, as well as lack of access to the control center and the issuance of new currency units. The most famous practical solution based on this technology is crypto currency, which has already been created in more than 2000 versions of various modifications. The rapid growth in cryptocurrency turnover, even in the much-closed encryption sector, has led to the creation of specialized exchanges and even specialized banks serving this new financial asset.
- This study aims to identify the impact of smart applications on health care, identify the advantages of using smart applications in healthcare and propose solutions in overcoming the difficulties that hinder their use. Health care delivery.
- Is the unified use of electronic information and communication technology in the health sector national strategy? For electronic health. Improving the quality and efficiency of services.
- One of the most important things "is the general state of the body and mind, with reference to the safe functions of all the organs of the body, and the healing of any diseases, And the individual's psychological and mental happiness"
- And from our goals we found that one of the most important obstacles that accompanied the emergence of smart applications in healthcare is that the percentage of benefit from the application varies.Healing with the disappearance of technological capabilities. Our goal is to change this idea.
- Technology development used around the world uses engineers and scientists around the world sensors. Radiation sensors: Electronic devices that sense the presence of alpha, beta or gamma particles and provide signals to meters and projectors.

- Among the objectives are teamwork and state assistance, such as state assistance to us. High level of information privacy of health data between patient and doctor, so the introduction of the wrong to the emergence of wrong decisions.
- To develop the provision of doctors for various services and electronic interconnection between health institutions in Different regions in order to obtain an accurate diagnosis of the patient's condition, which will contribute to the creation of digital repositories containing data Accurate and structured medical support for scientific research in medical journals.
- Strengthening primary health care is essential to achieving the Sustainable Development Goals for health and universal health coverage. This will contribute to other goals beyond the goal of good health and well-being (the third goal of the Sustainable Development Goals), including those relating to poverty eradication, the total eradication of hunger, quality education, gender equality, clean water and hygiene, decent work and economic growth, inequality reduction and climate action.

Chapter two
literature review

chapter 2

2.1 data base

2.1.1 Research About Data in Health

This paper provides an overview of the most recent Advances in big data in the context of biomedicine and health informatics. Defines the main characteristics of big data and How will medical and health informatics, translational bioinformatics, sensor informatics, and imaging informatics benefit from An integrated approach to synthesize different aspects of Personal information from a variety of data sources Structured and unstructured, as well as imaging and clinical diagnosis, and in the long term Continuous physiological sensing of the individual. it is expected that Recent advances in big data will expand our knowledge of testing New hypotheses about disease management from diagnosis to prevention and personalized treatment. However, the rise of big data.lt also raises challenges in terms of privacy, security and data ownership Data oversight and governance. This paper discusses some Current activities and future opportunities related big data For health, while identifying some of the basic core issues that need it is handled cumulative number of publications.

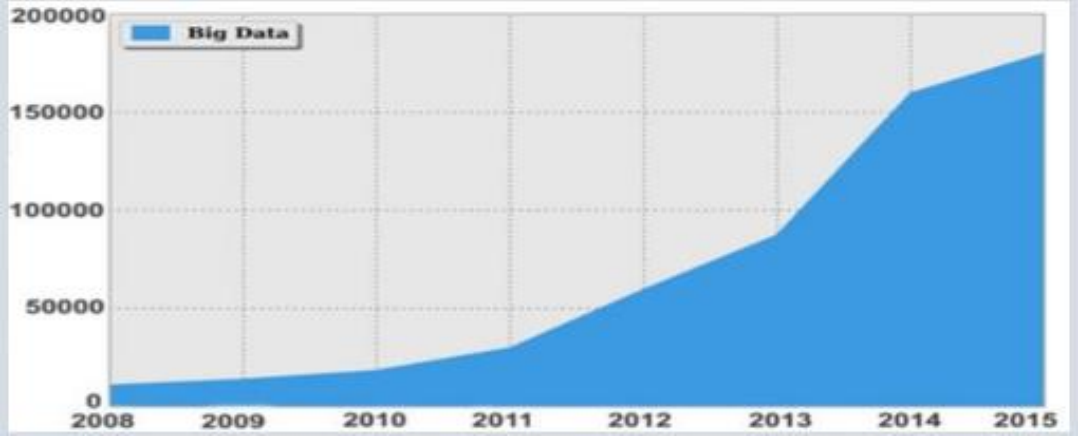


Figure 2.1 (big data)

A symposium for the Dubai Health Authority stressed the importance of "data in health systems development" as it allows leaders and decision-makers to predict and possess innovative tools to understand conditions and make correct decisions

that achieve the required goals The virtual symposium touched on the Statistical methods used in health data management processes, research their quality, and derive predictive models from them to support the decision - maker in preparing for future health cases, such as: the current “Covid-19” pandemic through indicators such as the reproduction rate , which shows the speed of the virus's spread among individuals in the society it discussed the sources , images , uses , and objectives of big data , comparing it with normal data , the impact of big data in making the right decision , its great role in the field of health care , and the importance of employing big data in the face of the " Corona " virus .

2.1.2 The importance of data in the health process .

Decision - making should be based on facts, regardless of industry . The importance of data collection and its analysis leveraging Big Data technologies has demonstrated that the more accurate the information gathered, the sounder the decisions made, and the better the results that can be achieved. Medicine is that very industry that is greatly influenced and altered by Big Data . Read our article if you want to learn about the importance of data collection in healthcare and the tools that are used to collect information and turn it into business value. The graph by Statista demonstrates a range of sources used for gaining information: transactions , system logs , sensors , texts , social media , clickstream data , videos and images . As of summer 2016, 64% of respondents were already analyzing transaction data within their organizations, and 28% were planning to introduce this practice, which proves the essential role of collecting data for business.

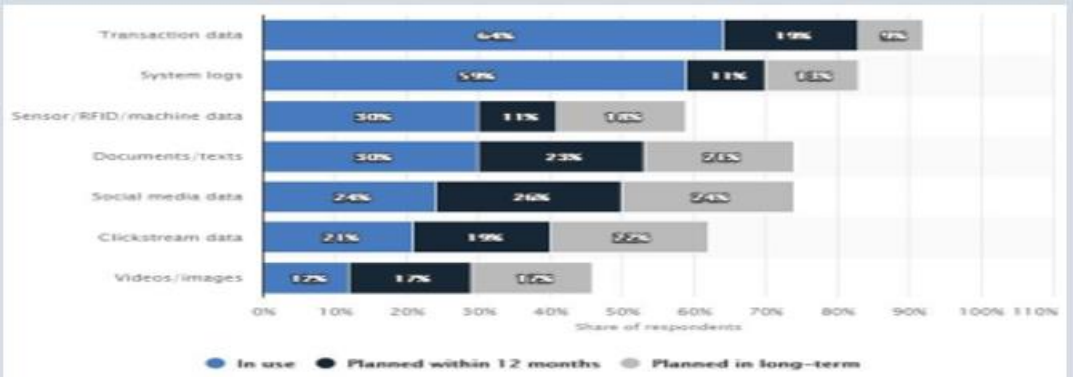


Figure 2.2 (Sources of big data used by industry professionals worldwide in 2016)

2.1.3 The Impact of Data Collection in Health

In the healthcare sector , we can find the best examples of how data tracking and analysis change world for the better . The use of Big Data in medicine is motivated by the necessity to solve both local organizational issues , such as reducing workloads and increasing profits

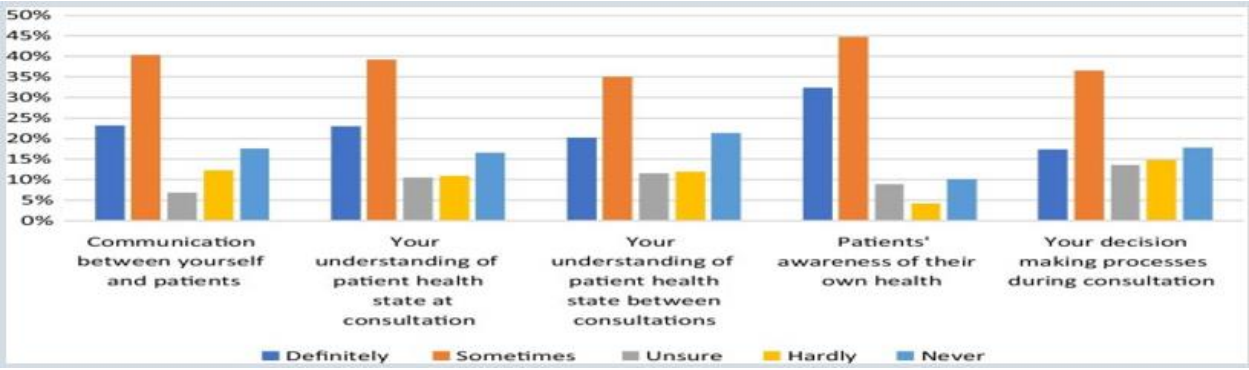


Figure 2.3 (Data Collection in Health)

of a medical agency , and the global problems of humanity , such as forecasting epidemics and combating existing diseases more efficiently

2.1.4 Research Big Data in Healthcare - Challenges

- **Big Data in Healthcare**

There have been big volumes of information gathered by the healthcare industry over the years. A large amount is kept in hard copies, but nowadays, the virtual storage is used. These huge amounts of information are called Big Data, whose purpose is to improve healthcare's quality by diminishing the expenses that come along. Bid Data promises supporting several aspects of healthcare such as medical functions which refer to disease observation, the management of people's health and medical decision support. Big Data identifies connections and understands directions and patterns within the

Information, and, as a result, care is improved, lives are saved and, an important aspect

Diminishes costs and expenses. In doing so, Big Data in the healthcare domain makes use
Of the explosion of information to make better decisions. It is also a research group so healthcare is an important field to be analyzed. After Big Data being analyzed and observed and the previously talked about connections, patterns and directions being exposed the

Ones that offer healthcare services and those dealing with healthcare delivery system can
Work and discover new diagnoses and healing programs, which would eventually lead to
More qualitative care activities which cost less but bring more results.
Big Data may lead to the understanding of a disease's causes and consequences, but also to possible methods of improving. The recording similar anterior situations may lead to a future diagnosis, but also to an understanding of its success in this program. The disease causes can be better understood, and the more adequate treatments can be given to rapid identified patients, which have a big risk of disease.

Challenges Faced by Today's Healthcare Administrators

- **Protecting Against Cyberattacks**

  Cybersecurity remains a top challenge in 2020 for leaders in healthcare administration. And attackers are getting smarter and more strategic. In the first half of 2020, when healthcare administrators were distracted with other pressing issues related to COVID-19, cyber attackers took advantage. Between the months of February and May 2020, there **were** 132 reported breaches—almost 50% more than the same time frame the previous year.8 According to experts, the healthcare industry is especially vulnerable to these types of threats

- **Expanding the Use of Telehealth and Virtual Healthcare**

  Telehealth expanded significantly during the COVID-19 pandemic as hospitals and doctors were forced to transition to virtual care and remote appointments. Now, many healthcare leaders are advocating for the

permanent expansion of telehealth beyond the end of the public health emergency. While the expansion of telehealth would offer many benefits for patient care, it can also pose new challenges—such as cybersecurity and patient privacy issues—for healthcare administration.

- **Managing Medicare and Medicaid**

  In a 2019 annual survey of hospital executives, 71% of respondents identified Medicaid reimbursement and 54% of respondents identified Medicare reimbursement as among their top challenges.1 Also in 2019, more than two-thirds of medical practices reported that Medicare payments were not enough to cover the cost of delivering care, leaving healthcare administrators with a budget shortfall. What's more, record unemployment rates due to the COVID-19 crisis will likely add to the problem. In April 2020, the U.S. saw 14.7% unemployment — the highest unemployment rate in the U.S. since the Great Depression.6 The result is an estimated 16.2 million workers who have likely lost their employer-provided health insurance.7 The masses of newly unemployed individuals could likely result in a marked increase in the number of patients who have Medicaid coverage or who are uninsured or underinsured. Healthcare administrators are challenged with providing healthcare services to these patients while maintaining fiscal responsibility.

- **Recruiting Top Nursing Talent**

  The need for qualified nurses is never more evident than during the global pandemic. But even before the COVID-19 heath crisis hit, healthcare administrators struggled to fill the demand for nurses. And the shortage is only expected to grow.

- According to the American Nurses Association, there will be far more registered nurse (RN) jobs available than any other profession by 2022.4 With more than 500,000 seasoned RNs anticipated to retire by 2022, there is a need for an additional 1.1 million new RNs. Competing to recruit and retain top nurses and fill empty positions has been and will continue to be a major challenge for leaders in healthcare administration.
- <u>But we're going to change?</u> We will overcome over all this challenges where will protect our data against hackers by Cipher Stored data and store all important data about State OF patient and retrieve it to Diagnosis of the

patient's condition and use this data in researches to detect the reasons of the disease and medicine used to the treatment.

2.2 Flutter

2.2.1 International Journal of Trend in Scientific Research and Development (IJTSRD)

A Review- Role of Mobile Application for Medical Services

In advanced mobile communications and portable computation devices are now combined in handheld devices called “smart mobile phones, IPADs, Tablet PC”, which are also capable of running third-party software. The number of smart mobile phones users is growing rapidly, including among healthcare professionals. The purpose of this study was to classify smart mobile phones -based healthcare technologies as discussed in academic literature according to their functionalities, services and summarize articles in each category. Many medical applications for smart mobile phones have been developed and widely used by health professionals, doctors, consultant and patients. The use of smart phones is getting more attention in healthcare and medical services day by day. Medical service provider applications make smart mobile phones useful tools in the practice of evidence-based medicine at the point of care, in addition to their use in mobile clinical communication with a correct references. Also, smart mobile phones can play a very important role in patient education, disease self-management, and remote monitoring of patient’s .But our goal, which is added, is? Diseases and diagnoses will be added better in terms of design and quality and this application will become in every home in order to increase health

2.2.2 A Mobile Application for Keyword Search in Real-World Scenes

Keyword search in a cluttered environment is difficult in general, and even more challenging for people with low vision. While magnification can help in reading for low vision people, it does not facilitate efficient visual search due to the constriction of the field of view. The motivating observation for this study is that, in a large number of visual search tasks, people know what are they looking for (i.e., they know the keywords), they just do not know where to find them in the scene. We have developed a mobile application that allows the users to input keywords (by voice or by typing), uses an optical character recognition (OCR) engine to search for the provided keyword in the scene captured by the smartphone camera, and zooms in on the instances of the keyword detected in the captured images, to facilitate efficient information acquisition. In this paper we describe the development and evaluation of various aspects of the application, including comparing the various mainstream OCR engines that power the app, and an evaluation study comparing the app to the conventional optical magnifier vision aid. Normally sighted adults, while wearing blur glasses to lower their visual acuity, performed keyword searches for a series of items ranging from easy to difficult with the app and with a handheld magnifier. While there was no difference in the search times between the two methods for the easier tasks, the app was significantly faster than the magnifier for the difficult tasks. But we're going to change? IOT based clinical sensor data management and transfer using block chain technology for purposes of this guidance, a “mobile medical app” is a mobile app that incorporates Device software functionality that meets the definition of device in section 201(h) of the FD&C Act11.

2.2.3 A Robust and Flexible Access Control Scheme for Cloud-IoT Paradigm with Application to Remote Mobile Medical Monitoring

Wei Ren, Yi Ren, Mu-En Wu, and Chia-Jung Lee

04 February 2016

Remote mobile medical monitoring is widely seen as an emerging application of the Internet of Things (IoT).

Through these services, patients can be moved out of hospitals and receive more care in their familiar homes, which provide better psychological conditions and may lead to a faster recovery, and take care of their family members,

Medical measurements can be made anytime and anywhere with the help of body area networks (BANs) [4] through various sensors.

These sensors are located inside a dedicated BAN, and communicate with an access point.

From the access point, the data is transmitted to the database servers in the cloud. These data are personal electronic health records (PEHRs).

But this collected data may be attacked by some people who are not authorized to view it or the doctors' diagnoses, hence the idea of encrypting this data with the Blockchain technology in order to ensure the integrity of the data connection without disclosing or modifying it by any unauthorized party.

2.3 AI

2.3.1 Phase-domain Deep Patient-ECG Image Learning for Zero-effort Smart Health Security

Qingxue Zhang, Member, IEEE

INTRODUCTION Smart health is greatly advanced by technological innovations. Vast amounts of promising applications are emerging nowadays leveraging smart sensing, big data, and computational intelligence techniques [1-6], such as, wearable heart rate monitoring, daily activity monitoring, fall detection for aging population, emotion monitoring, blood oxygen monitoring, and so on. These vital signs are usually continuously measured by the body sensor network [7, 8], and thus pose huge challenges to the security and privacy requirements. The wearable sensing devices are more vulnerable to different attacks. This is due to the fact that wearable/mobile monitors usually have strict constraints on the power and performance in order to guarantee the wearability and sustainability. Therefore, it is impractical to introduce complex and sophisticatedly designed security protocols [9-11]. Another reason is that, along with increasing amounts of information measured and transmitted, the risks to be attacked keep increasing. Evidently, how to enhance the security and privacy in the era of smart health is among key factors to make smart health a reality. Deep feature learning. Then the ECG image is fed into the deep CNN [24], to automatically learn the hierarchical features, without manual feature engineering. The learned features will be automatically encoded as the weights of the neural connections. The local patterns of the ECG image can be abstracted layer by layer in CNN, to finally yield the user identity.

Contributions In summary, the major contributions include:

- Enabling blind ECG segmentation, to avoid manual engineering methods to identify heartbeat locations, by phase domain transformation that can hide phase differences and different numbers of heartbeats;
- Enabling deep ECG image learning, to avoid heavy feature engineering and limited generalization ability, by generating ECG images and learning deep hidden nonlinear features using a convolutional neural network;
- Extending ECG biometric user identification to patient ECG databases, which are of many more diversities.

