



# **IOT BASED SMART CLASSROOM AUTOMATION**



## **A PROJECT REPORT**

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*in partial fulfillment of the requirement*

*for the award of the degree*

*of*

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*in*

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**SAMAYAPURAM – 621 112**

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**BONAFIDE CERTIFICATE**

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## DECLARATION

We jointly declare that the project report on “**IOT BASED SMART CLASSROOM AUTOMATION**” is the result of original work done by us and best of our knowledge, similar work has not been submitted to “**ANNA UNIVERSITY CHENNAI**” for the requirement of Degree of Bachelor of Engineering. This project report is submitted on the partial fulfilment of the requirement of the award of Degree of **BACHELOR OF ENGINEERING**.

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Date: 26-05-2022

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## **ABSTRACT**

Smart classroom is the representative of the modern teaching. With the advent of modern technology it becomes easier for the students as well as teachers to perform their task more efficiently. With the aid of modern technology it has become easier for the students and teachers across the world to get a good grasp of the theoretical as well as practical knowledge. Through technology it has become easier to visualize anything in 3D and therefore the technology helps us to be conversant of the nuances of any concept. The smart classroom is rectification to various problems that teacher as well as student faces inside the classroom. This projects aims to make use of the modern technology for helping the teachers in utilizing more time for teaching and students to easily get access to the study material. In this project we are building a prototype of smart classroom in which an application would be pivotal for carrying out various operations in classroom.

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## **CHAPTER 1**

### **INTRODUCTION**

The quality of education is a vital demand in today's competitive setting. Technology has affected us in each facet. Intuitive categories are a progressive approach of education within the education situation in India that offer quality teaching and learning opportunities to lecturers and students by serving them to longer devotion towards the teaching, better construct formation and educational action. In efforts to grow academically it should be considered that differentiated modalities of teaching and learning area unit necessary to implement deeper levels of growth and abstract development ICT has gone from being a communication and information technology to a system of creation and distribution of curricula for lecturers and students. New teaching ways are introduced that are called intelligent category. It uses instructional material, 3D animated modules and videos, and every one fame instructional institutions use this idea. The idea of intelligent schoolroom has not solely created an interesting education however a chance for college kids to boost their performance. The possibilities or blessing of good lecture rooms area unit endless. Though adopting such a brand new idea could be tricky call for several however the technology will produce new gap for the education sector.

#### **1.1 Smart Classroom**

A smart learning setting not solely permits students to access digital resources and Engagein learning systems anyplace and anytime however additionally actively provides necessary student learning, suggestions and support tools, study suggestions within the right place, at the correct time and to the correct manner.

The smart classroom is an enhanced classroom of technology that improves teaching and learning opportunities by group action learning technologies, like

computers, special software, response technology audiences, helpful listening devices, networking, and audio / visual capabilities.

### **1.1.1 Connected devices:**

These are electrical devices that are smart, courtesy of Internet connectivity as well as sensors. The Master can control these devices from their phones from anywhere in the room.

### **1.1.2 Internet of Things:**

It's a enchantment wand that turns the classroom into a keen classroom. In conjunction with the combination of sensors, savvy frameworks, Android apps, IOT interface every day accessible objects to a organize, which empowers these things to total errands and communicate with each other , without input commitments from the client.

After you incorporate automation within the classroom, associated gadgets and IOT you'll be able get Smart Classroom. A present day shrewd domestic can be effectively overseen through a Smartphone, tablet.

## CHAPTER 2

### LITERATURE REVIEW

#### 2.1 INTRODUCTION

**Authors:** F. Chang, H. Huang and L. Chu,

**Title:** "Learning the Classroom Automation Preferences with Low User Intervention," 2020 IEEE 2nd Global Conference on Life Sciences and Technologies (Life-Tech), 2020, pp. 31-34, doi: 10.1109/LifeTech48969.2020.1570616823.

**Abstract:** With the affordable Internet of Things (IoT) devices, the number of smart classrooms are increasing. There are researches on how to incorporate the IoT technology into the pedagogy. We put the emphasis on classroom automation which enables the teacher to flexibly configure the smart devices without coding. It is achieved by a framework on top of the physical IoT network. In the framework, the automation process is modeled as a state transition engine. The teacher only needs to signal the engine to take a few system state snapshots as the preferences. Once the preference model is derived by the learning process, an event would trigger the engine to compute the suggested system states from this model. Then the automation process invokes the predefined actions to reach the target system states. The framework allows the engineer to provide the basic functions to configure the system, while keeping the user intervention low at providing the training data. In addition to describing the example applications of the framework, a simple use case is also simulated to demonstrate how to design a learning mechanism for this framework.

**Author:** A. Gupta, P. Gupta and J. Chhabra,

**Title:** "IoT based power efficient system design using automation for classrooms," 2015 Third International Conference on Image Information Processing (ICIIP), 2015, pp. 285-289, doi: 10.1109/ICIIP.2015.7414782.

**Abstract:** The paper presents the design and implementation of an Ethernet-based intelligent automated system for conserving electrical energy using a INTEL GALILEO 2ND generation development board, which can be used in large organizations like a University or an office. The proposed system works on automation, so that the electrical devices and switches can be remotely controlled and monitored without any human intervention. It uses the available infrastructure in a classroom that includes surveillance camera and Ethernet connectivity so as to minimize the cost criteria. It is monitored and controlled remotely from a web server located at the control room using the Internet or the Intranet connectivity. The proposed outcome of the project aims as multiple benefits, saving on electricity bills of the University or any other organization it is deployed in, eliminating human involvement and manpower which is often required to manually toggle the lights and electrical device on/off, and last but most importantly, conserve the precious natural resources by reducing electrical energy consumption.

## 2.2 PROBLEM STATEMENT

An ideal classroom is an environment in which teachers are able to focus completely on their lectures and the students are able to concentrate on the information they are being conveyed. Unfortunately, this does not happen most of the time in Indian Classrooms. During the first ten minutes of every class hour, time is usually wasted in many ways such as manually recording student's attendance one after another in the attendance register. Other disruptions also occur throughout class time such as temperature and light variation in summer and winter seasons respectively. These problems cause affected students to wander around the class guessing for the right switch and adjusting it to equilibrate the environment back to

satisfying or comfortable conditions. This causes disturbances for both teachers and all the other students, and so to eliminate these irritations and automated classroom is created which allows the classroom to become more efficient, and eliminate any human assistance in controlling the atmosphere.

### **2.3 EXISTING SYSTEM:**

There are two methods which is being followed previously. They are

1. Manual method
2. Automation without IoT and individual costly systems

#### **2.3.1 Advantages of the existing system:**

- Manual methods are used in small schools with less number of students.
- Automation can be implemented for only needy systems which may reduce cost

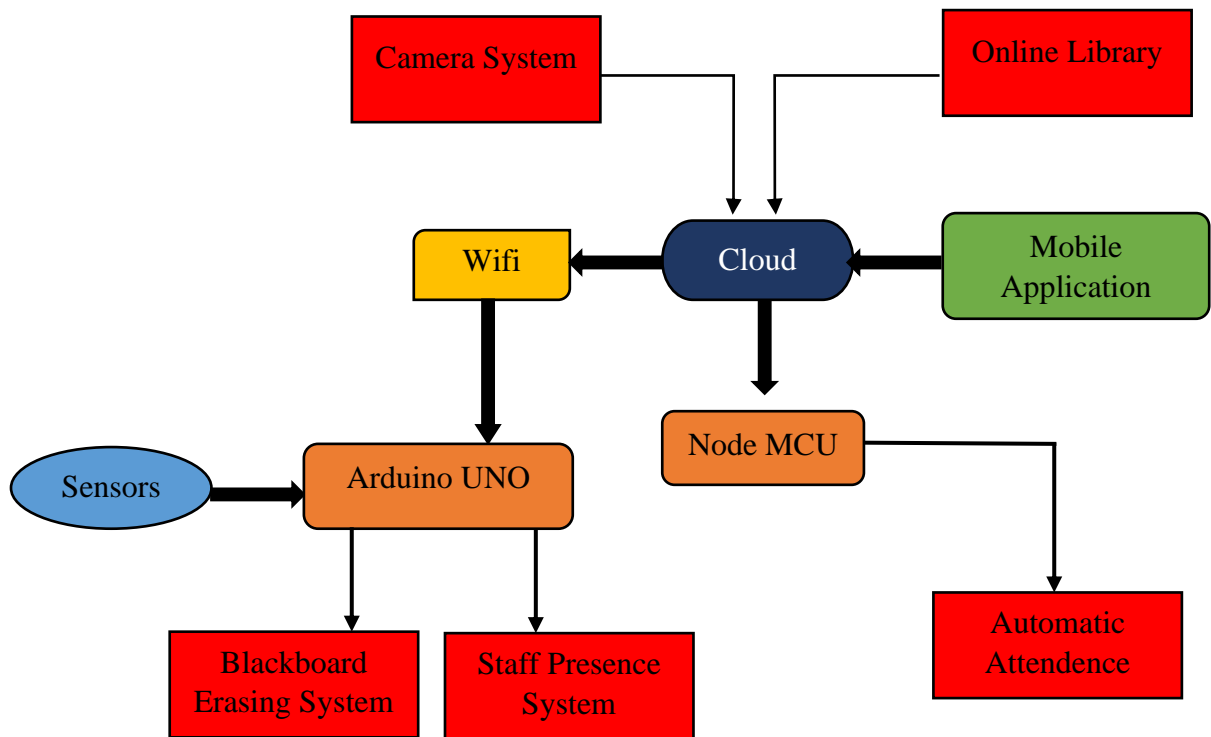
#### **2.3.2 Main disadvantages of this existing systems:**

- Time consuming
- Relatively high cost
- Contains minimum number of automated systems
- Students and teachers will get disturbed
- Electricity is wasted due to carelessness

However in our system these disadvantages are overcome effectively.

## 2.4 PROPOSED SYSTEM

The proposed system integrates all individual systems under one board. So that the cost of overall system will be reduced efficiently. The block diagram of proposed system is shown in Figure.



**Fig. 1.1 Block Diagram of Proposed System**



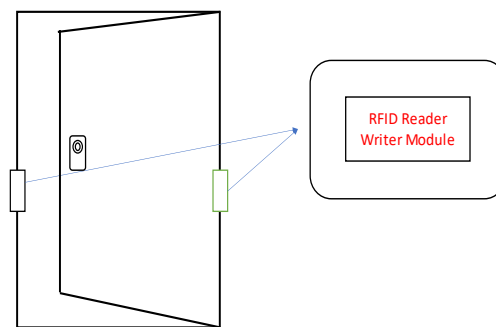
## CHAPTER 3

### METHODS AND MATERIALS

#### 3.1 METHODOLOGY

##### 3.1.1 AUTOMATIC ATTENDANCE SYSTEM USING RFID:

In this project, we are going to build an RFID based attendance system using Node MCU. An RFID based Attendance Management System is based on some simple concepts. We store a set of RFID card data in our system, say 3 or 10 RFID card data. When the person with the right RFID card (compatible to data preloaded in our program/system) come and swipes his RFID tag, his arrival time will be stored on the system. When the same person swipes his RFID tag again, the system will save it as his leaving time and add it to his total working hours.

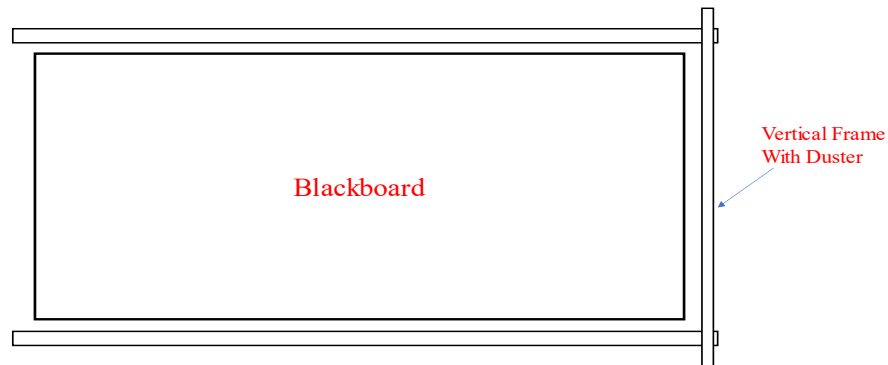


**Fig.1.2 Automatic Attendance System**

##### 3.1.2 AUTOMATIC BLACK BOARD ERASING SYSTEM:

After every lecture is over one has to erase the blackboard manually. This takes more time and the dust particles affects breathing of the person who is erasing the board. So In order to overcome this, automatically black board is erased by simply

pushing a button ON/OFF. A vertically fixed framed powered by electric motor slides through a guide way in a manner to erase the contents in the black board. The sample Board cleaning system is shown in below Fig.



**Fig. 1.3 Automatic black board erasing**

### **3.1.3 REAL TIME FACE MASK DETECTION:**

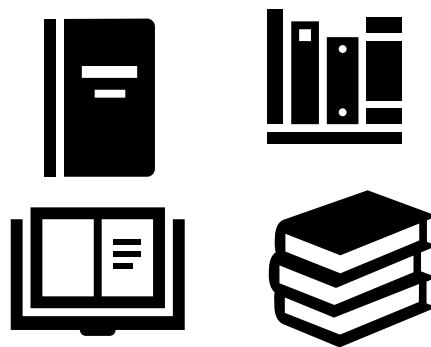
To shield ourselves from the COVID-19 Pandemic, virtually everyone puts on a face mask. In most public events, such as malls, theatres, and parks, it is becoming increasingly important to see if people in the crowd wear face masks. The development of an AI solution to detect whether a character is wearing a face mask and grant them access could be extremely beneficial to society. In this project, a simple Face Mask detection machine is built using Convolutional Neural Networks, a Deep Learning method (CNN). This CNN Model is built with the TensorFlow system and the OpenCV library, which are both excellent used for real-time applications. This version can also be used to extend a full-fledged software application so that anyone can test it out before submitting it to the general public. This version achieves a level of accuracy of over 96 percent.



