**Name of the Student : Sowmiya N**

**Register Number : 212221230106**

**Year/Sem : II/III**

**Department : BTech AI-DS**

**Duration (Specify Date from & to) : 25 JAN 2023– 23 FEB 2023**

**No of Days : 30**

**Company Name & Address : EDIFY TECHNO SOLUTIONS**
**202, H.NO:23/1,**
**SECOND FLOOR, 5th St,**
**Alagiri Nagar, Vadapalani,**
**Chennai,Tamil Nadu 600026**

**DESCRIPTION OF THE COMPANY**

**EDIFY TECHNO SOLUTIONS** is an Industrial Automation Software Services, Solution and a Training provider company. They provide full scale engineering services cross the product development life cycle ranging ideation, R&D, consulting application development technology re-engineering and product support enabling companies to be competitive in the market.

**INFORMATION ABOUT THE INTERNSHIP**

**IOT – Internet Of Things**

The Internet of things (IoT) describes physical objects (or groups of such objects) with sensors, processing ability, software and other technologies that connect and exchange data with other devices and systems over the Internet or other communications networks.

IOT involves connecting the hardware to the internet. During the internship period , we where asked to work on hardware components – microcontrollers and push the data of controller to the cloud. A typical IoT system works through the real-time collection and exchange of data. An IoT system has three components:

- Smart devices
  This is a device, like a television, security camera, or exercise equipment that has been given computing capabilities. It collects data from its environment, user inputs, or usage patterns and communicates data over the internet to and from its IoT application.
- IoT application
  An IoT application is a collection of services and software that integrates data received from various IoT devices. It uses machine learning or artificial intelligence (AI) technology to analyze this data and make informed decisions. These decisions are communicated back to the IoT device and the IoT device then responds intelligently to inputs.
- A graphical user interface
  The IoT device or fleet of devices can be managed through a graphical user interface. Common examples include a mobile application or website that can be used to register and control smart devices.

**REVIEW OF EXPERIENCE**

*DAY PLAN :*

| DATE | DATE | NAME OF THE TOPIC/MODULE COMPLETED |
|---|---|---|
| DAY 1 | MONDAY | Reporting at office with all photocopies of Documents.<br>Overview to Company Profile and Total Internship schedule |
| DAY 2 | TUESDAY | Introduction to Embedded systems Role of devices in AI development Applications in industries in AI |
| DAY 3 | WEDNESDAY | Introduction to embedded C programs, understating Programming basics |
| DAY 4 | THURSDAY | ARDUINO IDE installations<br>Understanding Integration |
| DAY 5 | FRIDAY | Learning about sensors |
| DAY 6 | SATURDAY | Learning about input and output devices |
| | | |
| DAY 7 | MONDAY | Learning about sensors and working |
| DAY 8 | TUESDAY | Intrusion detection system<br>Human detection sensors |
| DAY 9 | WEDNESDAY | Understanding Wireless sensor monitoring(WSN) networks,<br>Humidity environment monitoring sensor |
| DAY 10 | THURSDAY | Serial port communication |
| DAY 11 | FRIDAY | LCD display interfacing |
| DAY 12 | SATURDAY | Arduino IDE with Serial monitor and analysis<br>Understanding Clouds |
| | | |
| DAY 13 | MONDAY | Understanding Machine learning algorithms<br>Types of learning algorithms |
| DAY 14 | TUESDAY | Evolutionary algorithms |
| DAY 15 | WEDNESDAY | Understanding NODE MCU<br>Pin descriptions |
| DAY 16 | THURSDAY | Cloud configurations,<br>Testing |
| DAY 17 | FRIDAY | Arduino IDE with Node MCU interface |
| DAY 18 | SATURDAY | Integrating Arduino device with IoT cloud |
| | | |
| DAY 19 | MONDAY | Learning firmware development |

| | | |
|---|---|---|
| DAY 20 | TUESDAY | Thing speak testing |
| DAY 21 | WEDNESDAY | Testing and evaluation of Arduino integrated with all available sensors |
| DAY 22 | THURSDAY | |
| DAY 23 | FRIDAY | Understanding thing speak IoT cloud |
| DAY 24 | SATURDAY | Configuring feilds , Graphical visualizations |
| | | |
| DAY 25 | MONDAY | Viewing errors and fixing methods while doing connectivity |
| DAY 26 | TUESDAY | IOT testing and evaluation using open source codes |
| DAY 27 | WEDNESDAY | Libraries configurations<br>Thing speak IoT free cloud |
| DAY 28 | THURSDAY | ESP8266, WIFI, Generic NODEMCU |
| DAY 29 | FRIDAY | IoTcloud configuration |
| DAY 30 | SATURDAY | Testing with ESP8266<br>Testing the cloud for uploaded data |

*ACTIVITIES CARRIED OUT :*

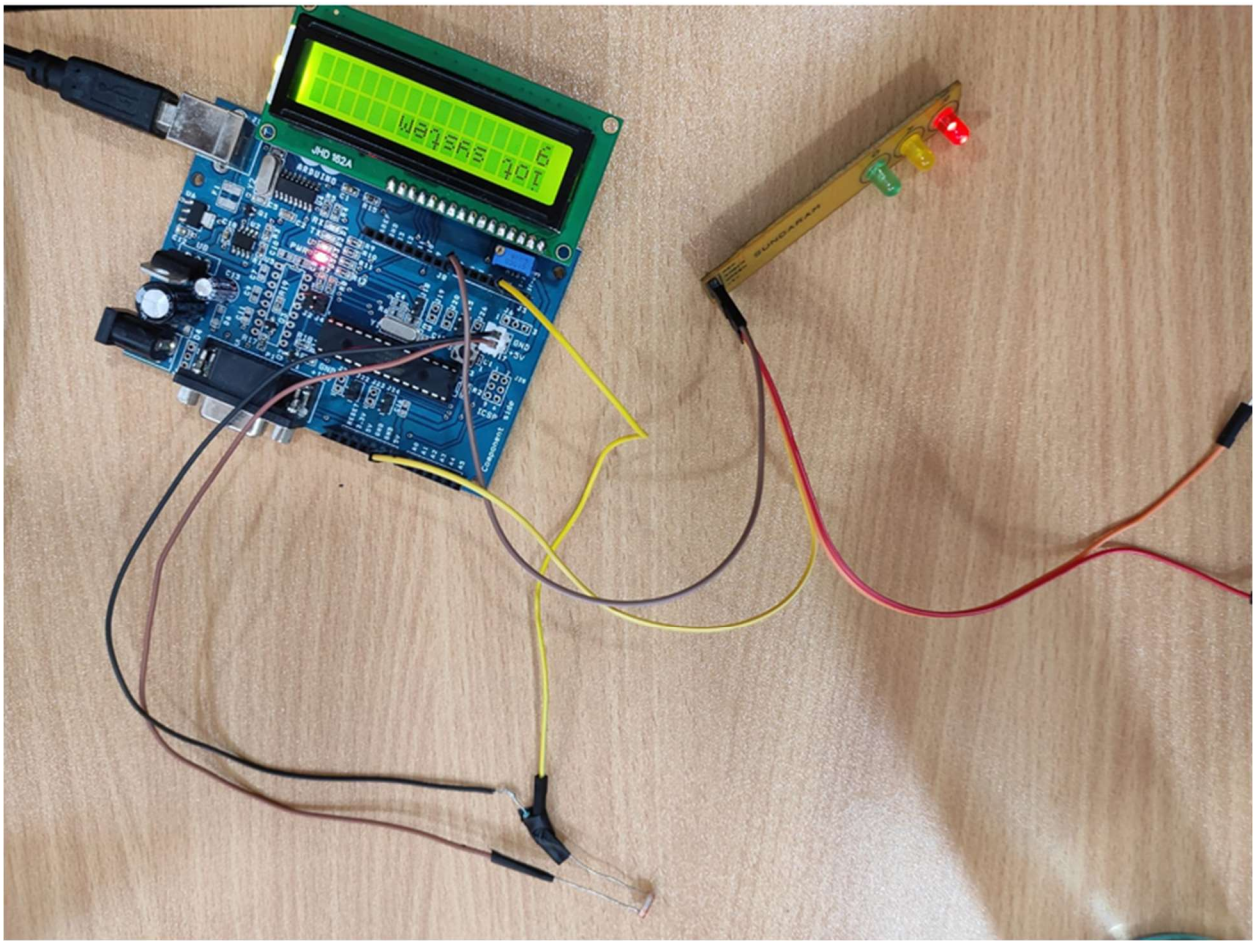
Arduino – Sensor Interface

These are the list of sensors, we worked on

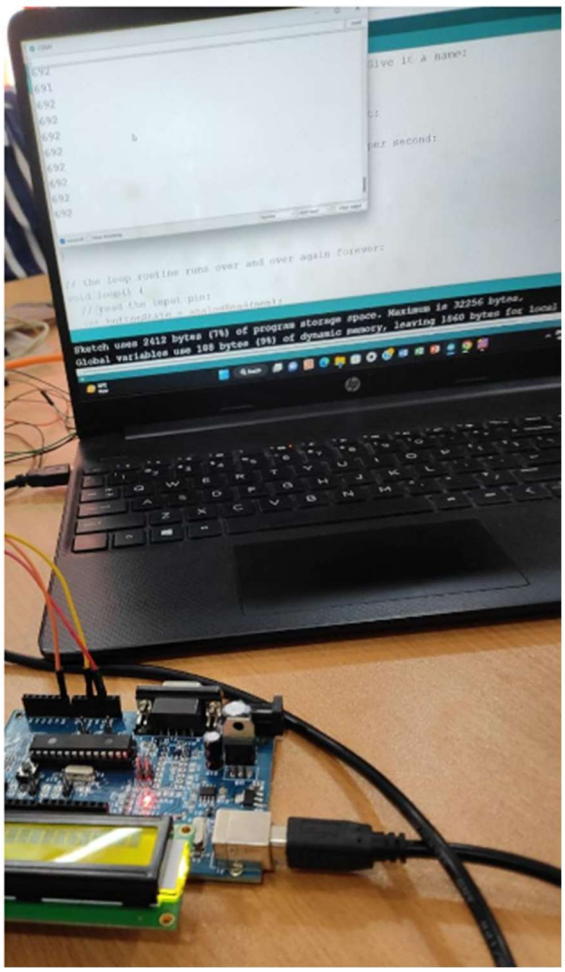
- Gas monitoring sensor
- Light detection sensor
- Humidity sensor
- Human detection sensor
- Moisture content detector sensor
- IR Infrared Obstacle Avoidance sensor
- Soil Moisture Sensor.
- Ultrasonic sensor
- Flame sensor
- Temperature and the Humidity sensor
- Magnetic fields sensor

