KANTIPUR ENGINEERING COLLEGE

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A FINAL YEAR PROJECT ON

COVID -19 DETECTION AND PROTECTION

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A MAJOR PROJECT PROPOSAL SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE DEGREE OF BACHELOR IN ELECTRONICS & COMMUNICATION ENGINEERING

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ABSTRACT

As we all are aware that COVID-19 has affected us in very harsh manner, we have come up to a solution of an semi intangible machine that can be used in public places which will sanitize a person's hand, sterilize his/her belongings, measures temperature,oxygen level and Heart beat and use it to predict if he or she has COVID symptoms or not. Moreover it will detect if a person is wearing a mask or not and determining whether he/she can enter the area or not with the help of Image Processing.Finally it will also have the capability to process if the people in the area are maintaining social distancing or not. This machine is Partially intangible and works using proximity sensor and Arduino Nano as micro-controller. The physical body of the machine was the main concern which we were able to proceed with a 3D design and then was finally fit into a complete piece. It doesn't only work on AC supply but also works on battery. We have used a Infrared thermal gun to measure temperature so the measured temperature matches health and medical standard. To sterilize a person belonging we have used a UV-C ray.

Keywords

COVID-19, Arduino, Sterilizing,Image Processing

ACKNOWLEDGMENT

We are thankful to the Department of Electronic and Communication Engineering, Kantipur Engineering College and Er. Sujin Gwachha for the providing this platform for us. Our thanks and gratitude to our colleagues in developing the project and Our respected Lecturer who have willingly helped us.

We have made every attempt to make this report informative and helpful for understanding. We would accept suggestion and recommendation regarding to this report that can help us in future.

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CHAPTER 1
INTRODUCTION

Corona virus Infectious Disease - 2019 (COVID – 19) is caused by the Severe Acute Respiratory Syndrome Corona virus 2 (SARS-CoV-2) affecting millions and killing tens of thousands of individuals around the globe. Some people may be affected by Corona in drastic manner which need proper medical care. These system is proposed to help people follow the basic COVID-19 protocol and also take in clinical features like temperature,Heart beat and oxygen level to predict the symptoms of Covid for the user.

1.1 Overview

The three basic important protocols to be followed are wearing mask, using hand sanitizer or washing hand for at least up to 20 seconds, sanitizing own belongings which are used most frequently. If there is any symptoms of fever and cough immediately take precaution and isolate yourself from the crowd.

The primary propose of this machine is that it can easily help us to follow above fundamental protocols with in a one machine rather than having different system and places. The main advantage of this machine is that we can check and sanitize with in one machine. The machine works on power supply and also works on battery power.

1.2 Background

In this machine one can sanitize oneself and belongings intangibly, we use industrial grade IR sensor in order to make the machine function intangibly. However measuring oxygen level is not possible that way to predict the symptoms.That is why we have proposed a semi tangible machine following all safety protocol proposed by WHO in order to complete the project.

1.3 Problem Statement

Realizing the effect of COVID-19 pandemic in the present scenario, a certain health protocol has to be implemented in every human daily life routine. While going to some landmarks, public places where a huge crowd is present, it is at owns sake to follow a certain protocol to protect themselves from this dreadful virus. The pandemic has affected the whole world mentally, physically as well as economically but this should not stop people from doing their daily jobs. We can see security guards or some people holding a bottle of sanitizer and a thermal gun to manually measure temperature and sanitize hand which is not feasible at long term or at crowded places. Therefore, the machine we are proposing overcomes those problem[1] In the context of Nepal, many mechanical innovations have been in use since the pandemic to sanitize people in places like restaurant and landmark. The fault in those products are they are tangible, but the machine we have proposed has tackled this issue as it is intangible[2].

1.4 Objectives

The objectives of proposed project are given below:

- To sanitize human hands and people's belongings.
- To build Health monitoring system like temperature,Pulse,SPO_2
- To Analyze clinical features in predicting COVID symptoms
- To Analyze clinical features in predicting COVID symptoms
- To detect if social distancing is being followed or not.

1.5 Project Features

The features of proposed projects are given below:

- Infrared thermometer to measure a person's body temperature.
- The health monitoring system measures the vital criteria like temperature,Pulse,SPO_2
- Camera to detect if a person is wearing a mask and maintaning Social distance or not
- UV ray to sterilize the belongings
- Proximity Sensor to function the process of sanitizing, sterilizing and measuring temperature intangibly.