**Fig.1.4 Real Time Face Mask Detection**

### 3.1.4 ONLINE LIBRARY MANAGEMENT SYSTEM:

Online Library Management System is a system which maintains the information about the books present in the library, their authors, the members of library to whom books are issued, library staff and all. This is very difficult to organize manually. Maintenance of all this information manually is a very complex task. Owing to the advancement of technology, organization of an Online Library becomes much simple. The Online Library Management has been designed to computerize and automate the operations performed over the information about the members, book issues and returns and all other operations. This computerization of library helps in many instances of its maintenances. It reduces the workload of management as most of the manual work done is reduced

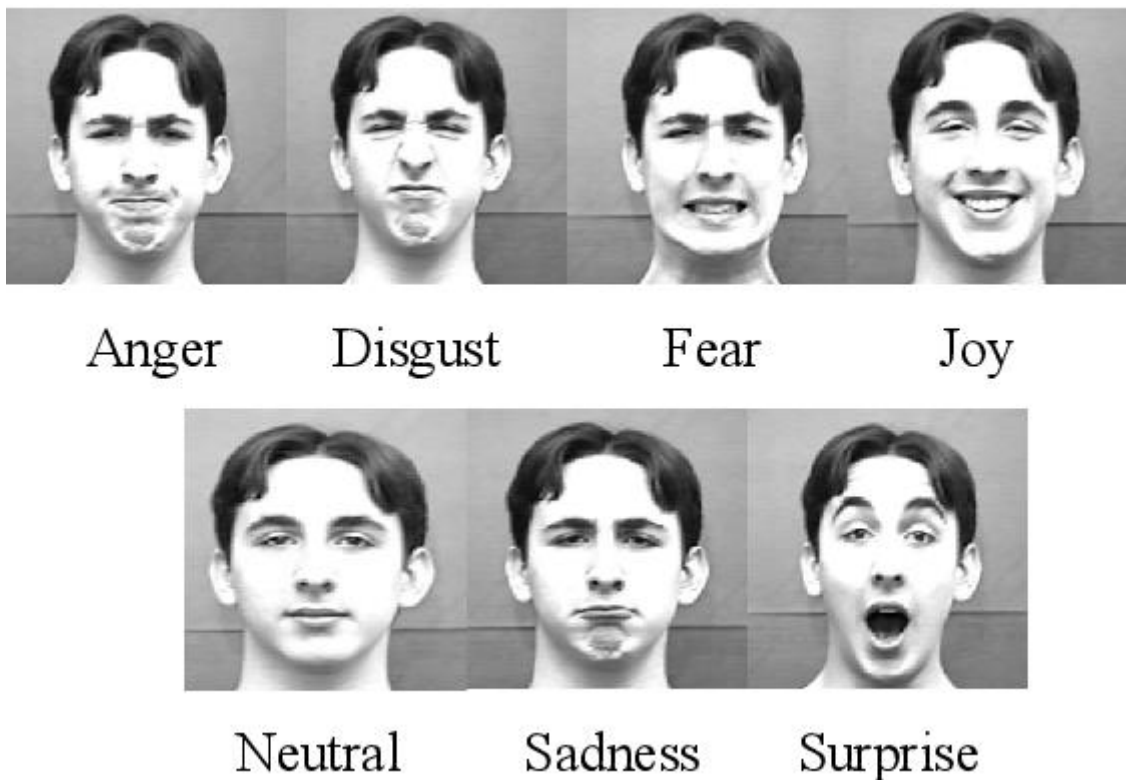


**Fig.1.5 Online Library Management System**

### 3.1.5 REAL TIME EMOTION DETECTION:

Interpersonal interaction is oftentimes intricate and nuanced, and its success is often predicated upon a variety of factors. These factors range widely and can include the context, mood, and timing of the interaction, as well as the expectations of the participants. For one to be a successful participant, one must perceive a counterpart's disposition as the interaction progresses and adjust accordingly. Fortunately for humans this ability is largely innate, with varying levels of

proficiency. Humans can quickly and even subconsciously assess a multitude of indicators such as word choices, voice inflections, and body language to discern the sentiments of others. This analytical ability likely stems from the fact that humans share a universal set of fundamental emotions. Significantly, these emotions are exhibited through facial expressions that are consistently correspondent. This means that regardless of language and cultural barriers, there will always be a set of fundamental facial expressions that people assess and communicate with.



**Fig. 1.6 Real Time Emotion Detection**

## 3.2 COMPONENTS:

### 3.2.1 ARDUINO UNO R3

Arduino is a development board that integrates a microcontroller and its support circuitry with digital and analog inputs and outputs. It has an open source computing development platform based on an environment for programs creation.

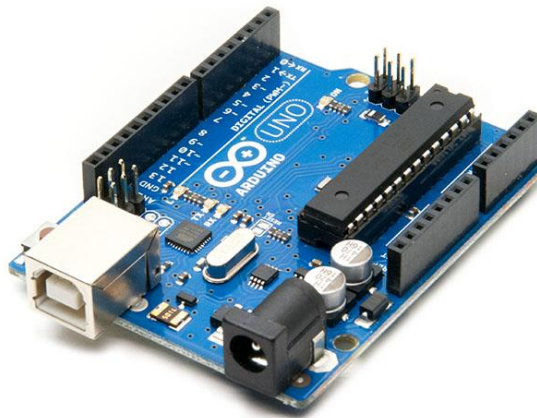


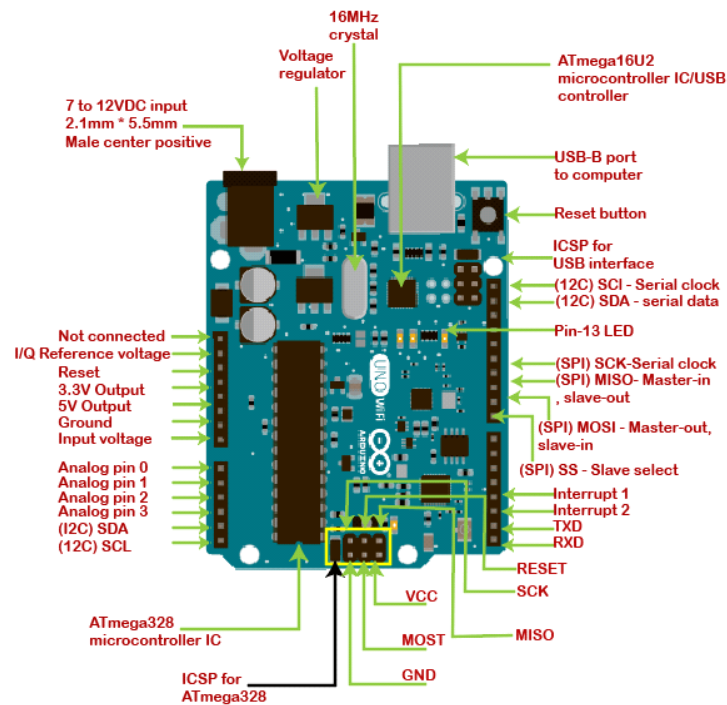
Fig. 1.7 Arduino UNO r3

#### 3.2.1.1 SPECIFICATIONS:

Table 2.1 Specification of Arduino UNO

Arduino Board	Microcontroller	Input Voltage	Operating Voltage	Output Current	Clock Frequency	Flash Memory	SRAM	EEPROM	Digital Inputs	PWM Outputs	Analog Inputs
UNO	ATmega a328P	7-12 V	5V	20mV	16MHz	32 KB	2KB	1KB	14	06	06

### 3.2.1.2 PINS AND PARTS:

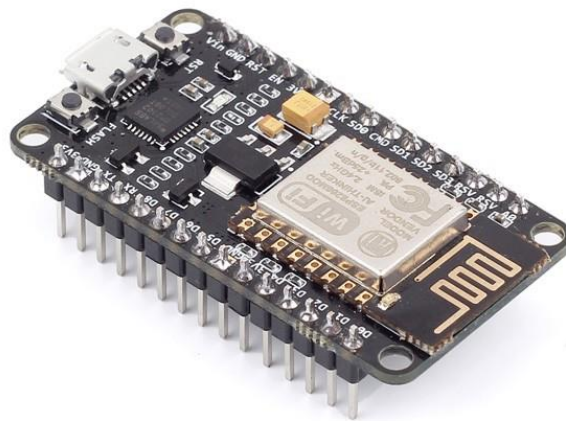


**Fig. 1.8 Parts and Pins of Arduino UNO**

### 3.2.2 NODEMCU

NodeMCU is a low-cost open source IoT platform. It initially included firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which was based on the ESP-12 module. Later, support for the ESP32 32-bit MCU was added. It is an open source firmware for which open source prototyping board designs are available. The name "NodeMCU" combines "node" and "MCU" (micro-controller unit). The term "NodeMCU" strictly speaking refers to the firmware rather than the associated development kits. Both the firmware and prototyping board designs are open source. The firmware uses the Lua scripting language. The firmware is based on the eLua project, and built on the Espressif Non-OS SDK for ESP8266. It uses many open source projects, such as lua-cjson and SPIFFS. Due to resource constraints, users need to select the

modules relevant for their project and build a firmware tailored to their needs. Support for the 32-bit ESP32 has also been implemented. The prototyping hardware typically used is a circuit board functioning as a dual in-line package (DIP) which integrates a USB controller with a smaller surface-mounted board containing the MCU and antenna. The choice of the DIP format allows for easy prototyping on breadboards.



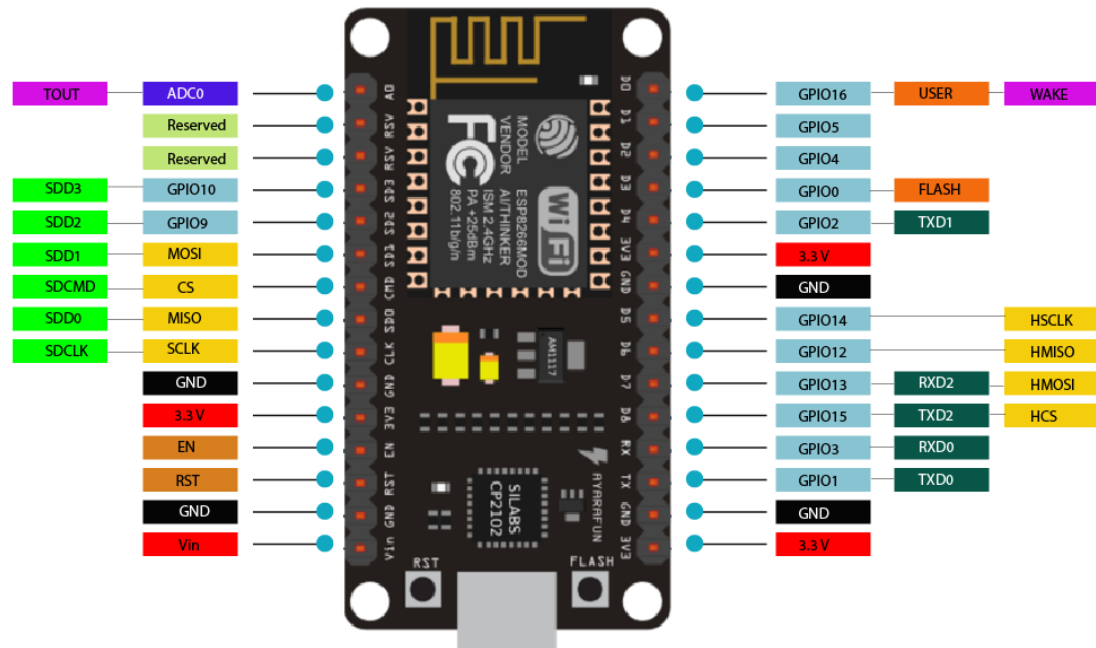
**Fig. 1.9 NodeMCU**

### 3.2.2.1 SPECIFICATION

**Table 2.2 Specification of Node MCU**

<b>NodeMCU</b>	<b>Microcontroller</b>	<b>Input Voltage</b>	<b>Operating Voltage</b>	<b>Output Current</b>	<b>Clock Frequency</b>	<b>Flash Memory</b>	<b>SRAM</b>	<b>EEPROM</b>	<b>Digital I/O pins</b>	<b>I2Cs &amp; SPIs</b>	<b>UARTs</b>
<i>ESP8266</i>	<i>ESP8266 32bit</i>	<i>7-12 V</i>	<i>3.3 V</i>	<i>12mV</i>	<i>80MHz</i>	<i>4 KB</i>	<i>64KB</i>	<i>1KB</i>	<i>16</i>	<i>01</i>	<i>01</i>

### 3.2.1.2 PINS AND PARTS:



## 1.10 Parts and Pins of Node MCU

### 3.2.3 WEBCAM (720p HD 1280x&20)

The Lapcam web camera comes with high-resolution video calls with video quality support up to 1280x720 pixels along with the latest version of skype, video chat & a high-quality video experience for the user. The device has been designed for recording high-quality videos, i.e : 720p upto (1280 x720) for youtube or other uploads with 5 glass lens that assures the user to capture an image with H.D quality. The webcam has an inbuilt & high-quality isolated microphone that helps to avoid unnecessary noise during video chats & while recording HD videos, along with an automatic low light correction feature for a low light environment. The webcam has



been designed with a universal clip that can be easily attached to your laptop/computer screen or used as a stand for a desk or shelf with different angles. It can also get easily fixed with tripod ready universal clip that perfectly fits with the Laptop & LCD monitors.



**Fig 1.11 WEB CAM (720P HD 1280X&20)**

### 3.2.3.1 SPECIFICATION

**Table 2.3 Specification of WEBCAM**

<b>Special Feature</b>	Low Light
<b>Video Capture Resolution</b>	720p
<b>Colour</b>	Black
<b>Brand</b>	Lapcare
<b>Lens Type</b>	Wide-Angle
<b>Exposure Control Type</b>	Automatic
<b>Image Capture Speed</b>	30 fps
<b>Connectivity Technology</b>	USB
<b>Item Weight</b>	200 Grams
<b>Special Feature</b>	Low Light
<b>Video Capture Resolution</b>	720p
<b>Colour</b>	Black
<b>Brand</b>	Lapcare
<b>Lens Type</b>	Wide-Angle
<b>Exposure Control Type</b>	Automatic
<b>Image Capture Speed</b>	30 fps
<b>Connectivity Technology</b>	USB
<b>Item Weight</b>	200 Grams

## 3.2.2 SENSORS

### 3.2.2.1 RFID READER WRITTER MODULE & TAG:

RC522 - RFID Reader / Writer 13.56MHz with Cards Kit includes a 13.56MHz RF reader cum writer module that uses an RC522 IC and two S50 RFID cards. The MF RC522 is a highly integrated transmission module for contact-less communication at 13.56 MHz. RC522 supports ISO14443A/MIFARE mode. RC522 - RFID Reader features an outstanding modulation and demodulation algorithm to serve effortless RF communication at 13.56 MHz. The S50 RFID Cards will ease up the process helping you to learn and add the 13.56 MHz RF transition to your project.

The module uses SPI to communicate with microcontrollers. The open-hardware community already has a lot of projects exploiting the RC522 – RFID Communication, using NodeMCU.

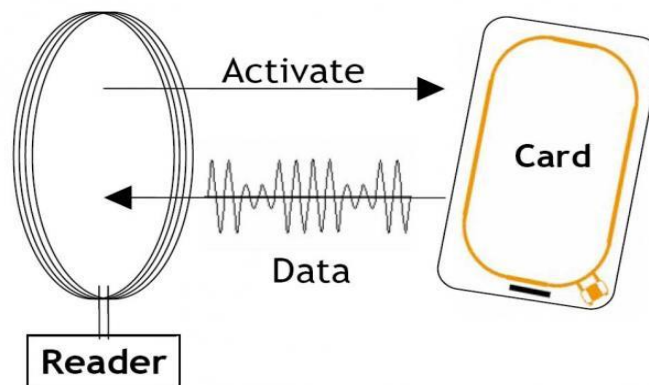


**Fig. 1.12 RFID Module Keychain & Cards**

### 3.2.2.1.1 RFID WORKING

This is RFID Reader/Writer RC522 SPI S50 CARD AND KEYCHAIN which works on non-contact 13.56mhz communication, is designed by NXP as low power consumption, low cost and compact size read and write chip, is the best choice in the development of smart meters and portable hand-held devices.

It uses the advanced modulation system, fully integrated at 13.56MHz with all kinds of positive non-contact communication protocols. Support 14443A compatible answer signal. DSP deal with ISO14443A frames and error correction.