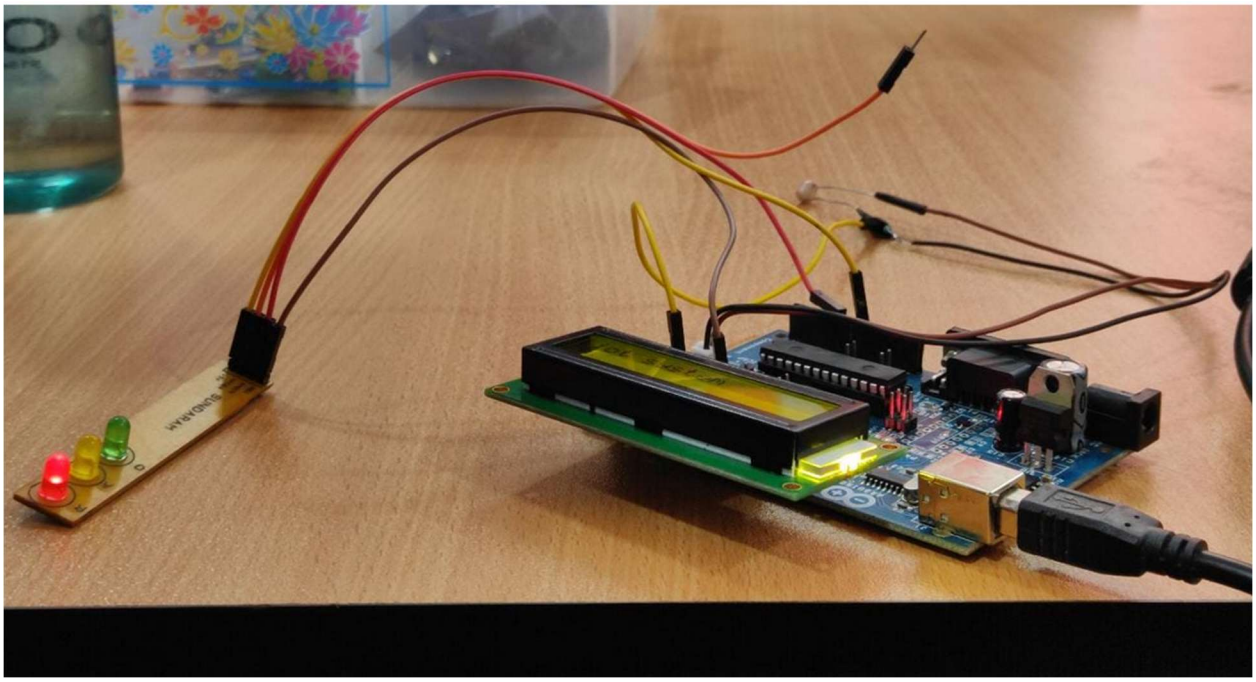
These sensors were connected with the Arduino and also interfaced with lcd and led , then programmed via Arduino software.

