DESIGN AND IMPLIMENTATION OF A PLATFORM FOR PANDEMIC CONTROL USING ARTIFICAL INTELLIGENCE (A CASE STUDY OF COVID- 19 GLOBAL PANDEMIC)

BY

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BEING A PROJECT WORK SUBMITTED TO THE DEPARTMENT OF COMPUTER SCIENCE, SCHOOL OF INFORMATION AND COMMUNICATION TECHNOLOGY, AUCHI POLYTECHNIC, AUCHI, EDO STATE.

IN PARTIAL FULFILLMENT FOR THE REQUIREMENTS FOR THE AWARD OF HIGHER NATIONAL DIPLOMA (HND) IN COMPUTER SCIENCE AUCHI POLYTECHNIC, AUCHI, EDO STATE.

FEBURARY, 2022

CERTIFICATION

We the undersigned certify that this project was carried out by; **EGBE JOHN** With **Mat No:ICT/6251840407,** in the department of computer science.

We also certify that the work is adequate in scope and quality in partial fulfillment of the requirement for the award of Higher National Diploma in Computer Science.

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MR. OLUBODUN FORD **DATE**
(Project Supervisor)

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MR. AKHETUAMEN, S.O. **DATE**
(Head of Department)

DEDICATION

This project is dedicated to God almighty the giver of knowledge and to my wonderful parent and siblings. I love you all undoubtedly.

ACKNOWLEDGEMENT

My profound gratitude goes to the almighty god, the father of wisdom who has guided my step this far. This project would not have been completed without the valuable contribution of my supervisor, friends and family. I would like to express my gratitude and appreciation for the support and contribution of everyone who assisted me during this project.

I owe my deepest gratitude to my supervisor; **MR. OLUBODUN FORD** for his encouragement and assistance during the course of my research. I appreciate his devotion to help me achieve my goals. Also my head of department **MR. AKHETUAMEN, S.O** and the entire lecturers in the department of computer science for knowledge they impacted in me.

I would like to express my deepest gratitude goes to my parents; **MR. AND MRS. EGBE** for their financial support, moral teaching, love care and motivation, and also my appreciation goes to my family and friends for their prayer and advice.

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ABSTRACT

This project provides an overview of the multiple ways that artificial intelligence has been either used or suggested as a tool in the context of the COVID-19 pandemic. This project identifies and analyzes two specific classes of applications of AI that have already been implemented and which present potentially stark implications for marginalized and vulnerable populations (sorting and surveillance.) For each application, their technical attributes are detailed, and the ethical, human rights and differential impacts of these applications explored, drawing upon interviews conducted with experts in the field as well as a wide body of literature. Based on this analysis, a research agenda is proposed to support the fair, just, transparent, and accountable use of those AI applications in the future. The findings are intended to help raise awareness among populations impacted by the application of AI-based technologies in the current pandemic and in the future, to inform policy makers and health professionals who determine whether and how these tools are deployed during the current pandemic, during future public health crises, and in general, and to broaden the scope of understanding among developers and researchers in the AI community of the implications of the use of these AI-based technologies.

***Keywords**: Artificial Intelligence, AI, COVID-19, Applications, Surveillance, Resource Allocations.*

CHAPTER ONE

INTRODUCTION

1.0 Background of the Study

The words “Artificial Intelligence” AI evoke super-human learning abilities and machines endowed with the power to analyze astronomically large datasets for purposes benign or beneficial, from making movie recommendations to controlling traffic. At the same time, AI also evokes more nefarious and consequential applications of its power: mass surveillance (Qiang, 2019; Daly, 2019); bail determination (Angwin et al. 2016; Flores et al., 2016); and selection for enhanced medical follow-up (Obermeyer, 2019).

AI technology, however, feels different to most people because it is different: AI is the first technology that is becoming an integral part of our personal and public decision-making processes. What is more, in some cases, the software itself is the decision-maker.

Nowhere has this potential been so visible than in the applications of AI to the global health crisis that shook the world in 2020 and continues into 2021. From the moment the knowledge of the novel coronavirus became public and, in the months following its emergence from China as a global pandemic, the number of applications claiming or proposing to use AI to combat the virus exploded. The COVID-19 pandemic provided an opportunity for "redemption" for AI practitioners: here was a unique

opportunity to prove that AI could be harnessed for the benefit of all humanity and AI developers seized the moment. AI became central to the fight against COVID-19, but the existing issues raised by the use of the technology persist, as the technology, like the pandemic itself, highlights and threatens to exacerbate existing social inequalities.

The pandemic has exacerbated existing issues impacting poor and disenfranchised communities for decades: lack or paucity of access to healthcare, resource inequalities, and disparities in the quality of care received. One way to consider the disparities in experience across demographic groups is to differentiate between differences arising because of individual characteristics, for example, gender, race, and age, and those caused by broader societal and structural factors, for example, whether someone lives in a multigenerational household, or is employed in an industry at greater health or socioeconomic risk during the pandemic, for example, cashiers, cleaning crews, delivery services, restaurant servers, and trade workers. These workers (and their families) are exposed to the virus in higher proportions. The impacts of these societal factors are difficult to estimate and even harder to correct (Nan, 2020).

This project was born of the value in taking stock of the ways AI has or could have been deployed in the fight against COVID-19 and to identify the applications that raise the most serious ethical and human rights concerns so that we can apply the lessons learned in the current context in the future. The application of artificial intelligence (AI) to healthcare has increased rapidly. AI involves the development of sophisticated algorithms to execute complex tasks efficiently and effectively. The main objective of

applying AI to healthcare is to unfold hidden information from big data and assist healthcare policymakers and clinicians in making effective clinical decisions. However, the application of AI technology to disease detection, cancer patient screening, therapy selection, reducing medication errors, and productivity improvement is now growing.

Furthermore, AI application to COVID-19 research has increased, especially to the diagnosis, classification, detection, severity, and mortality risk. AI technology has already shown its potentiality to track the spread of coronavirus, as well as stratifying high-risk patients. It has also shown great effectiveness in predicting real-time infection rates by adequately analyzing the previous data.

1.1 Statement of the problem

The novel coronavirus spread fast and wide, causing much damage to human health and wellbeing across the globe. Fortunately, science also moved fast. Several working vaccines against COVID-19 have been developed within a year at unprecedented speed, and inoculation programs, together with improving patient treatments and regular testing, point to a way out of this pandemic. There are no guarantees we'll be able to return to a normal life soon though and the virus can still test us with new local outbreaks and dangerous mutations. A continuing global collaboration to keep track of the virus, and renewed efforts to ensure that all of the world's population is signed up to vaccine programs and can benefit from accumulating knowledge on the disease, seem essential. The risks posed by coronavirus will be with us for a long time and preparations for fighting outbreaks in the near future need to be underway.

1.2 Aim and Objectives of the Study

The aims and objectives of the study are as follows:

- To help facilitate the use of AI throughout the crisis, policy makers should encourage the sharing of medical, molecular, and scientific datasets and models on collaborative platforms to help AI researchers build effective tools for the medical community, and should ensure that researchers have access to the necessary computing capacity.
- To realise the full promise of AI to combat COVID-19, policy makers must ensure that AI systems are trustworthy and aligned with the OECD AI Principles: they should respect human rights and privacy; be transparent, explainable, robust, secure and safe; and actors involved in their development and use should remain accountable.
- To understand the virus and accelerating medical research on drugs and treatments
- To detect and diagnosing the virus, and predicting its evolution
- To assist in preventing or slowing the virus' spread through surveillance and contact tracing
- To respond to the health crisis through personalised information and learning
- To monitor the recovery and improving early warning tools.

1.3 Significance of the study

Artificial intelligence is similar to watching wristbands that assist in ordering people classes bending the isolation law. PDAs and AI-enhanced warm cameras are being used to differentiate between those with fever and others that were injured.

Countries such as Taiwan have infused their national medical care database with details from immigration and customs, exposing coronavirus patients depending on their travel histories and symptoms. Overall, AI is utilized to detect, monitor, and predict outbreaks and aid in virus diagnosis. It is used in the processing of medical claims. Drones and robotics are used to distribute food and drugs, as well as to disinfect public spaces. Utilizing supercomputers, AI is assisting in the creation of medicines and a coronavirus vaccine.

1.4 Scope of the Study

The scope of this study covers all health sectors globally.