1.6 Feasibility

Technically speaking this is crucial part of the system because it decides whether the concept is achievable in real life or not. Most of the system analysis enhances the best utilization of money, resources as well as time. So before carrying out detail system analysis, certain time was devoted in dealing with feasibility study.

1.6.1 Economical Feasibility

This project is quite cost effective as the hardware components that we will be using in the construction of this device are easily available in the market and are cheap apart from the Infrared Thermal sensor. Since the temperature we need to measure should follow health and medical standard we have reverse engineered Infrared Thermal Gun and made it work automatically using proximity sensor.

1.6.2 Technical Feasibility

Our project seems to be technically feasible on its structural development and its hardware requirement, since it uses less number of sensors and other electronic components. By using the limited numbers of sophisticated electronic components we can receive the desired output. This project is based on modern technology based hardware components and devices which will be very applicable in real life. We have selected the hardware components in such a manner that this project is technically feasible.

1.6.3 Operational Feasibility

As this system is stationary with multiple functionality, it is every efficient because the proximity sensor we are using is of industrial grade. The system works both on power supply as well a 12 V lead acid battery so electric power cut is not a problem to our machine. Also this is a 4 in 1 machine that sanitizes, sterilizes, detects mask and measures temperature without even touching the machine.

CHAPTER 2
LITERATURE REVIEW

Coronaviruses are transmitted from animals to people, with this particular strain of coronavirus thought to have originated from a seafood market in the city of Wuhan in China in late December of 2019. Symptoms of COVID-19 resemble that of the common cold, with those infected often experiencing fever, coughing, and shortness of breath. However, infection can lead to pneumonia, multi-organ failure, severe acute respiratory syndrome, and even death, in more severe cases. The elderly and those with preexisting chronic health conditions have accounted for the majority of deaths from COVID-19[**?**] In human terms, the toll of the disease is almost unfathomable: COVID-19 has killed more than 2 million people since it was first reported by the World Health Organization (WHO). There have been nearly 80 million cases reported so far—and many more go undocumented. As we know in the pandemic time -in context of Nepal- when vaccination wasn't an option, safety protocols are the most important to keep us away from covid-19[?]. According the WHO 5 sanitizing hand with alcohol or washing hand repeatedly with shop up to at least 20 second, wearing mask and sterilizing our belonging can keep us away from covid-19. In market after pandemic many types of machine came with many feature, this is the only one which have all the safety features in one machine[3]. All these protocol should be followed by everyone at everywhere. Mainly places where flow of the people is more like bank, shopping malls etc. this machine is needed.

2.1 Sanitizing Machine in Market

2.1.1 Fogger Machine

Figure 2.1 shows the fogger machine. This fog machine produces special fog to the surrounding which kills the viruses present in the air as well as surfaces.

Figure 2.1: Fogger Machine

2.1.2 UV sterilizing Machine

Figure 2.2 shows the fogger machine. This fog machine produces special fog to the surrounding which kills the viruses present in the air as well as surfaces.

Figure 2.2: UV Sterilizing Machine

CHAPTER 3
SYSTEM REQUIREMENT

3.1 Software Requirement

3.1.1 Python IDE

Python is an interpreted high-level general-purpose programming language. Python's design philosophy emphasizes code readability with its notable use of significant indentation. Its language constructs as well as its object-oriented approach aim to help programmers write clear, logical code for small and large-scale projects. We use python in order to perform machine learning to predict the symptoms of COVID with higher accuracy

3.1.2 Arduino IDE

The Arduino Software (IDE) includes a text editor for writing code, a message area, a text console, a toolbar with buttons for basic functions, and a series of menus. It communicates with the Arduino and Genuino devices by connecting to them and uploading code. Sketches 8 are programs created with the Arduino Software (IDE). These sketches were created with 7 a text editor and saved with the.ino file extension. The message section indicates faults and provides feedback while storing and exporting. The Arduino Software (IDE) outputs text to the console, which includes detailed error messages and other information.

3.2 Hardware Requirement

3.2.1 Arduino

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. It can tell your board what to do by sending a set of instructions to the microcontroller on the board.