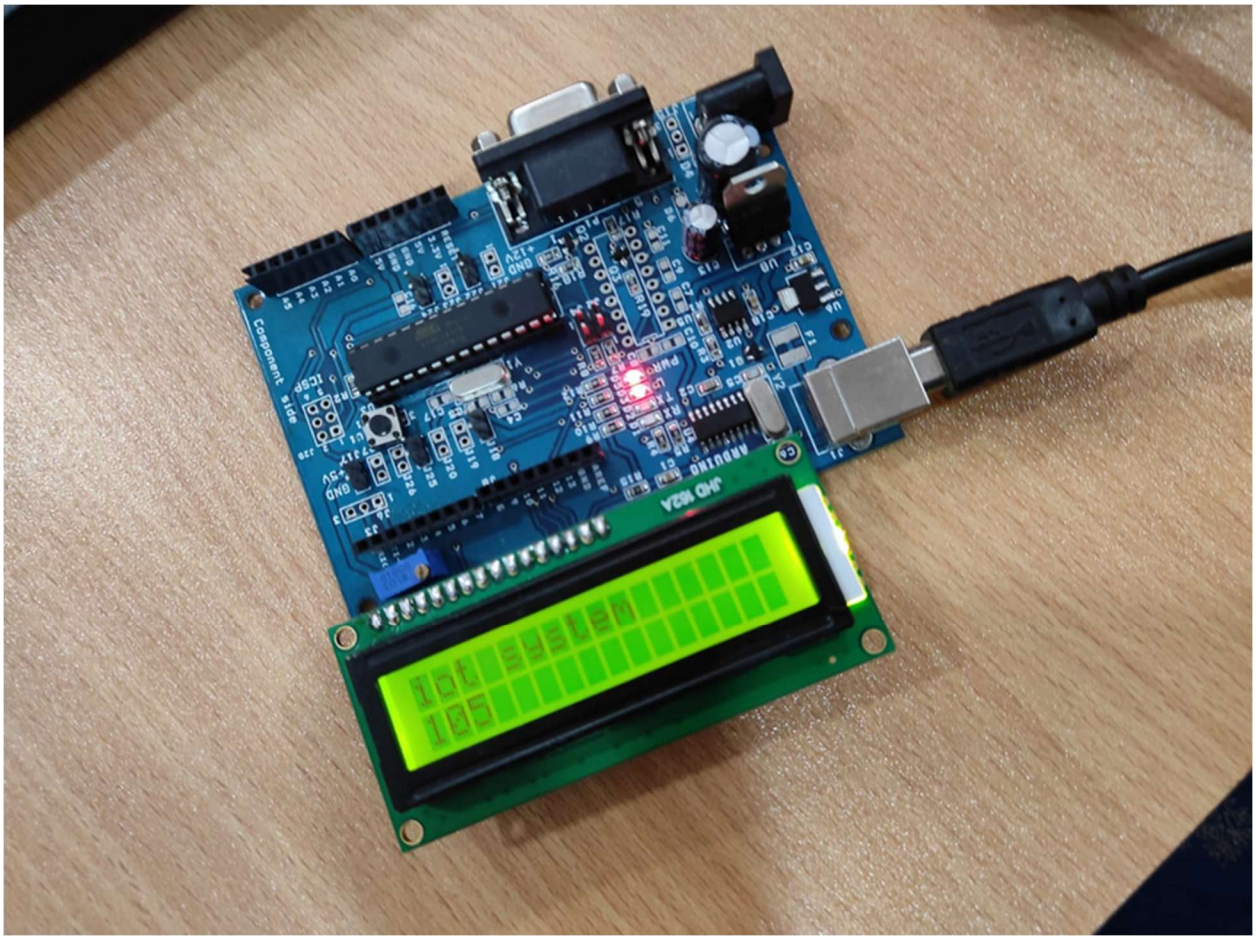
*SAMPLE WORKS :*

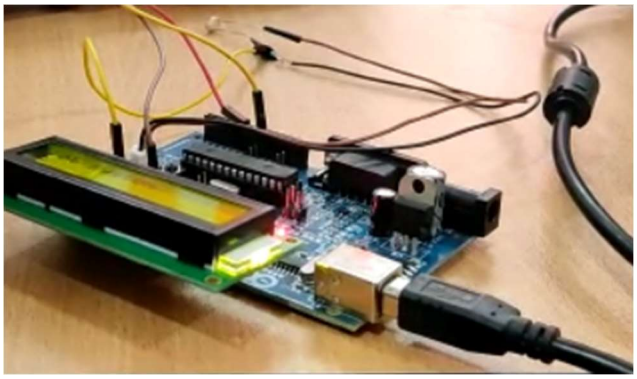

JHD 162A

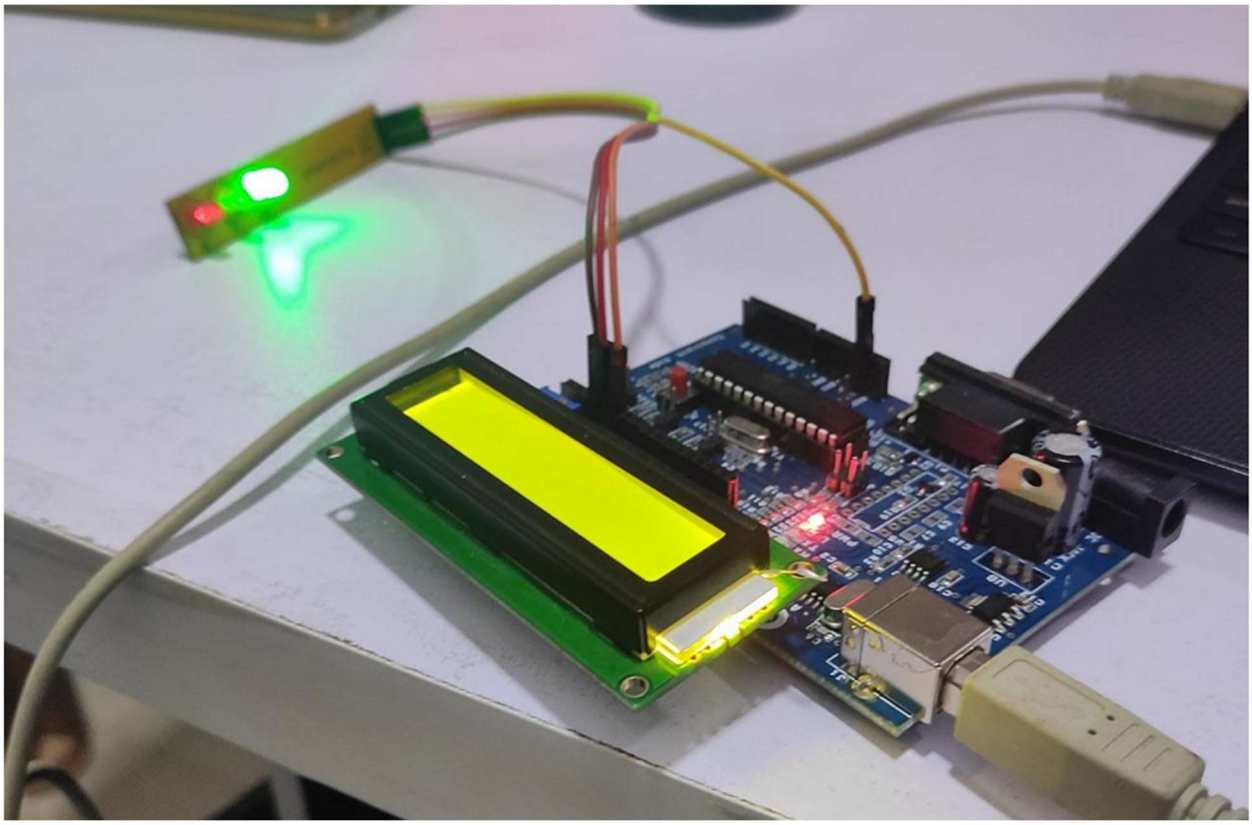

iot system

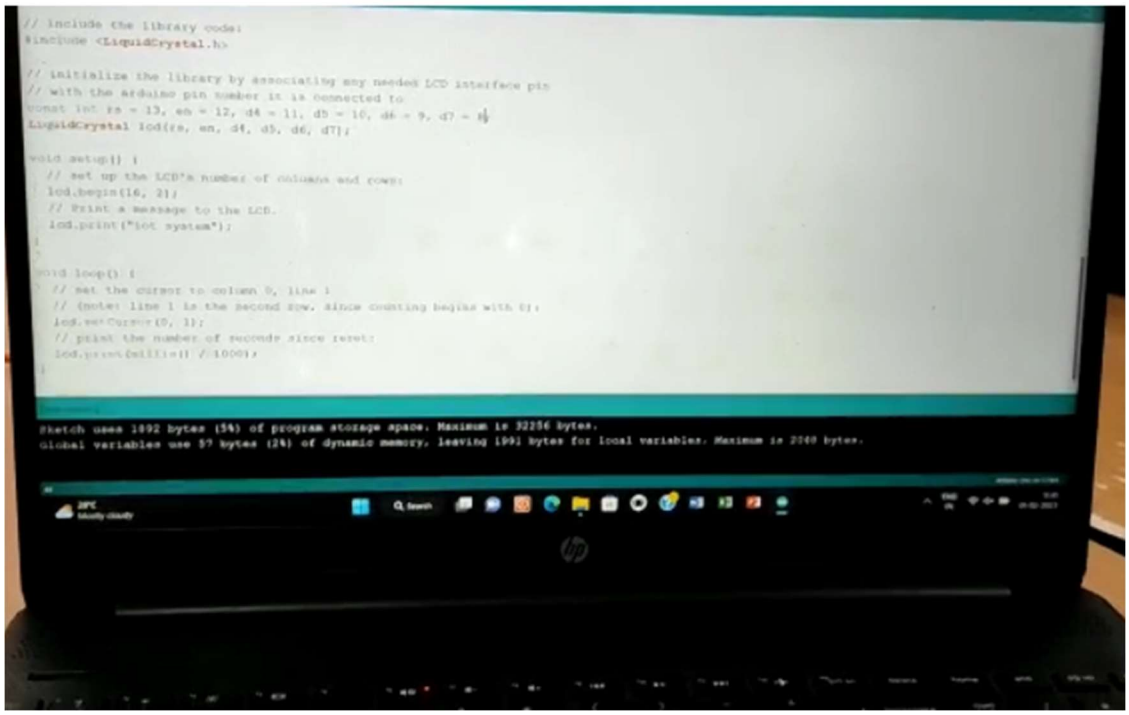

Sketch uses 2412 bytes (7%) of program storage space. Maximum is 32256 bytes.
Global variables use 108 bytes (5%) of dynamic memory, leaving 1940 bytes for local




Component side
ARDUINO MEGA






// include the library code:
#include <LiquidCrystal.h>
// initialize the library by associating any needed LCD interface pin
// with the arduino pin number it is connected to
const int rs = 13, en = 12, d4 = 11, d5 = 10, d6 = 9, d7 = 8;
LiquidCrystal lcd(rs, en, d4, d5, d6, d7);
void setup() {
// set up the LCD's number of columns and rows:
lcd.begin(16, 2);
// Print a message to the LCD.
lcd.print("iot system");
}
void loop() {
// set the cursor to column 0, line 1
// (note: line 1 is the second row, since counting begins with 0):
lcd.setCursor(0, 1);
// print the number of seconds since reset:
lcd.print(millis() / 1000);
}
Sketch uses 1892 bytes (5%) of program storage space. Maximum is 32256 bytes.
Global variables use 97 bytes (2%) of dynamic memory, leaving 1951 bytes for local variables. Maximum is 2048 bytes.

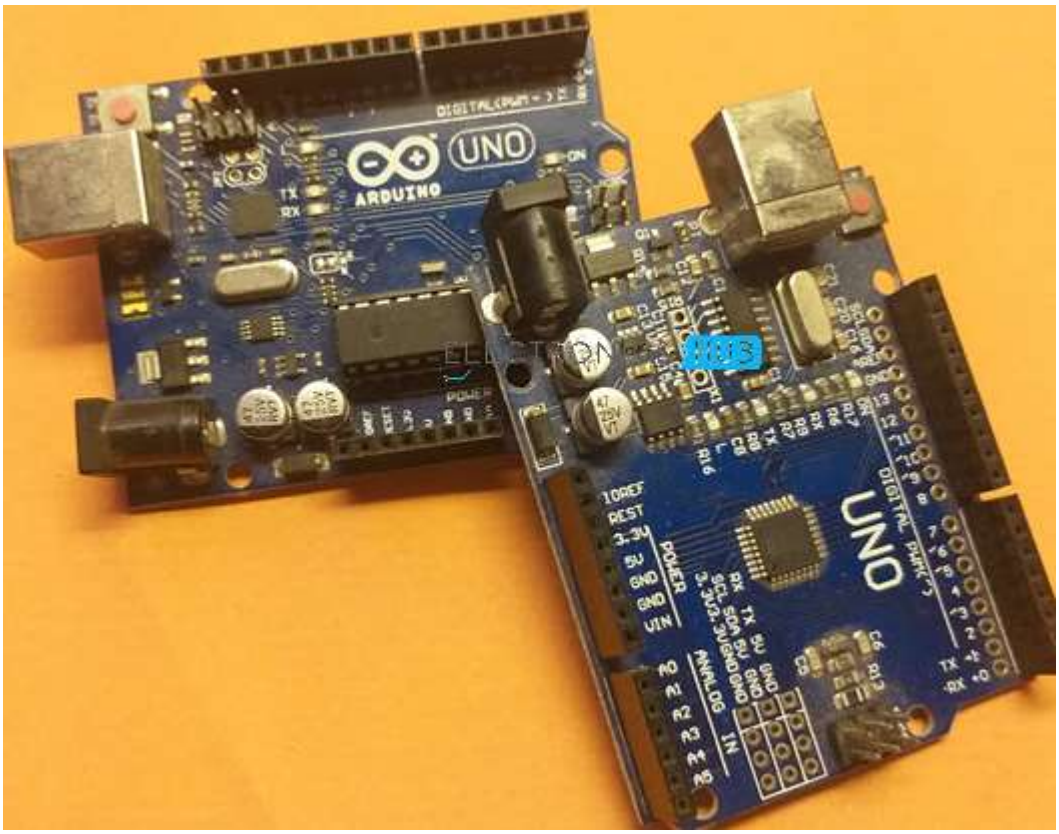
**REFLECTION ON LEARNING**

**ARDUINO IDE**

The Arduino UNO is the best board to get started with electronics and coding. If this is your first experience tinkering with the platform, the UNO is the most robust board you can start playing with. The UNO is the most used and documented board of the whole Arduino family.