This phase-domain deep patient-ECG image learning framework is expected to enable zero-effort ECG-enhanced smart health security. But we're going to change? But we're going to use deep learning to analyze some data to find out if a person has a heart disease or is in good health

2.3.2 Deep learning-based ECG-free Cardiac Navigation for Multi-Dimensional and Motion-Resolved Continuous Magnetic Resonance Imaging

Elisabeth Hoppe, Jens Wetzl, Seung Su Yoon, Mario Bacher, Philipp Roser, Bernhard Stimpel, Alexander Preuhs, and Andreas Maier, Member, IEEE

FOR the diagnosis of various ischemic and non-ischemic cardiomyopathies, the cardiac magnetic resonance imaging (MRI) is an established tool [1]–[6]. In order to enable a comprehensive diagnostic protocol, especially the following factors have to be covered within a scan: (1) Anatomic imaging for the evaluation of the cardiac structure, and (2) timeresolved (cine) imaging for the evaluation of the cardiac function [7]. Further, additional quantitative tissue characterization, e.g., T1 mapping [8], [9], requires multi-contrast imaging. For anatomic imaging, often

3-D volumes of the whole heart are acquired, providing flexibility for retrospective reformations into different views, and improving the anatomic evaluation. For cine imaging, further processing is necessary in order to represent the dynamic anatomic motion: Data is resolved into different motion states (respiratory, cardiac) or the respiratory motion within the scan has to be compensated. Finally, the need for sampling multiple contrasts adds another dimension to the scan. These dimensions have to be sampled simultaneously and synchronized with anatomic motion, e.g., cardiac cycles. All these factors lead to increased protocol complexity, as well as prolonged scan times. In order to decrease the complexity during scan planning and data acquisition, recently so-called continuous protocols have been proposed [10]–[17]. Here, data is acquired continuously and independently of the specific cardiac, respiratory or contrast state. These scans are performed in a segmented manner, i.e., data used for the reconstruction of one 3-D volume for one specific cardiac phase is collected during multiple heartbeats. The complexity is shifted to the reconstruction framework: Once all data samples are acquired, they are sorted to bins prior to the actual reconstruction according to their specific sampling timepoint, e.g., cardiac, contrast or respiratory state. This introduces the need to know the current cardiac phase at every timepoint during the scan, in order to use this information for data binning. In the following, we give a summary of state-of-theart (SotA) cardiac navigations for continuous MRI. But we're going to change? We will use a set of data about ECG heart rate to find out if a person has heart disease or is in good health

2.4 Iot (internet of things)

2.4.1 MED-IoT: A Medicine Confirmation System

Harsh Thakkar; Jigar Chauhan; Viral Trivedi; Urvi Jolapara

Date of Conference: 5-5 Jan. 2018
Date Added to IEEE *Xplore*: 19 November 2018

Abstract:

IoT is a Technology in which physical objects are accessible through internet. It has numerous applications in health care system which provides solutions for the patient and health care professionals. It makes medical equipment's more efficient by allowing real time monitoring of patient health, in which sensors acquire data. Therefore, propose system named as MED-IoT (Medicine Confirmation System using Internet of Things) in which the given system will focus on reminding patients who forget to take medicines on time. MED-loT is a system in which user will have to provide the prescription information through the web page after that system will analyze the weight of medicines before consumption and again calculate the weight of medicine after the dosage is consumed by the patient. This tends to happen on regular intervals as mentioned by the user. This weight is displayed on 16-bit LCD display and buzzer mechanism is embedded to alert the user at the time when weight of the medicine changes. This change in weight mechanism is calculated by component called Load cell. The system will send text messages to end user at the time when the weight of medicine changes.But our goal, which is added, is ,We will use the IoT to measure some tests such as (Heart rate sensor, Mlx 90614 temperature sensor) by using machine learning we can know if a person is a heart patient or is he in good health In addition, it will be for all ages and not only for the elderly

2.4 .2 Elder Care System using IoT and Machine Learning in AWS Cloud

Aparajith Srinivasan; Nithya Natarajan; Raj Vignesh Karunakaran; Ramya Elangovan; Abirami Shankar; Padmanaaban M Sabharish; B S Sreeja; S Radha

Date of Conference: 14-16 Dec. 2020

Date Added to IEEE *Xplore*: 21 January 2021

The percentage of the elderly population across the world has been growing steadily by 0.2% annually over the past 5 years [1]. It is predicted that the growth of the elderly population will continue to outpace that of the younger population over the next 35 years [2]. As a result, the elderly support ratio, i.e., the number of people between 18 and 65 to the number of people above 65, reduces annually. Common challenges like dementia, physical disability, sensory impairments, and chronic illness leave the elderly dependent on their caregivers. Informal caregivers are people who are a part of the elder's family. Since 66% of them are women, the number of informal caregivers has reduced in recent times, owing to the increased participation of women in the employment sector [3]. With increasing nuclear families, almost 34.4% of elderly people live independently across the world, which makes them rely on formal caregivers. Formal caregivers are those who are paid to take care of the elder. The demand for this job has increased by 6% in the past 5 years [4]. Despite being an expensive option, 70% of the caregiver’s primary work is just monitoring [5]. But it is impossible for the caregiver to monitor the elder continuously. In case of a medical emergency, the chances of them being left unattended are dangerously high. Therefore, a reliable elder care system that helps elders get through difficult situations is the need of the hour. Eldercare is an important domain that can be revolutionized with the help of IoT and Cloud computing. IoT based sensors help in the collection of body vital parameters, which changes drastically in emergency situations. These vital parameters can be

stored and accessed effectively using a database in a cloud server. With the advancement of Machine Learning algorithms in the cloud, the prediction of aberration in the vitals has become more accurate. It has led to the miniaturization of data acquisition units. To bridge the gap between a willing but working informal caregiver and the existing healthcare system, an autonomous monitoring and alerting system is necessary for today's scenario. Considering these discernments, the features of the presented work are as follows:

1. Bypassing of manual trigger
2. Alerts based on machine learning
3. Monitoring of body vitals

But our goal, which is added, is We will use the IoT to measure some tests such as (Heart rate sensor, Mlx 90614 temperature sensor) by using machine learning we can know if a person is a heart patient or is he in good health In addition, it will be for all ages and not only for the elderly

2.5 Design

2.5.1 Developing Apps for Researching the COVID-19 Pandemic with the TrackYourHealth Platform

Carsten Vogel∗, Rüdiger Pryss∗, Johannes Schobel†, Winfried Schlee‡ and Felix Beierle∗

published in ∗Institute of Clinical Epidemiology and Biometry, University of Würzburg, Würzburg, Germany

In early 2020, the coronavirus spread all around the globe and posed major challenges to all areas of society. Not only does COVID-19 affect the respiratory system of infected people, it also impacts the social consequences and measures trying to contain the virus. Lockdowns, home office, restricted everyday routines, limited freedom of movement and social distancing take their toll on everyone. Studies have found that overall mental health has declined [1], [2]. In order to find

out about the mental and physical health of people during sudden events like the COVID-19 pandemic, mobile applications with ecological momentary assessment (EMA) and mobile crowdsensing (MCS) features are a viable solution. Employing mobile applications has two major benefits for both researchers and potentially also its users: (1) advancing research and (2) supporting people to cope. However, in most cases, researchers demand such an app that can be easily adapted to their needs, such as the changing COVID-19 situation might require. Besides developing the software itself, researchers face additional challenges that are costly and time consuming, like compliance with privacy regulations, ethical guidelines, local laws, and platform regulations. At the same time, while facing these challenges, unforeseen events like the current pandemic make a short time-to-market crucial.

the app consist of several modules that work independently. Each module is intended for a specific functionality such as filling out questionnaires, giving feedback to the user, or managing user accounts, etc. Depending But we're going to change?

- Use an administration login
- Our design is able to connect the patient with the doctor through the administration
- Using a chatbot directs the user to the section he wants

2.5.2 Putting Fun into Function with QuizMed - an Interactive Medical Application

Finola Bradley, Benjamin Jung

QuizMed is a web-based visual medicine application aiming to meet the following three distinct objectives: medical information resource, educational tool and professional communication and case discussion forum.

The prototype-in-operation presents primarily dermatology and cytology images together with (optional) auxiliary case descriptions. These can be classified by the user with varying functionality depending on the user role. Anonymous users (e.g.

students) can propose and submit a diagnosis for an existing image but we're going to change?

- Diagnosing the patient's condition by a specialized doctor and then directing him to the correct department
- Allow him to attach any pictures, x-rays and analyzes related to the patient's condition
- A nurse is available to follow up on the patient's condition

Chapter three
Design

Chapter 3

3.1 –IOT

The Internet of Things (IoT) describes the network of physical objects "things" embedded with sensors, software, and other technologies to connect and exchange data with other devices and systems over the internet. These devices range from ordinary household objects to sophisticated industrial tools. With more than 7 billion connected IoT devices today, experts are expecting this number to grow to 10 billion by 2020 and 22 billion by 2025. Oracle has a network of device partners.

3.1.2-Why is the Internet of Things (IoT) so important?

Over the past few years, IoT has become one of the most important technologies of the 21st century. Now that we can connect everyday objects—kitchen appliances, cars, thermostats, baby monitors—to the internet via embedded devices, seamless communication is possible between people, processes, and things.

Using low-cost computing, the cloud, big data, analytics, and mobile technologies, physical things can share and collect data with minimal human intervention. In this hyperconnected world, digital systems can record, monitor, and adjust each interaction between connected things. The physical world meets the digital world—and they cooperate

3.1.3-What technologies have made IoT possible?

While the idea of IoT has been in existence for a long time, a collection of recent advances in several different technologies has made it practical.

- **Access to low-cost, low-power sensor technology.** Affordable and reliable sensors are making IoT technology possible for more manufacturers.

- **Connectivity.** A host of network protocols for the internet has made it easy to connect sensors to the cloud and other "things" for efficient data transfer.
- **Cloud computing platforms.** The increase in the availability of cloud platforms enables both businesses and consumers to access the infrastructure they need to scale up without actually having to manage it all.
- **Machine learning and analytics.** With advances in machine learning and analytics, along with access to varied and vast amounts of data stored in the cloud, businesses can gather insights faster and more easily. The emergence of these allied technologies continues to push the boundaries of IoT and the data produced by IoT also feeds these technologies.
- **Conversational artificial intelligence (AI)**

  Advances in neural networks have brought natural-language processing (NLP) to IoT devices (such as digital personal assistants Alexa, Cortana, and Siri) and made them appealing, affordable, and viable for home use.

3.1.4-What is industrial IoT?

Industrial IoT (IIoT) refers to the application of IoT technology in industrial settings, especially concerning instrumentation and control of sensors and devices that engage cloud technologies. Refer to this titan for a good example of IoT. Recently, industries have used machine-to-machine communication (M2M) to achieve wireless automation and control. But with the emergence of cloud and allied technologies (such as analytics and machine learning), industries can achieve a new automation layer and with it create new revenue and business models. IoT is sometimes called the fourth wave of the industrial revolution, or Industry 4.0. The following are some common uses for IoT:

- Smart manufacturing
- Connected assets and preventive and predictive maintenance
- Smart power grids
- Smart cities

- Connected logistics
- Smart digital supply chains
- Unlock business value with IoT

As IoT becomes more widespread in the marketplace, companies are capitalizing on the tremendous business value it can offer. These benefits include:

- Deriving data-driven insights from IoT data to help better manage the business
- Increasing productivity and efficiency of business operations
- Creating new business models and revenue streams
- Easily and seamlessly connecting the physical business world to the digital world to drive quick time to value

3.1.5 What are IoT applications?

Business-ready, SaaS IoT Applications

IoT Intelligent Applications are prebuilt software-as-a-service (SaaS) applications that can analyze and present captured IoT sensor data to business users via dashboards. We have a full set of IoT Intelligent Applications.

IoT applications use machine learning algorithms to analyze massive amounts of connected sensor data in the cloud. Using real-time IoT dashboards and alerts, you gain visibility into key performance indicators, statistics for mean time between failures, and other information. Machine learning-based algorithms can identify equipment anomalies and send alerts to users and even trigger automated fixes or proactive countermeasures.

With cloud-based IoT applications, business users can quickly enhance existing processes for supply chains, customer service, human resources, and financial services. There’s no need to recreate entire business processes.

3.1.6-What are some ways IoT applications are deployed?

The ability of IoT to provide sensor information as well as enable device-to-device communication is driving a broad set of applications. The following are some of the most popular applications and what they do.

- **Create new efficiencies in manufacturing through machine monitoring and** product-quality monitoring.

  Machines can be continuously monitored and analyzed to make sure they are performing within required tolerances. Products can also be monitored in real-time to identify and address quality defects.

- **Improve the tracking and "ring-fencing" of physical assets.**

  Tracking enables businesses to quickly determine asset location. Ring-fencing allows them to make sure that high-value assets are protected from theft and removal.

- **Use wearables to monitor human health analytics and environmental conditions.**

  IoT wearables enable people to better understand their health and allow physicians to remotely monitor patients. This technology also enables companies to track the health and safety of their employees, which is especially useful for workers employed in hazardous conditions.

- **Drive efficiencies and new possibilities in existing processes.**

  One example of this is the use of IoT to increase efficiency and safety in connected logistics for fleet management. Companies can use IoT fleet monitoring to direct trucks, in real-time, to improve efficiency.

- **-Enable business process changes.**

An example of this is the use of IoT devices for connected assets to monitor the health of remote machines and trigger service calls for preventive maintenance. The ability to remotely monitor machines is also enabling new product-as-a-service business models, where customers no longer need to buy a product but instead pay for its usage.

3.1.7-What industries can benefit from IoT?

Organizations best suited for IoT are those that would benefit from using sensor devices in their business processes.

- **Healthcare**

  IoT asset monitoring provides multiple benefits to the healthcare industry. Doctors, nurses, and orderlies often need to know the exact location of patient-assistance assets such as wheelchairs. When a hospital's wheelchairs are equipped with IoT sensors, they can be tracked from the IoT asset-monitoring application so that anyone looking for one can quickly find the nearest available wheelchair. Many hospital assets can be tracked this way to ensure proper usage as well as financial accounting for the physical assets in each department.

- **-Manufacturing**

  Manufacturers can gain a competitive advantage by using production-line monitoring to enable proactive maintenance on equipment when sensors detect an impending failure. Sensors can measure when production output is compromised. With the help of sensor alerts, manufacturers can quickly check

equipment for accuracy or remove it from production until it is repaired. This allows companies to reduce operating costs, get better uptime, and improve asset performance management.

- **Public Sector**

  The benefits of IoT in the public sector and other service-related environments are similarly wide-ranging. For example, government-owned utilities can use IoT-based applications to notify their users of mass outages and even of smaller interruptions of water, power, or sewer services. IoT applications can collect data concerning the scope of an outage and deploy resources to help utilities recover from outages with greater speed.

- **-General Safety Across All Industries**

  In addition to tracking physical assets, IoT can be used to improve worker safety. Employees in hazardous environments such as mines, oil and gas fields, and chemical and power plants, for example, need to know about the occurrence of a hazardous event that might affect them. When they are connected to IoT sensor-based applications, they can be notified of accidents or rescued from them as swiftly as possible. IoT applications are also used for wearables that can monitor human health and environmental conditions. Not only do these types of applications help people better understand their health, but they also permit physicians to monitor patients remotely.

3.1.8-Sensors :

1. Body Temperature Sensor
2. ECG AD8232 Heart Rate (Pulse) Sensor kit

Body Temperature Sensor

This is human body temperature sensor. It can be applied to skin surface and indicate the body temperature after reaching steady state. The sensor is accurate and stable and comply with medical certification. It can be used in many applications such as child incubators, patient monitoring and medical research labs.

Body Temperature Specifications

- Accuracy: +/- 0.4%
- Resistance: 2.25 Kohm at 25 C
- Cable Length: 3 meters
- Time constant: 7 second (sensor require about 5 time constant for stability to read (99%)
- Temperature range: -40 to 100 C
- Certification: CE,ISO13485

figufigure (3.2) Body Temperature

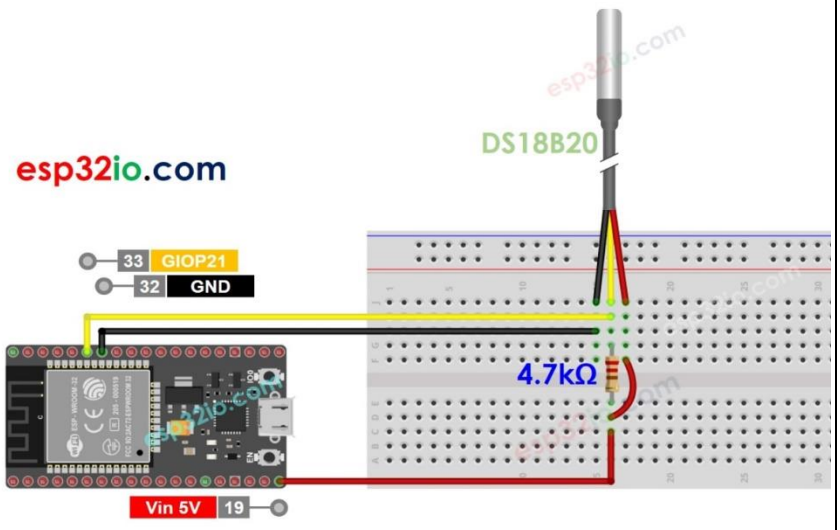


figure (3.1) Body Temperature

- ECG Heart rate sensor

The AD8232 Heart rate (Pulse) Sensor is a cost-effective board used to measure the electrical activity of the heart. This electrical activity can be charted as an ECG or Electrocardiogram and output as an analog reading. ECGs can be extremely noisy, the AD8232 Single Lead Heart Rate Monitor acts as an op amp to help obtain a clear signal from the PR and QT Intervals easily.