1.5 Limitations of the Study

The following where the limitations faced while undergoing this project study:

- **Time frame:** The time used for research and in the production of this work was quite small.
- **Power**: The inconstancy of the Benin Electricity district company (BEDC) of Nigeria in the delivery of power was a major drawback.
- **Financial incapacitation**: procuring a personal internet access to enable for upload, properly develop and test this model on the web, was not possible. A local server was used instead.
- **Non-availability of research materials:** Materials were not readily available for research.

1.6 Definition of Terms

- **Artificial Intelligence:** the theory and development of computer systems able to perform tasks normally requiring human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages.
- **Application:**An application program is a computer program designed to carry out a specific task other than one relating to the operation of the computer itself, typically to be used by end-users.
- **Automation:** This is the use of technology or computers to control and process data reducing the need for human intervention.
- **Covid-19:** An acute respiratory illness in humans caused by a coronavirus, capable of producing severe symptoms and in some cases death, especially in older people and those with underlying health conditions.
- **Database:** This refers to a large store of related data on a computer that user can access and modify.
- **Research:** A careful study of a subject to discover facts, establish a theory or develop a plan of action based on the facts discovered.
- **Surveillance:** The monitoring of behavior, many activities, or information for the purpose of information gathering, influencing, managing or directing.
- **System:** A set of computer components functioning together.
- **Software:** A computer program or set of instructions that direct a computer to perform processing functions.

- **Information System:** A collection of producers, people, instructions and equipment to produce information in a useful form.
- **Processing:** This is dealing with something according to an established procedure.

CHAPTER TWO

Literature Review

2.0 Introduction

More than a year since the COVID-19 pandemic began, AI's power in the fight against the disease has been both visible and largely unmonitored. AI-based applications have been adapted from pre-pandemic uses for diagnosis and drug development, for forecasting the disease's spread and monitoring population movement. New applications have also been developed to address novel and acute needs in the pandemic, including in the provision of healthcare. At this moment of rapid development and deployment of AI, this report was prepared to capture the breadth of AI applications relevant to COVID, and to analyze these for their social impacts, particularly those that gave rise to the most serious ethical and human rights concerns.

The goal being to ensure that these concerns were adequately known, an information base provided to address the concerns in the context of the pandemic, but also to ensure that when the global health crisis abates careful consideration is given to whether and, if so, with what oversight and consideration are these applications integrated into non-pandemic life. The review of AI-based technologies being deployed in the course of the pandemic revealed the breadth of applications being used and proposed, and the need in each case to assess the extent to which each application meets both technical validation requirements but also the public health need for which it was deployed. In the case of both contract tracing applications and medical triage tools,

technical validation questions remain and standards by which to validate the tools are lacking. Data validation is an additional important aspect that determines the effectiveness of the tool which, if not explicitly screened for potential biases in the data can lead to biased, unfair and unjust applications.

Data fairness is just one of the ethical and human rights issues that arises in the context of the application of AI-based tools in the context of the COVID-19 pandemic. As the report acknowledges, a pandemic presents a particularly unique circumstance, and tackling the crisis presents unique challenges. The human rights framework recognizes that such a crisis may necessitate actions that are contrary to human rights but demands that any such actions be necessary in the context, that they not be contrary to that basis tenets of human dignity, and that they be limited in time and scope.

The human impacts of the AI-based technologies used in the context of the pandemic are potentially immense, be they at the individual scale in the context of medical triage, or the societal scale in the context of contact tracing. The specific experiences of marginalized populations impacted by these technologies is inadequately documented, a gap that needs to be filled as lessons are drawn from the current crisis and the real potential exists for the continuation or redeployment of these tools in the future.

To that end, the last part of this report, detailed in Section 5, contains the lessons learned from this detailed inspection of the selected applications. It proposes a path forward for researchers and developers, policymakers, and funders. That path implies addressing fundamental issues in the conditions in which the applications are validated

and trained while ensuring viable data governance and privacy protections. The report also identifies several other gaps in the general understanding of the implications of these applications' widespread use. These gaps are described below.

The initial Coronavirus Infection report in December 2019 (COVID-19) in China, specifically in Wuhan city, impacted more than two hundred countries and regions across the globe with 2,000,000 instances and reached 120 thousand passings as of 21/04/2020 (Ruiz, 2020).. Depending on this expanding emergency, organizations and experts worldwide are observing for the methods to solve the issues of this virus, alleviate the spreading, and sets up treatment for this pandemic

Science and engineering are playing a critical role in this great war. For example, when China first responded to the outbreak, it relied on AI by relying on facial recognition cameras to track infected patients with activity histories, robots to deliver food and drugs. Automatons sanitize open spots and watch and transmit sound signals to open, encouraging them to stay at home (Nguyen, 2020). To provide support for COVID-19, artificial intelligence was already extensively used to find new particles when in motion. Many scientists utilize AI to find new drugs and medicines for remediation, with specific software engineers focusing on identifying the irresistible patients by clinical image preparation such as X-beams and CT examinations.

In either case, artificial intelligence is similar to watching wristbands that assist in ordering people classes bending the isolation law. PDAs and AI-enhanced warm cameras are being used to differentiate between those with fever and others that were injured (Maghdid, 2020). Countries such as Taiwan have infused their national medical care

database with details from immigration and customs, exposing coronavirus patients depending on their travel histories and symptoms,. Overall, AI is utilized to detect, monitor, and predict outbreaks and aid in virus diagnosis. It is used in the processing of medical claims. Drones and robotics are used to distribute food and drugs, as well as to disinfect public spaces. Utilizing supercomputers, AI is assisting in the creation of medicines and a coronavirus vaccine (Bullock, 2020).

The current research focuses on the utilizing of AI developments in the war against the Coronavirus outbreak. It goes through many of the technological advancements used to lessen and smother the outburst's significant effect. This review aims to determine the effectiveness of the procedures described and recommend how they can be used. This paper demonstrates AI applications and provides an overview of how new technology might respond to the COVID-19 pandemic (Kumar, 2020).

2.1. Major AI applications in the COVID-19 pandemic

The meaning of technology includes strategies, systems, and techniques resulting from scientific information being obtained for remediation purposes. AI can be divided into Natural Language Processing (NLP), Machine Learning (ML), and Computerized Vision devices. These capacities command computers to use extensive data depending on models to implement, analyze, and decide.

In the following points, we illustrate some methods where AI is generally used against coronavirus

2.2. Make Early Diagnosis And Recognition For The Patient's Infection

Artificial Intelligence can resolve infrequent symptoms speedily and other red alarms, giving an alarm to the healthcare management and patients. It gives a faster response to make a decision, which offers a lower cost. It develops a good management and diagnosis system for the coronavirus condition by utilizing fast and good algorithms. AI helps to discover the causes that infected with the disease by utilizing other imaging techniques like a Magnetic resonance imaging (MRI) scanner for body parts of humans and Computed tomography (CT).

2.3. Controlling the remediation

AI can build an intelligent framework for auto-controlling and can predict the propagation of this pandemic. The development of a neural network could also be extracted the seen characteristics of this virus, giving proper remediation and monitoring of the influenced patients. It can give continuous patient updates and give solutions to be dependent on the pandemic of COVID-19.

2.4. Tracing of contact for the users

AI could analyze the value of contagion by this pandemic, knowing the clusters and tracing contact for the patients, and controlling them. AI can estimate the near course of this virus and its likely preexistence.

2.5. Estimation of the number of cases and death-rate

This technology can identify and forecast the presence of the virus, and the possibilities of spread and potential distribution, using social networking, publicly available data, and media networks. It could also predict how many positive cases and

accidents would occur in a specific region. AI would aid in identifying the most affected regions, peoples, and nations, allowing for effective measures to be taken.

2.6. Improvement of vaccines and drugs

AI is utilized for drug research by analyzing the existing data on COVID-19. It may be utilized to create and expand drug distribution processes. This technique is utilized to speed up substance recognition in real-time, whereby traditional research takes a long time and enables a vastly accelerated process that would be impractical for a human to complete. It could help in the development of new drugs to treat COVID-19 sick people. It was evolved into a valuable method for developing medical tests and vaccines (Joynt, 2020). AI aids in developing drugs and medications at a far higher pace t and clinical testing throughout vaccine development.

2.7. Decreasing the workload on the workers in healthcare

Following the pandemic of COVID-19, healthcare staff became overworked due to a dramatic and unexpected increase in sick people. Artificial intelligence (AI) has been utilized to assist healthcare workers in reducing their workload (Joynt, 2020). It helps in early detection and treatment using digital tools and judgment research and providing doctors and students with the most up-to-date information on this emerging illness (Maddah, 2020). AI can change future health remediation and solve further potential problems, reducing physicians' workload.