Main Features

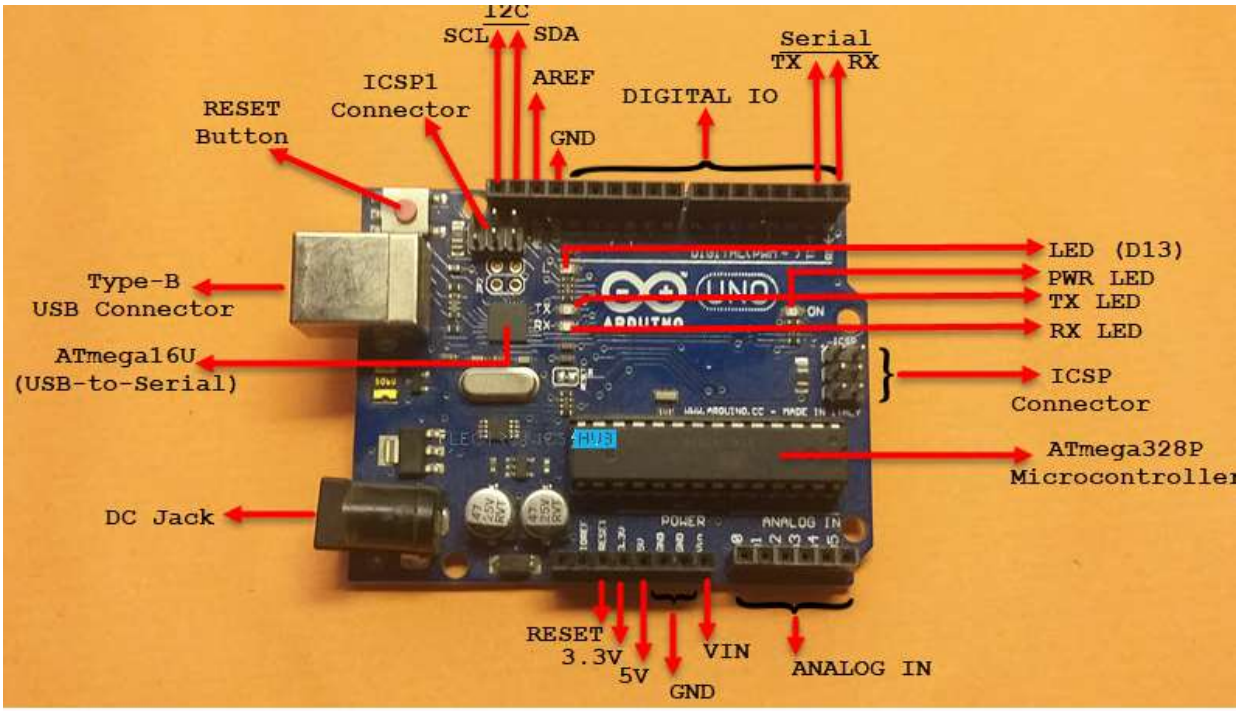
Arduino UNO is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. You can tinker with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.




Arduino UNO is based on ATmega328P Microcontroller, an 8-bit AVR Architecture based MCU from ATMEL. Arduino UNO comes in two variants: one consists of a 28-pin DIP Microcontroller while the other consists of 32 lead Quad Flat Package Microcontroller.

**Arduino UNO Board Layout**

The following image shows the layout of a typical Arduino UNO board. All the components are placed on the top side of the PCB.




As you can notice, there is a Type-B USB connector on the left short edge of the board, which is used for powering on the board as well as programming the Microcontroller. There is also a 2.1 mm DC jack to provide external power supply.Apart from that, the layout of Arduino UNO is very much self-explanatory.

**Technical Specifications of Arduino UNO**

As Arduino UNO is based on ATmega328P Microcontroller, the technical specifications of Arduino UNO are mostly related to the ATmega328P MCU. But none the less, let me give you a brief overview about some important specifications of Arduino UNO.

How to power up the Arduino UNO?

There are a couple of ways in which you can power the UNO board. The first and easy way is using the Type-B USB Connector. The next way is to provide an unregulated supply in the range of 6V to 20V to VIN pin of the UNO (Pin number 26).

You can also supply the unregulated supply through the 2.1mm DC Jack, in which case, you can access the supplied voltage through the VIN Pin.

Strictly speaking, this is specific to the MCU i.e., ATmega328P, used on the Arduino UNO Board.

There are three different memories available in ATmega328P. They are:

32 KB of Flash Memory

2 KB of SRAM

1 KB of EEPROM

0.5 KB of the Flash Memory is used by the bootloader code.

What are the Input and Output Pins of Arduino UNO?

Of the 32 pins available on the UNO board, 22 pins are associated with input and output. In that 14 pins (D0 to D13) are true digital IO pins, which can be configured as per you application using pinMode(), digitalWrite() and digitalRead() functions.

All these Digital IO pins are capable of sourcing or sinking 20mA of current (maximum 40mA is allowed). An additional feature of the Digital IO pins is the availability of internal pull-up resistor (which is not connected by default).

The value of the internal pull-up resistor will be in the range of 20KΩ to 50KΩ.

There are also 6 Analog Input Pins (A0 to A5). All the analog input pins provide a 10-bit resolution ADC feature, which can be read using analogRead() function.

An important point about Analog Input pins is that they can be configured as Digital IO pins, if required.

Digital IO pins 3, 5, 6, 9, 10 and 11 are capable of producing 8-bit PWM Signals. You can use analogWrite() function for this.

Arduino UNO supports three different types of communication interfaces. They are:

Serial

I2C or I2C

SPI

Perhaps the most common communication interface in the Arduino universe is the Serial Communication. In fact, the Arduino boards (UNO or Nano or Mega) are programmed using the serial communication.

Digital IO pins 0 and 1 are used as Serial RX and TX pins to receive and transmit serial data. These pins are connected to the serial pins of the on-board USB to Serial Converter IC.

Analog Input Pins A4 and A5 have alternative functions. They can be configured as SDA (A4) and SCL (A5) to support I2C or I2C or Two Wire Interface (TWI) communication.

The final communication interface is the SPI. Digital IO Pins 10, 11 12 and 13 can be configured as SPI pins SS, MOSI, MISO and SCK respectively.

There is an on-board LED connected to digital IO pin 13. Use this LED to perform Blinky operations.

The reference voltage for the internal ADC is by default set to 5V. But using the AREF pin, you can manually set the upper limit of the ADC.

Using the IOREF pin, you can set the reference voltage for Microcontroller operations.

To reset the microcontroller, you can use the on-board RESET button.

Although you can program the Arduino UNO using the USB cable, there is a provision to program the MCU using the In-Circuit Serial Programming (ICSP) interface.

The UART bootloader, which is preloaded in to the ATmega328P microcontroller, enables programming through serial interface. But ICSP doesn’t need any bootloader.

You can program Arduino UNO using ISCP or use the ISCP of Arduino UNO to program other Arduino Boards.

Digital IO Pins 2 and 3 can be configured as External Interrupts Pins INT0 and INT1 respectively. Use attachInterrupt() function to configure the Interrupt for rising edge, falling edge or level change on the pin.

**Pin Description**

For pin description of Arduino UNO, let us assume some basic numbering. Let the numbering begin with the RX Pin (D0). So, RX is Pin 1, TX is Pin 2, D2 is Pin 3 and so on.

On the other side, NC is Pin 19, IOREF is Pin 20 etc. Overall, there are 32 pins on the Arduino UNO Board.

With this information, let us now see the pin description of Arduino UNO.

Esp8266

**High Durability**

ESP8266EX is capable of functioning consistently in industrial environments, due to its wide operating temperature range. With highly-integrated on-chip features and minimal external discrete component count, the chip offers reliability, compactness and robustness.

**Compactness**

ESP8266EX is integrated with a 32-bit Tensilica® processor, standard digital peripheral interfaces, antenna switches, RF balun, power amplifier, low noise receive amplifier, filters and power management modules. All of them are included in one small package, our ESP8266EX.

**Power-Saving Architecture**

Engineered for mobile devices, wearable electronics and IoT applications, ESP8266EX achieves low power consumption with a combination of several proprietary technologies. The power-saving architecture features three modes of operation: active mode, sleep mode and deep sleep mode. This allows battery-powered designs to run longer.

**32-bit Tensilica Processor**

The ESP8266EX microcontroller integrates a Tensilica L106 32-bit RISC processor, which achieves extra-low power consumption and reaches a maximum clock speed of 160 MHz. The Real-Time Operating System (RTOS) and Wi-Fi stack allow about 80% of the processing power to be available for user application programming and development

## APPLICATION DEVELOPMENT

### HOME MONITORING SYSTEM

The architecture of a smart home monitoring system we have implemented for the long-term care of elder people with special needs is explained below. People with physical activity require a range of care for their daily needs. Caregivers need help in managing care and identifying important care issues. Our system is designed to analyse the activity of residents what they do and where they do it and to provide reports on their activity as well as alerts about activity of particular interest. Our analysis framework is based on our research on tracking of elder people. Our system architecture is based on a smart home engine that provides local sensor management and control plus a cloud analysis engine that supports the analytics engine. This architecture is designed to be provide scalable efficiency as well as security and privacy. A smart home also referred to as a connected home or e-Home is an environment for living that has highly advanced automatic systems.