Features

- Voltage: DC3.3V Power.
- Analog Output.
- Low power control.
- LED indication.
- The electrode interfaces 3.5mm

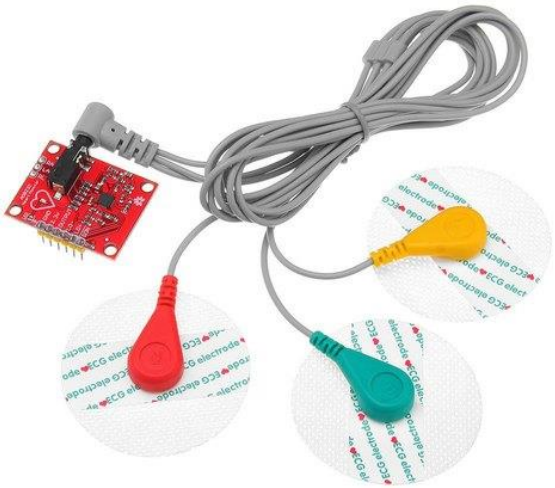


figure (3.3) ECG Heart rate sensor

We, Will, See How to connect the ECG Heart rate sensor in figure (3.4):

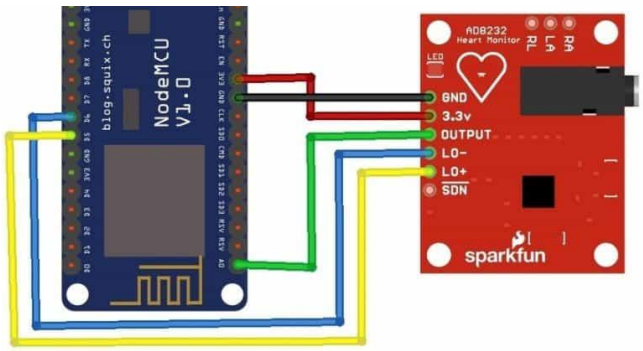


figure (3.4) ECG Heart rate sensor

3.2 AI

3.2.1-What is Artificial Intelligence?

Artificial intelligence is computer science technology that emphasizes creating an intelligent machine that can mimic human behavior. Here intelligent machines can be defined as a machine that can behave like a human, think like a human, and are also capable of decision making. It is made up of two words, "Artificial" and "Intelligence," which means the "man-made thinking ability. “With artificial intelligence, we do not need to pre-program the machine to perform a task; instead, we can create a machine with the programmed algorithms, and it can work on its own.

3.2.2-Why do we need Artificial Intelligence?

The goal of Artificial intelligence is to create intelligent machines that can mimic human behavior. We need AI for today's world to solve complex problems, make our lives more smoothly by automating routine work, saving manpower, and performing many more other tasks.

3.2.3- What are the types of AI?

-Based on Capabilities:

- **Weak AI or Narrow AI:** Weak AI is capable of performing some dedicated tasks with intelligence. Siri is an example of Weak AI.
- **General AI:** The intelligent machines that can perform any intellectual task with efficiency as a human.
- **Strong AI:** It is the hypothetical concept that involves the machine that will be better than humans and will surpass human intelligence.

-Based on Functionalities:

Reactive Machines: Purely reactive machines are the basic types of AI. These focus on the present actions and cannot store the previous actions**. Example: Deep Blue.**

- **Limited Memory:** As its name suggests, it can store past data or experience for a limited duration. The self-driving car is an example of such an AI type.

- **Theory of Mind:** It is the advanced AI that is capable of understanding human emotions, people, etc., in the real world.
- **Self-Awareness:** Self Awareness AI is the future of Artificial Intelligence that will have its consciousness, emotions, similar to humans.

3.2.4-What are the different domains/Subsets of AI?

AI covers lots of domains or subsets, and some main domains are given below: Machine Learning, Deep Learning, Neural Network, Expert System, Fuzzy Logic, Natural Language Processing, Robotics, and Speech Recognition.

3.2.5- What are the types of Machine Learning?

Machine Learning can be mainly divided into three types:

- **-Supervised Learning:** Supervised learning is a type of Machine learning in which the machine needs external supervision to learn from data. The supervised learning models are trained using the labeled dataset. Regression and Classification are the two main problems that can be solved with Supervised Machine Learning.
- **-Unsupervised Learning:** It is a type of machine learning in which the machine does not need any external supervision to learn from the data, hence called unsupervised learning. The unsupervised models can be trained using the unlabeled dataset. These are used to solve the Association and Clustering problems.
- **-Reinforcement Learning:** In Reinforcement learning, an agent interacts with its environment by producing actions, and learning with the help of feedback. The feedback is given to the agent in the form of rewards, such as for each good action, he gets a positive reward, and for each bad action, he gets a negative reward. There is no supervision provided to the agent. Q-Learning algorithm is used in reinforcement learning.

3.2.6-Which programming language is used for AI?

Below are the top five programming languages that are widely used for the development of Artificial Intelligence: Python, Java, Lisp, R, Prolog. Among the above five languages, Python is the most used language for AI development due to its simplicity and availability of lots of libraries, such as Numpy, Pandas, etc.

3.2.7-How is machine learning related to AI?

Machine learning is a subset or subfield of Artificial intelligence. It is a way of achieving AI. As both are two different concepts and the relation between both can be understood as "AI uses different Machine learning algorithms and concepts to solve the complex problems."

3.2.8-What are the different components of the Expert System?

An expert system mainly contains three components: User Interface: It enables a user to interact or communicate with the expert system to find the solution for a problem. Inference Engine: It is called the main processing unit or brain of the expert system. It applies different inference rules to the knowledge base to conclude it. The system extracts the information from the KB with the help of an inference engine. Knowledge Base: The knowledge base is a type of storage area that stores domain-specific and high-quality knowledge.

3.2.9-Which programming language is not generally used in AI, and why?

Perl Programming language is not a commonly used language for AI, as it is the scripting language.

-Logistic Function: Logistic regression is named for the function used at the core of the method, the logistic function. The logistic function, also called the sigmoid function was developed by statisticians to describe properties of population growth in ecology, rising quickly and maxing out at the carrying capacity of the environment. It's an S-shaped curve that can take any real-valued number and map it into a value between 0 and 1, but never exactly at those limits.1 / (1 + e^-value) Where e is the base of the natural logarithms (Euler's number or the EXP () function in your spreadsheet) and value is the actual numerical value that you want to transform. Below is a plot of the numbers between -5 and 5 transformed into the range 0 and 1 using the logistic function.

3.2.10- How is artificial intelligence used in medicine?

Artificial intelligence in medicine is the use of machine learning models to search medical data and uncover insights to help improve health outcomes and patient experiences. Thanks to recent advances in computer science and informatics,

artificial intelligence (AI) is quickly becoming an integral part of modern healthcare. AI algorithms and other applications powered by AI are being used to support medical professionals in clinical settings and ongoing research. Currently, the most common roles for AI in medical settings are clinical decision support and imaging analysis. Clinical decision support tools help providers make decisions about treatments, medications, mental health, and other patient needs by providing them with quick access to information or research that's relevant to their patients. In medical imaging, AI tools are being used to analyze CT scans, x-rays, MRIs, and other images for lesions or other findings that a human radiologist might miss. The challenges that the COVID-19 pandemic created for many health systems also led many healthcare organizations around the world to start field-testing new AI-supported technologies, such as algorithms designed to help monitor patients and AI-powered tools to screen COVID-19 patients. The research and results of these tests are still being gathered, and the overall standards for the use of AI in medicine are still being defined. Yet opportunities for AI to benefit clinicians, researchers, and the patients they serve are steadily increasing. At this point, there is little doubt that AI will become a core part of the digital health systems that shape and support modern medicine.

-AI applications in medicine:

There are numerous ways AI can positively impact the practice of medicine, whether it's through speeding up the pace of research or helping clinicians make better decisions. Here are some examples of how AI could be used: AI in disease detection and diagnosis, personalized disease treatment, AI in medical imaging, Clinical trial efficiency, Accelerated drug development

-Benefits of AI in medicine?

Informed patient care: Integrating medical AI into clinician workflows can give providers valuable context while they're making care decisions. A trained machine learning algorithm can help cut down on research time by giving clinicians valuable search results with evidence-based insights about treatments and procedures while the patient is still in the room with them.

Error reduction: There is some evidence that AI can help improve patient safety. A recent systemic review of 53 peer-reviewed studies examining the impact of AI on patient safety found that AI-powered decision support tools can help improve error detection and drug management.

Reducing the costs of care: There are a lot of potential ways AI could reduce costs across the healthcare industry. Some of the most promising opportunities include reducing medication errors, customized virtual health assistance, fraud prevention, and supporting more efficient administrative and clinical workflows.

Increasing doctor-patient engagement: Many patients think of questions outside of typical business hours. AI can help provide around-the-clock support through catboats that can answer basic questions and give patients resources when their provider's office isn't open. AI could also potentially be used to triage questions and flag information for further review, which could help alert providers to health changes that need additional attention.

Providing contextual relevance: One major advantage of deep learning is that AI algorithms can use context to distinguish between different types of information. For example, if a clinical note includes a list of a patient's current medications along with a new medication their provider recommends, a well-trained AI algorithm can use natural language processing to identify which medications belong in the patient's medical history.

3.2.11-What Is Logistic Regression?

Logistic regression is a supervised learning algorithm used to predict a dependent categorical target variable. In essence, if you have a large set of data that you want to categorize, logistic regression may be able to help. For example, if you were given a dog and an orange and you wanted to find out whether each of these items was an animal or not, the desired result would be for the dog to end up classified as an animal, and for the orange to be categorized as not an animal. The animal is your target; it is dependent on your data to be able to classify the item correctly. In this example, there are only two possible answers (binary logistic regression), animal or not an animal. However, it is also possible to set up your logistic regression with more than two possible categories (multinomial logistic regression).To dive a little deeper into how your model might attempt to classify these two items directly, let's consider what else the model would need to know about the items to decide where they belong. Other similar aspects of these items would need to be looked at when considering how to classify each item or data point. Aspects, or features, may include color, size, weight, shape, height, volume, or amount of limbs. In this way, knowing that an orange's shape was a circle may help the algorithm to conclude that the orange was not an animal. Similarly, knowing that the orange had zero limbs would help as well.Logistic regression

requires that the dependent variable, in this case, whether the item was an animal or not, be categorical. The outcome is either animal or not an animal—there is no range in between. A problem that has a continuous outcome, such as predicting the grade of a student or the fuel tank range of a car, is not a good candidate to use logistic regression. Other options like linear regression may be more appropriate.

-Probabilistic Predictions?

While many could easily identify whether an orange is an animal or not—based on previous knowledge of fruit, animals, etc.—the mathematical formula that calculates logistic regression does not have access to this sort of outside information. For this reason, the answers it provides are not definitive; they are probabilistic. The results are calculated based on likelihoods rather than absolute certainties.

Logistic regression derives its name from the sigmoid function, which is also known as the logistic function. The logistic function is an S-shaped curve that stretches from zero to one, while never being exactly zero and never being exactly one, either.

If you are interested in data science or the differences between data science and machine learning, read on to learn more about what logistic regression can do in both fields.

-What Is Logistic Regression Used For?

Here is a more realistic and detailed scenario for when logistic regression might be used:

Logistic regression may be used when predicting whether bank customers are likely to default on their loans. This is a calculation a bank makes when deciding if it will or will not lend to a customer and assessing the maximum amount the bank will lend to those it has already deemed to be creditworthy. To make this calculation, the bank will look at several factors. Lend is the target in this logistic regression, and based on the likelihood of default that is calculated, a lender will choose whether to take the risk of lending to each customer.

These factors, also known as features or independent variables, might include credit score, income level, age, job status, marital status, gender, the neighborhood of current residence, and educational history.

Logistic regression is also often used for medical research and by insurance companies. To calculate cancer risks, researchers would look at certain patient habits and genetic predispositions as predictive factors. To assess whether or not a patient is at a high risk of developing cancer, factors such as age, race, weight, smoking status, drinking status, exercise habits, overall medical history, family history of cancer and place of residence and workplace, accounting for environmental factors, would be considered.

Logistic regression is used in many other fields and is a common tool of data scientists.

As data scientists, one pitfall in statistical analysis to be sure to avoid when selecting which factors to choose for your logistic regression is a high level of correlation between features. If you find, for example, that sourdough bakers who knead their bread more than 9 times out of 10 also allow their loaves to ferment for 24 hours, then there would be no need to include both of these features since they occur at the same frequency.

-Making Predictions With Logistic Regression

As many of the earlier examples suggest, logistic regression is employed in data science as a supervised machine learning classification model. It can be useful in predicting category trends within a high range of accuracy. With the example of the high risk of cancer versus the not high risk of cancer, that prediction could be broken down into more granular categories depending on the researcher's requirements. As an ordinal logistic regression, it could be changed to high risk of cancer, moderate risk of cancer, and low risk of cancer. In this case, low risk of cancer might be set to encapsulate data points that are below 33% risk of cancer, for moderate it might be data points falling in between a 33% and 66% chance of cancer risk, while high risk would then be for cases above 66% risk.

-Logistic regression assumptions

- Remove highly correlated inputs.
- Consider removing outliers in your training set because logistic regression will not give significant weight to them during its calculations.
- Does not favor sparse (consisting of a lot of zero values) data.
- Logistic regression is a classification model, unlike linear regression.
- We will use a Logistic regression algorithm to know if the patient has heart disease or not

3.3 DESIGN

3.3.1- What is Adobe XD?

Adobe XD is developed by Adobe company started in 2015 under the name "project comet", as a response to popular software of Sketch. The first public beta was released in March 2016 for Mac OS, in December they were released to Windows. About a year later they announced that XD was officially out of beta.

Figure 3.5 (Adobe XD's design interface)

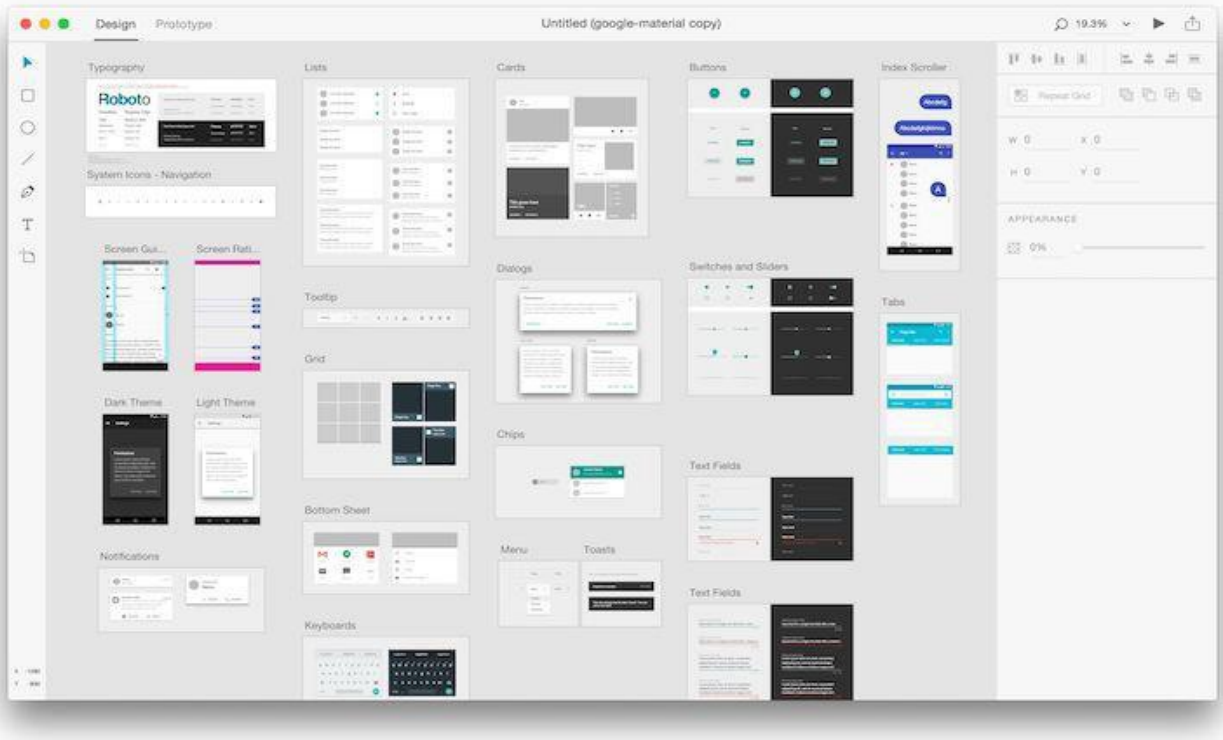


Figure 3.5 (Adobe XD's design interface)

Core software feature: Prototyping abilities Adobe XD is a vector-based editing tool, but different from Adobe's other vector-based software, XD has a clear focuses on software interface design, adorned with multiple pages transitioning interactions, previewing with easy sharing options. There's something sketch doesn't (yet) have component-level prototyping ability. In XD you can assign interaction down to the component level.

Extremely beginner-friendly If those previously mentioned functions sound too standard to you, that's probably because they indeed are becoming the standards. But adobe XD still shines with its simplicity and a truly enjoyable interface design. First-time users are often greeted with a step-by-step guide to start wireframing.

3.3.2- UI or User Interface Design:

Centers on building interfaces for mobile and software devices and applications. Said interfaces center on the looks and visual design of the product. UI overlaps with graphic design in that they both focus on what the user sees. Colors, text, backgrounds, and animations are some of the elements relevant to UI design.

3.3.3 - WHY IS UI DESIGN IMPORTANT FOR BUSINESSES?

UI design is very important when developing a website or application and should never be overlooked. Simply put, UI design is one of the main ways to **increase a website's traffic** and therefore move towards higher conversion rates. It is what makes people have a good user experience with a site and thus become loyal customers. Even the smallest adjustment in UI design can have a great impact. Basic changes such as shapes of buttons, colors, typography, or how information is distributed can determine whether people stay on your site or if they leave because it ends up being difficult to interact with.