2.8. The disease prevention

Using real-time data collection, AI can provide new information that is helpful in the prevention of this disease. It may be used to predict the possible areas of infection, the

virus's influx, and the requirement for beds and healthcare staff during the epidemic. AI will aid in the prevention of possible virus and illness outbreaks by using mentored data from the past rather than data collected at different periods. It describes the characteristics, sources, and explanations for infection transmission. This technology would be critical in the fight against other pandemics and epidemics in the future. It may be utilized to treat a host of illnesses as a preventative measure and treatment. In the future, AI will have a vital function in providing more preventive and predictive healthcare See Fig 1 & 2.

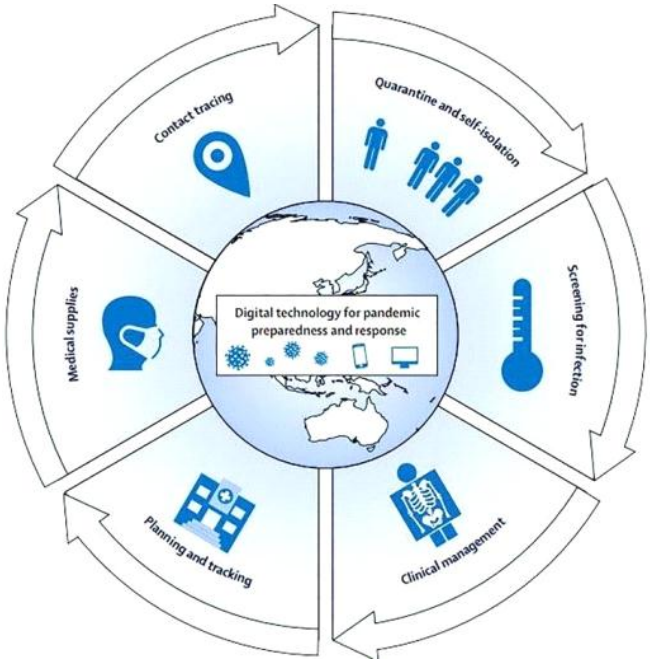

Fig. 1. Pandemic preparedness and reaction utilizing digital technology

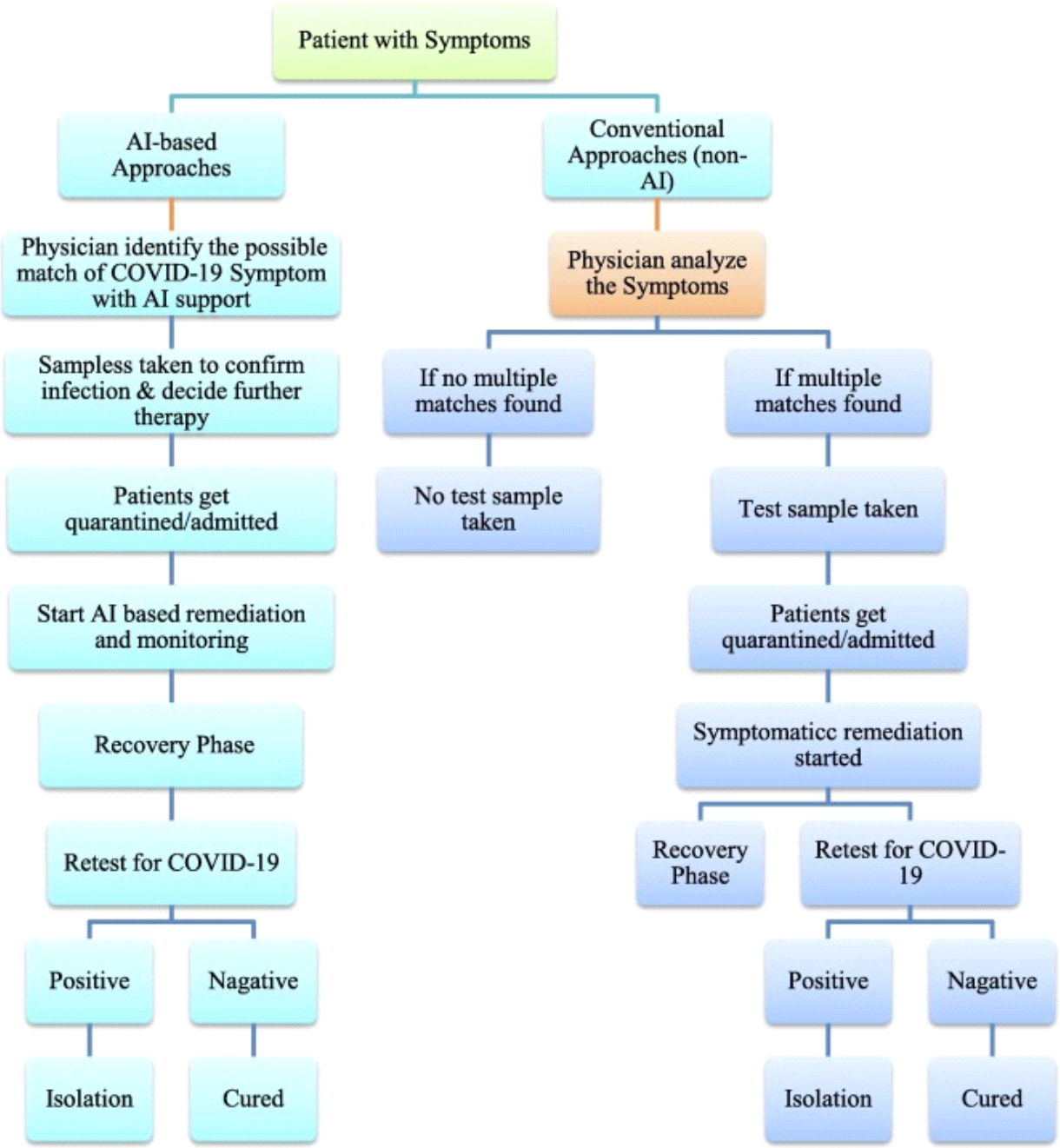

Fig. 2. The Overall procedure for non-AI and AI-related software that assist general practitioners in detecting COVID-19 symptoms

CHAPTER THREE

SYSTEM ANALYSIS AND DESIGN

3.0 Analysis of the Existing System

Covid-19 has hugely impacted the way we live, work, consume and socialize. As we are witnessing a shift in many habits, priorities, and even values, pre-Covid data, or even data that are produced during the pandemic, will probably not be valid, as they do not account for recent societal and economic changes. For instance, models built for retail businesses relying on massive amounts of historical data to discern patterns from which to make decisions, are now delivering predictions that are no longer valid, since businesses no longer have relevant data about new retail consumer behaviors and habits. And it will likely take some time to collect new data that reflect the new realities.

Before the pandemic outbreak, researchers were often cautious about sharing their data and models. However, in a global crisis, data sharing, and open models were identified as a key contributor to accelerate the research to contain and eradicate the virus. The lack of global coordination on data and methodology not only has consequences on the management of the health issues, but also worsen the unequal socioeconomic impact of the pandemic, for developing countries. Hence, amid the pandemic, openness has taken human and solidarity dimensions.

3.1 Analysis of the New System

The proposed system, generative AI is a relevant tool for DA, but it can also find application in many other scenarios. In medical settings, it can be used to create medical

images that depict the future development of a disease. In drug discovery, the generative HYPERLINK"https://www.sciencedirect.com/topics/computer-science/generative-model"HYPERLINK"https://www.sciencedirect.com/topics/computer-science/generative-model"HYPERLINK https://www.sciencedirect.com/topics/computer-science/generative-model"models can be used for generating molecular structures for medicines. In the marketing sector, it can enable innovative experiences for customers such as “try-on” articles virtually. In the entertainment industry, the video game industry can benefit hugely from generative AI through automatic generation of 3D models and automatic generation of facial images of characters. In robotics, creative robots capable for example of navigating through an imaginary environment without actually running into real obstacles could be designed using generative models. Now, with the shift caused by the pandemic in habits, behaviors, and business strategies, generative models are expected to span more and more in all areas of life.