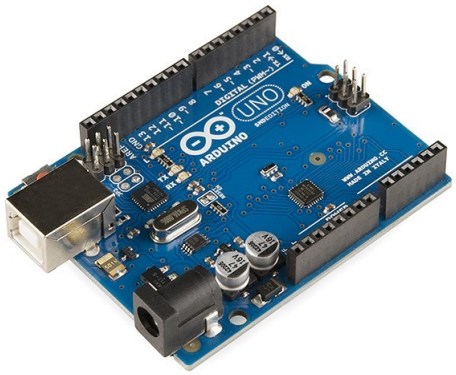


Figure 3.1: Arduino

3.2.2 Infrared Thermometer

This is the equipment used to measure the temperature of the human body without touching surface.

Figure 3.2: IR Thermometer

3.2.3 Car Wiper Motor

The car wiper motor is the component that powers the windshield wipers. As it spins, a mechanism built to it rotates a worm gear, arm and, finally, the windshield or windscreen wiper blades. The wiper blades then rid the windscreen of water, snow, dust, or any other debris that may affect visibility when driving.

Figure 3.3: Car Wiper Motor

3.2.4 Raspberry Pi

The Raspberry Pi is a low cost, credit-card sized computer that plugs into a computer monitor or TV, and uses a standard keyboard and mouse. It is a capable little device that enables people of all ages to explore computing, and to learn how to program in languages like Scratch and Python.The original Pi had a single-core 700MHz CPU and just 256MB RAM, and the latest model has a quad-core CPU clocking in at over 1.5GHz, and 4GB RAM.

Figure 3.4: Raspberry Pi

3.2.5 IR proximity sensor:

Proximity Sensor are used to detect objects and obstacles in front of sensor. Sensor keeps transmitting infrared light and when any object comes near, it is detected by the sensor by monitoring the reflected light from the object

Figure 3.5: IR Proximity Sensor

3.2.6 MAX30100

The MAX30100 is a sensor that combines pulse oximetry and a heart rate monitor. It detects pulse oximetry and heart rate signals using two LEDs, a photo detector, improved optics, and low-noise analog signal processing. It's an optical sensor that derives its readings from emitting two wavelengths of light from two LEDs – a red and an infrared one – then measuring the absorbance of pulsing blood through a photo detector. This particular LED colour combination is optimized for reading the data through the tip of one's finger.

Figure 3.6: Oxymeter

3.2.7 Pump Motor

Pump is a mechanical device that converts mechanical torque into hydraulic energy. It simply facilitates movement of fluids from one place to another using suction or pressure or both. Motors, on the other hand, are electro-mechanical devices that are used to convert electrical energy into mechanical energy.

Figure 3.7: Pump Motor

3.2.8 Temperature Sensor

The MAX30205 temperature sensor accurately measures temperature and provide an over temperature alarm/interrupt/shutdown output. This device converts the temperature measurements to digital form using a high resolution, sigma-delta, analog-to-digital converter (ADC).

Figure 3.8: Temperature Sensor

3.2.9 UV-C Tube Light

With a 99.9 effective rate, UVC LED Tubes can kill viruses promptly. Viruses are known for lingering on surfaces for a few hours to several days at a time. It is extremely sensitive to ultraviolet light and scientists have confirmed that the virus can be killed at certain exposures of UV.

Figure 3.9: UV-C Tube Light

3.2.10 USB Web Cam

A webcam is a video camera that feeds or streams an image or video in real time to or through a computer to a computer network, such as the Internet. Webcams are typically small cameras that sit on a desk, attach to a user's monitor, or are built into the hardware.

Figure 3.10: USB Webcam

CHAPTER 4
METHODOLOGY

This project includes four major parts, which are mainly used in COVID-19 safety protocols. Mask detection part detects mask on the face of the people, automatic temperature portion takes reading of the temperature of wrist of the people and shows on the display temperature reading in the LCD screen. To maintain the medical standard, we have reversed engineered the medical infrared thermal gun for this project. As we know most of the viruses transfer through hand and it has to be sanitize regularly so automatic hand sanitizer helps to sanitize our hand without touching any surfaces.