**Fig 1.13. RFID Module & Card**

### 3.2.2.2 IR SENSOR

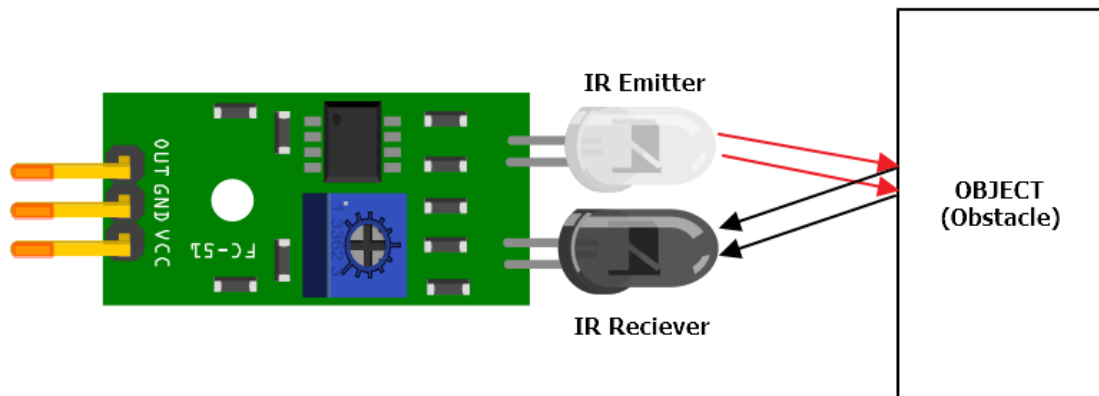
An infrared sensor is an electronic device that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measure only infrared radiation, rather than emitting it that is called a passive IR sensor. Usually, in the infrared spectrum, all the objects radiate some form of thermal radiation. These types of radiations are invisible to our eyes, which can be detected by an infrared sensor. The emitter is simply an IR LED and the detector is simply an IR photodiode that is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photodiode, the resistances and the output voltages will change in proportion to the magnitude of the IR light received.



**Fig 1.14. IR Sensor Module**

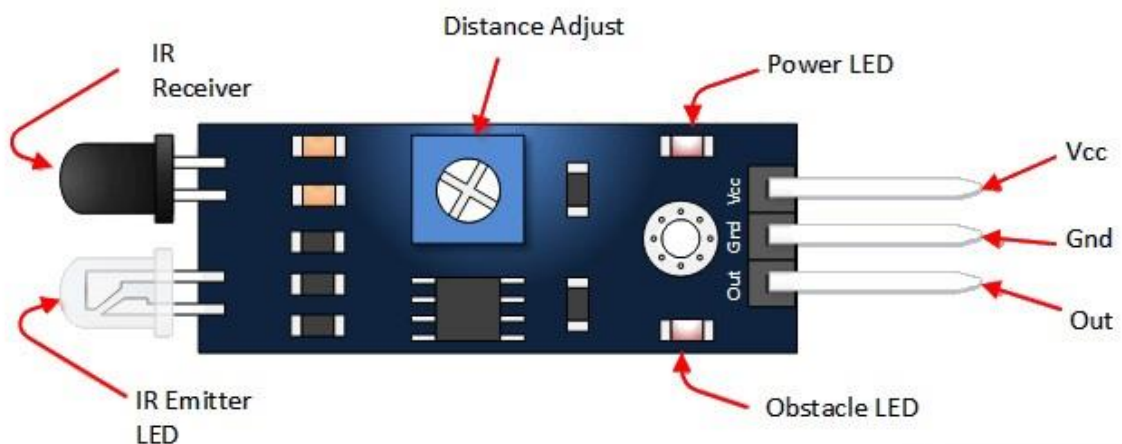
### **3.2.2.2.1WORKING**

The working principle of an infrared sensor is similar to the object detection sensor. This sensor includes an IR LED & an IR Photodiode, so by combining these two can be formed as a photo-coupler otherwise optocoupler. The physics laws used in this sensor are planks radiation, Stephan Boltzmann & weins displacement. IR LED is one kind of transmitter that emits IR radiations. This LED looks similar to a standard LED and the radiation which is generated by this is not visible to the human eye. Infrared receivers mainly detect the radiation using an infrared transmitter. These infrared receivers are available in photodiodes form. IR Photodiodes are dissimilar as compared with usual photodiodes because they detect simply IR radiation. Different kinds of infrared receivers mainly exist depending on the voltage, wavelength, package, etc. Once it is used as the combination of an IR transmitter & receiver, then the receiver's wavelength must equal the transmitter. Here, the transmitter is IR LED whereas the receiver is IR photodiode. The infrared photodiode is responsive to the infrared light that is generated through an infrared LED. The resistance of photo-diode & the change in output voltage is in proportion to the infrared light obtained. This is the IR sensor's fundamental working principle. Once the infrared transmitter generates emission, then it arrives at the object & some of the emission will reflect back toward the infrared receiver. The sensor output can be decided by the IR receiver depending on the intensity of the response.



**Fig 1.15. Working of IR Sensor Module**

### 3.2.2.2.2 PINS AND PARTS:



**Fig 1.16 Pins of IR Sensor**

### 3.2.2.1.1 Main characteristics:

- **Operating Voltage:**5V DC
- **I/O Pins:** 3.3V - 5V
- **Supply Current:**20mA
- **Range:** 20 to 50 cm
- **Accuracy:**±1/4

### 3.2.2.3 DC Gear Motor:

A gear motor is an all-in-one combination of a motor and gearbox. The addition of a gear head to a motor reduces the speed while increasing the torque output. The most important parameters in regards to gear motors are speed (rpm), torque (lb-in) and efficiency (%). In order to select the most suitable gear motor for your application you must first compute the load, speed and torque requirements for your application. ISL Products offers a variety of motors to meet all application requirements. Most of our DC motors can be complemented with one of our unique gearheads, providing you with a highly efficient gear motor solution. These motors are simple DC Motors featuring Metal gears for the shaft for obtaining the optimal performance characteristics. They are known as Center Shaft DC Geared Motors because their shaft extends through the center of their gear box assembly. These standard size DC Motors are very easy to use. Also, you don't have to spend a lot of money to control motors with an Arduino or compatible board. The L298N H-bridge module with onboard voltage regulator motor driver can be used with this motor that has a voltage of between 5 and 35V DC. This DC Motor 60RPM 12Volts can be used in all-terrain robots and a variety of robotic applications. These motors have a 3 mm threaded drill hole in the middle of the shaft thus making it simple to connect it to the wheels or any other mechanical assembly. Nut and threads on the shaft to easily connect and internally threaded shaft for easily connecting it to the wheels.



**Fig 1.17 DC Gear Motor**

### 3.2.2.3.1 WORKING

Geared DC motors can be defined as an extension of DC motor which already had its Insight details demystified here. A geared DC Motor has a gear assembly attached to the motor. The speed of motor is counted in terms of rotations of the shaft per minute and is termed as RPM .The gear assembly helps in increasing the torque and reducing the speed. Using the correct combination of gears in a gear motor, its speed can be reduced to any desirable figure. This concept where gears reduce the speed of the vehicle but increase its torque is known as gear reduction. This Insight will explore all the minor and major details that make the gear head and hence the working of geared DC motor.



**Fig 1.18 Dc Gear Motor (Inside)**



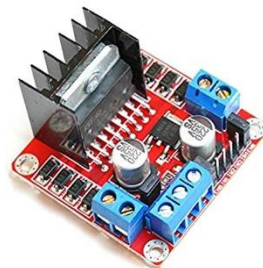
### 3.2.2.3.1 SPECIFICATION:

**Table 2.4 Specification of DC Gear Motor**

Gear Material	Metal
Rated Speed (RPM)	60
Operating Voltage (VDC)	12
Rated Torque(kg-cm)	3.6
Stall Torque(Kg-Cm)	15
Load Current Max (mA)	300
No-Load Current (mA)	60
Gearbox Diameter (mm)	38
Motor Diameter(mm)	32
Motor Length (mm)	75
Shaft Diameter (mm)	6
Shaft Length (mm)	21
Weight (gm)	75

### 3.2.2.4 MOTOR DRIVER

This L298N Motor Driver Module is a high power motor driver module for driving DC and Stepper Motors. This module consists of an L298 motor driver IC and a 78M05 5V regulator. L298N Module can control up to 4 DC motors, or 2 DC motors with directional and speed control.

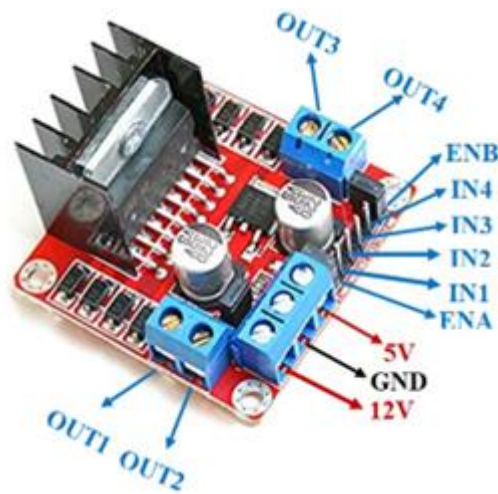


**Fig 1.19 DC Motor Driver**

### 3.2.2.4.1 PIN & PARTS

**Table 2.5 PINS of DC Gear Motor**

<b>Pin Name</b>	<b>Description</b>
IN1 & IN2	Motor A input pins. Used to control the spinning direction of Motor A
IN3 & IN4	Motor B input pins. Used to control the spinning direction of Motor B
ENA	Enables PWM signal for Motor A
ENB	Enables PWM signal for Motor B
OUT1 & OUT2	Output pins of Motor A
OUT3 & OUT4	Output pins of Motor B
12V	12V input from DC power Source
5V	Supplies power for the switching logic circuitry inside L298N IC
GND	Ground pin



**Fig 1.20 Pins of DC Motor Drive**

#### 3.2.2.4.2 FEATURES & SPECIFICATIONS

- Current Sense for each motor
- Heatsink for better performance
- Power-On LED indicator

#### 3.2.2.4.3 SPECIFICATIONS

**Table 2.6 Specification of DC Motor Driver**

<b>Driver Model</b>	L298N 2A
<b>Driver Chip</b>	Double H Bridge L298N
<b>Motor Supply Voltage</b>	46V
<b>Motor Supply Current</b>	2A
<b>Logic Voltage</b>	5V
<b>Driver Voltage</b>	5-35V
<b>Driver Current</b>	2A
<b>Logical Current</b>	0-36mA
<b>Maximum Power</b>	25W

### 3.2.2.4.4 MOTOR DRIVER CIRCUIT

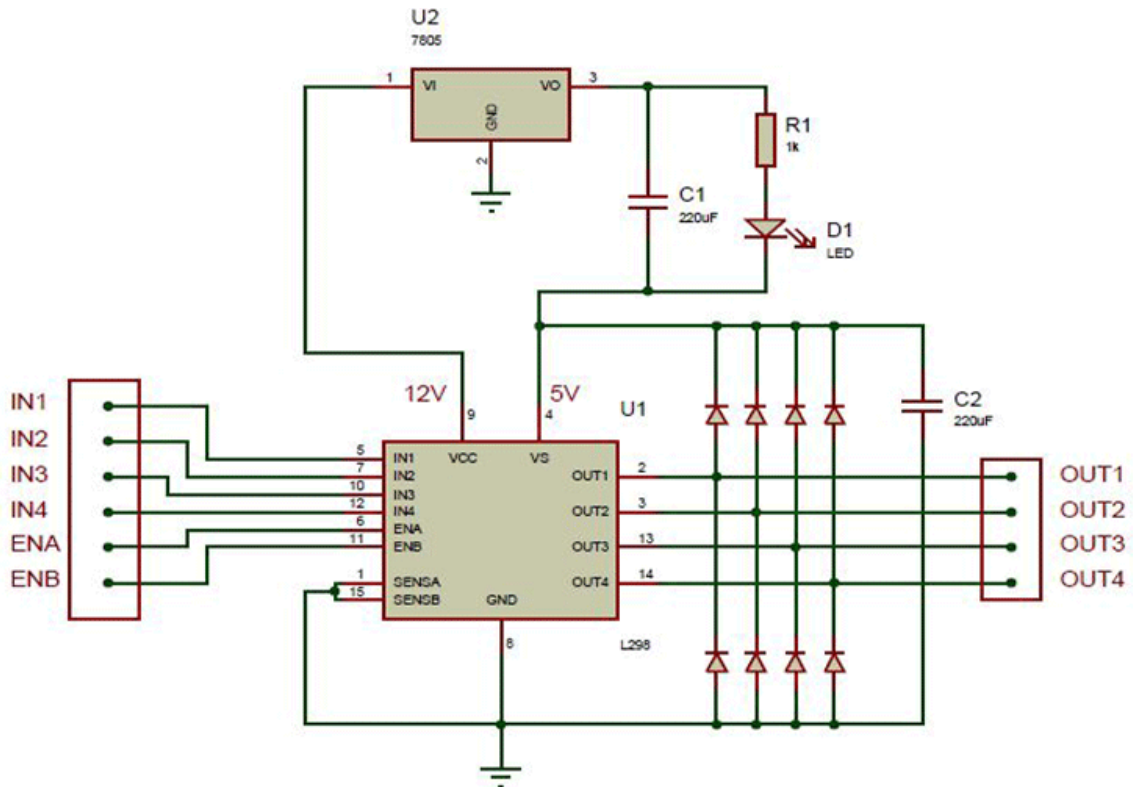


Fig 1.21 Circuit of DC Motor Driver

### 3.2.4.5 GEARS & WHEELS



Fig 1.22 Gear Wheels

### 3.2.2.6 WIRES :

Element that allows closing an electrical circuit. It has to be combined with soldering.



**Fig 1.23 Wires**

## CHAPTER 4

### EXPERIMENTAL SETUP AND PROCEDURE

#### 4.1 AUTOMATIC ATTENDANCE SYSTEM USING RFID:

This project has six objectives that will be explained in details in the further.

The first objective of the project is to automatically take attendance from students using RFID and record attendance. Students information is recorded, saved in a RFID Tag, and if the data is utilized and transmitted to a computer via Database, the attendance can be recorded with greater efficiency.