3.2. Objectives of the New System

- To quickly analyze irregular symptom and other ‘red flags’ and thus alarm the patients and the healthcare authorities.
- To helps to provide faster decision making, which is cost-effective.
- To helps to develop a new diagnosis and management system for the COVID 19 cases, through useful algorithms.
- To helpful in the diagnosis of the infected cases with the help of medical imaging technologies like Computed tomography (CT), Magnetic resonance imaging (MRI) scan of human body parts.

3.3 Design requirements

- **Functional Requirements**

Functional Requirement defines a function of a system and how the system must behave when presented with specific inputs or conditions. These may include calculations, data manipulation and processing and other specific functionality. In this system, the following are the functional requirements:

- Input test case must not have compilation and runtime errors.
- It must not stop working when kept running for even along time.
- It must function as expected for every set of test cases provided.
- It should generate the out put forgiven input test case and input parameters.
- It should generate on demand services.

- **Non-Functional Requirements**

Non-functional requirements are the requirements which are not directly concerned with the specific function delivered by the system. They specify the criteria that can be used to judge the operation of a system rather than specific behaviors. They may relate to emergent system properties such as reliability, response time and store occupancy. Non-functional requirements arise through the user needs, because of budget constraints, organizational policies, the need for inter operability with other software and hardware systems or because of external factors such as

- Product Requirement
- Organizational Requirements
- User Requirements

- Basic Operational Requirements

In systems engineering and requirements engineering, a non-functional requirement is a requirement that specifies criteria that can be used to judge the operation of a system, rather than specific behaviors. This should be contrasted with functional requirements that define specific behavior or functions. The plan for implementing non-functional requirements is detailed in the system architecture. Broadly ,functional requirements define what a system is supposed to do and non-functional requirements define how a system is supposed to be Functional requirements are usually in the form of system shall do requirement, an individual action of part of the system, perhaps explicitly in the sense of a mathematical function, a black box description input, output, process and control functional model or IPO Model .In contrast, non functional requirements are in the form of system shall be requirement an overall property of the system as a whole or of a particular aspect and not a specific function. The systems' over all properties commonly mark the difference between whether the development project has succeeded or failed.

- **Product Requirements**
- **Correctness**: It follows a well defined set of procedure and rules to compute and also rigorous testing is performed to confirm the correctness of the data.
- **Ease of Use:** The front end is designed in such a way that it provides an interface which allows the user to interact in an easy manner.
- **Modularity**: The complete product is broken up into many module sand well defined interfaces are developed to explore the benefit of flexibility of the product.

- **Robustness**: It is being developed in such away that the over all performance is optimized and the user can expect there salts with In limited time with utmost relevancy and correctness. Whereas evolution quality involves testability, maintain ability, extensibility or scalability.

- **Organizational Requirements**

Process Standards: IEEE standards are used to develop the application which is the standard used by the most of the standard software developer sell over the world. This stages the first step in moving from problem to the solution domain In other words, starting with what is needed design take out so work, how to satisfy the needs.

- **User Requirements**

The user requirements document (URD) or user requirements specification is a document usually used to software engineering that specifies the requirements user expects from software to be constructed in software project. Once the required information is completely gathered it is documented in a URD, which is meant to spell out exactly what the software must do and become sprat of the contractual agreement. A customer cannot demand feature not in the URD, whilst the developer cannot claim the product is ready if it does not meet an item of the URD.

The URD can be used as a guide to planning cost, timetables, milestones, testing etc. The explicit nature of the URD allows customers to show it to various stakeholders to make sure all necessary features are described. Formulating a URD requires negotiation to determine what is technically and economically feasible. Preparing a URD is one of those skills that lies between a science and economically feasible. Preparing a URD is

one of those skills that lies between a science and a nart, requiring both software technical skills and interpersonal skills.

- **Basic Operational Requirements**

Operational requirement is the process of linking strategic goals and objectives to tactic goals and objectives. It describes milestones, conditions for success and explains how, or what portion of, a strategic plan will be put into operation during a given operational period, in the case of, a strategic plan will be put into operation during a given operational period, in the case of commercial application, a fiscal year or another given budgetary term. An operational plan is the basis for, and justification of an annual operating budget request. Therefore, a five-year strategic plan would typically require five operational plans funded by five operating budgets. Operational plans should establish the activities and budgets for each part of the organization for the next 1-3 years.

They link the strategic plan with the activities the organization will deliver and the resources required to deliver them. An operational plan draws directly from agency and programs strategic plans to describe agency and program missions and goals, program objectives, and program activities. Like a strategic plan, an operational plan addresses four questions:

- Where are we now?
- Where do we want to be?
- How do we get there?

The customers are those that perform the eight primary functions of systems engineering, with special emphasis on the operator as the key customer. Operational requirements will define the basic need and, at a minimum, will be related to these following points:

Mission Profile or Scenario: It describes about the procedures used to accomplish mission objective. It also finds out the effectiveness or efficiency of the system

Performance and Related Parameters: It points out the critical system parameters to accomplish the mission.

Utilization Environments: It gives a brief outline of system usage, Finds out appropriate environments for effective system operation.

Operational Life Cycle: It defines the system lifetime.

3.4 Methods of Data Gathering

The method of data collection is based on information from various papers, Internet website and articles. In other words the research has secondary research approach.

Interviewing

Findings during the investigation process were gathered so as to fully identify the problem areas of the existing system. There are some flaws that were identified which the proposed system intends to correct. This stage is an important intermediated stage between investigation and design.

Observation

Naturally, observation is the process of enthusing an event and to this project; observation is by participation in the quest for project allocation in order to understand the entire system or process.

3.5. Architecture Framework

This is a conceptual model that defines the structure, behavior and more views of a system. An architecture description is a formal description and representation of a system organized in a way that supports reasoning about the structures and behaviors of the system. A system architecture can comprise system components that will work together to implement the overall system.

This architecture primarily concentrates on the internals or subsystems and on the interfaces between the system and its external environment. (Jaakkola, 2011).

Flowchart is a common system design tool which represents the sequential representation of data and data modules was used to design basic schema of the system based on an algorithm. This algorithm depicts the sequence of actions to be taken and the order in which to execute them, for the new system design to become a reality. Algorithm can be seen as the step-by-step method of implementing the system using the ordinary or simple language.