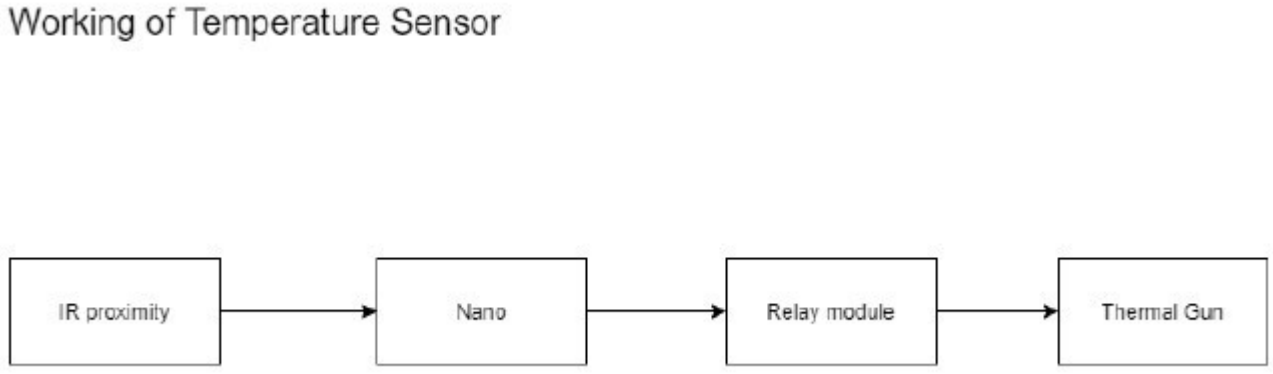
Finally, we have UV-C chamber in this project which is used to disinfect the person's belongings like bag, cloths, documents and cash etc. many of the research verified that exposer of viruses in UV-C kills the viruses more easily. Many of the country are also used to apply UV-C to kill pathogens or to disinfect the tools and other things.

The flow chart and block diagram of working are described below:

4.1 Block Diagram

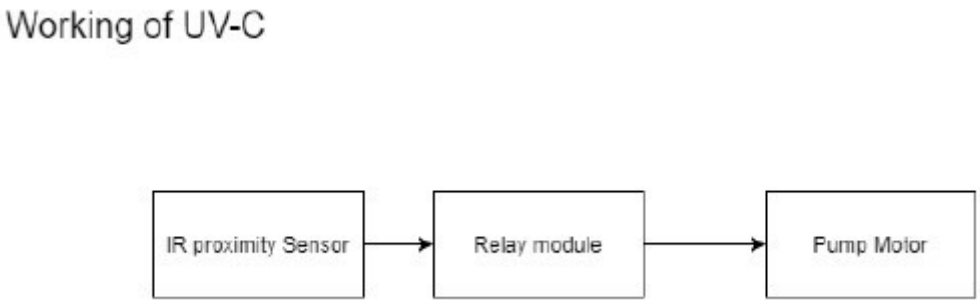
4.1.1 Temperature Sensor

In this project, the reversed engineered Thermal Gun will measure human body temperature sensor will be interface to reach the health and safety standard and display it digitally.



4.1.2 UV-C tube

In this project, the reversed engineered Thermal Gun will measure human body temperature sensor will be interface to reach the health and safety standard and display it digitally



4.1.3 Logistic Regression

Logistic regression is a process of modeling the probability of a discrete outcome given an input variable. The most common logistic regression models a binary outcome; something that can take two values such as true/false, yes/no, and so on. Multinomial logistic regression can model scenarios where there are more than two possible discrete outcomes. Logistic regression is a useful analysis method for classification problems, where you are trying to determine if a new sample fits best into a category. As aspects of cyber security are classification problems, such as attack detection, logistic regression is a useful analytic technique.