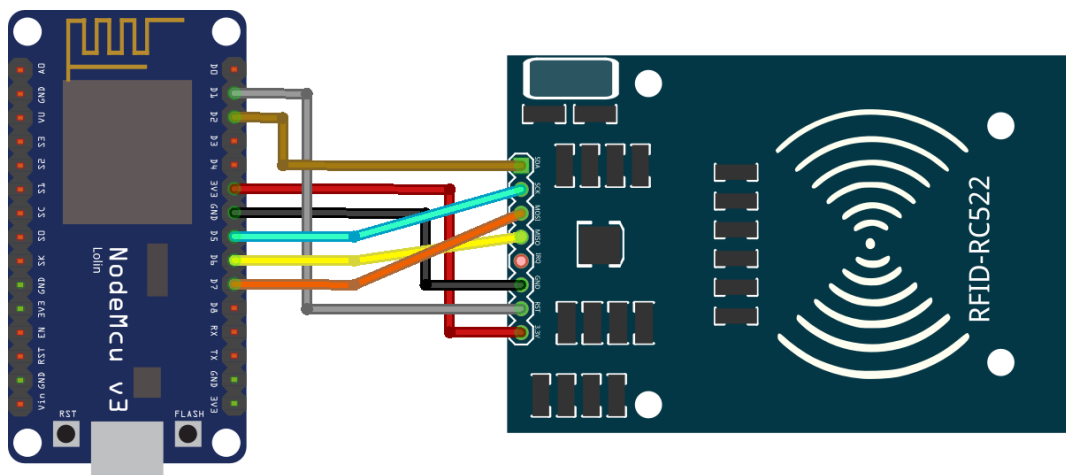
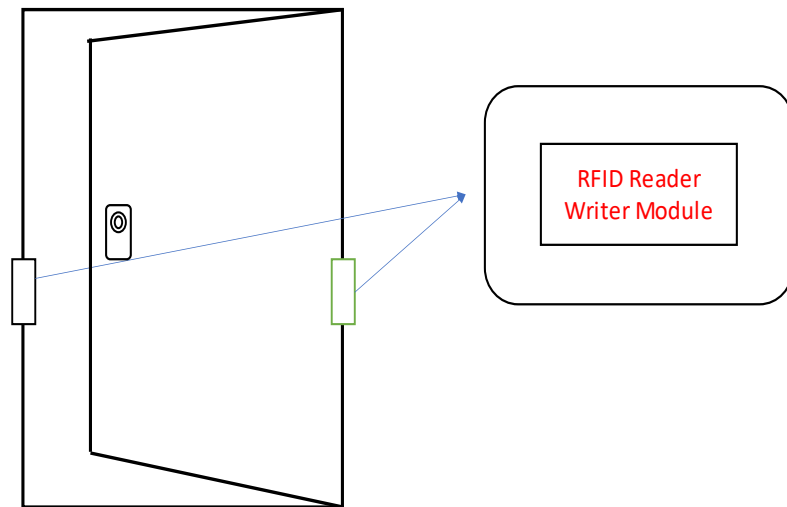


Fig 1.24 RFID RC522 to Node MCU      Fig 1.25 RFID Module

Table 2.7 Connection of RFID RC522 Interface with NodeMCU

NodeMCU	RFID RC522
PIN D2	SDA
PIN D5	SCK
PIN D7	MOSI
PIN D6	MISO
NC	IRQ
GND	GND
PIN D1	RST
3.3 V	3.3 V



**Fig 1.26 Automatic Attendance System**

## 4.2 REAL TIME MASK DETECTION USING PYTHON

The second objective is to automatically detect the face mask is wearing or not. As COVID-19 cases resurface throughout the world, it's critical to stay committed to helping to stop the virus from spreading. Although you can always wash your hands, cover your coughs and sneezes, avoid rubbing your ears, and adhere to social distancing laws, wearing a mask is an additional precaution you should take. Here's why: COVID-19 spreads more commonly through person-to-person communication, as we've learned during the pandemic. When an infected person coughs, sneezes, or speaks, metastasis droplets are released, which can fly up to six feet and land in the mouths or noses of others nearby. COVID-19 can also be spread by people who don't realise they have the virus because they don't have any symptoms.

The proposed framework uses the OpenCV, Tensor flow, Keras, and PyTorch libraries to identify a person wearing a face mask in an image/video stream using computer vision and deep learning algorithms.

## **4.2.1 DATA AT SOURCE**

OpenCV was used to enhance the majority of the images. “Mask” and “no mask” were already written on the set of images. The images were of various sizes and resolutions, and were most likely taken from a variety of sources or from computers (cameras) with varying resolutions.

### **4.2.1.1 DATA PREPROCESSING**

Any or all of the raw input pictures were subjected to the data preprocessing steps outlined below in order to turn them into clean versions that could be fed to a neural network machine learning model.

- 1.Resize the picture that has been given (256 x 256)
- 2.RGB colour filtering is applied to the channels (Our model MobileNetV2 supports 2nd three channel image)
- 3.Scaling / Normalizing images using PyTorch's built-in weights and the quality mean.
- 4.Cropping the picture in the centre with a 224x224x3 element price
- 5.Finally, they'll be converted to tensors (Similar to NumPy array)

## **4.2.2 ALGORITHM USED**

### **4.2.2.1 MACHINE LEARNING**

Machine learning is the study of computer algorithms that improve over time as a result of their use. It's thought to be a set of artificial intelligence. Machine learning algorithms build a mathematical model based on sample data, known as training data, to make new predictions or make other decisions although they are not explicitly programmed to do so. Depending on the essence of the "signal" and "feedback" available to the learning system, machine learning methods are historically divided into three different categories:

- Supervised learning: The computer is given examples of inputs and the need for required outputs, with the aim of learning a standard rule that maps inputs to outputs.
- Unsupervised learning:



The training algorithm isn't given a name, so it's left to figure out structure in an input on its own. Unattended learning may be a target in and of itself (finding hidden patterns in data) or a means to an end (finding hidden patterns in data) (feature learning). Reinforcement learning: A computer programme interacts with a complex world in which it must achieve a specific objective (such as driving a car or playing a game against an opponent). As it navigates its problem space, it receives feedback in the form of rewards, which it attempts to optimise. Other procedures have emerged that do not fit the neatness of this three-fold categorization, and the same machine learning method usually uses more than one.

#### **4.2.2.2 COMPUTER VISION**

Computer vision is a knowledge-based science area that deals with how machines can interpret visual images or videos at a high level. Computer vision tasks include techniques for collecting, processing, analysing, and interpreting digital images, as well as the extraction of high-dimensional data from the real world in order to provide numerical or symbolic knowledge, such as in the form of decisions. In this sense In this context, understanding refers to the conversion of visual images (retinal input) into representations of the world that are relevant to thought processes and may elicit appropriate action. The disentangling of symbolic knowledge from image data using models built with the assistance of geometry, physics, and learning theory is what this image can help us understand. The idea behind artificial systems that extract information from images is the subject of computer vision. Video loops, multiple camera views, and multi-dimensional knowledge from a 3D scanner or medical scanning system can all be examples of image knowledge. Computer vision is a scientific discipline that aims to apply its theories and models to the development of laptop vision systems. Computer vision is an interdisciplinary area that studies how machines can be programmed to interpret visual images or videos at a high level. It aims to change the tasks that the human visual system can perform from an engineering standpoint.

### **4.2.2.3 Cloud Computing**

The distribution of different resources over the Internet is known as cloud computing. These resources include information storage, databases, networking, servers, and software, among other tools and applications. Instead of saving files to a proprietary drive or local storage unit, cloud-based storage allows them to be saved to a remote database. As long as an electronic device has internet connectivity, it has access to information as well as the software programmes needed to operate it. For a variety of reasons, including cost savings, increased productivity, speed and efficiency, performance, and security, cloud computing can be a popular option for individuals and businesses. Since the information being accessed is located remotely inside the cloud or a virtual space, cloud computing is classified as such. Cloud service providers allow users to store files and software on remote servers and then access them through the Internet. This means the user doesn't have to be in the same position to gain access to it, allowing them to work remotely. Cloud computing moves all of the work of crunching and processing data away from the laptop you're carrying or sitting at. It also transfers all of the work to massive computer clusters that are isolated in cyberspace. Your information, jobs, and applications are accessible from any computer that can connect to the Internet, anywhere in the world. Cloud computing is a term that encompasses both public and private cloud computing. Public cloud providers charge for their services provided over the Internet. Private cloud providers, on the other hand, only provide services to a certain group of people. These services are comprised of a network of networks that provide hosted services. There is also a hybrid alternative, which combines elements of both public and private service.

### **4.2.2.4 DEEP LEARNING**

Deep learning aim of these approaches is to learn function features from higher levels and then apply to the lower level options. Without relying entirely on human features, a device can learn complex functions mapping the incoming input to the output directly from data by mechanically learning features at multiple levels of

abstraction. Deep learning algorithms get to take advantage of the unknown structure within the input distribution in order to discover good representations, usually at multiple levels, with higher-level learned features outlined in terms of lower-level choices.

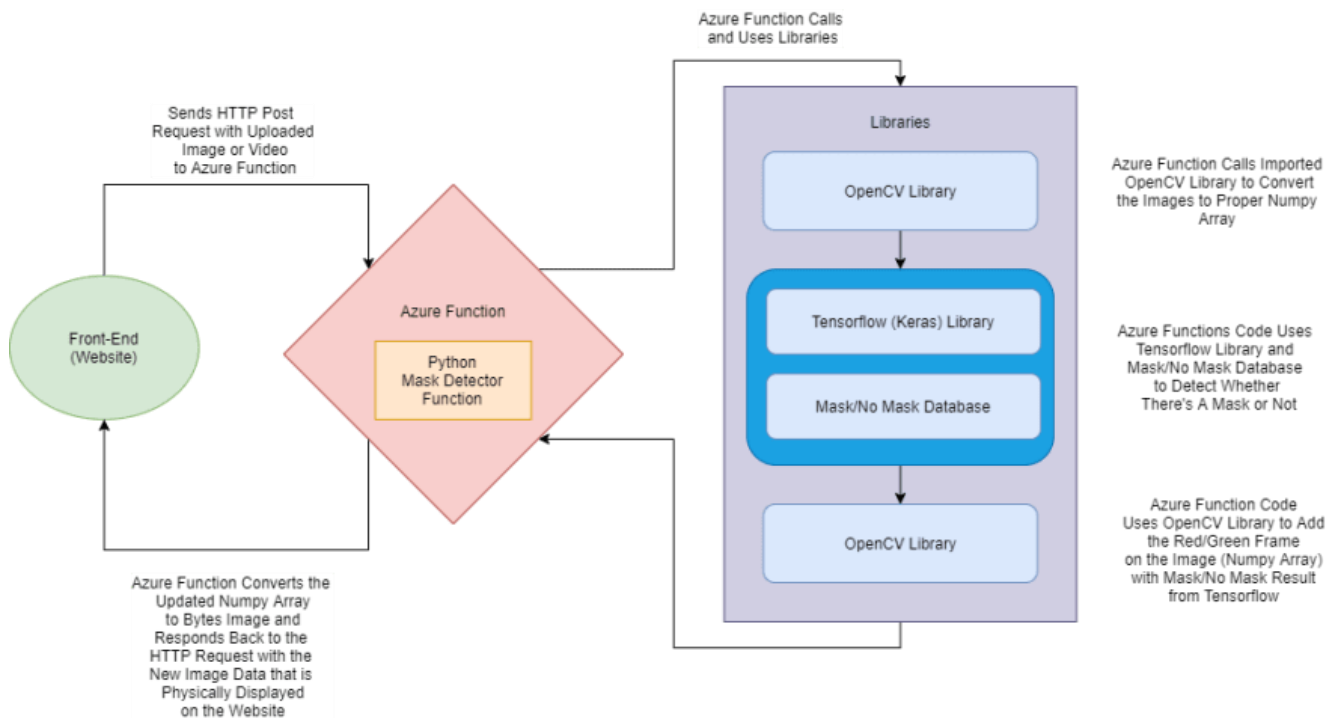
The hierarchy of concepts allows the machine to deduce more complex concepts by constructing them from simpler ones. If we draw a graph showing how these definitions are constructed on top of each other, we'll see that the graph is very complex, with many layers. As a result, we've moved to AI deep learning. Deep learning performs well in domains of analogue inputs (and also outputs). They are images of pixel data, documents of text data, or files of audio data, rather than a collection of quantities in a highly tabular format. Deep learning allows computational models made up of multiple process layers to discover information representations at multiple level of abstraction.

including neural networks. TensorFlow is Google's second generation system, and version 1.0.0 was released on February 11th. Unlike the reference implementation, which runs on single computers, TensorFlow can run on multiple CPUs and GPUs. TensorFlow is available for 64-bit Linux, macOS, Windows, and Android and iOS mobile computing platforms. Its adaptable architecture allows for easy computation preparation on a variety of platforms (CPUs, TPUs, GPUs).

#### **4.2.2.5 KERAS**

Keras is a human-centric API, not a machine-centric one. Keras adheres to industry best practices for reducing psychological feature load by providing consistent and quick APIs, reducing the number of user actions needed for common use cases, and providing transparent and unambiguous error messages. It also comes with a lot of documentation and developer guides. Keras includes a variety of implementations of commonly used neural-network building blocks including layers, goals, activation functions, optimizers, and a slew of other methods to make working with image and text data and writing deep neural network code simpler. The code is hosted on GitHub, and community support forums include a Slack channel and a GitHub problems tab. Keras may be a lightweight Python deep learning library that

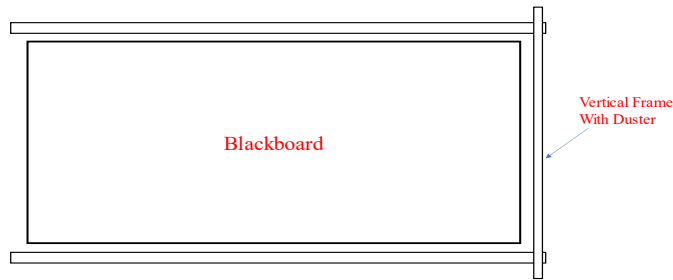
runs on top of Theano or Tensor Flow. It was created with the goal of making the implementation of deep learning models as simple and fast as possible for research and development. It runs on Python 2.7 or 3.7 and, depending on the underpinning frameworks, can run on both GPUs and CPUs. It's available under the Massachusetts Institute of Technology's permissive licence.



**Fig 1.27 Real-Time Face Mask Detection**

### **4.3 AUTOMATIC BLACKBOARD ERASING SYSTEM:**

The third objective is to erase the blackboard automatically by using controlling of DC gear motor. To reduce the work and time required to erase the blackboard so as to ease the problems of teachers as well as students. This Project can be further modified into a gesture controlled eraser by using DPST switch. We propose a framework to interface the mechanical parts of the mechanical erasing framework with micro controllers to upgrade it into automation as opposed to manual. We are utilizing small scale controller to interface the board deleting component. The principle segments of the framework can be recognized as 8051 Microcontroller, encoder and decoder (remote transmission) and L293d engine driving IC. The beginning stage incorporates the switches which will be utilized for course of the duster with the encoder IC in order to encode the given input by the client into appropriate configuration for transmission. The microcontroller utilized is 89C51. The yield created by encoder at the transmitter is after it gives to the microcontroller port. Whenever someone presses the switch then it gives the data to the encoder which encodes it into legitimate arrangement. The sign is transmitted to the collector segment. The info is then decoded utilizing decoder. The location lines of encoder and decoder are set at 0 in order to empower the data exchange between them. The decoded bits are after gives to microcontroller which then correct it for the course given by the client and produces appropriate yield for the L293d to execute. The L293d then gives the supply to the engines as indicated in the yield of the microcontroller and the development begins. Whenever someone give the voice command then its gives the data to the encoder. The command is then decoded utilizing decoder. The decoded command is after gives to microcontroller and swapper can move.



**Fig. 1.28 Automatic Black Board Erasing System**

#### **4.4 ONLINE LIBRARY MANAGEMENT SYSTEM:**

The fourth objective is to manage the library via online. Here we use only front-end for anyone can read the books without any authentication. The technology we used for this website are,

- HTML
- CSS
- JS
- GitHub
- Netlify

##### **4.4.1 HTML**

HTML or Hyper Text Markup Language is the main mark up language for creating web pages and other information that can be displayed in a web browser. HTML is written in the form of HTML elements consisting of tags enclosed in angle brackets (like `<html>`), within the web page content. HTML tags most commonly come in pairs like `<h1>` and `</h1>`, although some tags represent empty elements and so are unpaired, example `<img>`. The first tag in a pair is the start tag, and the second tag is the end tag (they are also called opening tags and closing tags). In between these tags web designers can add text, further tags, comments and other types of text-based content. The purpose of a web browser is to read HTML documents and

compose them into visible or audible web pages. The browser does not display the HTML tags, but uses the tags to interpret the content of the page. HTML elements form the building blocks of all websites. HTML allows images and objects to be embedded and can be used to create interactive forms. It provides a means to create structured documents by denoting structural semantics for text such as headings, paragraphs, lists, links, quotes and other items. It can embed scripts written in languages such as JavaScript which affect the behaviour of HTML web pages.