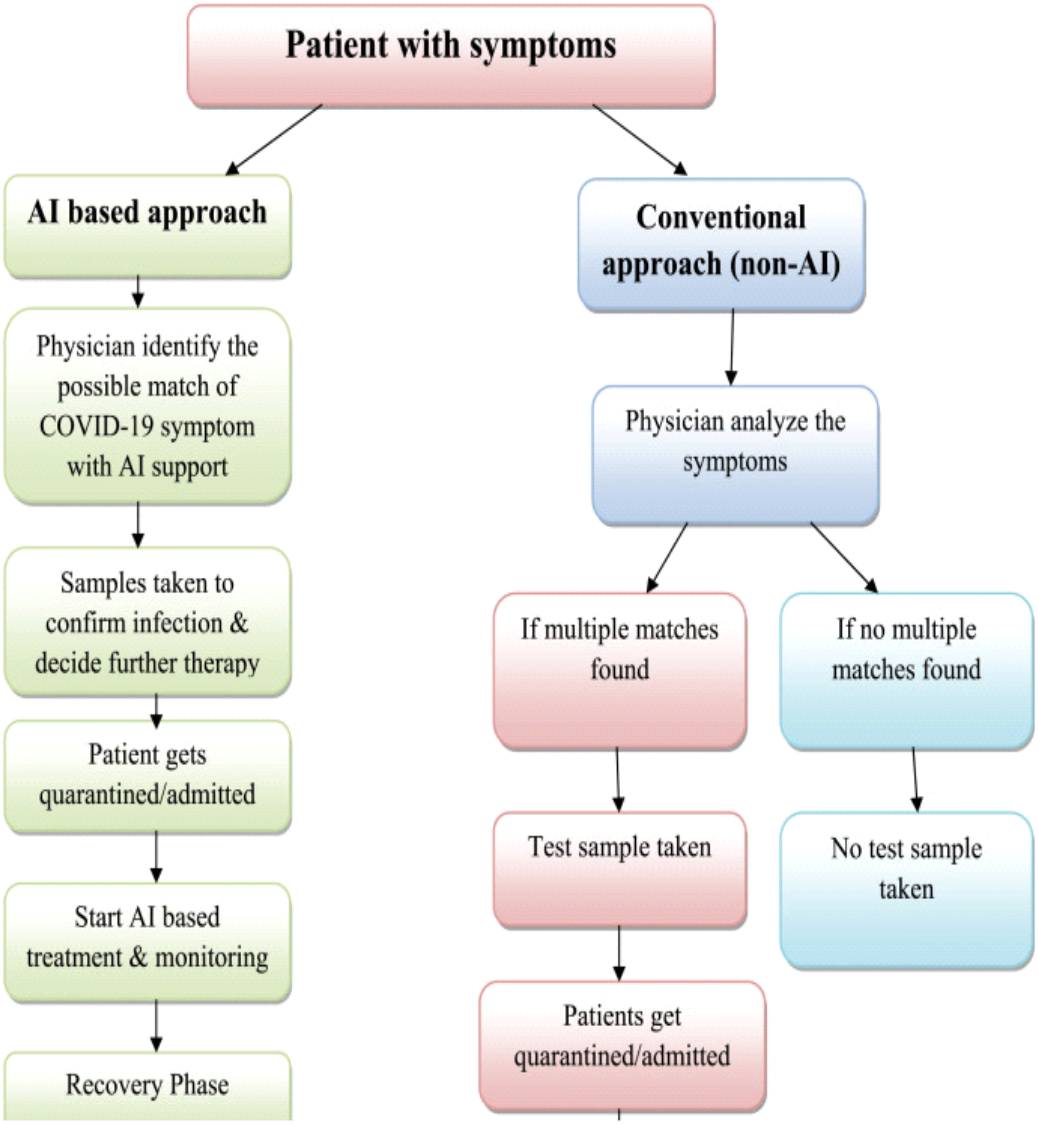

Fig 4.1: AI based approach and Conventional approach

CHAPTER FOUR

SYSTEM IMPLEMENTATION AND SPECIFICATION

4.0 Choice of Programming Language

The choice of programming for this project work is HTML (Hypertext Mark-up Language), CSS (Cascading Style Sheet), JavaScript, PHP (Hypertext Pre-processor) and MySQL Database. This is chosen because its runs in all platform of operating system. It is used for developing web-based applications. It is user friendly and flexible.

4.1. System Implementation

The new system is designed to be put into efficient use. It begins after the management has accepted the new system. It follows the detailed design state and consists of installation of the new system and removal of the old system. This involves the co-ordination of the efforts of the users' department in getting the new system into operation. During the process of implementing the new system, the old system is also used in line with the new system so as to support the newly implemented software in case the system does not meet up with the necessary requirement or unable to perform as expected. The implementation of the new system involves the following stages;

- Testing of the program
- Education and staff training
- System change over plan

4.2. Development and Testing Of Program

Developing this software is a step-by-step process and the processes are together called as Software Development Lifecycle. There are totally some steps involved in the software development and each step has a set of process specifically. Some of the steps are;

Planning

Analysis

Design

The product's working form is tested for defects. Testing is almost final part in the development process. The last time adjustments are made in the software before giving the software to the end user. The person who performs this testing is known as testers.

4.3. Education and Staff Training

This is one of the important phases of a system implementation as it ensures the efficiency, effectiveness and proficiency of the users. In the design of this new system, it is not intended that a permanent system operator be employed, but rather that the prospective users should have a fair knowledge of the computer. Apart from this, it is the opinion of the designer of this system to;

(i) Give seminar on the new system and

(ii) Mount in-house short training program for the users of the system.

The training program is intended to highlight major aspects of this new software, the things that different modules can do and how to make best use of the software.

Two-week lecture programmes that will entail the following courses are recommended also for the staff of the department.

Computer Literacy and Application: This will comprise basic computer operation training, MS-DOS and Windows Operating System.

Software Packages: This course will focus on Word Processing using Microsoft Word and introduction to Database Management using Microsoft Access, and then, the Software developed for the new system.

4.4. System Change Over Plan

This is the process of changing from old information system to the newly designed, developed and installed system. There are four major methods of system changeover, namely:

Parallel Running Method

Direct Cut-over Method

Pilot Approach

Phased Approach

The method which has been chosen for use is very important in system implementation as it might affect the workability of the system at any time. In the case of the new system, it is hereby recommended that the parallel changeover plan should be used. In the parallel approach, both the old and the new systems are operated alongside

each other for a number of cycles until the new system has been proved to be operating reliably and correctly. The old system is now phased out.

The parallel approach will allow the staff of the Department to become gradually familiar with the system and if there is any problem, they can always fall back on the old system.

4.5. Hardware Requirements

- Minimum of Duo Core Microprocessor Computer System is required.
- Minimum RAM of 1GB required.
- Mobile Devices such as phones with Internet Access
- MODEM
- Printer (Optional)
- Database Server
- Internet Service Provider (ISP)

4.6 Software Requirements

Operating system - Windows XP and above, Android OS and Mac OS

Database - MYSQL is used as database as it easy to maintain and retrieve records by simple queries which are in English language which are easy to understand and easy to write.

Development tools and Programming language - HTML is used to develop web pages with CSS, Java Script for validation and JSP for sever side scripting.

4.7. Data Flow Diagram

A Data Flow Diagram (DFD) is a structured analysis and design tool that can be used for flowcharting. A DFD is a network that describes the flow of data and the processes that change or transform the data throughout a system. This network is constructed by using a set of symbols that do not imply any physical implementation. It has the purpose of clarifying system requirements and identifying major transformations. So it is the starting point of the design phase that functionally decomposes the requirements specifications down to the lowest level of detail. DFD can be considered to an abstraction of the logic of an information-oriented or a process-oriented system flow-chart. For these reasons DFD's are often referred to as logical data flow diagrams. The data flow diagram is shown below.

4.8. Program Flowchart

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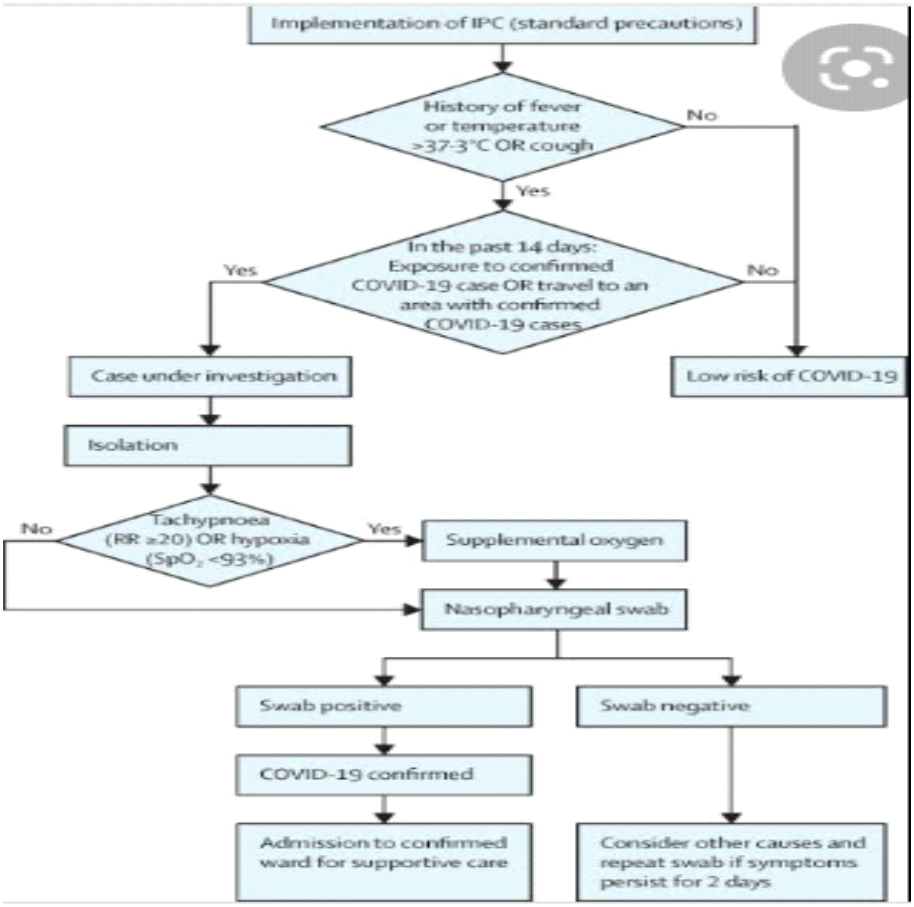


Adoption of COVID-19 triage strategies for no low-income setting

Fig 4.1: Program flowchart

4.9. System Testing

Testing is a set activity that can be planned and conducted systematically. Testing begins at the module level and work towards the integration of entire computers based system. For testing our software we test each and every path that user can go at any point in the lifetime of the system. Nothing is complete without testing, as it is vital success of the system.