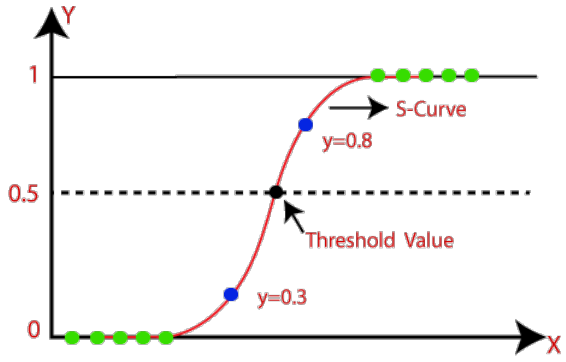


Figure 4.1: Logistic Regression

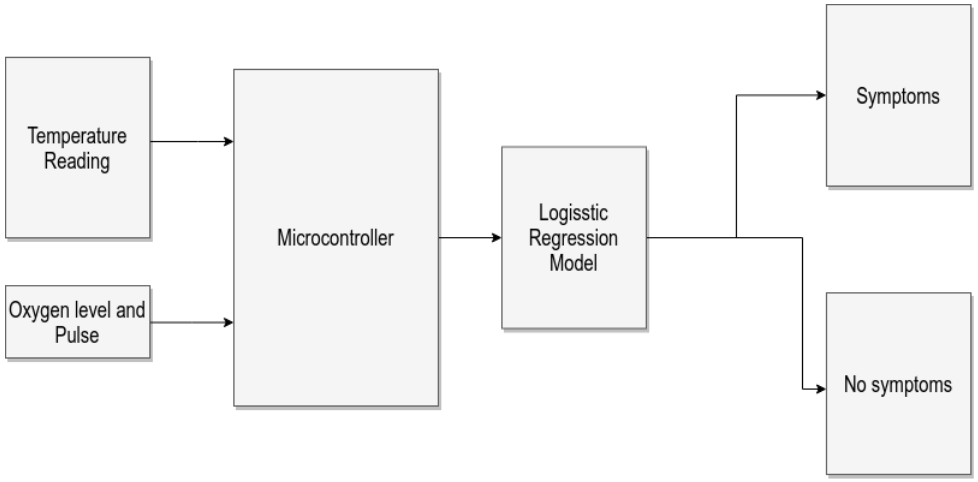


Figure 4.2: Logistic regression

4.1.4 Convolutional Neural Networks

A Convolutional Neural Network (ConvNet/CNN) is a Deep Learning algorithm which can take in an input image, assign importance (learnable weights and biases) to various aspects/objects in the image and be able to differentiate one from the other. The pre-processing required in a ConvNet is much lower as compared to other classification algorithms. While in primitive methods filters are hand-engineered, with enough training, ConvNets have the ability to learn these filters/characteristics.

CNN develops an automatic diagnostic system which uses chest X-ray analysis results to diagnose whether a person is COVID-19-affected or normal. The study begins with collection of primary dataset containing two image classes: one class belonged to chest X-rays of COVID-19-confirmed cases and the other class of images belonged to the normal people without the disease. The open source dataset is concerned medical professionals analysed the dataset and removed some of the X-ray images which were not clear in terms of quality and diagnostic parameters which result dataset very clean, as each X-ray image was of good quality as well as clear in terms of significant diagnostic parameters according to their expertise.The dataset will be augmented to increase its size. The resulted dataset is used to train the model in the next phase. After training, the model will be tested for its performance in the disease detection. The testing of proposed CNN model has been done using test dataset held from the primary dataset as well as using the independent validation dataset.