#### **4.4.2 CSS**

Cascading Style Sheets (CSS) is a style sheet language used for describing the look and formatting of a document written in a markup language. While most often used to style web pages and interfaces written in HTML and XHTML, the language can be applied to any kind of XML document, including plain XML, SVG and XUL. CSS is a cornerstone specification of the web and almost all web pages use CSS style sheets to describe their presentation. CSS is designed primarily to enable the separation of document content from document presentation, including elements such as the layout, colors, and fonts. This separation can improve content accessibility, provide more flexibility and control in the specification of presentation characteristics, enable multiple pages to share formatting, and reduce complexity and repetition in the structural content (such as by allowing for table less web design). CSS can also allow the same markup page to be presented in different styles for different rendering methods, such as on-screen, in print, by voice (when read out by a speech-based browser or screen reader) and on Braille-based, tactile devices. It can also be used to allow the web page to display differently depending on the screen size or device on which it is being viewed. While the author of a document typically links that document to a CSS file, readers can use a different style sheet, perhaps one on their own computer, to override the one the author has specified. However if the author or the reader did not link the document to a specific style sheet the default style of the browser will be applied. CSS specifies a priority scheme to determine which style rules apply if more than one rule matches against a particular element. In this so-called cascade, priorities or weights are calculated and assigned to rules, so that the results are predictable.

### 4.4.3 JAVA SCRIPT

JavaScript(JS) is a dynamic computer programming language. It is most commonly used as part of web browsers, whose implementations allow client-side scripts to interact with the user, control the browser, communicate asynchronously, and alter the document content that is displayed. It is also being used in server-side programming, game development and the creation of desktop and mobile applications. JavaScript is a prototype-based scripting language with dynamic typing and has first-class functions. Its syntax was influenced by C. JavaScript copies many names and naming conventions from Java, but the two languages are otherwise unrelated and have very different semantics. The key design principles within JavaScript are taken from the Self and Scheme programming languages. It is a multiparadigm language, supporting object-oriented, imperative, and functional programming styles. The application of JavaScript to use outside of web pages—for example, in PDF documents, site-specific browsers, and desktop widgets—is also significant. Newer and faster JavaScript VMs and platforms built upon them (notably Node.js) have also increased the popularity of JavaScript for server-side web applications. On the client side, JavaScript was traditionally implemented as an interpreted language but just-in-time compilation is now performed by recent (post-2012) browsers.

### 4.4.4 GitHub and Git:

GitHub is an online software development platform used for storing, tracking, and collaborating on software projects. It enables developers to upload their own code files and to collaborate with fellow developers on open-source projects. GitHub also serves as a social networking site in which developers can openly network, collaborate, and pitch their work. Since its founding in 2008, GitHub has acquired millions of users and established itself as a go-to platform for collaborative software projects. The service is free and comes with several helpful features for sharing code and working with others in real-time.

On top of its code-related functions, GitHub also encourages users to build a personal profile and brand for themselves. You can visit anyone's profile and see what projects they own and contribute to. This makes GitHub a type of social



network for programmers and fosters a collaborative approach to software and Web Development. We'll discuss GitHub in more detail in a bit. But first, we'll need to understand the technology that GitHub is based on, Git.

Git is open-source version control software, used for managing and tracking file revisions. It can be used with any file type, but is most often used for tracking code files. Git is the most widely used version control system in software development, and GitHub leverages this technology for its service, hence its name. You've likely worked with some form of version control before. For example, Google Docs (as well as other Google Workspace tools) has a "Version History" tool where you can view changes to the document at different points in time. Microsoft Office has something similar with its "Track Changes" feature. Or, you might prefer saving multiple copies of a file and labeling them "v1", "v2", etc. Advanced version control is necessary for software projects, especially collaborative ones. When building software, developers are frequently and simultaneously updating the code to add features and fix bugs. It wouldn't make sense to make these changes to the source code directly, since any issues would affect users. Instead, developers work with their own copies of the code, then — after the code has been thoroughly tested — add this code to the main codebase. That seems all well and good. But, with multiple contributors, things can get very messy very quickly if there's no way to combine everyone's contributions into one unified codebase or see who contributed what changes. These changes also must be tracked and stored in case something breaks and the developers need to backtrack and restore a previous version.

This is what Git is for. When a developer wants to make a change to the software, they download their own copy of the source code from its central storage location (called a repository, or "repo" for short) to their local system, make modifications safely to their own copy, then merge their revised copy back with the source files in the repository along with comments explaining the changes. Git tracks all of these modifications and stores previous versions as backups. GitHub allows software developer and engineers to create remote, public-facing repositories on the cloud for free. Once you've set up a repository on GitHub, you can copy it to your device, add and modify files locally, then "push" your changes back to the repository where your changes are displayed to the public.

#### 4.4.4.1 ENHANCED COLLABORATION

The single biggest selling point of GitHub is its set of project collaboration features, including version control and access control.

To illustrate what's possible with GitHub, imagine this scenario: You want to code up an online game, and you enlist your friend to help you. You create a repository on GitHub that stores all the files, including current and past versions, then give your friend collaborator access to this repo as well.

You decide to work on the main gameplay and screens while your partner tackles the game's menu and settings screens. In order for you both to push your changes at the same time without interfering with the other's work, you create a branch — a separate development area — where your teammate can build out their screens. Meanwhile, you continue work in your branch.

Once your friend finishes their work, they can make a pull request asking to combine their work with yours. If you approve, you can merge your branches, and thus your code.

Now, say another developer sees your game's repository and has an idea to add multiplayer mode. They can fork — or make their own copy of — your repository, then add their new features. Once finished, they can submit a pull request to you. If you approve, this forked repository merges with yours, and your game is now multiplayer! Note that anyone can fork a public repository, but it's up to the repository owners to accept or reject pull requests.

Of course, no software is perfect on the first go, which is why your GitHub repo also has an **Issues** section for listing to-dos and reporting problems with your game, discussing them, and marking them resolved. To address these issues, you might look back at a file's changelog to see when and where things went wrong.

To sum up, GitHub provides a centralized space where several, dozens, or even thousands of developers can seamlessly contribute to a project, without worrying about overriding anyone's work or losing track of changes.

#### **4.4.4.2 EASY FILE MANAGEMENT**

GitHub adds a sleek graphical user interface (GUI) layer on top of Git. On its own, Git operates through the command line (a computer's text-based interface). Developers know how to use the command line, but for many, it's not always the most efficient way to interact with files.

GitHub's interface provides a clean and user-friendly means to perform Git actions as well as view file history. This is more convenient for developers and more accessible for beginners getting the hang of Git.

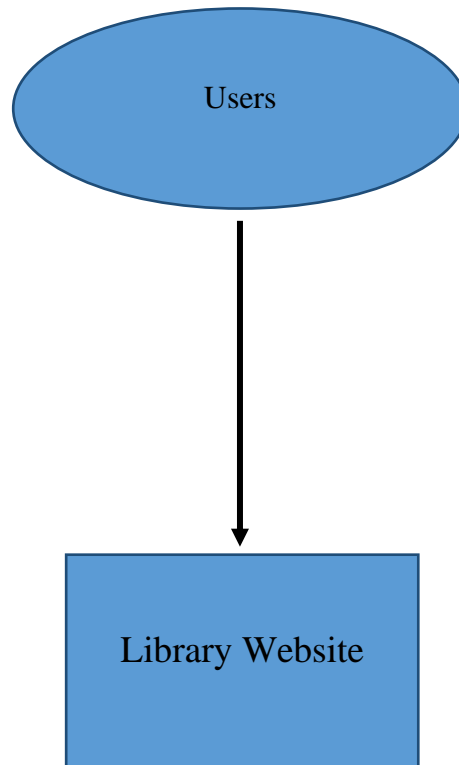
Another benefit that makes GitHub more accessible is its cloud-based infrastructure. A GitHub user may access their repository from any location and any device, download the repository, and push their changes. Using GitHub means you're not limited to one device or environment.

#### **4.4.4.3 SOCIAL NETWORKING**

Any GitHub user knows the platform is more than just a place to work on code. All GitHub users have profiles to display their projects, contributions, and activity on the site, and can see anyone's public-facing profile and repositories.

When we think of technological innovations, it's sometimes easy to attribute everything to one person — think Steve Jobs or Bill Gates. Of course, the reality is that software advances thanks to the millions of professional and amateur developers working together to develop new things in new ways.

That's the beauty of GitHub: It lowers the barrier of entry for collaboration, so anyone can pitch in their ideas toward projects of their choice, or start a project of their own. It's difficult to imagine the world of open-source software before GitHub — indeed, there sure was a lot less of it.



**Fig 1.29 Online Library Management System**

#### **4.5 REAL TIME EMOTION DETECTION:**

During training, the system received a training data comprising grayscale images of faces with their respective expression label and learns a set of weights for the network. The training step took as input an image with a face. Thereafter, an intensity normalization is applied to the image. The normalized images are used to train the Convolutional Network. To ensure that the training performance is not affected by the order of presentation of the examples, validation dataset is used to choose the final best set of weights out of a set of trainings performed with samples presented in different orders. The output of the training step is a set of weights that achieve the best result with the training data. During test, the system received a grayscale image of a face from test dataset, and output the predicted expression by using the final network weights learned during training. Its output is a single number that represents one of the seven basic expressions.

Humans can quickly and even subconsciously assess a multitude of indicators such as word choices, voice inflections, and body language to discern the sentiments of others. This analytical ability likely stems from the fact that humans share a universal set of fundamental emotions. Significantly, these emotions are exhibited through facial expressions that are consistently correspondent. This means that regardless of language and cultural barriers, there will always be a set of fundamental facial expressions that people assess and communicate with. The popularity of image recognition continues to grow as more and more sophisticated tools see the daylight. With advances in AI and computer vision (and the fact that now we have an enormous amount of data available thanks to the internet), now it's also possible to do face expression recognition inside the browser.

Today, I would like to introduce you to `face-api.js`, which is a JavaScript face recognition library implemented on top of `TensorFlow.js`, the popular machine learning library created for JavaScript. `face-api` is super easy to use. It has a powerful API that exposes only the necessary configuration, hiding all the underlying layers, such as actually writing neural nets. Apart from different models of recognition, it also comes with pre-built drawing functions so we don't have to mess around with a canvas.

#### **4.5.1 SETTING UP FACE-API**

Let's start with the index file. All we're going to need is an image we want to work with. I've collected some pictures of Mark with different facial expressions. This will be the test subject for the tutorial: I have the image in the root directory and also added some minor styles. We're going to draw the detection boxes onto a canvas element. However, we don't need to create a canvas tag as we are going to create it from the script. By giving it an absolute position, it will be placed on top of the image. In place of images, `face-api` supports other media elements for face recognition such as video or canvas. With that set and ready, we can dive into scripting!

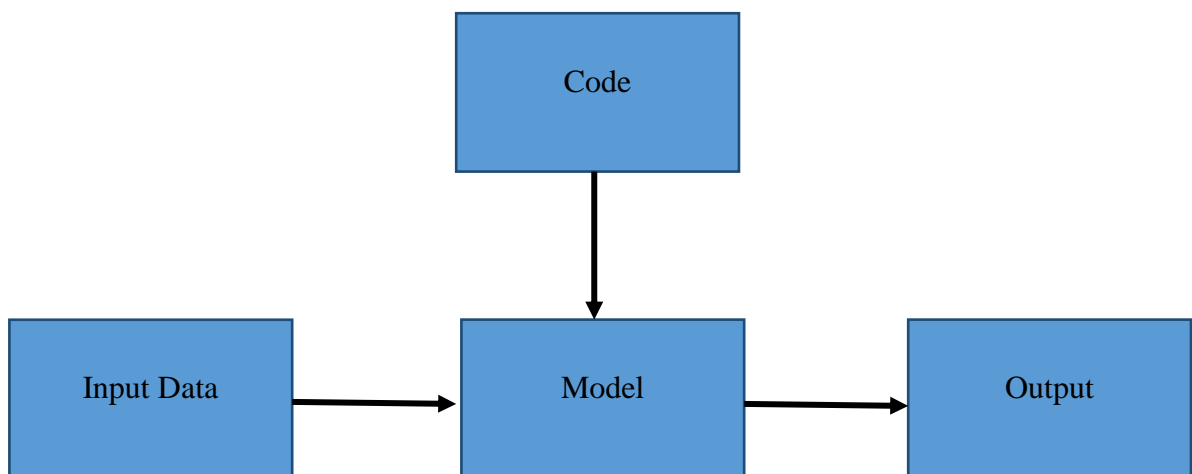
## 4.5.2 LOADING THE MODEL

The very first thing we need to do is include the models that will be used for recognition. Create a models folder and download the models from the weights from our github repository.

The detection and recognition implementation proposed here is a supervised learning model that will use the oneversus-all (OVA) approach to train and predict the seven basic emotions (anger, contempt, disgust, fear, happiness, sadness, and surprise). The overall face extraction from the image is done first using a Viola-Jones cascade object face detector. The ViolaJones detection framework seeks to identify faces or features of a face (or other objects) by using simple features known as Haar-like features. The process entails passing feature boxes over an image and computing the difference of summed pixel values between adjacent regions. The difference is then compared with a threshold which indicates whether an object is considered to be detected or not. This requires thresholds that have been trained in advance for different feature boxes and features. Specific feature boxes for facial features are used, with expectation that most faces and the features within it will meet general conditions. Essentially, in a feature-region of interest on the face it will generally hold that some areas will be lighter or darker than surrounding area. For example, it is likely that the nose is more illuminated than sides of the face directly adjacent, or brighter than the upper lip and nose bridge area. Then if an appropriate Haar-like feature, such as those shown in Figure 1, is used and the difference in pixel sum for the nose and the adjacent regions surpasses the threshold, a nose is identified. It is to be noted that Haar-like features are very simple and are therefore weak classifiers, requiring multiple passes.

However, the Haar-like feature approach is extremely fast, as it can compute the integral image of the image in question in a single pass and create a summed area table. Then, the summed values of the pixels in any rectangle in the original image can be determined using a total of just four values. This allows for the multiple passes of different features to be done quickly. For the face detection, a variety of features will be passed to detect certain parts of a face, if it were there. If enough

thresholds are met, the face is detected. Once the faces are detected, they are extracted and resized to a predetermined dimensional standard. As Zhang has shown that lower resolution (64x64) is adequate, we will resize the extracted faces to 100x100 pixels. This will reduce computational demand in performing the further analysis. Next, the mean image for all training faces will be calculated. The entire training set is comprised of faces from the Extended Cohn-Kanade [3] dataset, and comprises faces that express the basic emotions. The mean image is then subtracted from all images in the training set. Then using the mean-subtracted training set the scatter matrix  $S$  is formed. The intention is to determine a change in basis that will allow us to express our face data in a more optimized dimensionality. Doing so will allow the retention of most of the data as a linear combination of the much smaller dimension set. PCA accomplishes this by seeking to maximize the variance of the original data in the new basis. We perform PCA on the using the Sirovich and Kirby method, where the eigenvalues and eigenvectors of the matrix  $SHS$  are first computed to avoid computational difficulties. The eigenvectors of the scatter matrix, defined as  $SSH$ , can then be recovered by multiplying the eigenvector matrix by  $S$ . Retaining the top eigenvectors, also known in this context as eigenfaces, allows us to project our training data onto the top eigenfaces, in this case the 100 associated with the top eigenvalues, in order to reduce dimensionality while successfully retaining most of the information.