There are several rules that can serve as testing objectives, they are;

Testing is a process of executing a program with the intent of finding an error.

A good test case is one that has high probability of finding an undiscovered error.

A successful test is one that uncovers an undiscovered error.

If testing is conducted successfully according to the objectives as stated above, it would uncover errors in the software. Also testing demonstrates that software functions appear to the working according to the specification, that performance requirements appear to have been met.

The testing of the system is done based on two strategies. First, each module or program was tested independently to ascertain its functionality and the performance of the task defined in its structure. This process of testing is known as unit test. Since the system is made up of a collection of different modules (classes), all existing in hierarchy and tied together to actualize the task of online advertising system. The next level of testing involves putting all the modules together and testing them all at once. This interestingly was achieved with the hypertext reference (href) function in the PHP source

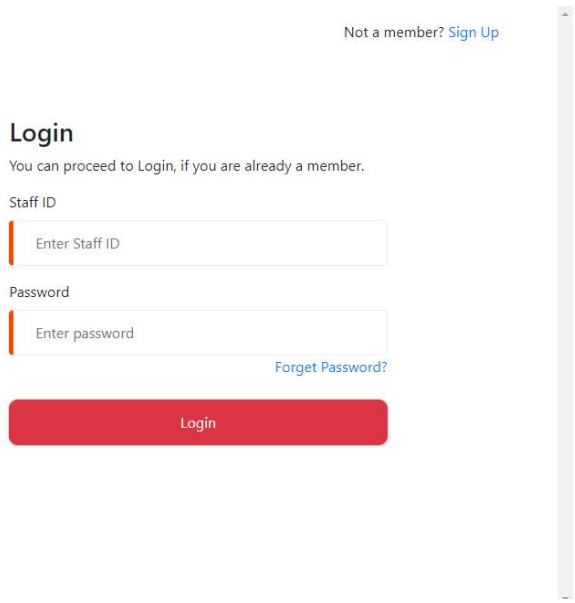
module; this method of testing is called integrating testing. Integration testing is done in terms of interface testing, function calls, input/output operation as well as storage. To this effect, integration gives a true picture of the system, how it works and the overall appraisal of the system should be done here by the users.

The overall evaluation results show that the system offers an effective solution to the problem of efficiently managing online advertising system.

4.11 System Design

- **Input Design**

The Login/Registration page of the app adopted the use REST API (Representational State Transfer/Application Programming interface). The entered data is check and verified if the doctor is already registered and it proceeds to the dashboard where a lot of activities can be carried out.



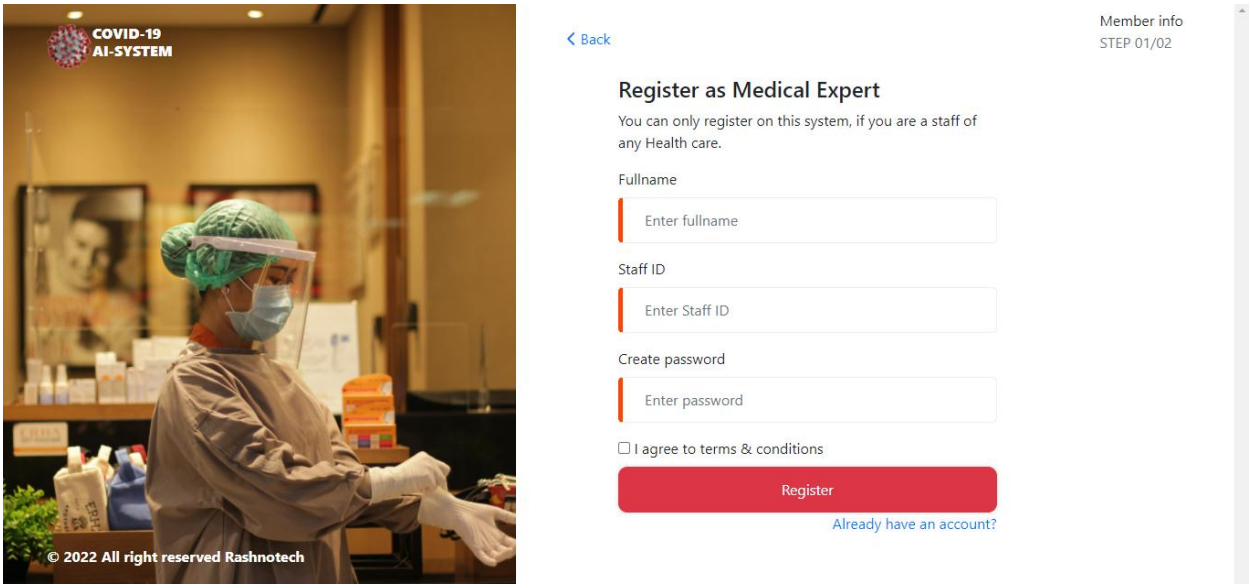


Fig 4.2: Login and Registration Page

➢ Output Design

The output design deals with the activities that take place after the doctor haslogged in or registeredand have schedule an appointment for patient to be tested for proper medications.

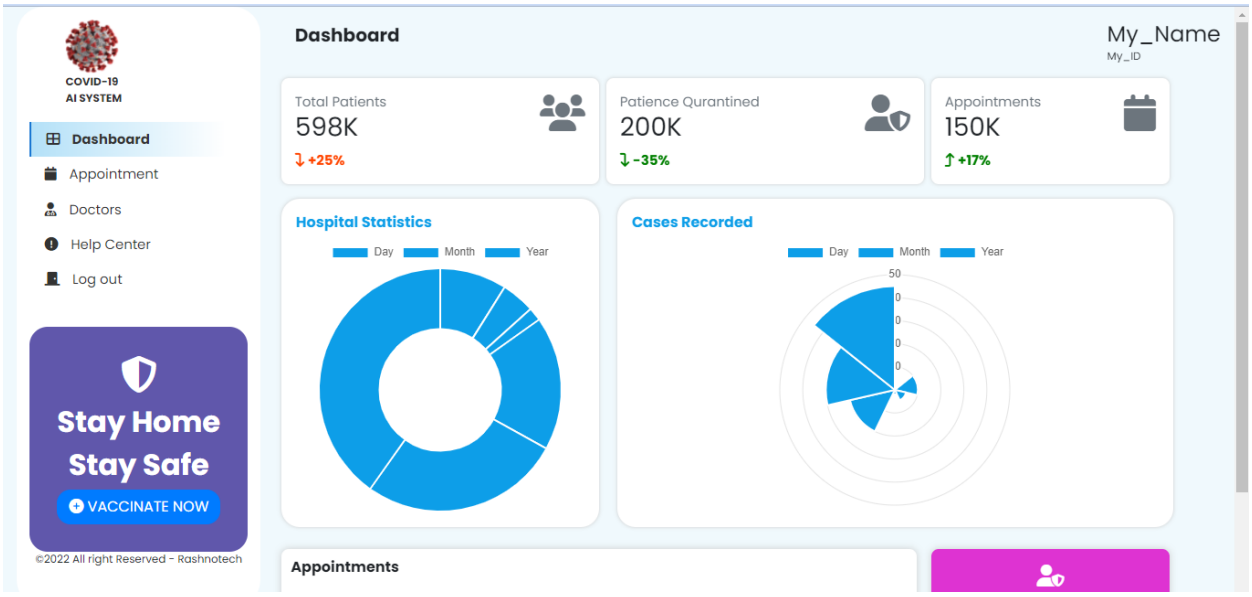


Fig 4.3: Dashboard

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.0 Summary

Today, all technologies and tools play a key role in every aspect of the covid-19 crisis response.

Understanding the virus and accelerating medical research on drugs and treatments, detecting and diagnosing the virus and predicting its evolution, assisting in preventing or slowing the virus spread through surveillance and contact tracing, responding to the health and learning, monitoring the recovery and improving early warning tools.

5.1. Conclusion

Artificial intelligence is an upcoming useful tool to identify early infections due to corona virus and also help in monitoring the condition of the infected patients. It can significantly improve the treatment consistency and decision making by developing useful algorithms. A1 is not only useful in the treatment of COVID-19 infected patient but also for their proper health monitoring. It can track the crisis of COVID-19 at different scales such as medical molecular and epidemiological applications. Its also helpful to facilitate the research of this virus using analyzing the available data. A1 can help in developing proper treatment regimens, prevention strategies, drugs and vaccine development.