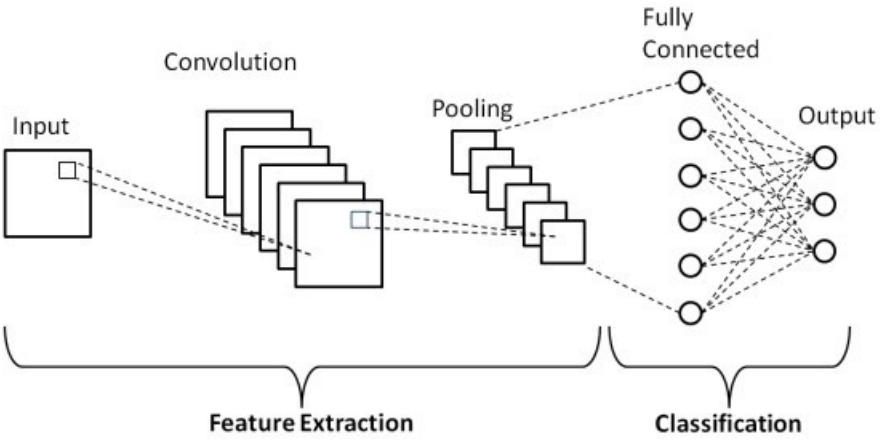


Figure 4.3: Convolutional Neural Network

VGGNet-16

The full name of VGG is the Visual Geometry Group.It has released a series of convolutional network models beginning with VGG, which can be applied to face recognition and image classification, from VGG16 to VGG19. The original purpose of VGG's research on the depth of convolutional networks is to understand how the depth of convolutional networks affects the accuracy and accuracy of large-scale image classification and recognition. -Deep-16 CNN), in order to deepen the number of network layers and to avoid too many parameters, a small 3x3 convolution kernel is used in all layers.

The input of VGG is set to an RGB image of 224x244 size. The average RGB value is calculated for all images on the training set image, and then the image is input as an input to the VGG convolution network. A 3x3 or 1x1 filter is used, and the convolution step is fixed. . There are 3 VGG fully connected layers, which can vary from VGG11 to VGG19 according to the total number of convolutional layers + fully connected layers. The minimum VGG11 has 8 convolutional layers and 3 fully connected layers. The maximum VGG19 has 16 convolutional layers. +3 fully connected layers. In addition, the VGG network is not followed by a pooling layer behind each convolutional layer, or a total of 5 pooling layers distributed under different convolutional layers. The following figure is VGG Structure diagram:

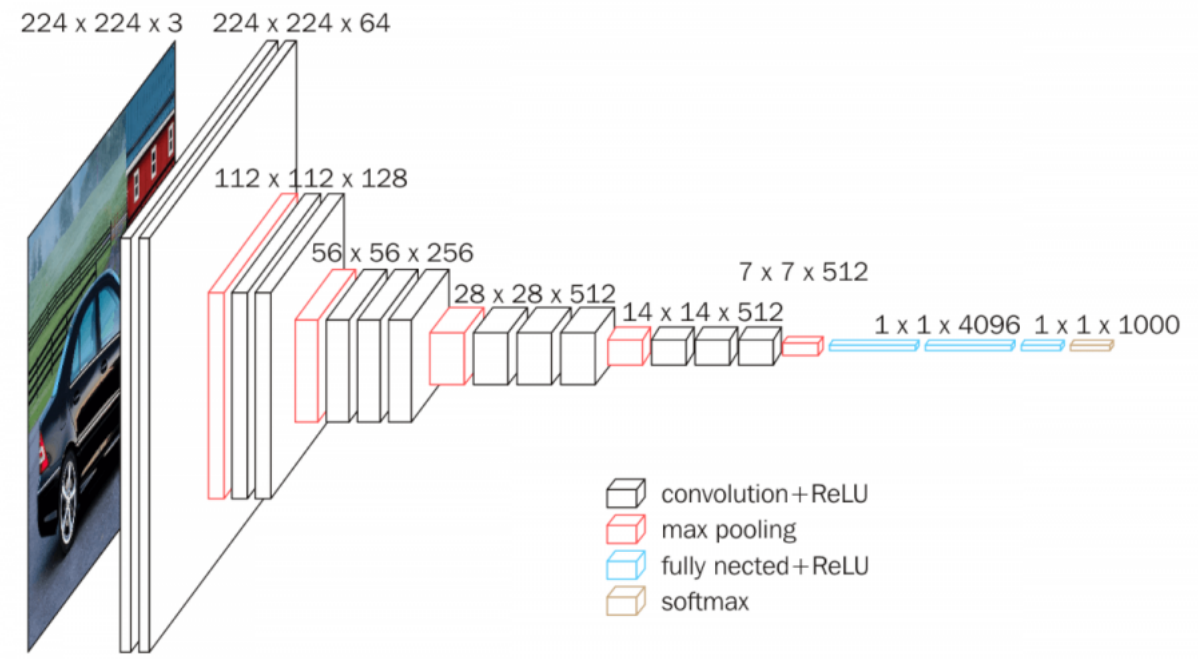


Figure 4.4: VGG

Figure 4.5: VGG architecture

4.1.5 SP02 Sensor

In this project MAX30100 Pulse Oximeter Sensor will be Interfacing with Arduino Uno that can measure Blood Oxygen and Heart Rate and send it to a server. The blood Oxygen Concentration termed as SpO2 is measured in Percentage and Heart Beat/Pulse Rate is measured in BPM. The MAX30100 is a Pulse Oximetry and heart rate monitor sensor solution.