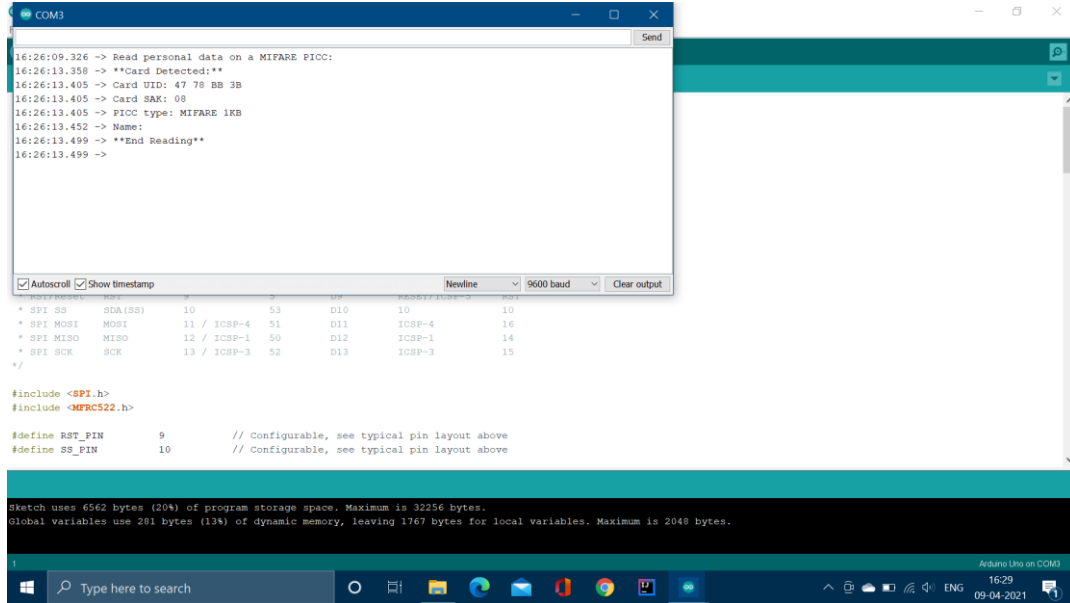


**Fig 1.30 Real-Time Emotion Detection**

The last objective is to be overall cost effective. While the idea to improve classroom is the priority of this project work, importance is made to ensure that this system is affordable to all those who need it. The setup cost may initially be a bit high, but in the long run it is expected that there will be a reduction in both electricity and paper cost.



## CHAPTER 5 RESULTS AND DISCUSSION



**Fig 1.31 Output for Attendance System using ARDUINO IDE**

	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Date	Name	Number	Card ID	Time IN	Time OUT								
2	03-04-2021	Abitharan	EE1803	135780	14:40	14:43								
3	03-04-2021	Balaji	EE1851	135782	14:40	14:43								
4	03-04-2021	Prakash	EE1830	135781	14:40	14:43								
5														
6														
7														
8														
9														
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12														
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21														
22														
23														
24														
25														

**1.32 Output for Attendance System via Excel sheet**

## RFID Attendance System



User Data Table

Name	ID	Gender	Email	Mobile Number	Action
Arun Prakash S.B	74D73A52	Male	arunprakasharun27@gmail.com	+919585814077	<a href="#">Edit</a> <a href="#">Delete</a>
Balaji J	98C525S23	Male	balaji052gmail.com	+91	<a href="#">Edit</a> <a href="#">Delete</a>
Hanifa Asraf Ali.M	9120A930	Male	hanifaasrafali@gmail.com	+918056985764	<a href="#">Edit</a> <a href="#">Delete</a>
Prakash Ravichandran	5165G255	Male	prakashravichandran253@gmail.com	+919360230757	<a href="#">Edit</a> <a href="#">Delete</a>

Fig 1.33 Output for Attendance System via Website

```

sketch_apr23a | Arduino 1.8.13 (Windows Store 1.8.42.0)
File Edit Sketch Tools Help
sketch_apr23a $
sketch_apr23a $
#define MOTOR_EN_1_2 10
#define MOTOR_IN1 9
#define MOTOR_IN2 8

#define slow 64
#define normal 128
#define fast 255

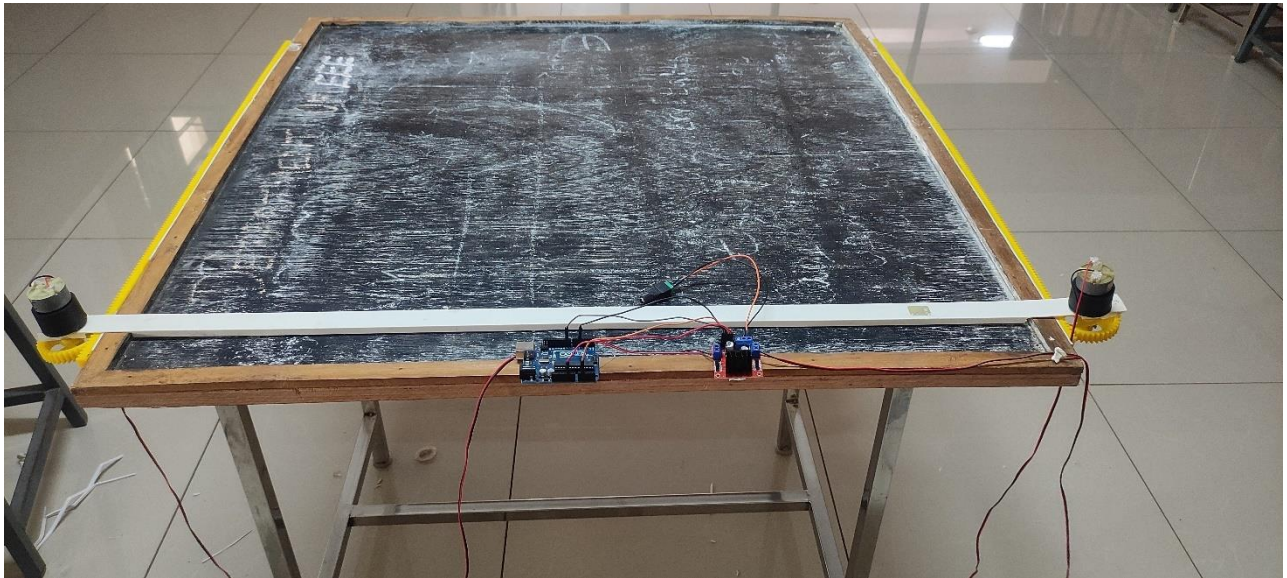
int Speed;

void Forward_Rev(void){
  analogWrite(MOTOR_EN_1_2, Speed);
  digitalWrite(MOTOR_IN1, HIGH);
  digitalWrite(MOTOR_IN2, LOW);
}

void Backward_Rev(void){
  analogWrite(MOTOR_EN_1_2, Speed);
  digitalWrite(MOTOR_IN1, LOW);
  digitalWrite(MOTOR_IN2, HIGH);
}

void Forward_ramp_up(void){
  digitalWrite(MOTOR_IN1, HIGH);
  digitalWrite(MOTOR_IN2, LOW);
  for (int i=0; i<255; i++) { analogWrite(MOTOR_EN_1_2, i); delay(10); } void Forward_ramp_down(void){ digitalWrite(MOTOR_IN1, HIGH); digitalWrite(MOTOR_IN2, LOW); for (
  
```

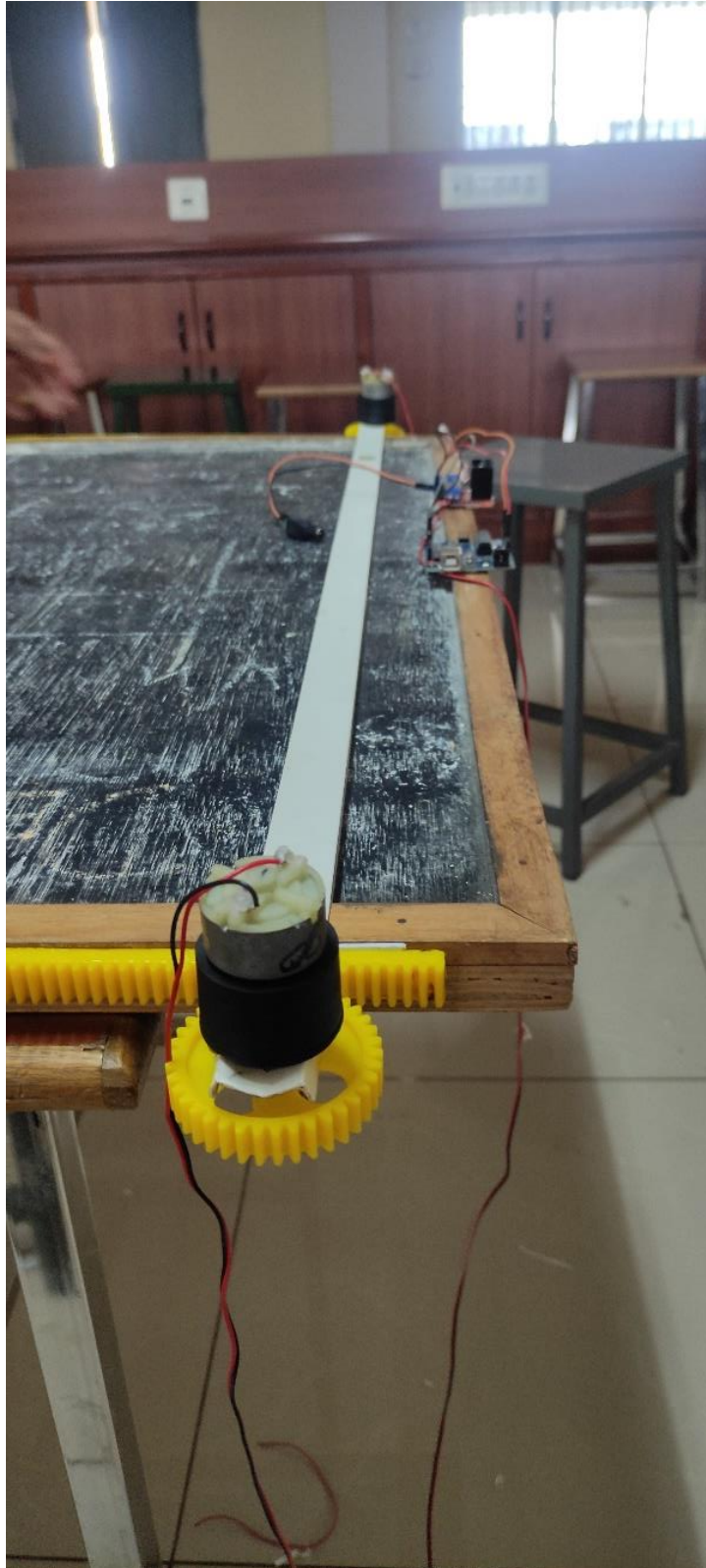
Fig 1.34 Code for DC Motor Control using Arduino UNO



**Fig 1.35 Automatic BlackBoard Erasing System (1)**



**Fig 1.36 Automatic BlackBoard Erasing System (2)**



**Fig 1.37 Automatic BlackBoard Erasing System (3)**

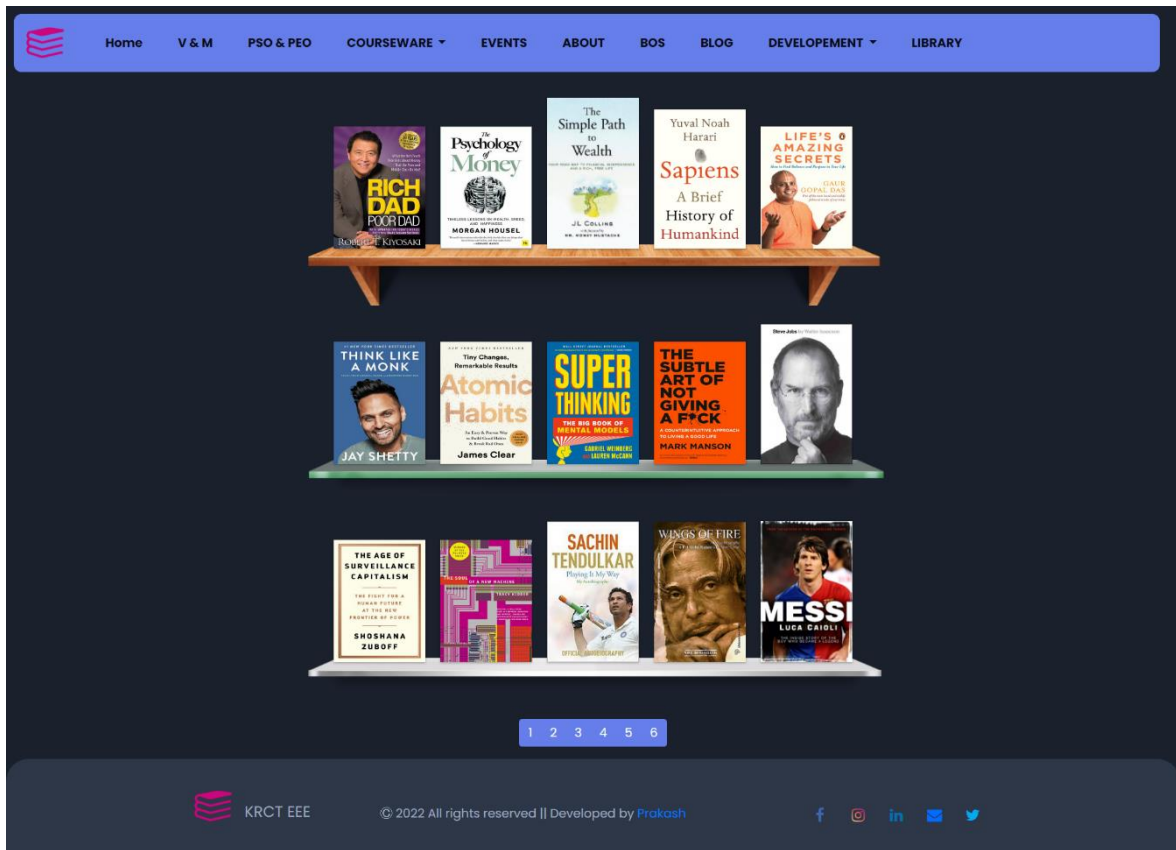


Fig 1.38 Online Library Management Website (Index Page)