5.2. Recommendation

- An automated, robust architecture can be built with the help of image classification using X-ray and CT images for the detection of COVID-19 as well as other diseases, which will provide an end-to-end solution for fast detection.
- It is also recommended that for further research development work, we need more data to combat the COVID-19 situation. Besides, this Combined Data Repository will help us to fight back with similar pandemics.
- Implementation of Medical Assistive in Real-World: For supporting the health professionals, it is mandatory to implement this medical-assisting tool in hospitals, radiology clinics.
- For assisting the COVID-19 infected patients without human labor, these robots are supposed to be used in hospitals to curb the spread of disease.
- It is also recommended that breading sound should be checked. This can be a new and easier area for detecting coronavirus. Scientists can focus on this for fast detection.
- For biological research, this AI system can be used to predict the structure of proteins and genetic sequence.

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APPENDIX I

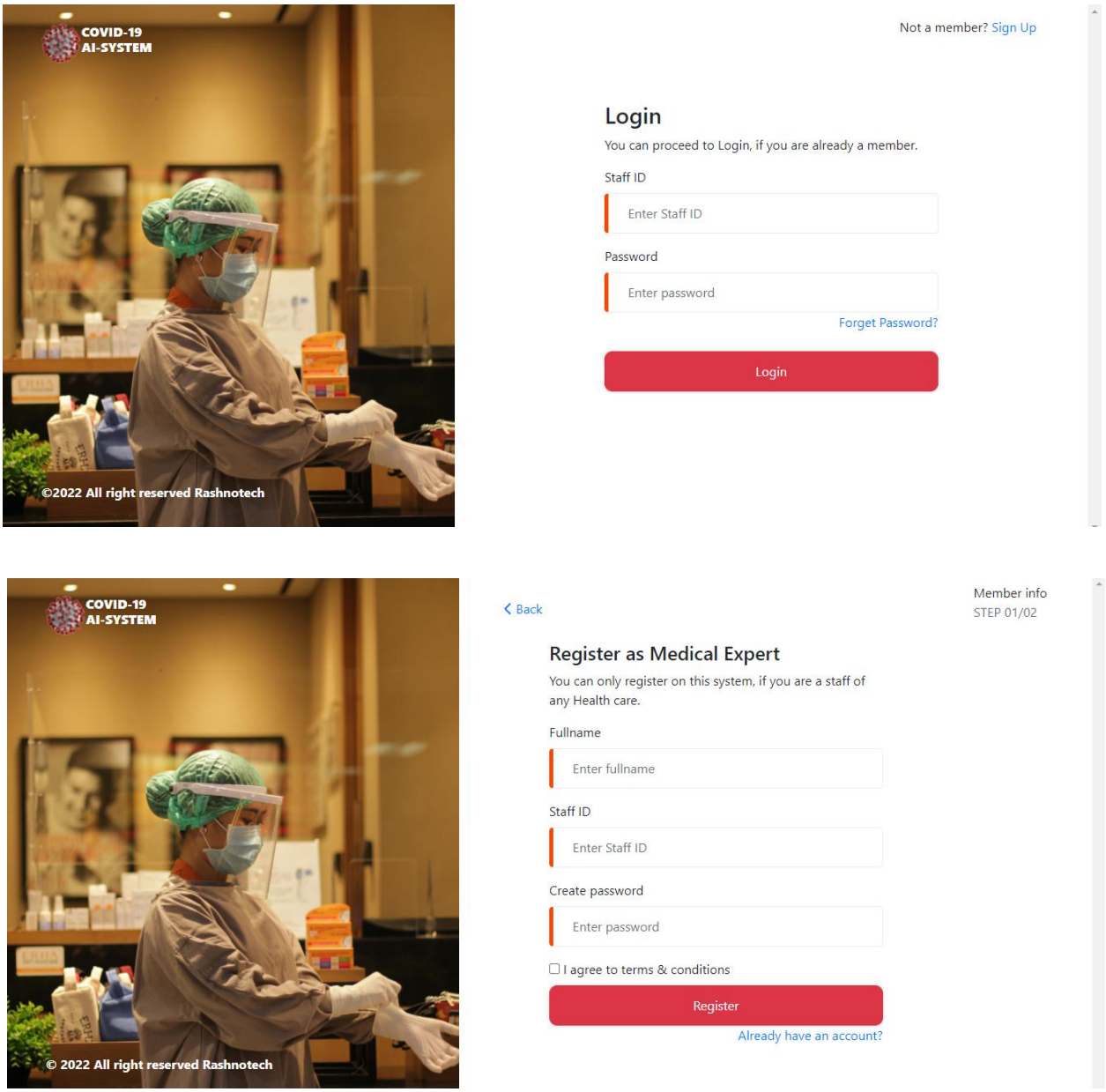

Fig 4.2: Login and Registration Page

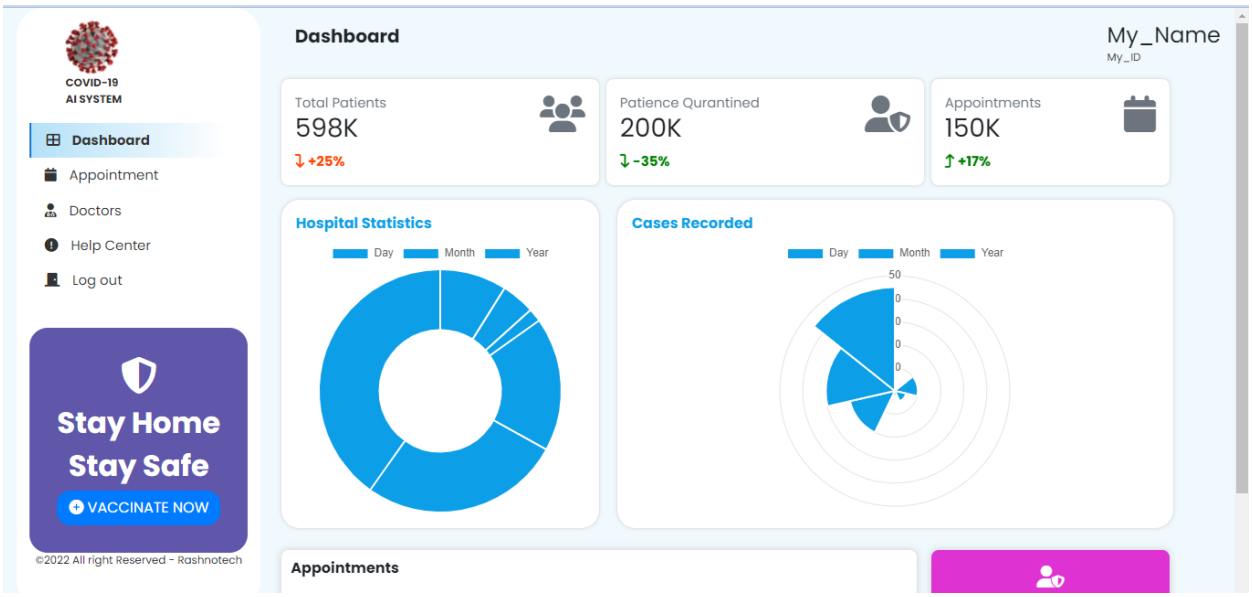

Fig 4.3: Dashboard

APPENDIX II

```
<?php
  class Covid{
   private $host = "localhost";
   private $db_name = "covid";
   private $password = "";
   private $username = "root";

   private $conn;

   public function connect(){
      $this->conn = null;

      try{
         $this->conn = new PDO("mysql:host=".$this->host.";dbname=".$this-
           >db_name,$this->username, $this->password);
         $this->conn-
           >setAttribute(PDO::ATTR_ERRMODE,PDO::ERRMODE_EXCEPTION);
         $this->conn->setAttribute(PDO::ATTR_EMULATE_PREPARES, false);
      }catch(PDOEXCEPTION $e){
         echo " Cannot connect to Database".$e->getMessage();
      }
      return $this->conn;
   }

   public function login($data){
         extract($data);
         $staff = strtoupper($staff_id);
         $pwd = md5($pwd);
         $query = "SELECT * FROM doctors WHERE staff_id = :staff_id AND password
           = :pwd";
         $stmt = $this->conn->prepare($query);
         $stmt->bindParam(':staff_id',$staff);
         $stmt->bindParam(':pwd',$pwd);
         $stmt->execute();
         return $stmt;
   }

   public function rememberMe(){
      $cookie = isset($_COOKIE['rememberme']) ? $_COOKIE['rememberme'] : '';
         if ($cookie) {
            list ($user, $token, $mac) = explode(':', $cookie);
```

```
        if (!hash_equals(hash_hmac('sha256', $user . ':' . $token, SECRET_KEY),
      $mac)) {
            return false;
        }
      $usertoken = fetchTokenByUserName($user);
        if (hash_equals($usertoken, $token)) {
          logUserIn($user);
        }
      }
}

public function onLogin($user) {
      $token = GenerateRandomToken(); // generate a token, should be 128 - 256 bit
      storeTokenForUser($user, $token);
      $cookie = $user . ':' . $token;
      $mac = hash_hmac('sha256', $cookie, SECRET_KEY);
      $cookie .= ':' . $mac;
      setcookie('rememberme', $cookie);
}
public function registered_patient(){
   $query = "select * from patient";
   $stmt = $this->conn->prepare($query);
   $stmt->execute();
   return $stmt;
}
public function quarantined_patient(){
   $negative = "POSITIVE";
   $query = "select * from test where result = :negative";
   $stmt = $this->conn->prepare($query);
   $stmt->bindParam(':negative',$negative);
   $stmt->execute();
   return $stmt;
}
   public function getUser(){
   $query = "select p.patient_id, p.firstname,p.lastname, t.covid_id,
   t.schedule_date,t.doctor_attendant,t.time,t.result from patient AS p, test AS t where
   p.patient_id = t.patient_id ORDER BY p.patient_id DESC LIMIT 4";
   $stmt = $this->conn->prepare($query);
   $stmt->execute();
   return $stmt;
}
public function schedule(){
   $null = "";
```

```
    $query = "select * from test where schedule_date != :null";
    $stmt = $this->conn->prepare($query);
    $stmt->bindParam(':null',$null);
    $stmt->execute();
    return $stmt;
}
public function test(){
    $patient_id = $_SESSION['lastId'];
    $query = "select * from test where patient_id = :id";
    $stmt = $this->conn->prepare($query);
    $stmt->bindValue(':id',$patient_id);
    $stmt->execute();
    return $stmt;
}

public function register($data){
    extract($data);
    $pass_word = md5($pwd);
    $staff = strtoupper($staff_id);
    $id = null;
    $query = "INSERT INTO doctors VALUES (:id,:staff_id,:fullname,:password)";
    $stmt = $this->conn->prepare($query);
    $stmt->bindValue(':id',$id);
    $stmt->bindValue(':staff_id',$staff);
    $stmt->bindValue(':fullname', $fullname);
    $stmt->bindValue(':password',$pass_word);
    $stmt->execute();
    return true;
}
public function addPatient($data){
    extract($data);
    $id = null;
    $query = "INSERT INTO patient VALUES
        (:id,:fname,:lname,:dob,:gender,:tel,:email,:address)";