Factor analysis was performed to extract the underlying structure of physical activity and gait features for both mean and extreme values. Outcomes of the smartphone-based home monitoring are associated with clinical assessments. Extreme values seem to be more informative than the mean values and are more closely related with clinical assessments. we present an original and sensor less alert management solution which performs multimedia and home automation service discrimination and extracts highly regular home activities as sensors for alert management. The results of simulation data, based on real context, allow us to evaluate our approach before application to real data. It is expected that smart home care technologies would be potentially useful in monitoring the safety of the elderly in the home environment. The safety of older and disabled people can be continuously monitored without interrupting

their daily routine with intelligent devices and modern sensors located in their home environment and on the body. While home care technologies are beneficial for older people, and encourage independence, there are still privacy and safety issue that need to be considered if such systems are to be widely adopted. Further research is required, especially with respect to regarding use cases and the cost implications of home-based systems.

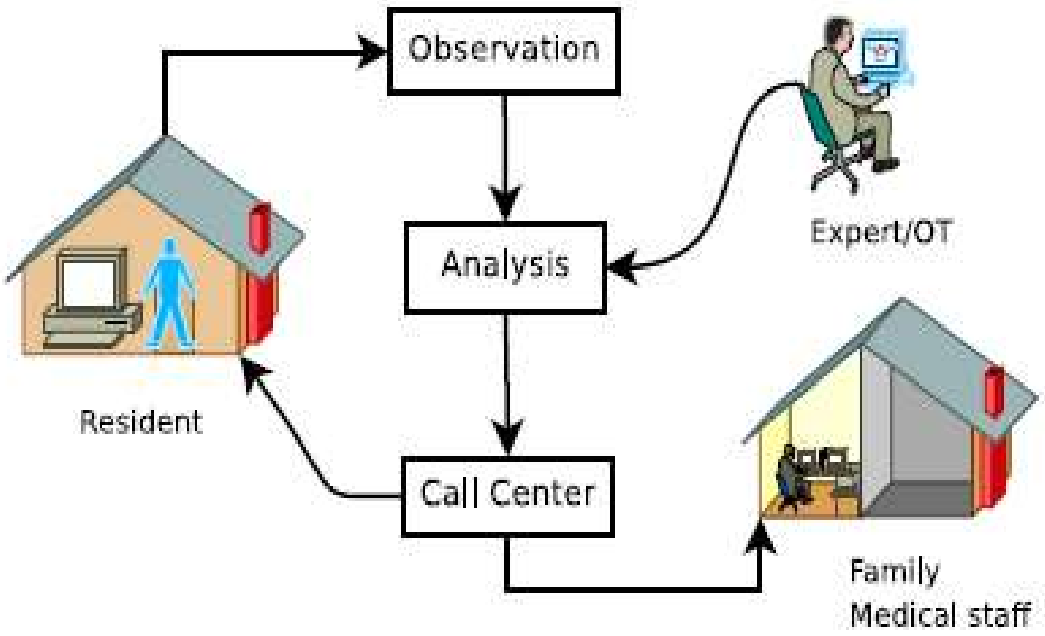



Fig. 1. Overview of Home Monitorign system

Fig. 1. Shows the overview f Home monitoring system where the observation, analysis and call centre are inforporated as shown above.

- In order to overcome the existing impacts, The proposed model created with an intelligent prototype module for Home anomaly monitoring for the elderly who live alone.
- The process will be equipped with one small electronics unit which consists of Microcontroller, Two PIR sensor, Temperature sensor, Mems Sensor, LCD and IOT module. By using PIR sensor we can monitor the anomaly detection of person.

- In this PIR sensors are will be two different places in the home. Body Temperature will be detected by using Temperature sensor. Mems sensor is used to sense the position of elder in home. If occur any abnormal detection, the message will sent to caretakers and the status will be updated to IOT webpage through IOT module. Also, In this system sensor status will be display on LCD.

### *A.* ARDUINO UNO

Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter. Arduino Uno has a number of facilities for communicating with a computer, another Arduino board, or other microcontrollers.


**Arduino UNO**

- Microcontroller: ATmega328P
- Operating voltage: 5V
- Input voltage: 7-12V
- Flash memory: 32KB

- SRAM: 2KB
- EEPROM: 1KB

***B.*** MEMS accelerometer

Acceleration is a measure of how quickly speed changes. Just as a speedometer is a meter that measures speed, an accelerometer is a meter that measures acceleration. Accelerometers are useful for sensing vibrations in systems or for orientation applications. Accelerometers can measure acceleration on one, two, or three axis. 3-axis units are becoming more common as the cost of development for them decreases. You can use an accelerometer's ability to sense acceleration to measure a variety of things that are very useful to electronic and robotic projects.


**Accelerometer**

***C.*** PIR sensor

In a practical aspect, all objects emit heat energy in the form of radiation. The theory behind this concept is that all objects with a temperature above absolute zero (absolute zero is -273.15 degree Celsius or zero Kelvin) emit heat energy in the form of radiation at infra red wavelengths (invisible to human eyes). These emitted infra red radiations can be detected with the help of electronics and this principle is employed in the design of a PIR sensor. A PIR sensor does not emit any kind of radiation for detection

purposes but they just measure the infra red radiation emitted by other objects inside its field or range of measurement.

.

Micro-controller module: ARDUINO UNO ATMEGA328

Power supply – 12V 1 AMP

Temperature sensor – LM35

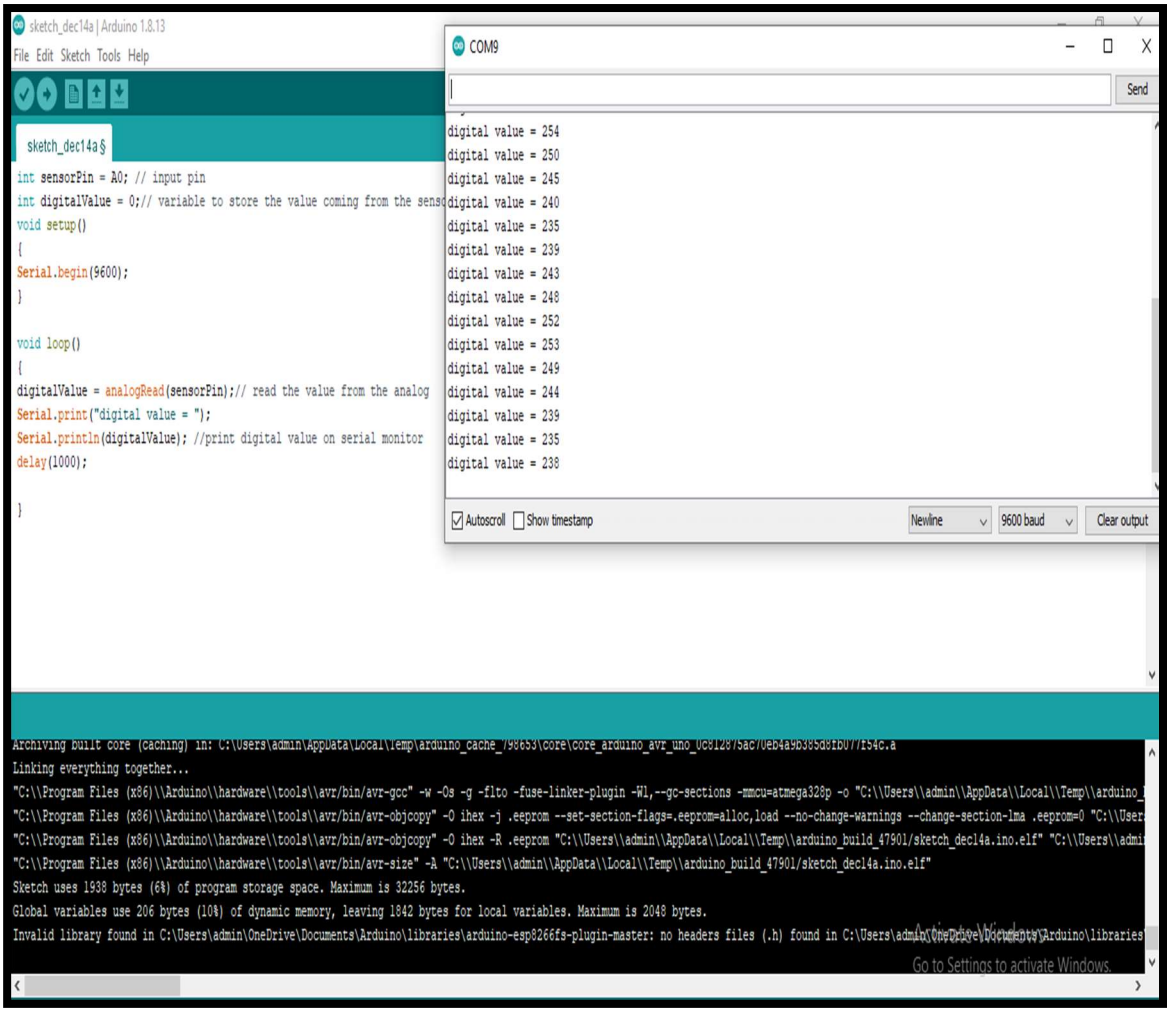
PIR sensor – Passive infrared (PIR) sensors