3.3.4 MAIN PRINCIPLES OF A GOOD USER INTERFACE:-

When creating user interfaces, most designers follow interface design principles to have successful results. Here are a few principles to take into account:

- **Simple Design:** Simple interfaces are better. Use clear language and avoid inessential elements or complicated designs that may lead to confusion.
- **Consistency is key:** Make sure to use common and familiar UI elements across your website. This will ensure users understand more quickly how your site works.
- **Easily navigable menus:** Don't make your menu hard to find. Guarantee that every part of your website is clearly labeled on the navigation menu and place them in strategic places where users can find them.
- **Adequate typography:** Test out different typographies and choose the one that fits your page.

- **Colors and textures:** Make sure they are appropriately used to draw the attention of the user.
- **User control:** Give your visitors as much control as possible and make sure your website has the option to quickly undo whatever they are doing if they need to. Also, include default options, pre-filled forms, and more. **Accessibility:** Confirm the interface is accessible and visible for every type of user. Try to identify those key elements that will get the user to where they need to be.

3.3.5- BENEFITS OF A WELL-DESIGNED UI DESIGN:-

- **ACQUISITION OF NEW CUSTOMERS** Having a successful UI design contributes to a positive user experience, becomes a competitive advantage, and acts as a key brand differentiator. When you offer a good design, your customers feel more comfortable while using your application. In that way, you can attract new customers and consequently increase sales. Good user interface design is a great advantage to enhance business and maximize revenue opportunities.
- **INCREASED CUSTOMER ENGAGEMENT AND RETENTION** An appealing UI design enhances customer engagement and helps you retain the customers you already have. If you develop a good interface that simplifies research and navigation, you will not only attract new users or avoid user frustration, but you will also make them want to continue their digital experience. In that way, there is a lower probability of bounce and a higher conversion rate.
- **BRAND LOYALTY** Related to the previous point, with interactive and good-looking UI designs, you have better chances of retaining your customers and can convince them to stay loyal to you and your brand.
- **INCREASED PRODUCTIVITY** If your product is well-designed and has a user-friendly interface, where customers can navigate easily, then search time will decrease, and users will fulfill their needs in a faster and more efficient way. This leads to an improvement in terms of productivity, both for the user and the brand.
- **LOWER DEVELOPMENT** AND TRAINING COSTS Having a user-friendly and intuitive interface from the very beginning can help avoid future problems, such as correcting navigation errors, adjusting the design so that it is more functional, or erasing useless functions and features. However, a well-

designed interface causes fewer problems for designers, avoiding additional costs and reducing time and effort..

.understand, users express issues or concerns when navigating the interface. However, if the interface is intuitive and practical, customer contact with support services will be less frequent. In this way, companies can benefit by **reducing customer service costs.** A simple and well-designed interface minimizes the occurrence of errors and unnecessary operations that may occur during the browsing process, thereby avoiding high customer service costs.

3.4-FLUTTER

-Flutter is an open-source UI software development kit created by Google. It is used to develop cross-platform applications for Android, iOS, Linux, Mac, Windows, Google Fuchsia, Web platform, and the web from a single codebase First described in 2015, Flutter was released in May 2017. 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. Art 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. I selected some of the reasons why I like Flutter and why I want to use it. I will give you details and my feedback below. Hospital organizations have been facing difficulties and challenges in balancing limited resources and costs to provide their demand for services. Medical research affects the introduction of modern medical techniques and medicines, which usually causes an increase in consumed costs. Increasing costs of healthcare systems have the growing demands on the public budgets, and also the patients' expenditures. Many countries start to seek alternative sources of financing for healthcare systems because the traditional systems of healthcare insurance are no more sufficient for covering expansive healthcare services costs. There are two types of widgets: 1. Stateless Widget: A widget that does not require a mutable state. 2. Stateful Widget: A widget that has a mutable state. The Flutter tooling supports three modes when compiling your app, and a headless mode for testing. You choose a compilation mode depending on where you are in the development cycle. The modes are - Debug - Profile – Release.

3.4.1- What is Dart and why does Flutter use it?

Dart is an object-oriented, garbage-collected programming language that you use to develop Flutter apps. It was also created by Google, but is open-source, and has community inside and outside Google. Dart was chosen as the language of Flutter for the following reason: art is AOT (Ahead of Time) compiled to fast, predictable, native code, which allows almost all of Flutter to be written in Dart. This not only makes Flutter fast, virtually everything (including all the widgets) can be customized. Art can also be JIT (Just In Time) compiled for exceptionally fast development cycles and game-changing workflow (including Flutter's popular sub-second stateful hot reload). Dart allows Flutter to avoid the need for a separate declarative layout language like JSX or XML, or separate visual interface builders because Dart's declarative, programmatic layout is easy to read and visualize. And with all the layouts in one language and one place, it is easy for Flutter to provide advanced tooling that makes the layout a snap.

3.4.2- What is a widget?

Mention its importance in Flutter. Widgets are the UI components in Flutter. It is a way to describe the configuration of an Element. They are inspired by components in React. Widgets are important in Flutter because everything within a Flutter application is a Widget, from a simple "Text" to "Buttons" to "Screen Layouts".

3.4.3-What is an App state?

State that is not ephemeral, that you want to share across many parts of your app, and that you want to keep between user sessions, is what we call application state (sometimes also called shared state).Examples of application state: - User preferences - Login info - Notifications in a social networking app - The shopping cart in an e-commerce app - Read/unread state of articles in a news app. What is the difference between main () and run app () functions in Flutter? The main () function came from Java-like languages so it's where all programs started, without it, you can't write any program on Flutter even without UI. Rupp () function should return the Widget that would be attached to the screen as a root of the Widget Tree that will be rendered.

3.4.4- Differentiate Stateless Widget and StatefulWidget?

Stateless: Widget state creates ONLY ONCE, then it can update values but not state explicitly. That's why it has only one class which extends with Stateless Widget. They can never re-run the build () method again. Stateful: Widgets can update their STATE (locally) & values multiple times upon event triggered. That's the reason, the implementation is also different. In this, we have 2 classes, one is StatefulWidget & the other is its State implementation handler i.e. State<Your Widget>. So if I say, they can re-run build () method again & again based on events triggered. A Stateless Widget will never rebuild by itself (but can from external events). A StatefulWidget can Stateless Widget is static where's a StatefulWidget is dynamic. See the diagram below:

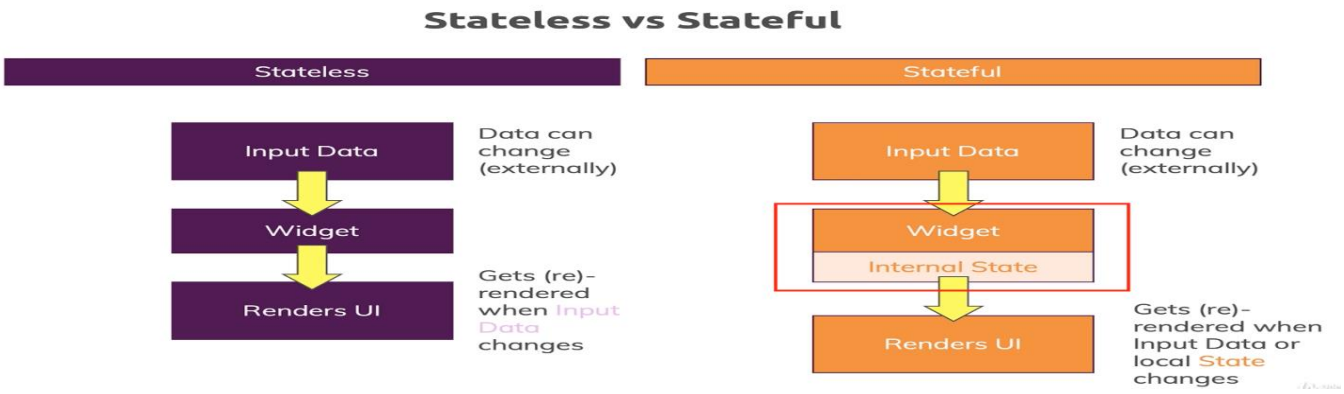


Figure 3.6 (stateless vs stateful)

3.4.5- Differentiate between Hot Restart and Hot Reload? Hot Reload

Flutter hot reload features works with a combination of the Small r key on command prompt or Terminal. The hot reload feature quickly compiles the newly added code in our file and sent the code to Dart Virtual Machine. After done updating the Code Dart Virtual Machine update the app UI with widgets. Hot Reload takes less time than hot restart. There is also a drawback in Hot Reload, if you are using States in your application then Hot Reload preservers the States so they will not update on Hot Reload our set to their default values. Hot Restart Hot restart is much different from a hot reload. In Hot restart, it destroys the preserves State value and sets them to their default. So if you are using States value in your application then after every hot restart the developer gets a fully compiled

application and all the states will be set to their defaults. The app widget tree is completely rebuilt with new typed code. Hot Restart takes much higher time than hot reload.

3.4.6-Differentiate between required and optional parameters in Dart?

Required Parameters art required parameters are the arguments that are passed to a function and the function or method required all those parameters to complete its code block. Optional Parameters Optional parameters are defined at the end of the parameter list, after any required parameters.

3.4.7-What are the keys in Flutter and when to use them?

A Key is an identifier for Widgets, Elements, and SemanticsNodes.A new widget will only be used to update an existing element if its key is the same as the key of the current widget associated with the element. Keys must be unique amongst the Elements with the same parent. Subclasses of Key should either subclass Local Key or Global Key. Keys are useful when manipulating collections of widgets of the same type. If you find yourself adding, removing, or reordering a collection of widgets of the same type that hold some state, then, you should use a key.

3.4.8- What are packages and plugins in Flutter?

Packages allow you to import new widgets or functionality into your app. There is a small distinction between packages and plugins. Packages are usually new components or code written purely in Dart whereas plugins work to allow more functionality on the device side using native code. Usually, on Dart Pub, both packages and plugins are referred to as packages, and only while creating a new package is the distinction mentioned.

3.4.9-What is the release mode and when do you use it?

Use release mode for deploying the app, when you want maximum optimization and minimal footprint size. Use release mode when you are ready to release your

app. For mobile, release mode (which is not supported on the simulator or emulator), means that: - Assertions are disabled. - Debugging information is stripped out. - Debugging is disabled. - Compilation is optimized for fast startup, fast execution, and small package sizes. Service extensions are disabled. Release mode for a web app means that: - The build is minified and tree shaking has been performed. - The app is compiled with the dart2js compiler for best performance. The command flutter run --release compiles to release mode. You can compile to release mode for a specific target with flutter build <target>.

3.4.10-Why do we pass functions to widgets?

Functions are first-class objects in Dart and can be passed as parameters to other functions. We pass a function to a widget essentially saying, “invoke this function when something happens”. Callbacks using interfaces like Android (<Java 8) have too much boilerplate code for a simple callback.

3.4.11- What are the advantages of Dart in programming?

Flutter supports two programming languages Dart and C++, but the former was specially created for use. Therefore, Flutter questions almost naturally always flow into the Dart space. Any Flutter developer must have at least a basic understanding of Dart. Unlike Python, JavaScript, PHP, Ruby, etc., Dart uses static typing, which makes it type-safe and easier to detect and avoid runtime errors, as well as ensure effective code optimization overall. While Dart is fairly similar to JavaScript, it runs code multiple times faster than the latter. The Dart VM (virtual machine) uses both Just-in-Time (JIT) and Ahead-of-Time (AOT) compilers to ensure faster and better code performance. More so, Dart uses object-oriented programming, which makes it very scalable and stable for building even the most complex applications. What are some editors used in Flutter development? The most popular Flutter IDEs include Android Studio, IntelliJ IDEA, Xcode, Emacs, Visual Studio, Code magic, among others.

- **-IntelliJ IDEA** is feature-rich, boasts extensive support for many languages, and provides smart coding assistance. Most beginner developers would probably get by with the free Community Edition, but the paid Ultimate Edition is required to access additional features.
- **-Android Studio** works like IntelliJ IDEA but for Android only. Unlike the latter, though, Android studio is free and open-source. With smart coding

assistance and a built-in debugger, it seems the best choice when programming for Android devices.

- **-Visual Studio code,** or simply VS Code, is a free tool backed by Microsoft. It speeds up development and lowers development time to minutes. It works with Windows, macros, and Linux.
- To add to this, you can also ask Flutter questions about what their favorite IDE is and the justification for their choice.

-First, this technology was used and small intensive care was made at home due to the spread of diseases, and this machine is made up of patients and medical staff, and it was used to help the state and the people. Patient: View prescription details View medication from a doctor, View operation history, Manage own profile. Doctor: Manage patient account opening and updating Create and manage appointment with patient Create prescription for patient Provide medication for patients Issue for the operation of patients and creates operation report Manage own profile. Nurse Provide medication according to patient prescription Keep record of patient operation Manage own profile. Also one of our goals is that heart rate changes occur frequently and occur soon or even before early electrographic or clinical change. The change can indicate the timing of the onset of a seizure and the specific rate pattern may be useful for diagnosing seizures and automatic seizure detection. Electrocardiogram abnormalities occur frequently and frequently in several episodes of the patient himself. Strengthening primary health care is essential to achieving the Sustainable Development Goals for health and universal health coverage. This will contribute to other goals beyond the goal of good health and well-being (the third goal of the Sustainable Development Goals), including those relating to poverty eradication, the total eradication of hunger, quality education, gender equality, clean water and hygiene, decent work and economic growth, inequality reduction, and climate action. And that the work team IOT and receive data and deal with artificial intelligence and start creating the application and take data and link it API with databases and display it to the app. Among the objectives are teamwork and state assistance, such as state assistance to us. High level of information privacy of health data between patient and doctor, so the introduction of the wrong to the emergence of wrong decisions may affect health. and write the code in IDE android studio. This application helps to form intensive care in the home intensive care unit and use sensors and ways to connect and store them on databases and that the doctor can follow the situation while in her home to be the intensive care room in each patient's home and measure the temperature, heart attacks, and pressure and give signals that give us the result and know how to

work and use the microcontroller or Arduino and at temperature the type Use MLX 90614 IR Sensor to measure patient temperature sensor is used in infrared rare temperature These components will be integrated. And that the results are entered on artificial intelligence to see whether or not there is a problem or disease and see whether it is normal or not and take the heart rate and start recording it and then see the problem and will use logistic regression with databases and encrypt it and use node ESP8266 has Wi-Fi to connect to the phone and start storing it using SQL SERVER and will also make a repeated question and duty so that the patient is facilitated to find a solution in the fastest form It's possible

3.5-DATABASE

3.5.1 - What Is a Database?

A database is an organized collection of structured information, or data, typically stored electronically in a computer system. A database is usually controlled by a database management system (DBMS). Together, the data and the DBMS, along with the applications that are associated with them, are referred to as a database system, often shortened to just database.

3.5.2 - What are databases used for?

Businesses use data stored in databases to make informed business decisions. Some of the ways organizations use databases.

3.5.3- Types of databases

1 – Relational Database

2 – Object-oriented Database

3 – Distributed databases

4 - Data warehouses

5 - Multimodal database

Programs used in databases

3.5.4- Workbench Program?

is the standard language for dealing with Relational Databases ,can be used to insert, search, update, and delete database records. and can do lots of other operations

3.5.5- What is SQL used for?

- It helps users to access data in the RDBMS system.
- It helps you to describe the data.
- It allows you to define the data in a database and manipulate that specific data.
- -With the help of SQL, you can create and drop databases and tables. -SQL offers you to use the function in a database, create a view, and stored procedure
- You can set permissions on tables, procedures, and views.

3.5.6-Types of SQL Statements?

- Data Definition Language (DDL)
- Data Manipulation Language (DML)
- Data Control Language (DCL)

3.5.7-List of SQL Commands

- **CREATE** – defines the database structure schema.
- **INSERT** – inserts data into the row of a table.
- **UPDATE** – updates data in a database.
- **DELETE** – removes one or more rows from a table.
- **SELECT** – selects the attribute based on the condition.
- **DROP** – removes tables and databases

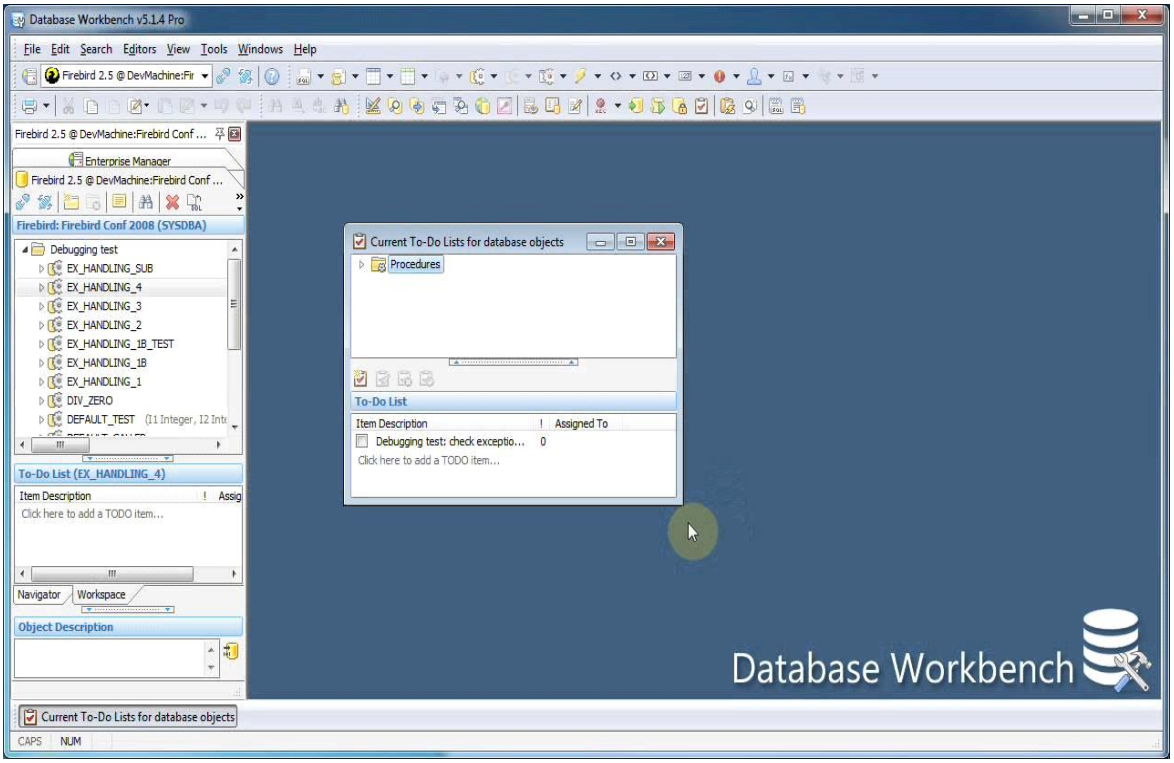


Figure 3.7 (database Workbench)

3.5.8 Connecting between flutter and database?

-SQL is a open-source database management system. The name My point founder Michael Wideners and SQL name is abbreviation of Structured Query Language. It's used for data warehousing, web applications, billing sectors, Software . Domain etc. We able to store and access any type of values, the help of sql queries. After connecting database

```
var settings = new ConnectionSettings(
  host: 'localhost',
  port: 3306,
  user: 'vetri',
  password: 'vetrimca',
  db: 'india'
);
var conn = await MySqlConnection.connect(settings);
```

Once the database is connected successfully, we start to insert data from the table. In below one simple example how store data from SQL server using flutter.

```
var results = await query.queryMulti(
    'insert into users (name, email, age) values (?, ?, ?)',
    [['vetri', 'vetri@gmail.com', 26],
    ['boss', 'boss@gmail.com', 28],
    ['selva', 'selva@gmail.com', 29]]);
```

INTRODUCTION TO UML

3.5.9- UML Design

The Unified Modeling Language (UML) is a standard language for specifying, visualizing, constructing, and documenting the software system and its components. It is a graphical language, which provides a vocabulary and set of semantics and rules. The UML focuses on the conceptual and physical representation of the system. It captures the decisions and understandings about systems that must be constructed. It is used to understand, design, configure, maintain, and control information about the systems.