    $stmt = $this->conn->prepare($query);
    $stmt->bindValue(':id',$id);
    $stmt->bindValue(':fname',$patient_fname);
    $stmt->bindValue(':lname', $patient_lname);
    $stmt->bindValue(':dob',$patient_dob);
    $stmt->bindValue(':gender',$patient_gender);
    $stmt->bindValue(':tel',$patient_tel);
    $stmt->bindValue(':email',$patient_email);
    $stmt->bindValue(':address',$patient_address);
```

```
    $stmt->execute();
    return $stmt;
}
public function filled_out($forms_var){
foreach ($forms_var as $key => $value) {
    if((!isset($key))|| $value ==" ){
        return true;
    }
}
return false;
}


public function checkUser($data){
    extract($data);
    $staff = strtoupper($staff_id);
    $query = "select staff_id from doctors where staff_id = :staff_id";
    $stmt = $this->conn->prepare($query);
    $stmt->bindValue(':staff_id', $staff);
    $stmt->execute();
    return $stmt;
}
public function checkPatient($data){
    extract($data);
    $query = "select * from patient where email = :email OR telephone = :tel";
    $stmt = $this->conn->prepare($query);
    $stmt->bindValue(':email', $patient_email);
    $stmt->bindValue(':tel', $patient_tel);
    $stmt->execute();
    return $stmt;
}
public function addQuestion($data){
    extract($data);
    @$quest1 = $question1 == "" ? NULL : $question1;
    @$quest2 = $question2 == "" ? NULL : $question2;
    @$quest3 = $question3 == "" ? NULL : $question3;
    @$quest4 =  $question4 == "" ? NULL : $question4;
    @$quest5 =  $question5 == "" ? NULL : $question5;
    @$quest6 =  $question6 == "" ? NULL : $question6;
    @$quest7 =  $question7 == "" ? NULL : $question7;
    @$quest8 =  $question8 == "" ? NULL : $question8;
    @$quest9 =  $question9 == "" ? NULL : $question9;
    @$quest10 =  $question10 == "" ? NULL : $question10;
```

```
        @$quest11 =  $question11 == "" ? NULL : $question11;
        $pat_id = $_SESSION['lastId'];
        $id = null;
        $query = "INSERT INTO question VALUES
            (:id,:quest1,:quest2,:quest3,:quest4,:quest5,:quest6,:quest7,:quest8,:quest9,:quest
            10,:quest11,:pat_id)";
        $stmt = $this->conn->prepare($query);
        $stmt->bindValue(':id',$id);
        $stmt->bindValue(':quest1',$quest1);
        $stmt->bindValue(':quest2', $quest2);
        $stmt->bindValue(':quest3',$quest3);
        $stmt->bindValue(':quest4',$quest4);
        $stmt->bindValue(':quest5',$quest5);
        $stmt->bindValue(':quest6',$quest6);
        $stmt->bindValue(':quest7',$quest7);
        $stmt->bindValue(':quest8',$quest8);
        $stmt->bindValue(':quest9',$quest9);
        $stmt->bindValue(':quest10',$quest10);
        $stmt->bindValue(':quest11',$quest11);
        $stmt->bindValue(':pat_id',$pat_id);
        $stmt->execute();
        return $stmt;
    }

public function proCeed($data){
        extract($data);
        $id = null;
        $query = "INSERT INTO test VALUES
            (:id,:p_id,:s_date,:time,:ward,:result,:doctor,:covid)";
        $stmt = $this->conn->prepare($query);
        $stmt->bindValue(':id',$id);
        $stmt->bindValue(':p_id',$patient_id);
        $stmt->bindValue(':s_date', $date);
        $stmt->bindValue(':time',$time);
        $stmt->bindValue(':ward',$ward);
        $stmt->bindValue(':result',$result);
        $stmt->bindValue(':doctor',$doctor);
        $stmt->bindValue(':covid',$covid_id);
        $stmt->execute();
        return true;
    }
public function checkQuestion(){
    session_start();
```

```
    $last = $_SESSION['lastId'];
    $query = "select * from question where patient_id = :pat_id";
    $stmt = $this->conn->prepare($query);
    $stmt->bindValue(':pat_id',$last);
    $stmt->execute();
    return $stmt;
}
    public function logout(){
        session_start();
        $_SESSION = array();
        if (ini_get("session.use_cookies")) {
            $params = session_get_cookie_params();
                setcookie(session_name(), '', time() - 42000,
                $params["path"], $params["domain"],
                $params["secure"], $params["httponly"]
                );
        }
        session_destroy();
        return true;
    }

}

?>
```

```php
<?php
 require_once('function_file.php');
 require('covid.php');

   $patient = new Covid;
   $conn = $patient->connect();

   if($_SERVER['REQUEST_METHOD']=="POST"){
      $result = $patient->login($_POST);
      $num =  $result->rowCount();
         try{
            if($num > 0){
               $row = $result->fetch(PDO::FETCH_OBJ);
               session_start();
               $_SESSION['staff_id'] = $row->staff_id;
               $_SESSION['fullname'] = $row->fullname;
               $success = array(
                  'message'=> 1
               );
               exit(json_encode($success));
            }else{
               throw new Exception("You've not enroll on this platform... Please Signup!");
            }
         }catch(Exception $e){
            $error = array(
               'message' => $e->getMessage()
            );
            exit(json_encode($error));
         }
   }


?>
```