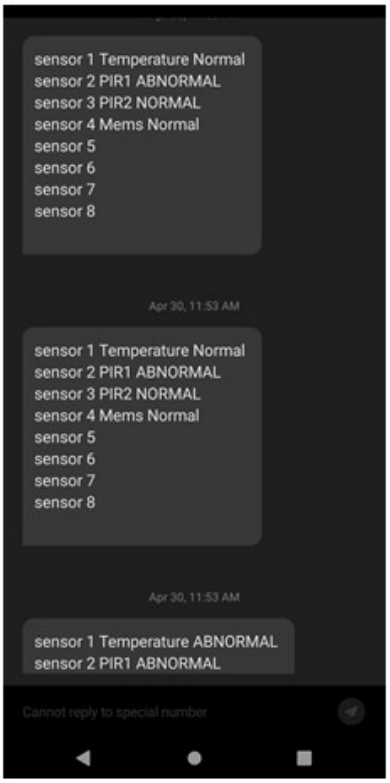
MEMS sensor – ADXL335

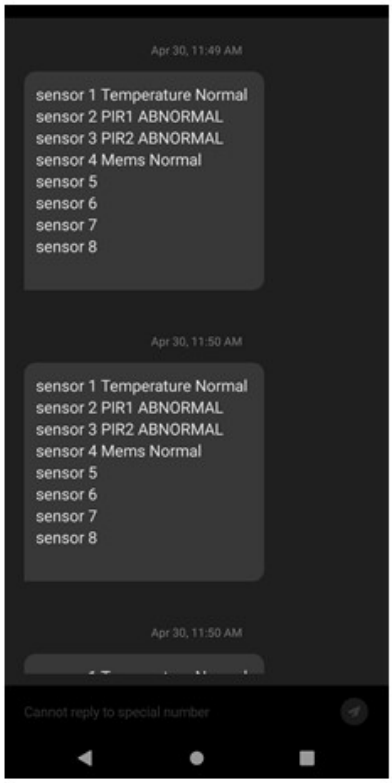
LCD – 16x2 Liquid Crystal display

IOT module: ESP8266 Wifi module

TEST AND EVALUATIONS




sensor 1 Temperature Normal
sensor 2 PIR1 ABNORMAL
sensor 3 PIR2 NORMAL
sensor 4 Mems Normal
sensor 5
sensor 6
sensor 7
sensor 8
Apr 30, 11:53 AM
sensor 1 Temperature Normal
sensor 2 PIR1 ABNORMAL
sensor 3 PIR2 NORMAL
sensor 4 Mems Normal
sensor 5
sensor 6
sensor 7
sensor 8
Apr 30, 11:53 AM
sensor 1 Temperature ABNORMAL
sensor 2 PIR1 ABNORMAL
Cannot reply to special number

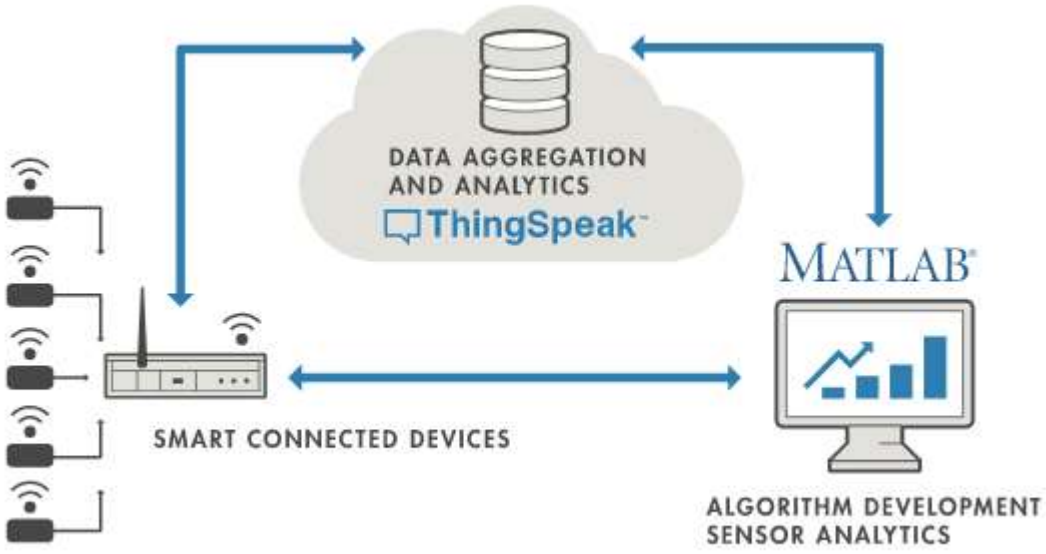

Apr 30, 11:49 AM
sensor 1 Temperature Normal
sensor 2 PIR1 ABNORMAL
sensor 3 PIR2 ABNORMAL
sensor 4 Mems Normal
sensor 5
sensor 6
sensor 7
sensor 8
Apr 30, 11:50 AM
sensor 1 Temperature Normal
sensor 2 PIR1 ABNORMAL
sensor 3 PIR2 ABNORMAL
sensor 4 Mems Normal
sensor 5
sensor 6
sensor 7
sensor 8
Apr 30, 11:50 AM
Cannot reply to special number

**IOT CLOUD CONFIGURATIONS**

**THING SPEAK**

ThingSpeak is an Internet of Things (IoT) platform and cloud service that allows developers to build and deploy IoT applications and devices. It is a platform that provides an easy-to-use interface and tools to collect, store, analyze, and visualize data from IoT devices in real-time. Internet of Things (IoT) describes an emerging trend where a large number of embedded devices (things) are connected to the Internet. These connected devices communicate with people and other things and often provide sensor data to cloud storage and cloud computing resources where the data is processed and analyzed to gain important insights. Cheap cloud computing power and increased device connectivity is enabling this trend.IoT solutions are built for many vertical applications such as environmental monitoring and control, health monitoring, vehicle fleet monitoring, industrial monitoring and control, and home automation.

At a high level, many IoT systems can be described using the diagram below:




Some key features of ThingSpeak include:

On the left, we have the smart devices (the “things” in IoT) that live at the edge of the network. These devices collect data and include things like wearable devices, wireless temperatures sensors, heart rate monitors, and hydraulic pressure sensors, and machines on the factory floor.

In the middle, we have the cloud where data from many sources is aggregated and analyzed in real time, often by an IoT analytics platform designed for this purpose.

The right side of the diagram depicts the algorithm development associated with the IoT application. Here an engineer or data scientist tries to gain insight into the collected data by performing historical analysis on the data. In this case, the data is pulled from the IoT platform into a desktop software environment to enable the engineer or scientist to prototype algorithms that may eventually execute in the cloud or on the smart device itself.

An IoT system includes all these elements. ThingSpeak fits in the cloud part of the diagram and provides a platform to quickly collect and analyze data from internet connected sensors.

ThingSpeak Key Features

ThingSpeak allows you to aggregate, visualize and analyze live data streams in the cloud. Some of the key capabilities of ThingSpeak include the ability to:

Easily configure devices to send data to ThingSpeak using popular IoT protocols.

Visualize your sensor data in real-time.

Aggregate data on-demand from third-party sources.

Use the power of MATLAB to make sense of your IoT data.

Run your IoT analytics automatically based on schedules or events.

Prototype and build IoT systems without setting up servers or developing web software.

Automatically act on your data and communicate using third-party services like Twilio® or Twitter®. To learn how you can collect, analyze and act on your IoT data with ThingSpeak, explore the topics below:

Data collection: ThingSpeak provides APIs and tools to collect data from various IoT devices such as sensors, cameras, and other data sources.

Data storage: ThingSpeak stores data in channels, which are essentially time-series databases that allow users to store and organize data from multiple devices.

Data analytics: ThingSpeak allows developers to analyze and manipulate data using built-in analytics tools such as MATLAB analytics, data visualizations, and machine learning models.

Integration with other services: ThingSpeak can be integrated with other IoT services and platforms such as Arduino, Particle, and other cloud services.

IoT device management: ThingSpeak offers a device management portal that allows developers to monitor and manage IoT devices and their connections.

One of the main advantages of ThingSpeak is its simplicity and ease-of-use. The platform offers a user-friendly interface and requires minimal coding skills, making it accessible to developers with varying levels of experience. Additionally, ThingSpeak is a free cloud service that offers a range of features, making it an attractive option for developers looking to build and deploy IoT applications quickly and cost-effectively.

## ROLE OF MACHINE LEARNING / AI

### Supervised Learning

Learning models are divided into three conventional types based on the way of Input and target is being analyzed. Supervised learning model is a technique in which the machine learning analysis is with the specific target is predictable. Based on the data provided to the labels the prediction process takes place. The label information provider to the machine learning algorithm keep focus on achieving the target matches score. Since the labels are non-factors to identify the target data supervisor learning approaches at times a high accuracy. Most of the practical applications utilized supervised learning process for fast and efficient outcome the supervisor learning model is represented by the expression given below.

$$Y=f(x)$$

Here f(x) is based on the mapping variable associated with it. Since supervised learning model depends on labels f(x) is always focused towards known selection of input data where the input variable x and the output variable Y is controlled by the certain mapping function derived by the algorithm. The mapping function is being supervised by the known data of certain pattern from the given input data.