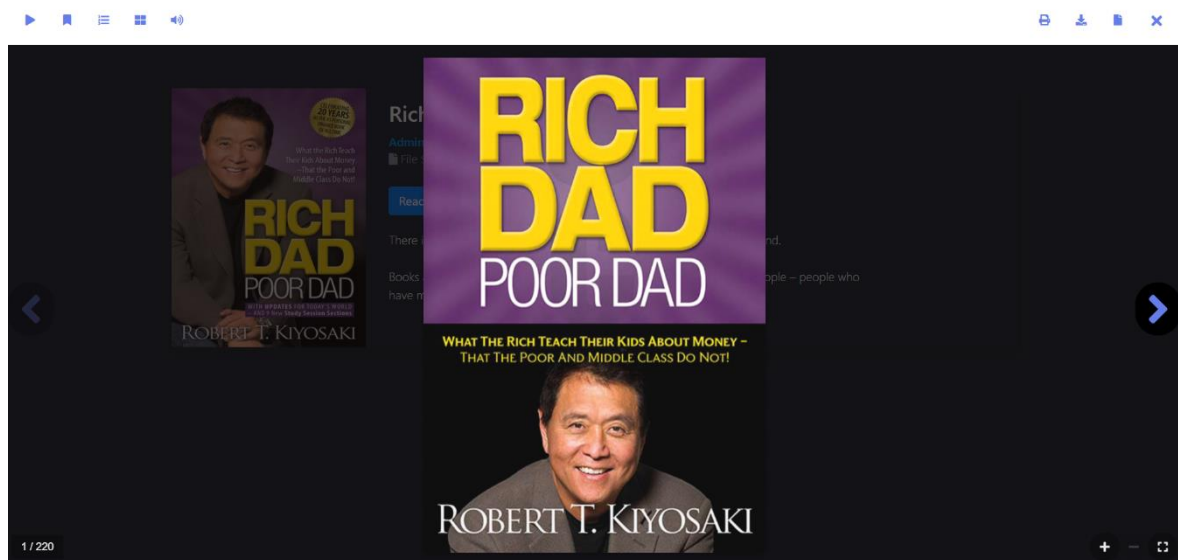
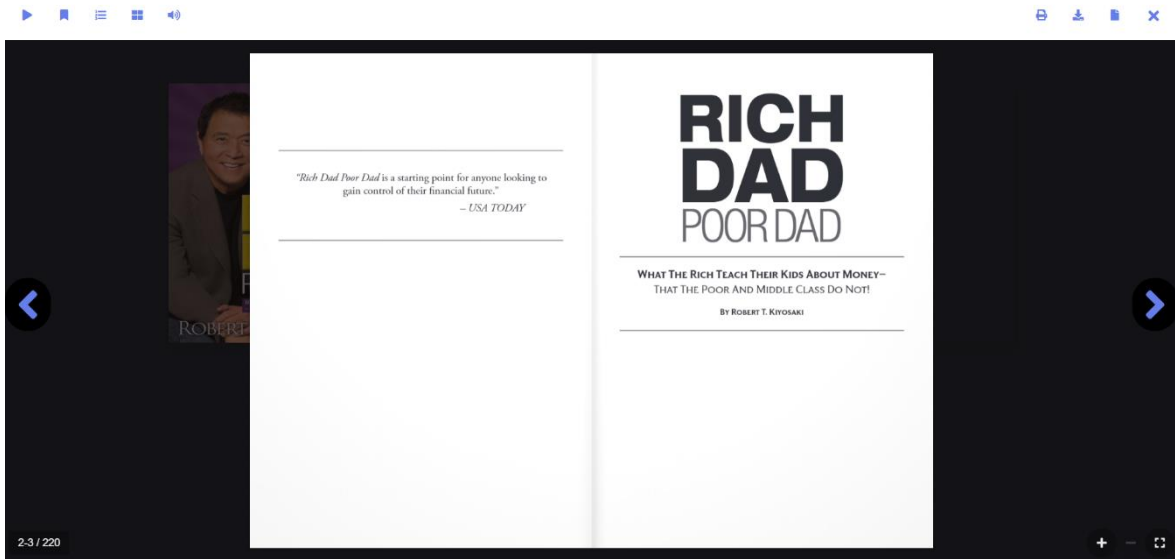


Fig 1.39 Online Library Management Website (1<sup>st</sup> Book)



**Fig 1.40 Online Library Management Website (Book Cover)**



**Fig 1.41 Staff Presence Finding System**

திருக்குறள் கற்போம்
வினாக்கள் கண்டுபிடி
குறள் கண்டுபிடி
வலைத்தளம் பற்றி

பாடல்: அறத்துப்பாயல்      அதிகாரம்: 1 - கூ. வள்ளுவர்த்து      [சாற்று](#)

**குறள் 1**

**அகர முதல எழுத்தெல்லாம் ஆதி பகவன் முதற்றே உலகு**

மு.வரதராசன்    சாலமன் பாப்பையா    மு.கருணாநிதி

எழுத்துக்கள் எல்லாம் அகரத்தை அடிப்படையாகக் கொண்டிருக்கின்றன. அதுபோல உலகம் கடவுளை அடிப்படையாகக் கொண்டிருக்கிறது.

**குறள் 2**

**கற்றதனால் ஆய பயனென்கொல் வாலறிவன் நற்றாள் தொழார் எனின்**

மு.வரதராசன்    சாலமன் பாப்பையா    மு.கருணாநிதி

தாய் அறிவு வடிவாக விளங்கும் இறைவனுடைய நல்ல திருவடிகளை தொழாமல் இருப்பாரானால், அவர் கற்ற கல்வியினால் ஆய பயன் என்ன?

**குறள் 3**

**மலர்மிசை ஏனினான் மாணடி சேர்ந்தார் நிலமிசை நீடுவாழ்வார்**

மு.வரதராசன்    சாலமன் பாப்பையா    மு.கருணாநிதி

அன்பரின் அகமாயி மலரில் வீற்றிருக்கும் கடவுளின் சிறந்த திருவடிகளை பொருந்தி நினைக்கின்றவர், இன்ப உலகில் நிலவத்து வாழ்வார்.

**குறள் 4**

**வேண்டுதல்வேண் டாமை இலானடி சேர்ந்தார்க்கு யாண்டும் இடும்பை இல**

மு.வரதராசன்    சாலமன் பாப்பையா    மு.கருணாநிதி

விருப்பு வெறுப்பு இல்லாத கூடவுளின் திருவடிகளை பொருந்தி நினைக்கின்றவர்க்கு எப்போதும் வேண்டித்தும் துன்பம் இல்லை.

**குறள் 5**

**இருள்சேர் இருவினையும் சேரா இறைவன் பொருள்சேர் புகழ்புரிந்தார் மாட்டு**

மு.வரதராசன்    சாலமன் பாப்பையா    மு.கருணாநிதி

கடவுளின் உண்மைப் புகழை விரும்பி அன்பு செலுத்துகின்றவரிடம் அறியாமையால் வினையும் இருவகை வினையும் சேர்வதில்லை.

**குறள் 6**

**பொறிவாயில் ஐந்தவித்தான் பொய்தீர் ஒழுக்க நெறிநின்றார் நீடுவாழ்வார்**

மு.வரதராசன்    சாலமன் பாப்பையா    மு.கருணாநிதி

ஐம்பொறிவாயிலாக பிறக்கும் வேட்கைகளை அவித்த இறைவனுடைய பொய்யற்ற ஒழுக்க நெறியில் நின்றுவார், நிலை பெற்ற நல்வாழ்க்கை வாழ்வார்.

**குறள் 7**

**தனக்குவமை இல்லாதான் தாள்சேர்ந்தார்க் கல்லால் மனக்கவலை மாற்றல் அரிது**

மு.வரதராசன்    சாலமன் பாப்பையா    மு.கருணாநிதி

தனக்கு ஒப்புமை இல்லாத தலைவனுடைய திருவடிகளைப் பொருந்தி நினைக்கின்றவர் அல்லாமல், மற்றவர்க்கு மனக்கவலையை மாற்ற முடியாது.

**குறள் 8**

**அறவாழி அந்தணன் தாள்சேர்ந்தார்க் கல்லால் பிறவாழி நீந்தல் அரிது**

மு.வரதராசன்    சாலமன் பாப்பையா    மு.கருணாநிதி

அறக்கடலாக விளங்கும் கடவுளின் திருவடிகளைப் பொருந்தி நினைக்கின்றவர் அல்லாமல், மற்றவர் பொருளும் இன்ப ஸாமாயி மற்றும் கடவுளைக் கடக்க முடியாது.

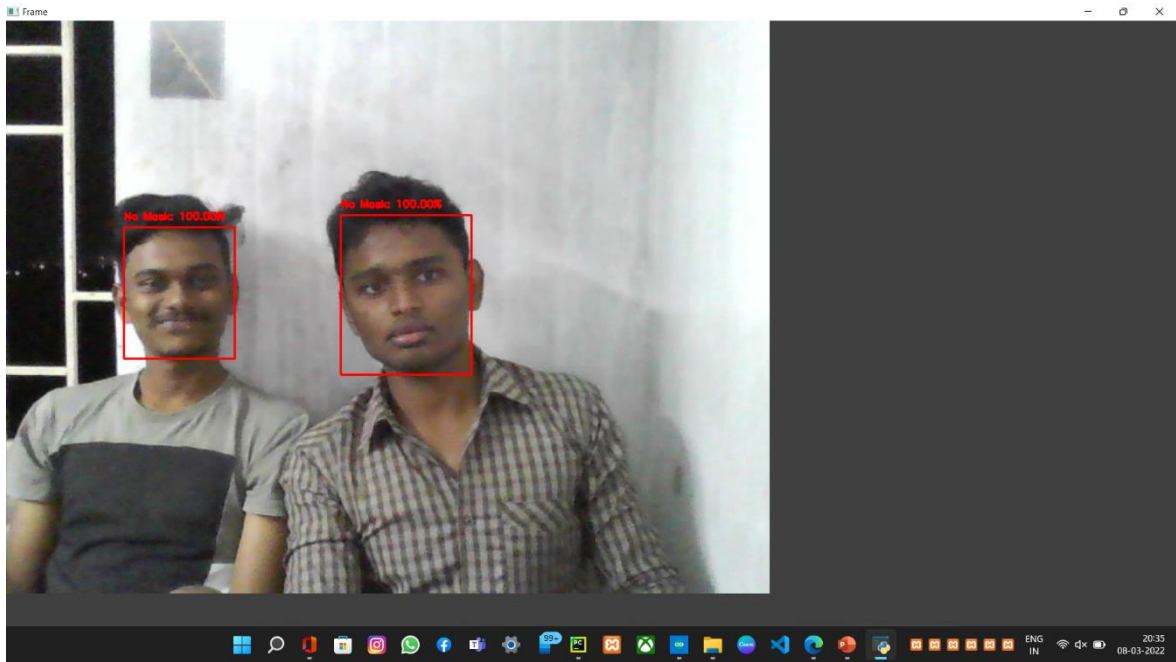
**குறள் 9**

**கோளில் பொறியின் குணமில்வே எண்குணத்தான் தானை வணங்காத தலை**

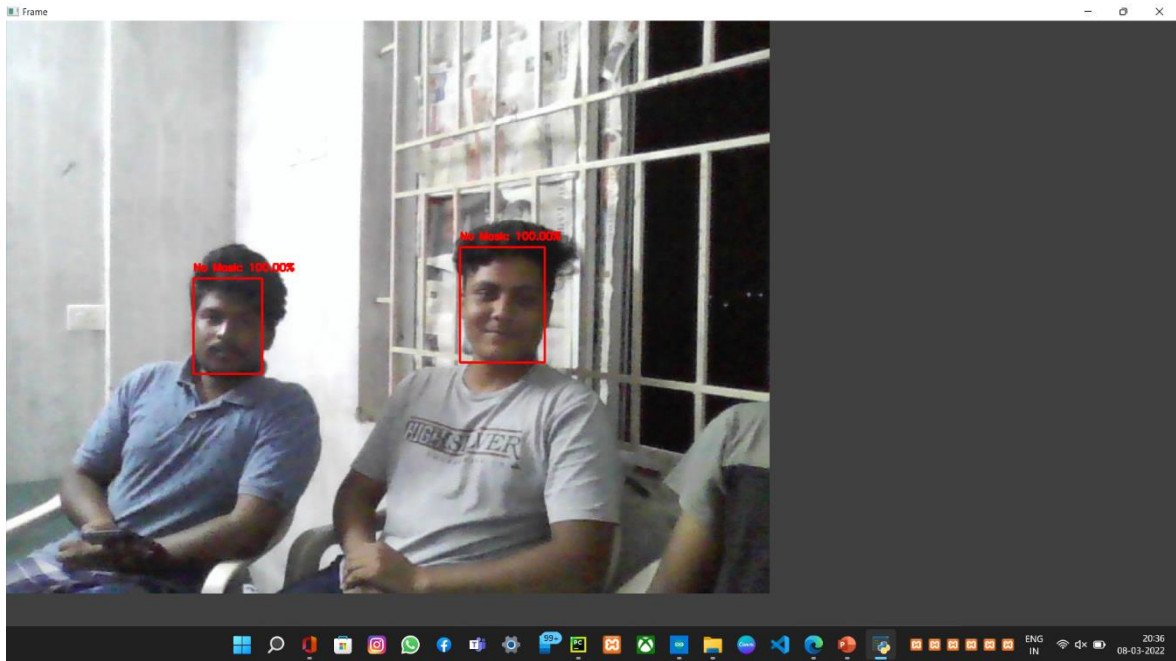
மு.வரதராசன்    சாலமன் பாப்பையா    மு.கருணாநிதி

கேட்காதசெவி, பார்க்காத கண் போன்ற எண் குணங்களை உடைய கடவுளின் திருவடிகளை வணங்காதவரின் தலைகள் பயனற்றவைகளாம்.