The uml is language for :

- Visualizing
- Specifying
- Constructing
- Documenting

-Visualizing

Through UML we see or visualize an existing system and ultimately we visualize how the system is going to be after implementation. Unless we think, we cannot implement. UML helps to visualize, how the components of the system communicate and interact with each other.

-Specifying

Specifying means building, models that are precise, unambiguous and complete UML addresses the specification of all the important analysis design, implementation decisions that must be made in developing and deploying a software system.

Constructing

UML models can be directly connected to a variety of programming language through mapping a model from UML to a programming language like JAVA or C++ or VB. Forward Engineering and Reverse Engineering is possible through UML.

-Documenting

The Deliverables of a project apart from coding are some Artifacts, which are critical in controlling, measuring and communicating about a system during its developing requirements, architecture, desire, source code, project plans, tests, prototypes releasers, etc.

3.5.10 - UML Approach:

A diagram is the graphical presentation of a set of elements, most often rendered as a connected graph of vertices and arcs you draw diagram to visualize a system from different perspective so a diagram is a projection into a system. For all but most trivial systems a diagram represents an elided view of the elements that make up a system. The same element may appear in all diagrams, only a few diagrams or

in no diagrams at all. In theory a diagram may contain any combination of things and relationships. In practice however a small number of common combinations arise which are consistent with the five most useful views that comprise the architecture of a software-intensive system. For this reason, the UML includes nine such diagrams:

1) Class diagram
2) Object diagram
3) Use case diagram
4) Sequence diagram
5) Collaboration diagram
6) State chart diagram
7) Activity diagram
8) Component diagram
9) Deployment diagram

3.5.11- USE CASE DIAGRAM:

A use case diagram in the Unified Modeling Language (UML) is a type of behavioral diagram defined by and created from a use-case analysis. Its purpose is to present a graphical overview of the functionality provided by a system in terms of actors, their goals (represented as use cases), and any dependencies between those use cases. Use case diagrams are formally included in two modeling languages defined by the OMG: theunfied modeling language (UML) and the systems modeling language (sysML)

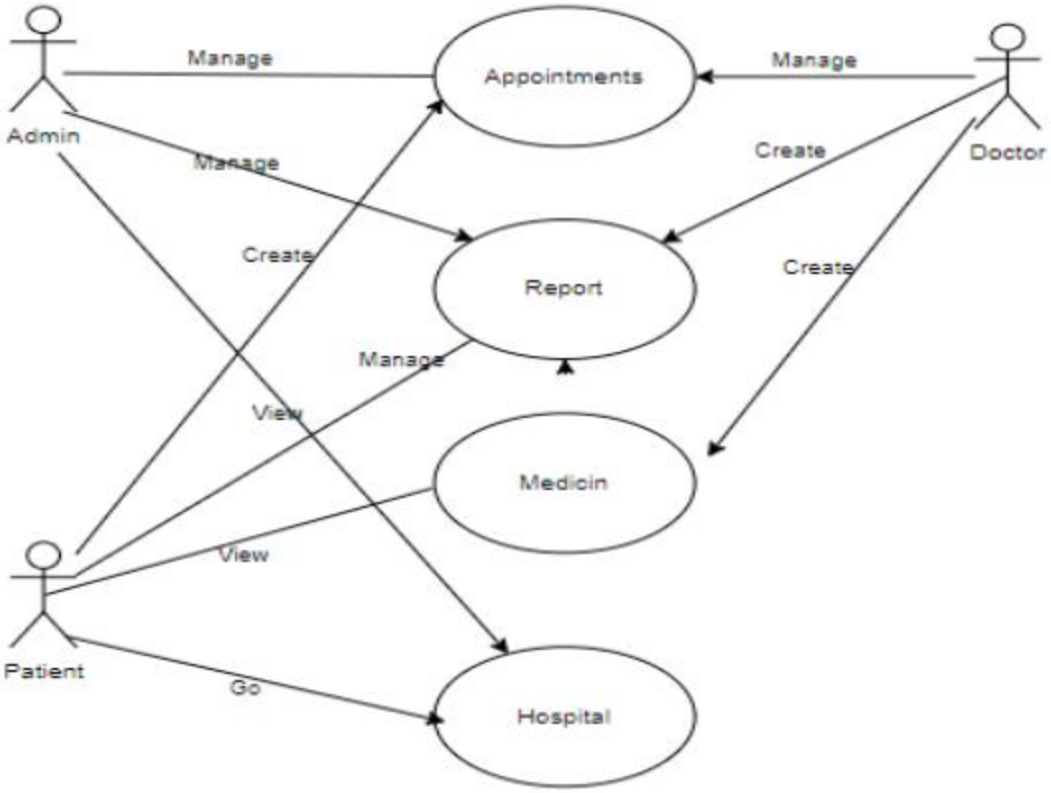


Figure 3.8 (use case duagram)

3.5.13-Employment diagram

A Deployment Diagram shows the configuration of run-time processing nodes and the components that live on them. Deployment diagrams address the static deployment view of architecture. They are related to component diagrams in that a node typically encloses one or more components.

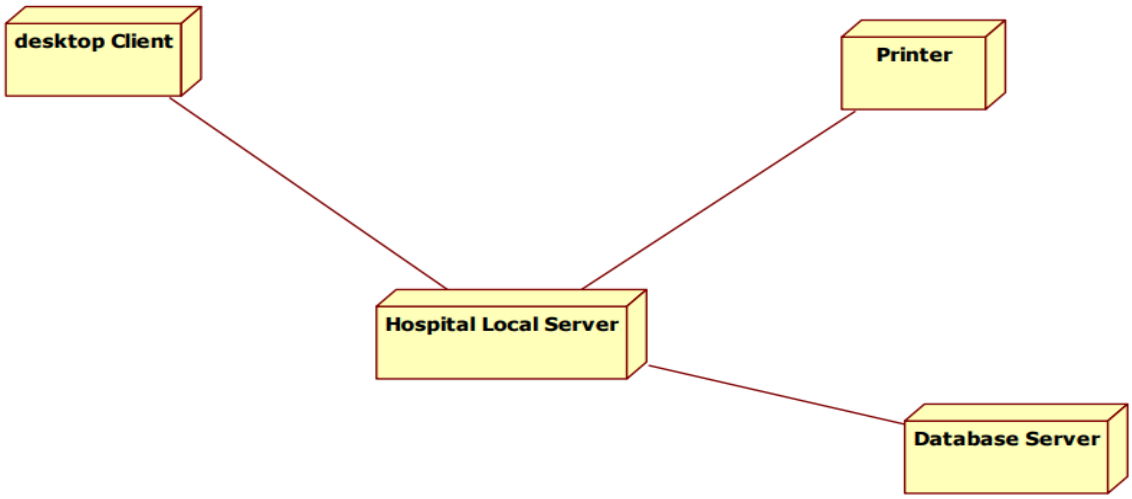


Figure 3.10 (Employment diagram)

3.5.14-Sequence diagram:

A Sequence Diagram is an interaction diagram that emphasis the time ordering of messages; a collaboration diagram is an interaction diagram that emphasizes the structural organization of the objects that send and receive messages. Sequence diagrams and collaboration diagrams are isomorphic, meaning that you can take one and transform it into the other

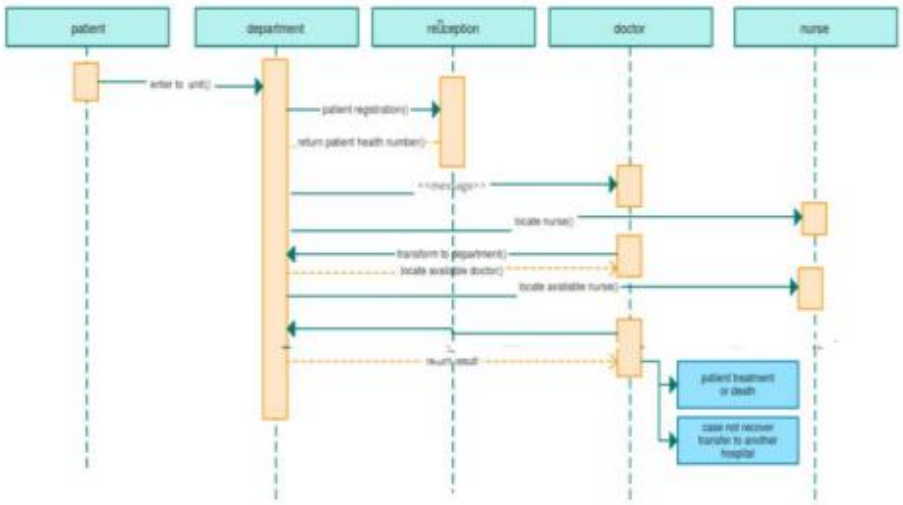


Figure 3.11
(Sequence diagram)

Chapter four
Result

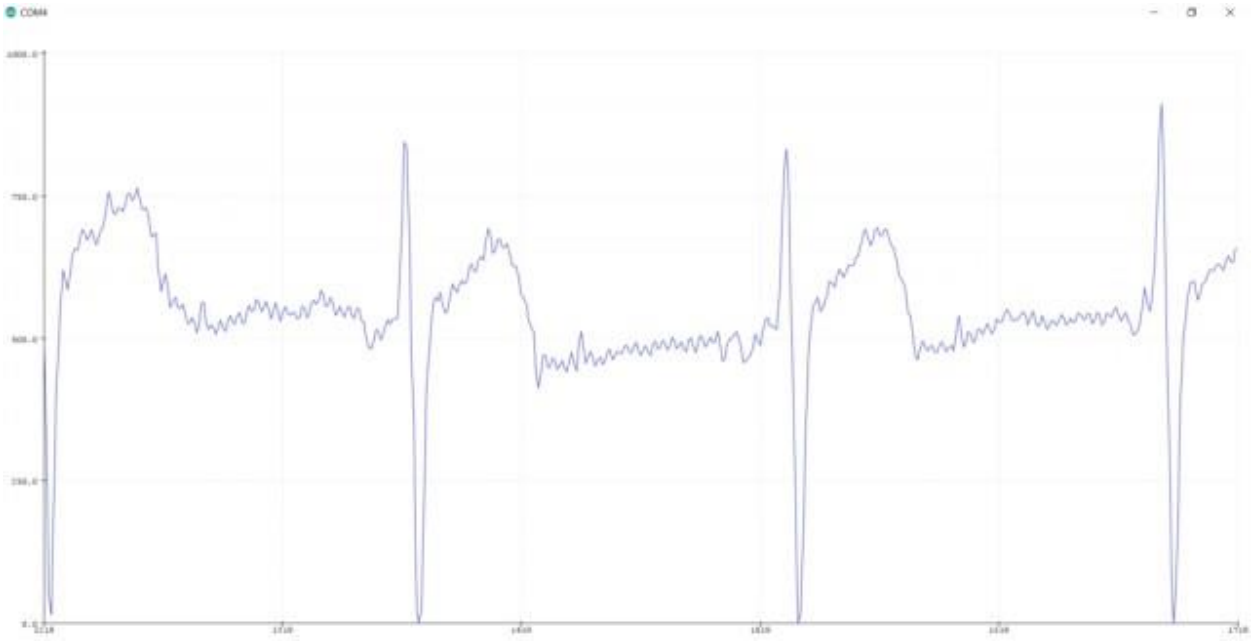
Chapter 4

4.1 Iot

4.1.1 Result & Observations

Once the code is upload, open the Serial Monitor and Set the Buad Rate to 9600. The ECG waveform can be seen below as a visualiations effect on Serial Monitor.

Figure 4.1 (result of ECG)



4.1.2 IoT based ECG Monitoring with AD8232 ECG Sensor & ESP8266

Using the above code you can visualize the ECG waveform on Serial Plotter Screen. But now we want to visualize the ECG waveform remotely from any part of the world. So for that, I won't need to send the signal generated to any IoT platform. For that I used NodMcu v3 to send data to the mobile application using wifi

esp8266 WiFi serial monitor result:

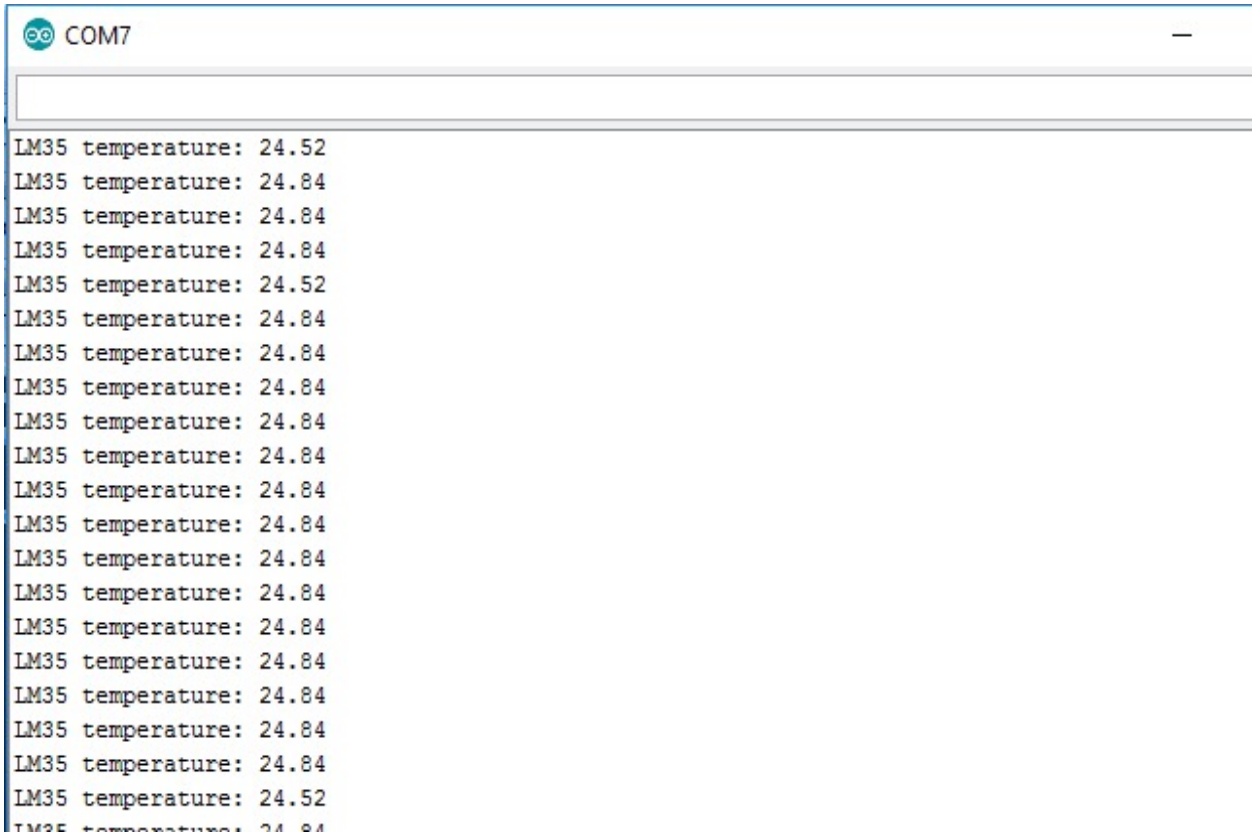


Figure 4.2 (result of tempreture)

4.2 flutter

4.2.1 flutter and database flowchart for application sample of activity and layout

1-Dart is an object-oriented, garbage-collected programming language that you use to develop Flutter apps. It was also created by Google, but is open-source, and has community inside and outside Google. Dart was chosen as the language of Flutter for the following reason: art is AOT (Ahead of Time) compiled to fast, predictable, native code, which allows almost all of Flutter to be written in Dart. This not only makes Flutter fast, virtually everything (including all the widgets) can be customized. Art can also be JIT (Just In Time) compiled for exceptionally fast development cycles and game-changing workflow (including Flutter's popular sub-second stateful hot reload). Dart allows Flutter to avoid the need for a separate declarative layout language like JSX or XML, or separate visual interface builders because Dart's declarative, programmatic layout is easy to read and visualize. And with all the layouts in one language and one place, it is easy for Flutter to provide advanced tooling that makes the layout a snap.