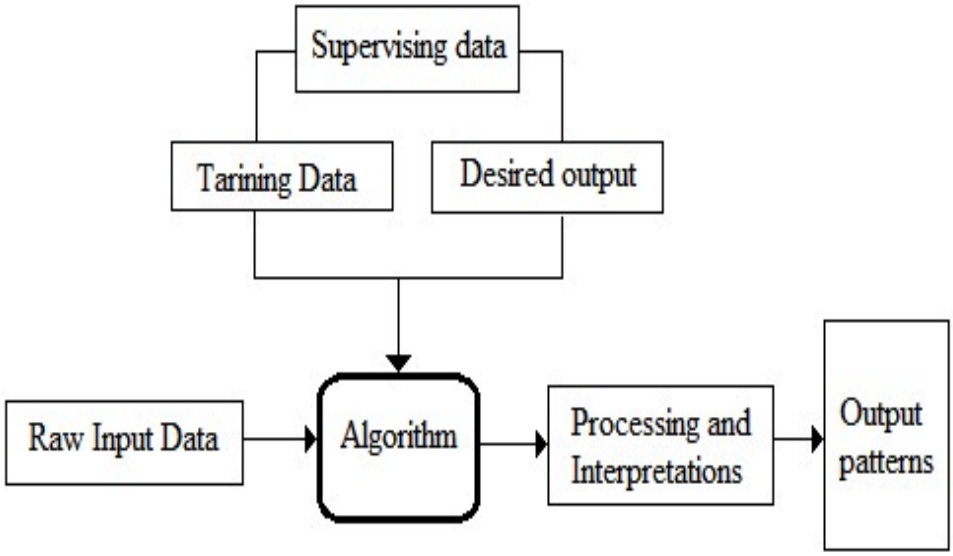



Figure 1.1 Supervised learning model

The output y is derived as the output function used as a derivative value of the whole process. The method is qualified into supervised learning process as algorithm keep on learning and understanding the pattern present with the input and interpret the results according to it. Supervised learning models are normally used in two problems. Regression problem and classification problem other two different problems is being solved by using the supervisor learning approaches. Aggression problems deal with the data that is unstructured in nature. Most of the real time data are unstructured and unbalanced in nature. Learning algorithm is used to produce continuously wearing data to analyse unique pattern present in IT. Certain patterns are relatively helpful to make the analysis and Decision Process easier.

**Steps involved in supervisor learning process**

First thing to determine the type of the data set. The collected data set need to be labelled based on the training data. Further split the dataset into training data, testing data and validation data. The machine learning systems contains 70% of training data 15% of testing data and 15% of validation data. This dataset are trained with respect to the features extracted from the future

extraction techniques adapted to the machine learning algorithm. Feature extraction is a vital process in machine learning algorithm that support the decision making process. Execute the algorithm on training data set. The model created using the machine learning algorithm need to be tested with the training data set. If the performance of the model is adaptively higher comparing with other existing systems then the model need to be considered for evaluation. For the testing data set need to be evaluated using the training model and further performance analysis can be vibrator through accuracy Precision recall and fonts code sensitivity.

**Advantages of supervised learning**

Supervised learning algorithms can give partial information about the outcome to be experienced. Since the supervised learning algorithm provides labeling of classes to be validator the supervised model solve various real time issues with respect to the labelled data such as anomaly detection fraud evaluation I am deduction filtering Malware detection etc.

With the help of supervisor learning process the model can predict the output of the given pattern of data effectively. The disadvantages of supervisor learning process is always relay on the handling work for Complex task given by the Real Time systems. Supervised learning process cannot predict different output if the labeling is not properly assigned in supervised learning process in a data need to be given for classification else the classification process itself deviated from the complete analysis.

**Applications of supervisor learning model**

In case of fryer experience with the supervised learning algorithms of existing frameworks the algorithm used for pattern pattern matching is effectively utilized. If there is no proper input provided with the system then the classification process is getting deviated not recommended for Complex inputs

### 1.3.6 Unsupervised learning

Unsupervised learning model is a kind of machine learning algorithm in which the labeling are not given to analyze the real pattern present in the input data. The instructor the data is given to the machine learning algorithm and for the analysis module need to conclude the unique pattern present with the input data set. And like other pattern recognition process and classification algorithms the kind of supervisor learning is effectively used to for real time applications and complex problem solving systems.

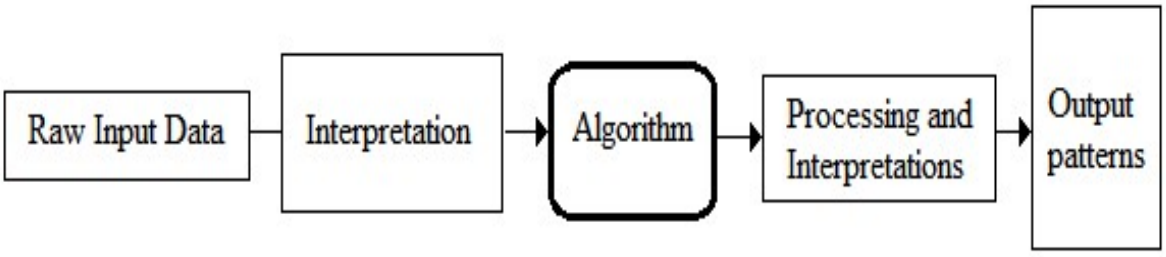



**Figure 1. 2 Unsupervised Learning Model**

Unsupervised learning models are not frequently used for regression problems and classification issues. Unsupervised learning model required to structure the data into a common format from the unstructured format. The combination need to procure unique pattern present in the data. On the other hand real time applications does not depend upon the data set available in such cases and supervised learning model cannot produce Highly Effective outcome hands learning model need to be tune.

Clustering is the process of converging similar kind of objects present in the group of input data. Clustering is a group of input features and their similarities present between the data set.

Association is a process involved in clustering process where the relativity between the data are randomly studied. Real time example such as purchasing similar product from in customers provides different feedbacks and different purchasing plans that produces the uniqueness present in the transaction details. Learning algorithms such as K means of frequently used in many applications

Some of the main reasons to define the importance of on supervised learning process are it is helpful to analyze the structure data and finding out the unique structure present in the data set. Unsupervised learning process is similar to the top human brain where it consideres so many constraints on making valid decisions. And supervised the learning process is closely related to artificial intelligence since there is no guidance for the system to make decision. The system need to take the pattern related decision accurately based on the learning process involved in it.

The steps involved in a and supervised learning process consider the input data set and divide the data set into training data testing data validation data etc. The real world data are not always depend on the problem to be solved sometimes the data set need to be analyzed to predict the problem present in it.

The advantages of unsupervised learning process considered Complex task comparing with the supervised learning process since that is no libeling of data is available in the classification process need more learning procedures. Unsupervised learning is preferable in the cases where similar pattern of occurrences of frequently repeated throat the data.

The disadvantages of unsupervised learning process are the time taken to learn the complete data set for Complex inputs. Most of the real time data sets are unbalanced in nature. It takes adequate time to learn the pattern present in it. Many cases if the similar pattern is not available within the

data set then the answer learning process takes more relativity extraction process hence the propagation time increases Applications of unsupervised learning model is completely Complex in computations since there is no labeled data are available to predict.

### 1.3.7 Reinforcement learning

Most of the real time applications are dynamic in nature. From the dynamic environment the data collector are completely variable and keep on getting we read based on the changes occurring in the environment. In order to achieve pattern reorganization with respect to the target a particular feedback is required to continuously very the analysis process based on the dynamically changing environment. Learning process is a dynamic method where the system process is getting keep on engaged and change the weight of the analysis based on the feedback coming up from the output. Rainfalls to learning process is also used for decoration as well as classification.The randomly distributed data is clustered with reference to the unique inputs, to form the classification shown in Figure1.3.

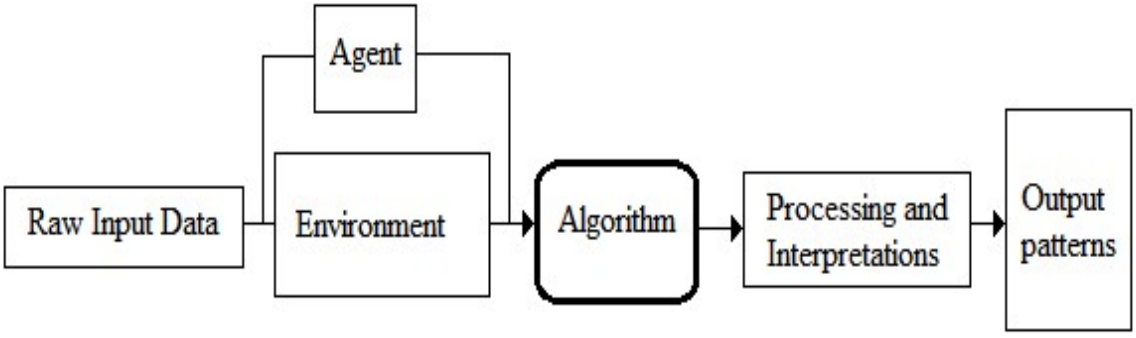



**Figure 1.3 Reinforcement Learning**

Applications of Reinforcement Learning

The applications of rainforest to learning includes the following things that need to be discussed such as maximum performance of the system is implemented to reach certain content. In manufacturing industries reinforced learning algorithm for used to automate the manual process

hens the changes occurring in the system need to be updated by the rainfalls to learning cycle. In inventory management in order to reduce the transmit time packing and unfaking poster learning process is used. Using Power Analysis systems the load and distribution capability are keep on changing with respect to the dynamic environment there the usage of free and force to learning is highly applicable.