CHAPTER 5
EPILOGUE

5.1 Expected Outcome

The following mentioned outcomes or results are highly expected:

- Semi tangible machine
- Measures human temperature, oxygen saturation level and heart beat rate and analyzes them to assure COVID safety
- Alerts public if they are not wearing a mask through image processing
- Measures distance within people to guide them follow social distancing.

5.2 Application

- To measure human temperature, oxygen saturation level and heart beat rate.
- To compare the data and analyse whether people carry COVID symptoms or not.
- To disinfect cash in banks, medical or surgical tools in hospitals and others.
- To ensure social distancing within people.
- To set up a public alert system for people who are not wearing masks.
- To ensure social distancing within people.

5.3 Budget Analysis

SN	Hardware Required	Quantity	Unit Price	Total
1	Arduino	3	900	2700
2	OLed	1	1600	1600
3	16*2 LCD	1	200	200
4	Microphone Module	1	200	200
5	ECG Sensor(AD8232)	1	2100	2100
6	Temperature Sensor (max 30205)	1	1200	1200
7	SpO_2 Sensor(max 30100)	1	1600	1600
8	Stethoscope Chest piece	1	750	750
9	Sd card module	1	200	200
Total:	*	*	*	10750

Table 5.1: Budget Analysis

5.4 Work Schedule

The work schedule followed for various parts of our project is shown in following chart:

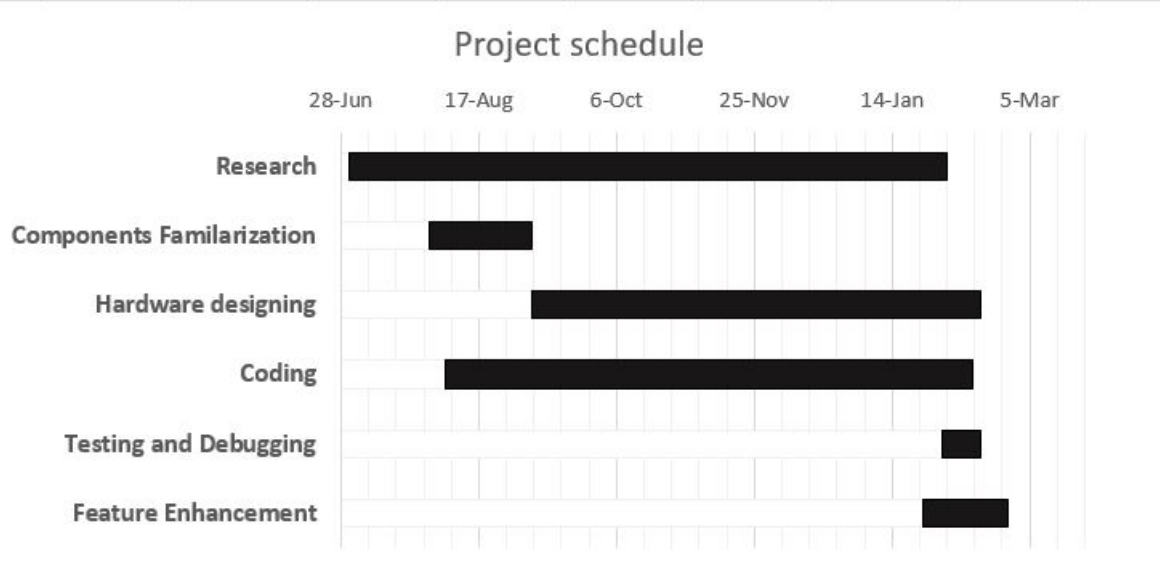


Figure 5.1: Gantt Chart

5.4.1 Work Completed

- Analysed and Checked Covid Prevention Machine.
- Obtained Pneumonia Data set from Kaggle.
- Created a Model of Pneumonia Detection.
- Created a Python GUI and implemented the Model.

5.4.2 Work Remaining

- Obtaining dataset of clinical data from different patients
- Creating a Logistic Regression Model and implemeting it in a web app
- Designing and Implementing a station for collecting validation data for prediction