Fig 1.42 Online Library Management Website (Tirukural Part)

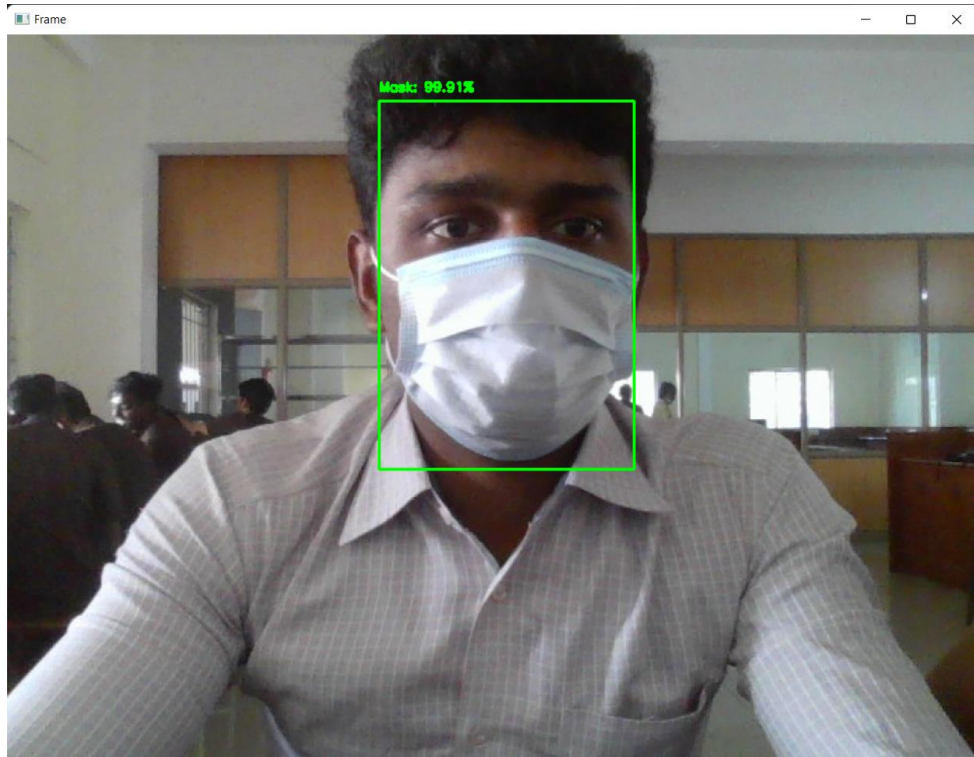


**Fig 1.43 Ouput Of Not Wearing Mask (1)**

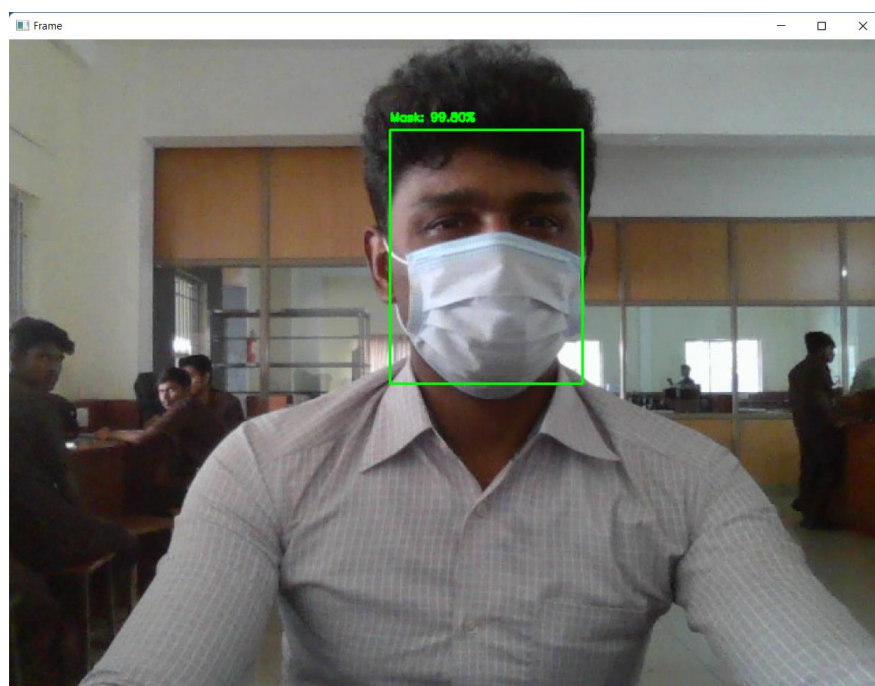


**Fig 1.44 Ouput Of Not Wearing Mask (1)**

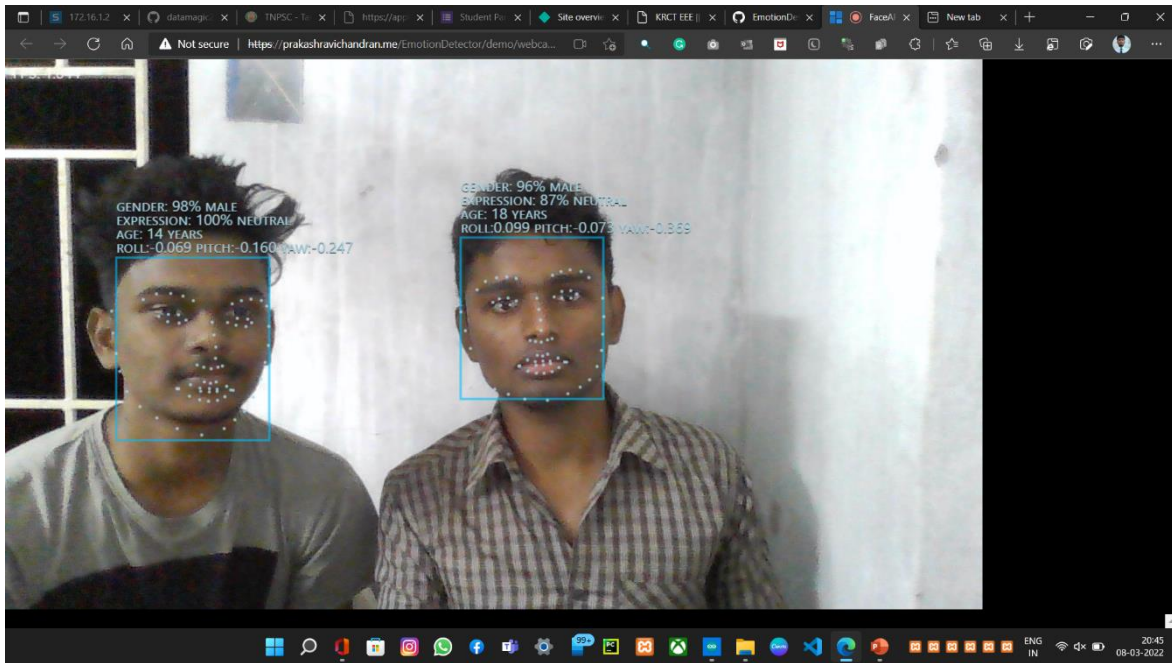




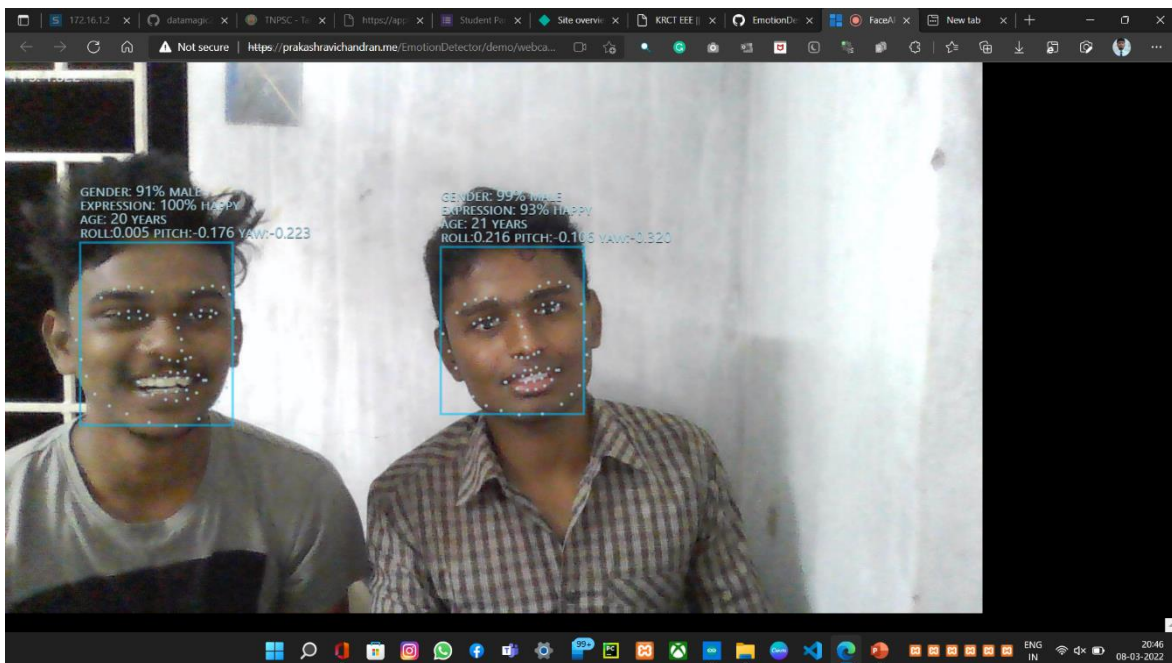
**Fig 1.45 Ouput Of Wearing Mask (1)**



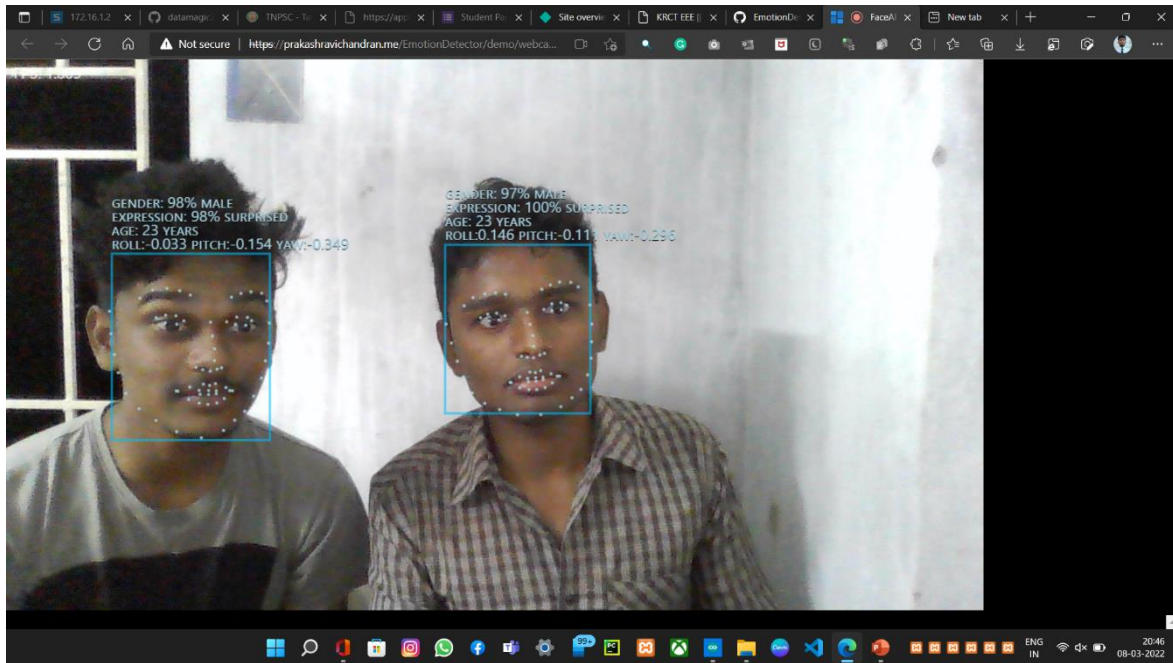
**Fig 1.46 Ouput Of Wearing Mask (2)**



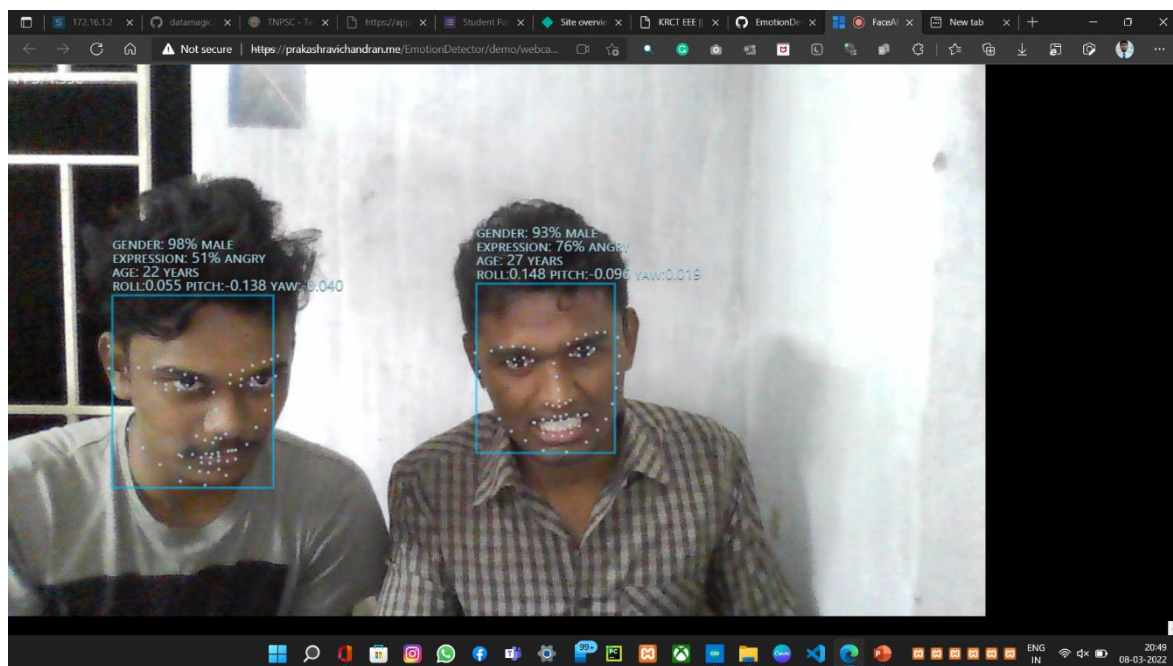
**Fig 1.47 Facial Expression - Neutral**



**Fig 1.48 Facial Expression - Happy**



**Fig 1.49 Facial Expression - Surprised**



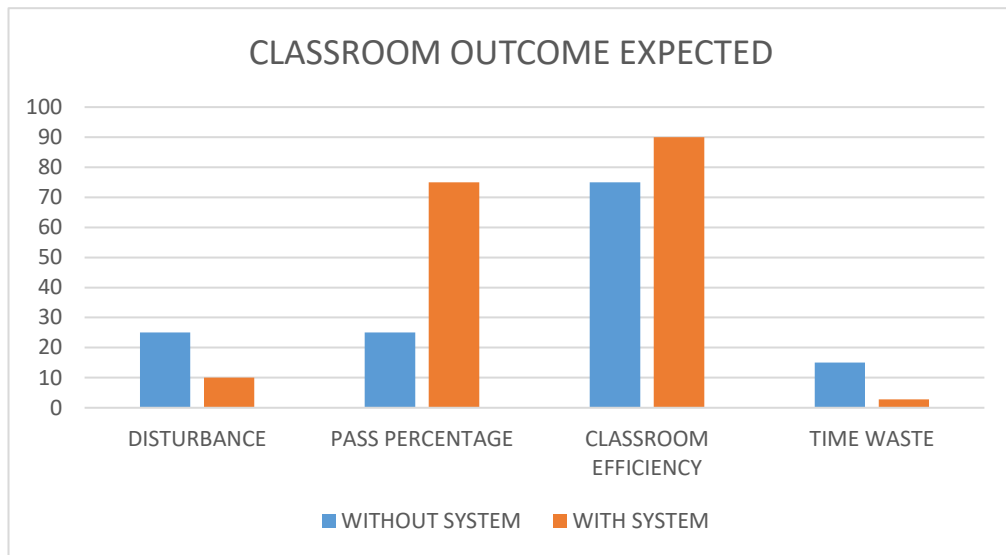
**Fig 1.50 Facial Expression - Angry**

## ENERGY SAVED

The data from the electric department which controls the power house of the college. The data is then compared with our assumption.

## CLASSROOM OUTCOME EXPECTED

The data from our department are sorted out and therequired data are plotted in the below Graph.



**Fig 1.51 Outcome Expected**

## **CHAPTER 6**

### **CONCLUSION**

It has a very simple and an effective user interface. It eases the user to control the device effortlessly and effectively. As mentioned in the beginning the focus is on classroom automation, classroom automation is what future technology should look like. The project will reach most of the people's expectation as it is controlled only via voice where we don't even have to touch things. We found designing and developing this interactive project very interesting and a good learning experience. Here we are integrating Blynk SDK (Software Development Kit) with using any third party application by manipulating source code. There are two types of outcomes expected from this project. We have collected some data from college electric department and our department to achieve the required results.

## LIST OF PUBLICATIONS



This is a certificate for Present our paper in *MESCIA 2K21*.



This is a certificate for Present our paper in *ZREYAS 2K21*.



This is a certificate for Present our paper in *TECHNOKRATZ-2K21*.



This is a certificate for Present our paper in *FAISCA '20*.

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