2- This study aims to identify the impact of smart applications on health care, identify the advantages of using smart applications in healthcare and propose solutions in overcoming the difficulties that hinder their use. Health care delivery.

3- Technology development used around the world uses engineers and scientists around the world sensors. Radiation sensors: Electronic devices that sense the presence of alpha, beta or gamma particles and provide signals to meters and projectors.

4- Strengthening primary health care is essential to achieving the Sustainable Development Goals for health and universal health coverage. This will contribute to other goals beyond the goal of good health and well-being (the third goal of the Sustainable Development Goals), including those relating to poverty eradication, the total eradication of hunger, quality education, gender equality, clean water and hygiene, decent work and economic growth, inequality reduction and climate action.

5- Start the program and enter the data and login, if data correct yes enter data if data no correct enter data again. And check data if data correct predict data, if data no correct check data again and end the program.

6- Among all fatal disease, heart attacks diseases are considered as the most prevalent. Medical practitioners conduct different surveys on heart diseases and gather information of heart patients, their symptoms and disease progression. Increasingly are reported about patients with common diseases who have typical symptoms. In this fast moving world people want to live a very luxurious life so they work like a machine in order to earn lot of money and live a comfortable life therefore in this race they forget to take care of themselves, because of this there food habits change their entire lifestyle change, in this type of lifestyle they are more tensed they have blood pressure, sugar at a very young age and they don't give enough rest for themselves and eat what they get and they even don't bother about the quality of the food if sick the go for their own medication as a result of all these small negligence it leads to a major threat that is the heart disease.

7 -scope:

- Reduce medical errors.
- Enhance patient safety.
- Decrease unwanted practice variation.
- Improve patient outcome.

8-purpose:

- Helps avoid human biases.
- Reduce medical errors.
- Reduce the cost of medical tests

9-function:

- User should be enter data correctly.
- The system should be connected by internet.
- Authentication.

10- To develop the provision of doctors for various services and electronic interconnection between health institutions in Different regions in order to obtain an accurate diagnosis of the patient's condition, which will contribute to the creation of digital repositories containing data Accurate and structured medical support for scientific research in medical journals.

11- Heart disease can be managed effectively with a combination of lifestyle changes, medicine and, in some cases, surgery. With the right treatment, the symptoms of heart disease can be reduced and the functioning of the heart improved. The predicted results can be used to prevent and thus reduce cost for

surgical treatment and other expensive. The overall objective of my work will be to predict accurately with few tests and attributes the presence of heart disease. Attributes considered form the primary basis for tests and give accurate results more or less. Many more input attributes can be taken but our goal is to predict with few attributes and faster efficiency the risk of having heart disease. Decisions are often made based on doctors' intuition and experience rather than on the knowledge rich data hidden in the data set and databases. This practice leads to unwanted biases, errors and excessive medical costs which affects the quality of service provided to patients. And Predict if the patient has a heart disease or not.

12- We believe that it is important to make the various process modelling methods more easily accessible to health care by providing clear guidelines or computer-based tool support for health care-specific process modelling. These supports can assist health care workers to apply initially unfamiliar, but eventually more effective modelling methods

13- This technology was used and small intensive care was made at home due to the spread of diseases, and this machine is made up of patients and medical staff, and it was used to help the state and the people. Patient: View prescription details View medication from a doctor, View operation history, Manage own profile. Doctor: Manage patient account opening and updating Create and manage appointment with patient Create prescription for patient Provide medication for patients Issue for the operation of patients and creates operation report Manage own profile. Nurse Provide medication according to patient prescription Keep record of patient operation Manage own profile.

4.2.2 What is a flowchart?

A flowchart is a diagram that depicts a process, system or computer algorithm. They are widely used in multiple fields to document, study, plan, improve and communicate often complex processes in clear, easy-to-understand diagrams. Flowcharts, sometimes spelled as flow charts, use rectangles, ovals, diamonds and potentially numerous other shapes to define the type of step, along with connecting arrows to define flow and sequence. They can range from simple, hand-drawn charts to comprehensive computer-drawn diagrams depicting multiple steps and routes. If we consider all the various forms of flowcharts, they are one of the most common diagrams on the planet, used by both technical and non-technical people in numerous fields. Flowcharts are sometimes called by more specialized

names such as Process Flowchart, Process Map, Functional Flowchart, Business Process Mapping, Business Process Modeling and Notation (BPMN),or Process Flow Diagram (PFD). They are related to other popular diagrams, such as Data Flow Diagrams (DFDs) and Unified Modeling Language (UML) Activity Diagrams.

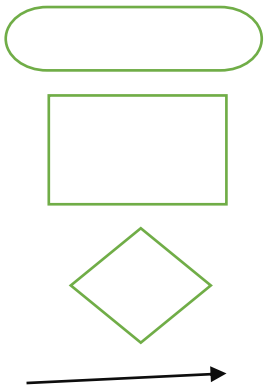
Flowchart symbols.

1-Terminal / Terminator

2=Process

3-Decision

4-Flow Arrow



Uses of Flowchart:

- Planning a new project
- Modeling a business process
- Mapping computer algorithms
- Data management
- Managing workflow

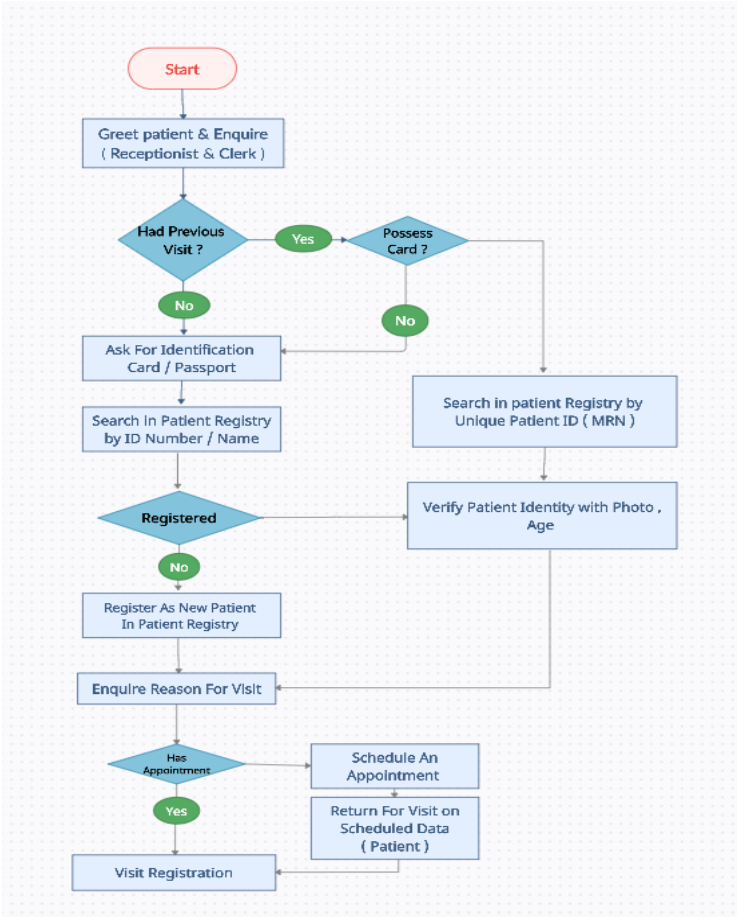


Figure 4.3 (flowchart)

4.2.3 What is Activity Diagram?

Activity diagram is another important behavioral diagram in UML diagram to describe dynamic aspects of the system. Activity diagram is essentially an advanced version of flow chart that modeling the flow from one activity to another activity.

When to Use Activity Diagram?

Activity Diagrams describe how activities are coordinated to provide a service which can be at different levels of abstraction. Typically, an event needs to be achieved by some operations, particularly where the operation is intended to achieve a number of different things that require coordination, or how the events in a single use case relate to one another, in particular, use cases where activities may overlap and require coordination. It is also suitable for modeling how a collection of use cases coordinate to represent business workflows

1-Model workflows between/within use cases.

2-Identify pre- and post-conditions (the context) for use cases.

3-Model in detail complex activities in a high level activity Diagram.

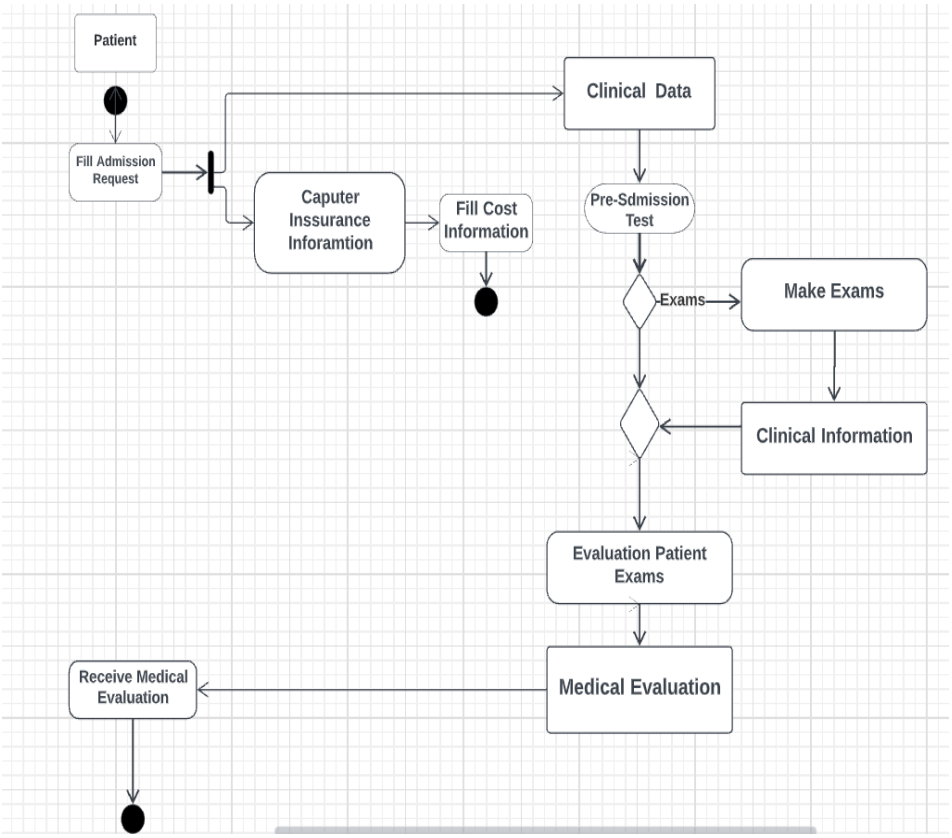
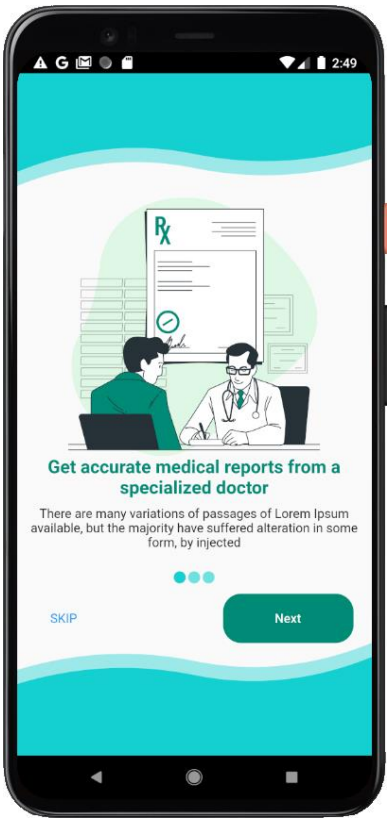
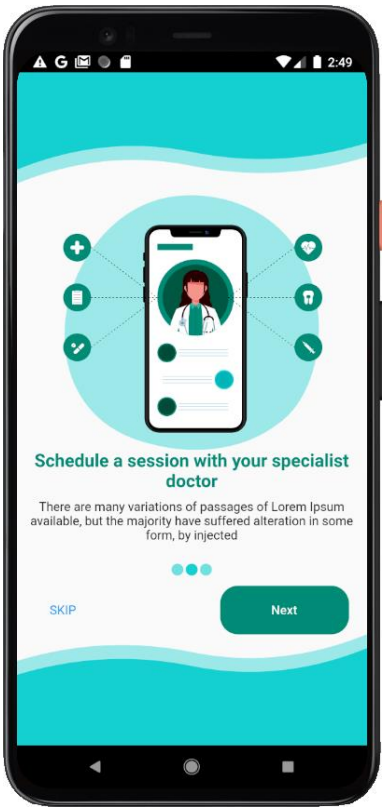
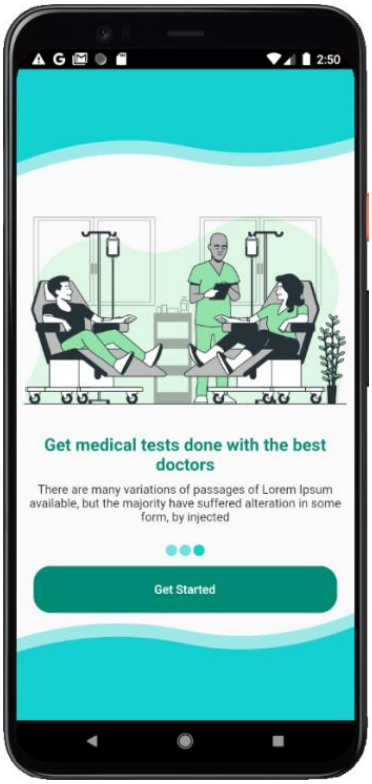


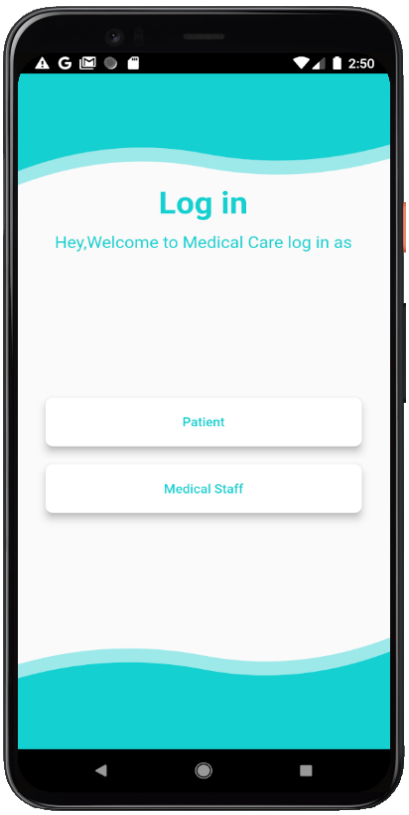
Figure 4.4 (activity diagram)

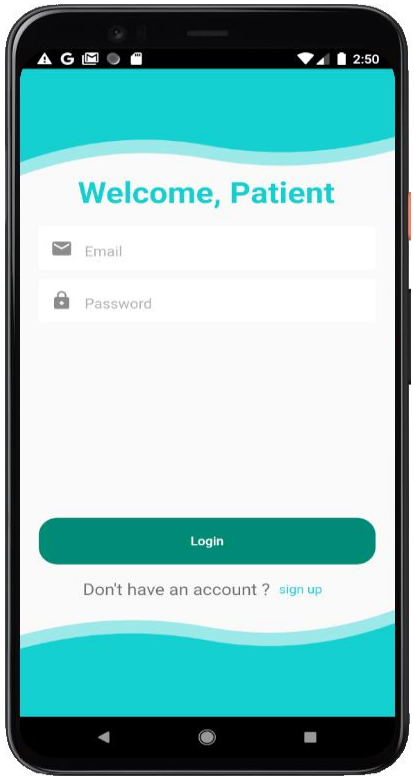
4.2.4 Authorization, Authentication

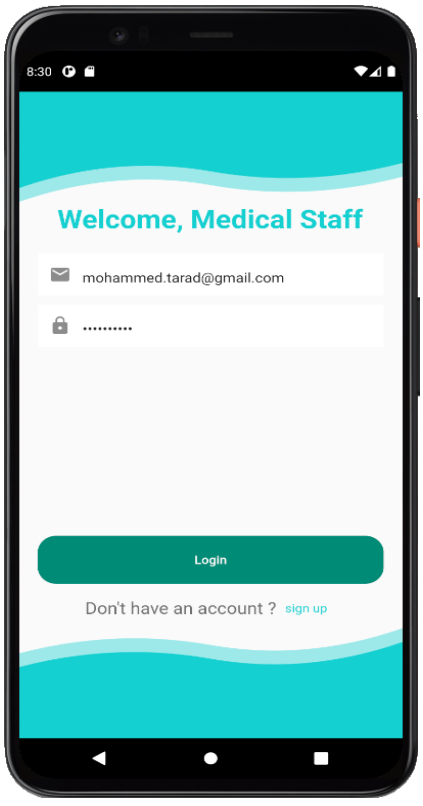


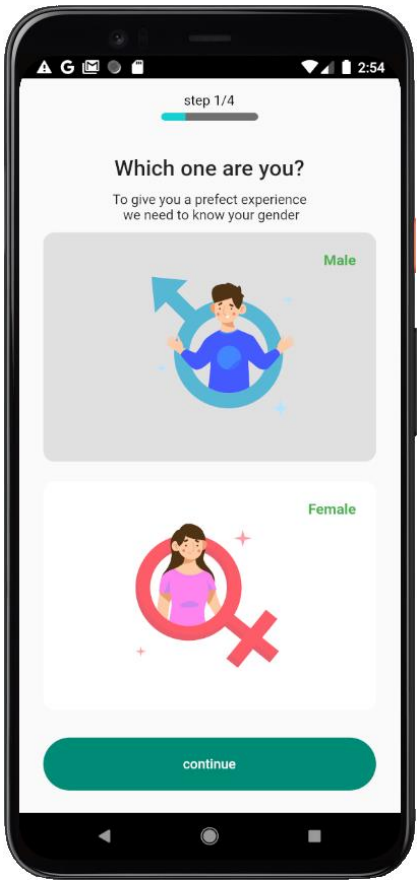




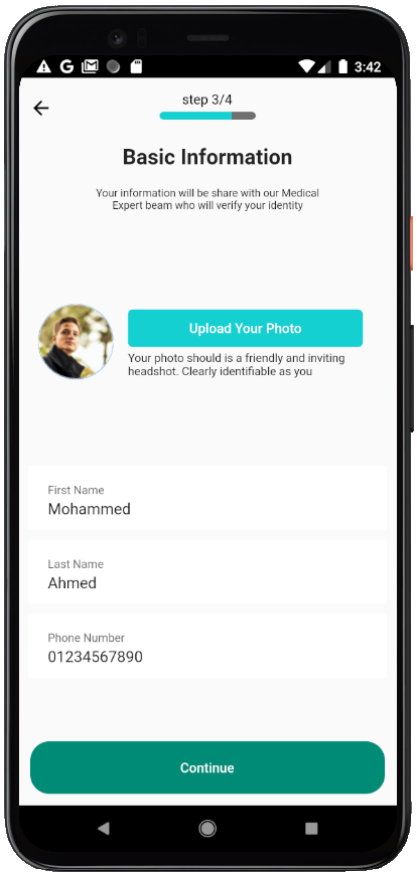


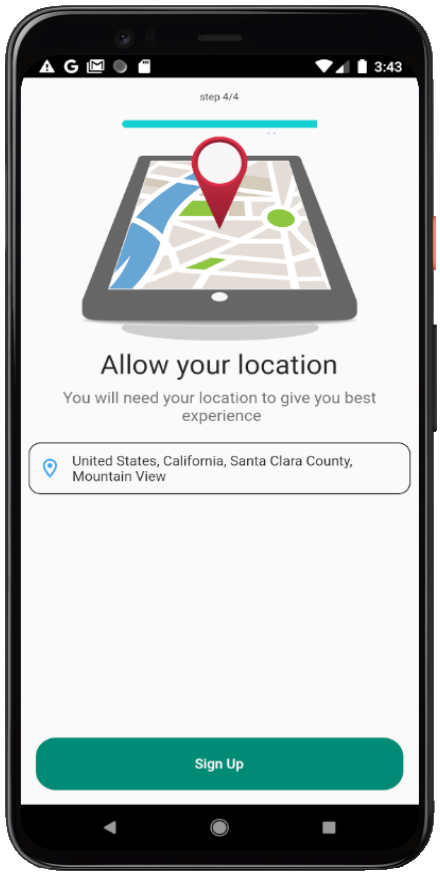


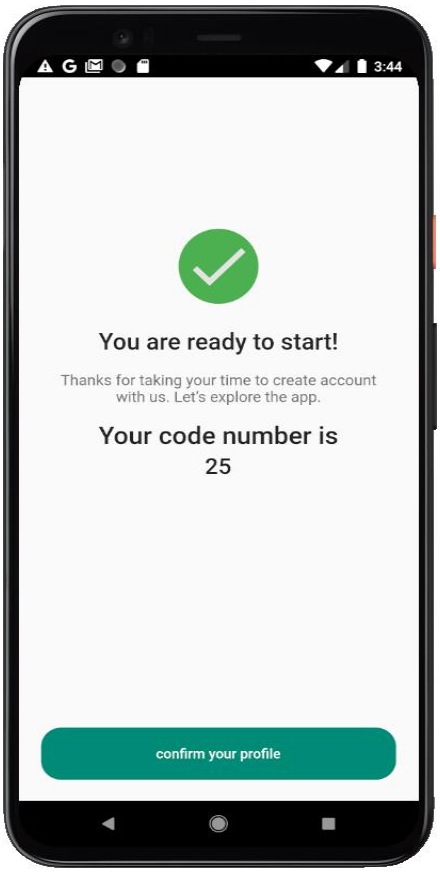


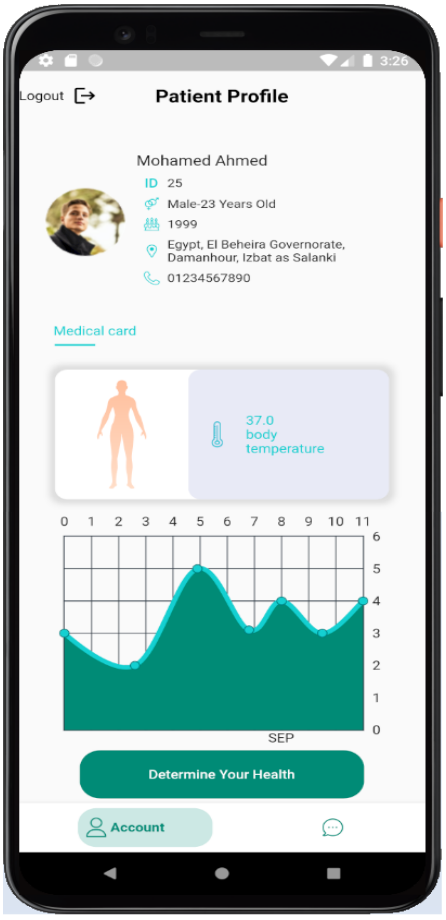

step 1/4
Which one are you?
To give you a prefect experience we need to know your gender
Male
Female
continue

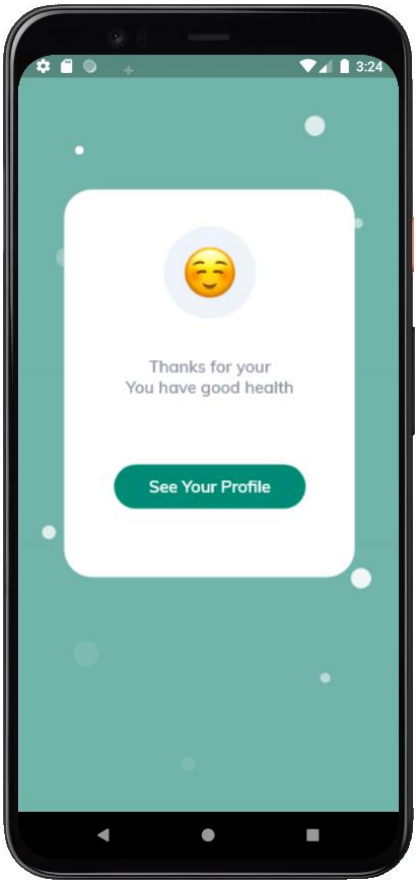
step 2/4
How old are you?
23
Continue

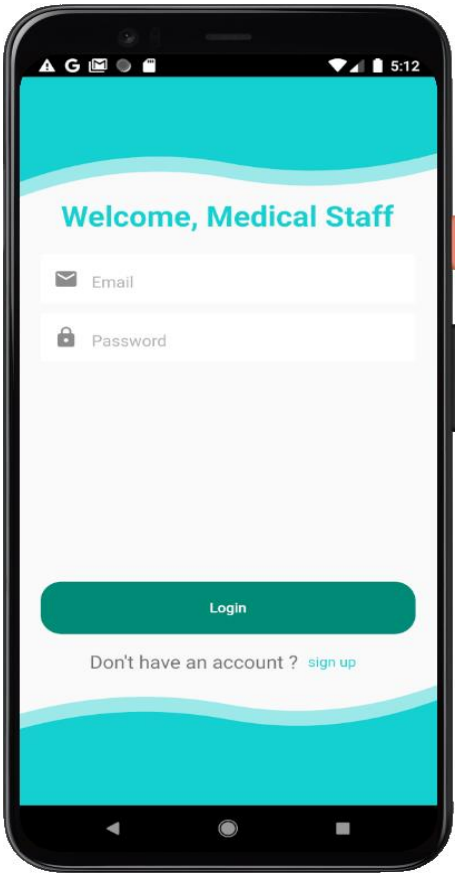

step 3/4
Basic Information
Your information will be share with our Medical Expert beam who will verify your identity
Upload Your Photo
Your photo should is a friendly and inviting headshot. Clearly identifiable as you
First Name
Mohammed
Last Name
Ahmed
Phone Number
01234567890
Continue

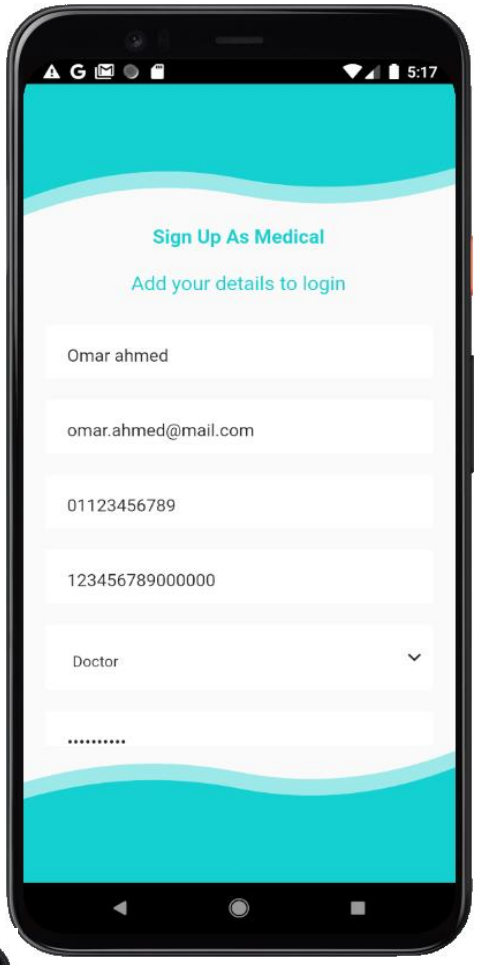

step 4/4
Allow your location
You will need your location to give you best experience
United States, California, Santa Clara County, Mountain View
Sign Up

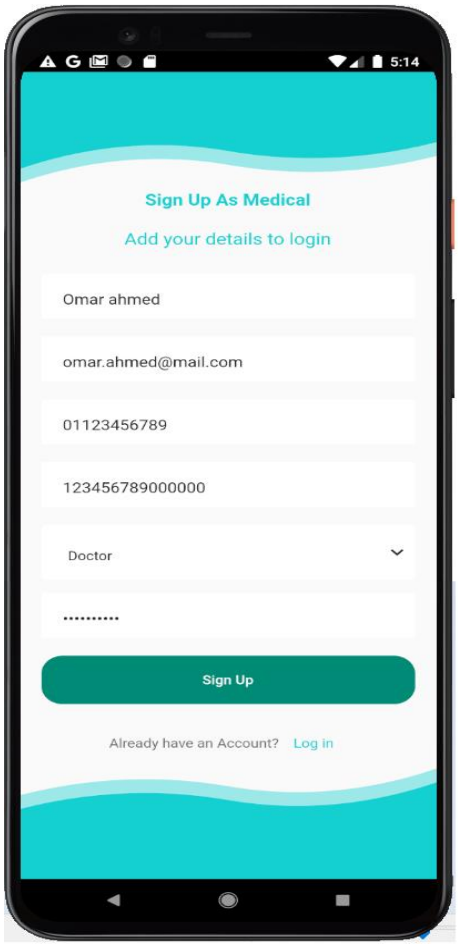

You are ready to start!
Thanks for taking your time to create account with us. Let's explore the app.
Your code number is
25
confirm your profile

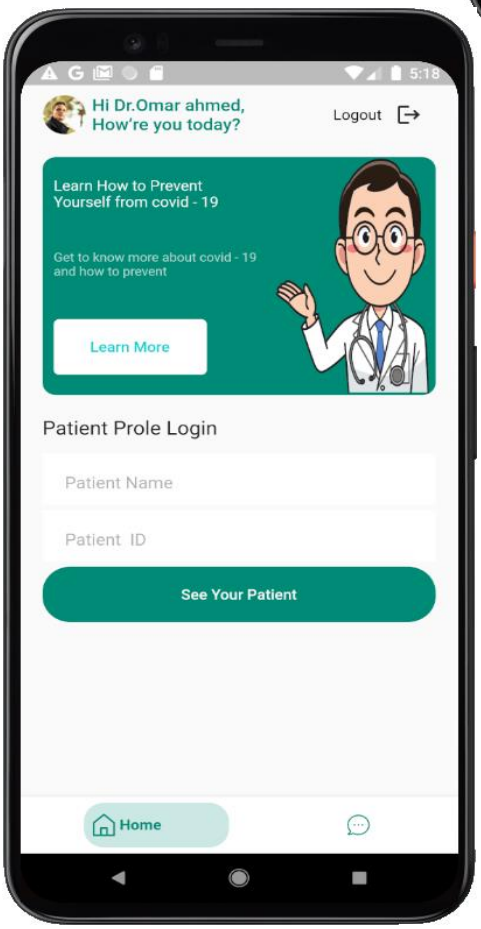

Logout
Patient Profile
Mohamed Ahmed
ID 25
Male-23 Years Old
1999
Egypt, El Beheira Governorate, Damanhour, Izbat as Salanki
01234567890
Medical card
37.0
body
temperature
SEP
Determine Your Health
Account

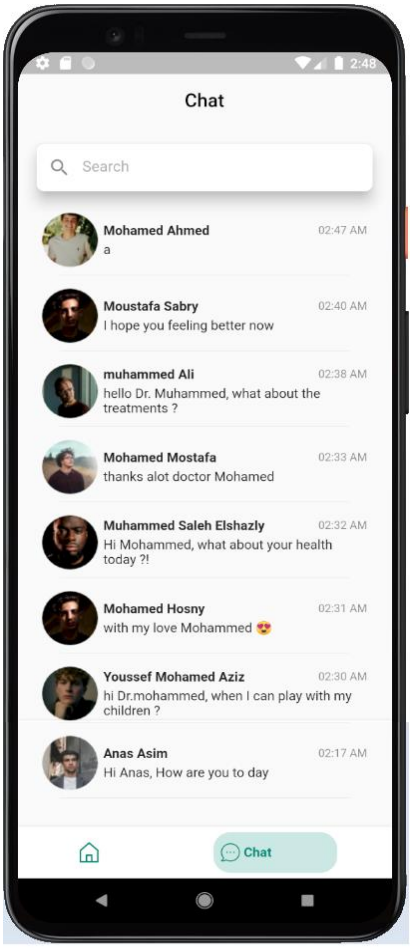

Thanks for your
You have good health
See Your Profile


Welcome, Medical Staff
Email
Password
Login
Don't have an account ? sign up


Sign Up As Medical
Add your details to login
Omar ahmed
omar.ahmed@mail.com
01123456789
123456789000000
Doctor


Sign Up As Medical
Add your details to login
Omar ahmed
omar.ahmed@mail.com
01123456789
123456789000000
Doctor
Sign Up
Already have an Account? Log in


Hi Dr.Omar ahmed,
How're you today?
Logout
Learn How to Prevent
Yourself from covid - 19
Get to know more about covid - 19
and how to prevent
Learn More
Patient Prole Login
Patient Name
Patient ID
See Your Patient
Home


Chat
Search
Mohamed Ahmed
02:47 AM
a
Moustafa Sabry
02:40 AM
I hope you feeling better now
muhammed Ali
02:38 AM
hello Dr. Muhammed, what about the treatments ?
Mohamed Mostafa
02:33 AM
thanks alot doctor Mohamed
Muhammed Saleh Elshazly
02:32 AM
Hi Mohammed, what about your health today ?!
Mohamed Hosny
02:31 AM
with my love Mohammed
Youssef Mohamed Aziz
02:30 AM
hi Dr.mohammed, when I can play with my children ?
Anas Asim
02:17 AM
Hi Anas, How are you to day
Chat

4.3 Deep learning Flowchart of proposed ml system and discussion

4.3.1 Resamble Data

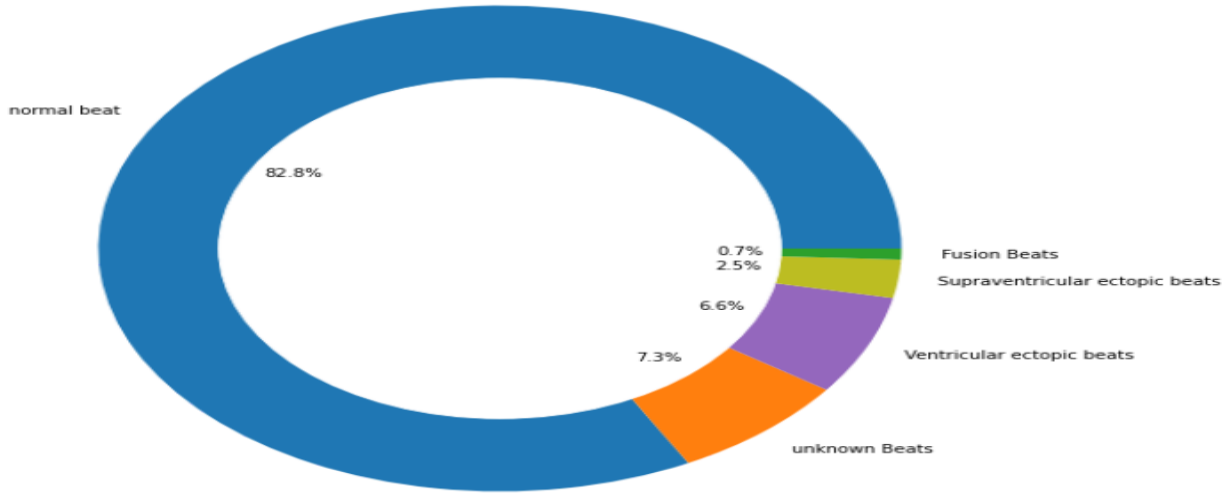


figure 4.5 (Data Before Resamble)

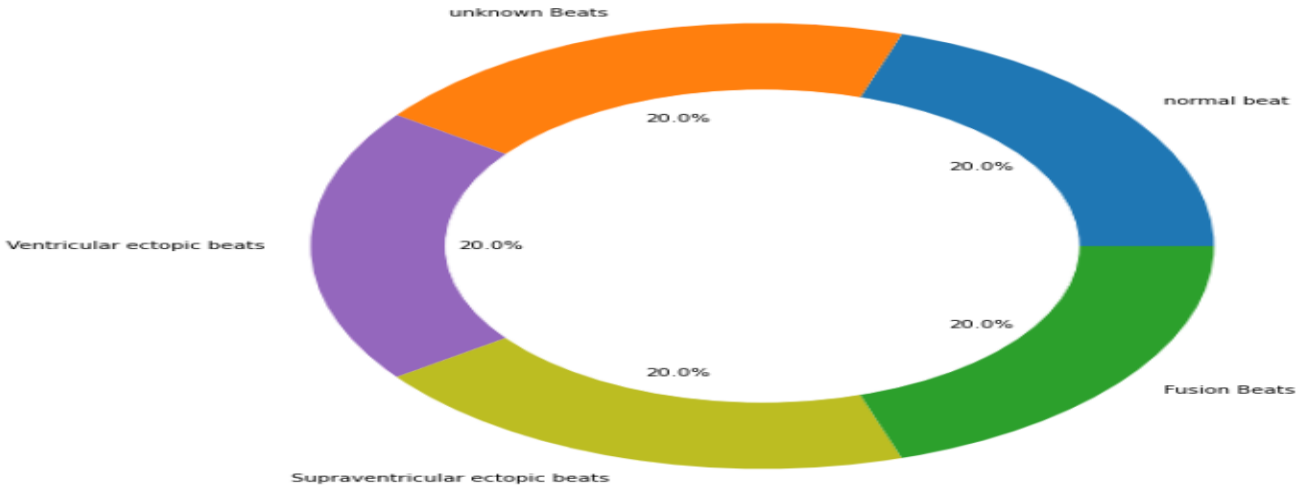
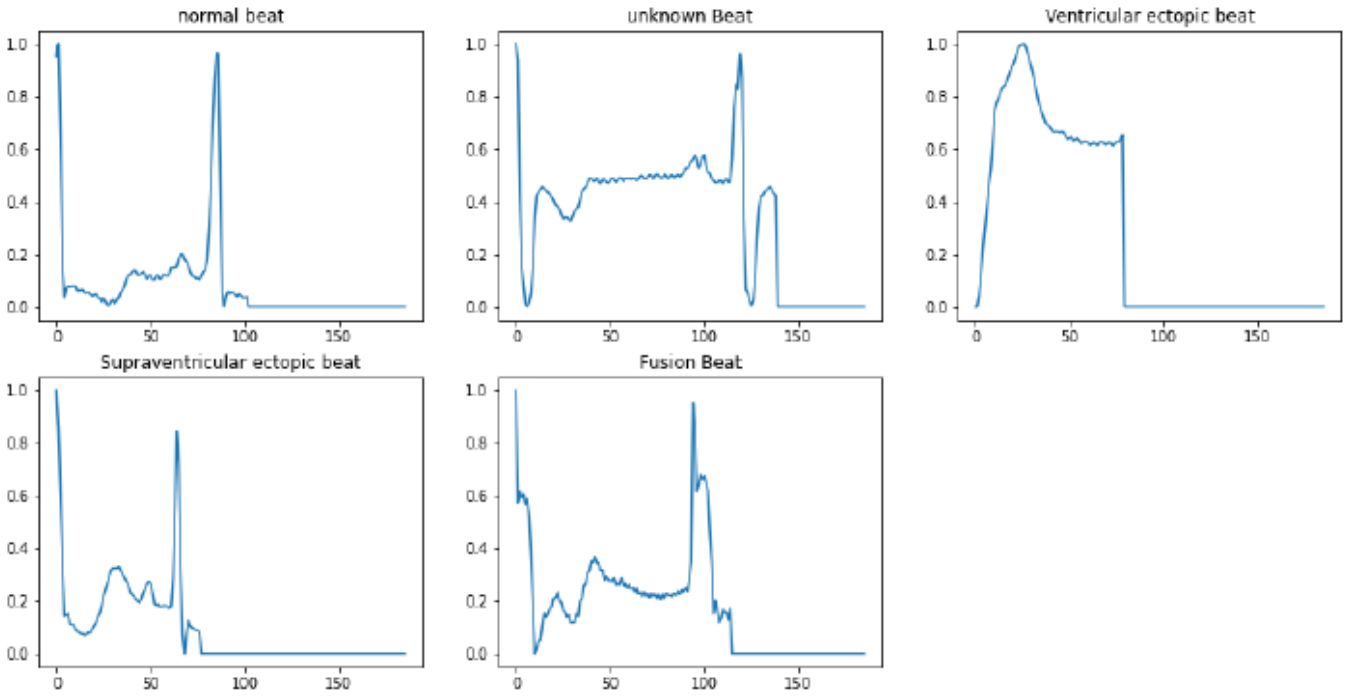


Figure 4.6 (data after Resamble)

4.3.2 -Types Of Beats

figure (4.7) Type Of Beats



4.3.3-Result of Training Model

```
Epoch 1/5
3125/3125 [==============================] - 63s 20ms/step - loss: 0.1876 - acc
uracy: 0.9326 - val_loss: 0.2101 - val_accuracy: 0.9313
Epoch 2/5
3125/3125 [==============================] - 62s 20ms/step - loss: 0.0735 - acc
uracy: 0.9747 - val_loss: 0.1350 - val_accuracy: 0.9578
Epoch 3/5
3125/3125 [==============================] - 62s 20ms/step - loss: 0.0480 - acc
uracy: 0.9838 - val_loss: 0.1572 - val_accuracy: 0.9538
Epoch 4/5
3125/3125 [==============================] - 61s 20ms/step - loss: 0.0393 - acc
uracy: 0.9869 - val_loss: 0.1327 - val_accuracy: 0.9673
Epoch 5/5
3125/3125 [==============================] - 61s 20ms/step - loss: 0.0314 - acc
uracy: 0.9900 - val_loss: 0.1140 - val_accuracy: 0.9749
Accuracy: 97.49%
```

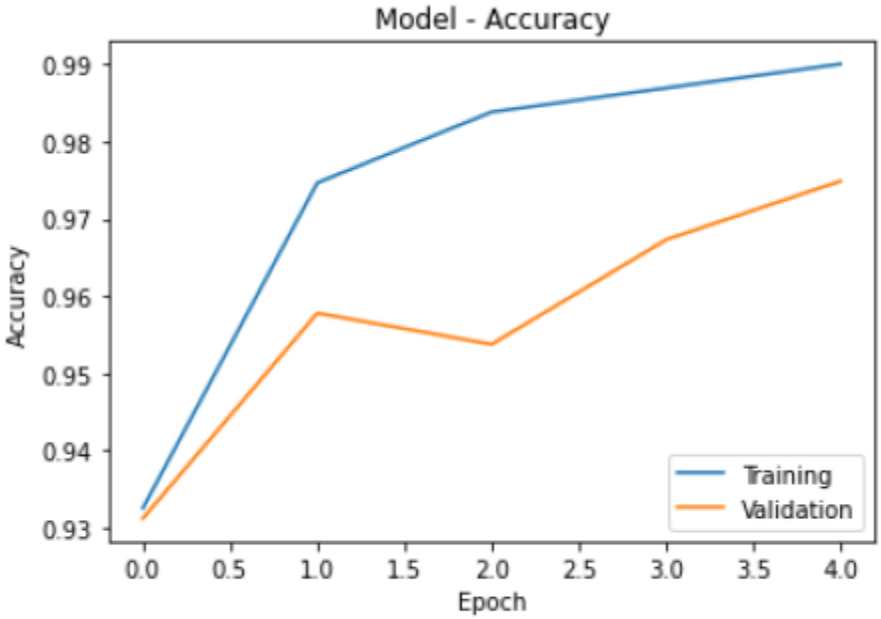


Figure 4.8 (Accuracy Vs Epoch Graph)

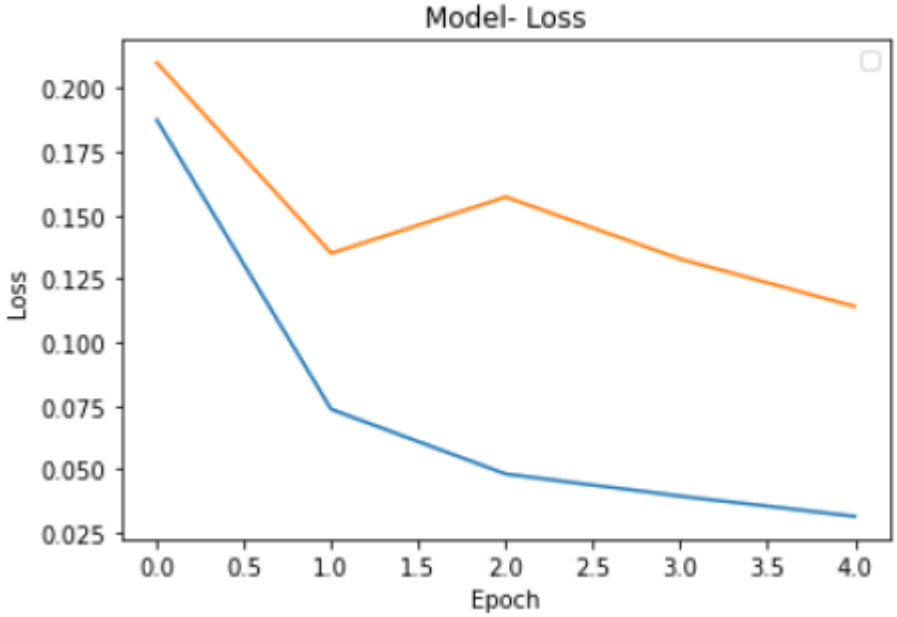


Figure 4.9 (of Loss Vs Epoch Graph)

4.3.4 A flowchart

Is a type of diagram that represents a workflow or process A flowchart can also be defined as a diagrammatic representation of an algorithm, a step-by-step approach to solving a task.

The flowchart shows the steps as boxes of various kinds, and their order by connecting the boxes with arrows. This diagrammatic representation illustrates a solution model to a given problem. Flowcharts are used in analyzing, designing, documenting or managing a process or program in various fields. We can see the flowchart in **Figure(4.7)**

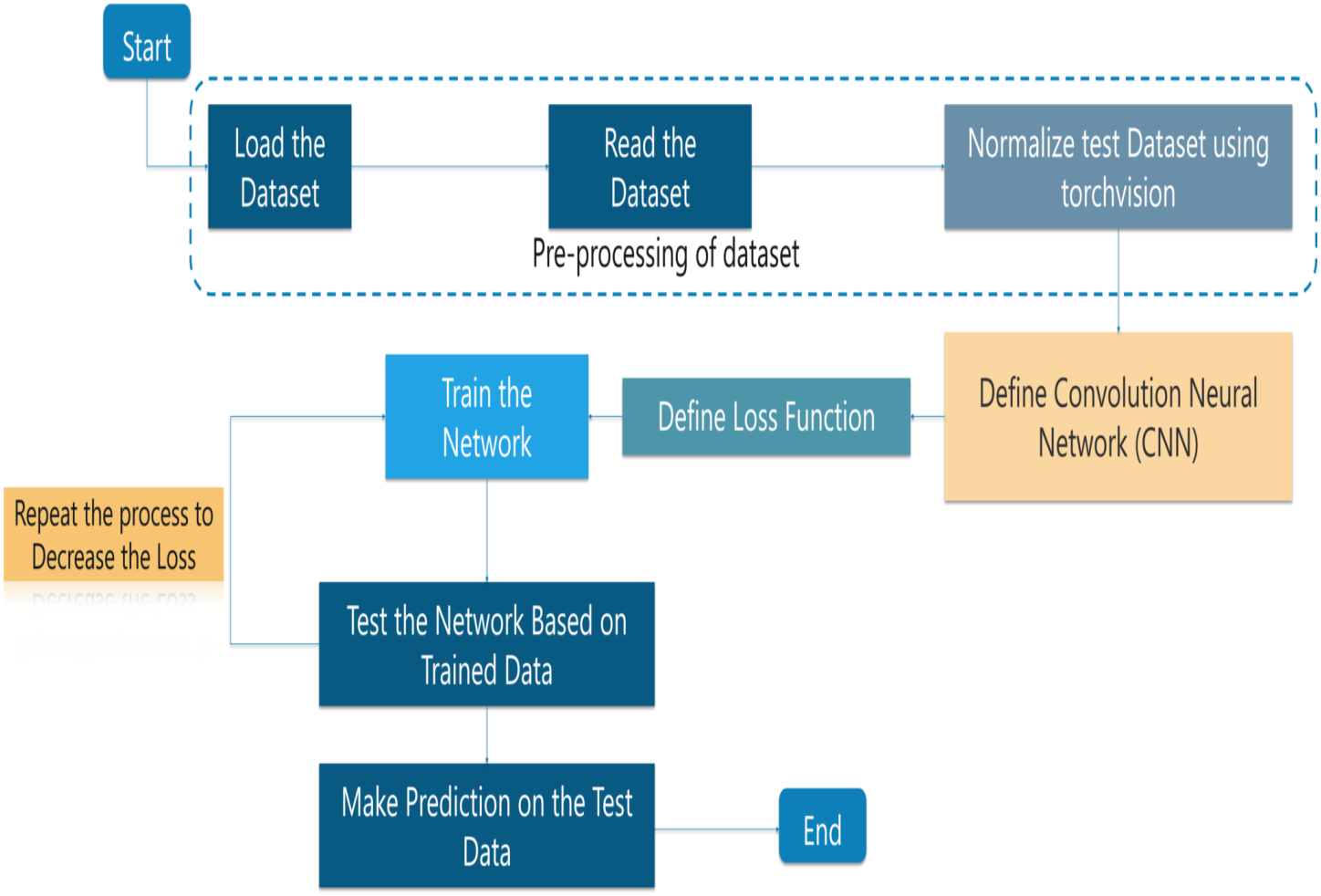


Figure 4.10 (Flowchart of CNN algorithm)

4.4 Overall system overview and integration between previous mentioned topics

It is a medical project that serves patients and consists of three sections, the patient, the doctor, and the nurse. Each section contains several pages of its own, each with its own tasks

The patient can create his own personal file. The doctor also has a file, and the patient is divided according to the patient's choice for the competent department. Each patient has the doctor who is specialized in his case. No one can access the personal file of the patient except the doctor who is specialized in the case. Each patient has a personal account number owned by the competent doctor only, so that no personal information about the case is released

The nurse can communicate with the patient, follow up on his case, and inform the doctor who specializes in the evolution of the situation. Likewise, the patient can communicate with the competent doctor and request a meeting to attend with the competent doctor to review the developments of the case. The application can measure the oxygen rate, heart strokes, and the temperature of the patient, and put it in the personal file of each patient

user module (patient)

- Create a personal account
- Choosing a specialist doctor to follow up on my case
- Communicate with the nurse and doctor to follow up on everything new
- Providing a personal account number so that the doctor can follow up on the case without disclosing any personal information

Doctor module

- Create a personal account
- Choosing a patient to follow up on
- Providing all the patient needs in terms of consultations via chat or calling, as well as attendance sessions

- Always Record the development of the patient's condition in his personal file

Nurse module

- Create a personal account View medication from doctor
- Taking into account the patient’s condition and Providing complete care to each patient
- Follow up on his case, and inform the doctor who specializes in the evolution of the situation. Manage own profile

CHAPTER FIVE
CONCLUSION AND FUTURE WORK

Chapter 5

5.1 Conclusion

Nowadays, humanity turns everything into doing remotely because of the CORONA virus people learned how to use new technologies so we tried to find solution about this kind of change in the world. It is to have focused care in every home to reassure all ages in society, especially the elderly, because of myocardial weakness with increased age. Let's communicate and help each patient with the necessary procedure so he can be healthy. This reduces hospital crowding in order to avoid the spread of diseases and shorten the way for the patient, because the older the age, the more difficult it is for the patient to move, especially heart patients. In an easy way for any user to deal with and easy to download on different devices Mobile medical apps are changing the way the world and health consumers handle their personal health care. These applications allow the health consumers to track their own health such as heart health and make their adjustments according to their lifestyles. The FDA is taking precautions to review these apps to make sure they are safe and function properly. Non-profit organizations will be able to reach more people and organizations profit are looking at an increase in future revenue. The financial management staff takes care of fiscal planning and also makes sure the money is used accordingly. When the FDA regulations and rules begin to weed out the unnecessary apps the remaining apps can be used to increase revenue. The cost would be moderate considering that the current apps are either free or inexpensive. The future especially possibilities of these apps are endless since clinicians are going to use these apps as well

5.2 Future works

The combination of IoT and healthcare will have huge benefits as well as health status Monitoring, self-care and discovering new ways to prevent and control diseases Tests and diagnosis and that's what we've been targeting in our healthcare system. The Internet of Things could make healthcare cheaper and more efficient in the future. can help create More customized and patient-oriented equipment. Moreover, IoT will enable patients to access it better access to personal data and care; Thus, leading to fewer visits to the hospital. The recent COVID-19 pandemic reminded us that human health is the most important thing in this world Our project attempted to implement a healthcare system that supports healthcare workers and The patients. In the future, we want this healthcare system to be implemented in all national hospitals as is Many patients in those hospitals need a lot of care and help from health care workers so we You want to help them in our healthcare system to get better service and reduce cost The hospital and we also want to help healthcare workers get a more organized system It helps them get their work done without the risk of getting infected with any virus.

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Link github

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