In the robotic applications where robotic navigation robotic soccer and many robotic controls are continuously understood by the rain forced learning technique.

Reinforced learning systems are adaptive in factory process and machine control telecommunication self-healing networks automated vehicles helicopters etc. In most of the gaming applications where the changing options completely very the outcome of the game free and forced learning algorithms utilised.

In chemical industry in order to optimise the amount of chemical process need to be read according to the changes in the environment and demanded chemical combinations based on Rain first learning method specific combinations are created.

In manufacturing industries various automobile companies utilise deep learning reinforced learning process to study the changing environment and further adopt the robotic system to the Dynamic input full stop the controls are completely we read based on the dynamic changes occurring at the input.

In financial sectors the prediction of future financial growth and fall are highly demandable. The enforced learning process completely learn the history of financial growth sudden rice and sudden fall conditions and determine the outcome predicted using reinforce to learning method.

Types of machine learning based classification algorithms

Classification algorithms are used to divide the input data into two different forms of outcomes.

Classifications are divided into linear method and nonlinear method.

Linear method have the inputs that very with respect to Linear changes in the input example Logistic regression support vector machine etc.

Nonlinear models involved in handling the unstructured data set sometimes it is also called as an supervised model. Some of the nonlinear machine learning models are K nearest neighbour algorithm kernel SVM Nav base algorithm decision tree classification random forest algorithm etc

### 1.3.8 Logistic Regression in Machine Learning

The Logistic regression in machine learning algorithm is relatively used algorithm bar supervised technique is involved. Reduced to predict categrical based outcome the depend on the input at some cases based on the labelled data. The label the data is touching but the dependent variable given as a short hint. Logistic regression predict output of the dependent variable and the classification output may belongs to logical 1 and logical zero. To different outcomes hence it is also called as binary classification technique.

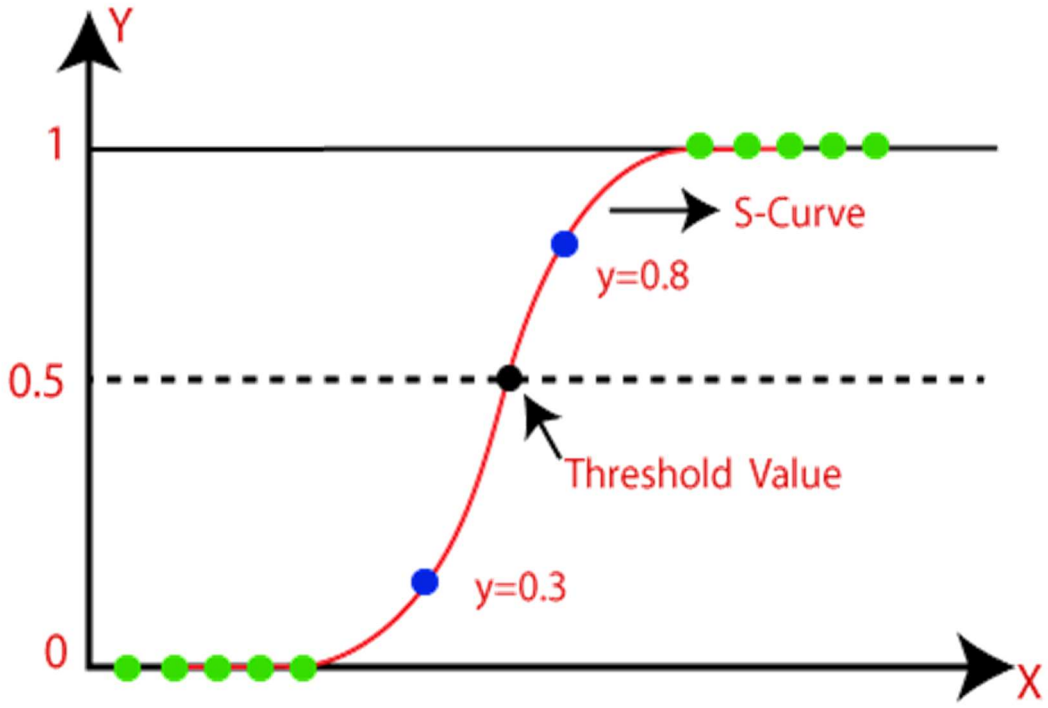



Figure 1.4 Logistic regression curves

Logistic regression is completely similar to than that of solving regulation problems where Logistic regression is used to solve various classification techniques involved in IT of the real time data sets are not enough to evaluate using Logistic regression. Hence fitting of Logistic regression for real time data set is not completely feasible fifth of based on the pattern present in the input data set the binary classification are nonlinear classification need to be decided. Logistic regression is significant are its aggregate the given data set into binary format and further divide the data set into two types of groups. Sometimes logical regression is used to transform the input data and for the divide the data into useful data and useful data. The Logistic regression curve depends on the two dress where the escrow cross that restored value and provides the Useful information beyond the threshold level are below the sold level.

### 1.3.9 Support Vector Machine Algorithm

Support vector machine(SVM) is one of the popular supervised learning algorithm this used for classification problem as well as regression problem. It is ultimately used for classification problems in machine learning algorithms. The goal of the SVM model is to provide a best feasible boundary line that divides the input data into two different category of classes. In many cases multi class SVM also utilized where the hyperplain has one are more threshold levels. Extreme vectors by while creating the hyperplane. These extreme cases handle the supporter machine algorithm in frequently involved data set. Figure shows the basic structure of support factor machine algorithm will stop

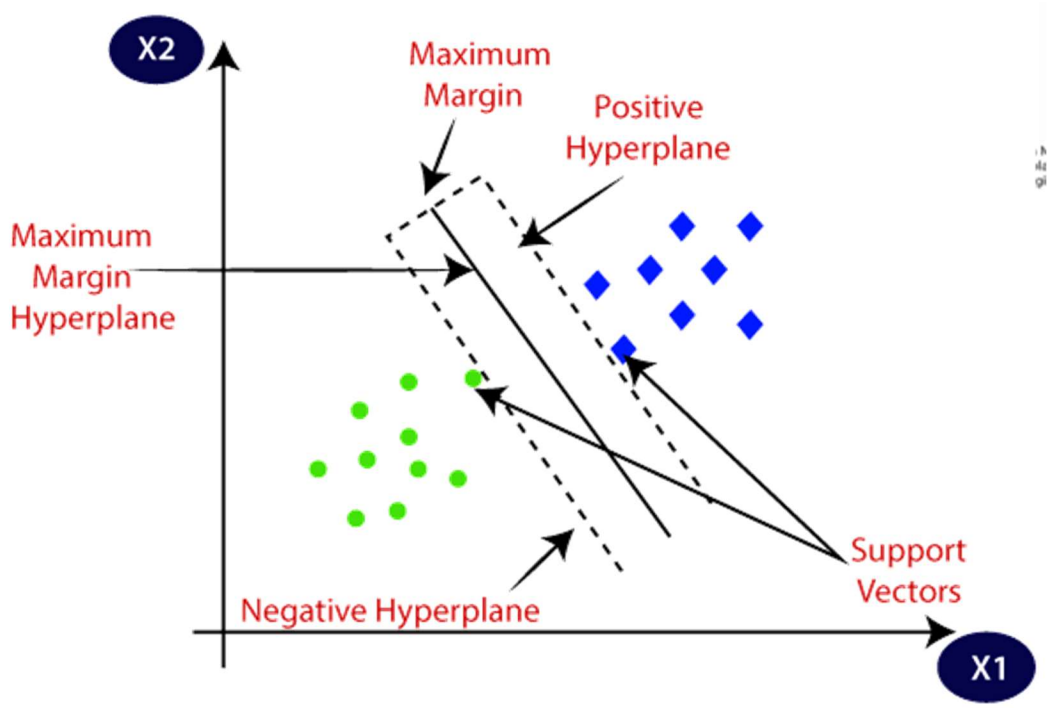



Figure 1.5 Support vector machine curves

1.3.10 K-Nearest Neighbor (KNN) Algorithm

one of the simple form of machine learning algorithm in which supervised learning technique is initially used. Depends on the input data group of training data and labels provided with the model. K-nearest neighbour algorithm find out the similarity between the training data and the testing data and evaluate the relative label associated with the training data. This kind of algorithm are normally used for classification process in which K nearest neighbour algorithm also utilized insert and regression problems. Depend on any of the input features patterns. It is also called as lazy Lon algorithm since the training data always relay on the input label provided to eat. Kane and algorithm after the training phase stores various kinds of relativity data into the memory such that it can compare the data with the future inputs

**1.3.11 Kernel SVM**

Analyser specific function used in support vector machine algorithm in order to optimise the problem solving process. It provides short procedures for Complex calculations. The amazing thing associated with kernel is that it can go to higher level of analysis process based on smoothening the input data. The kernel support the term machine goes to infinite number of dimensions using the associated kernels. Sometimes the support rectang machine device the given input data as per the problem s scenario between the hyperplains.

A kernel helps to divide the input data into the hyperplane such that it leaves only the relativity between the data set of. Kernels are also helpful in nonlinear problems where multiple classification is feasible. Support rectang machines are normally used in binary classification technique in which the hyperplains divide the input data set into positive plane are negative plane. Where is most of the real time data are unbalanced and unstructured in nature. Karnal SVM device the input data collector from the real time data set and further divide the hyperplane between multiple classes of data full stop are fitting is one of the issue that can happen in the

support formation algorithm where the number of features associated with the input data are not linear in nature. This problem need to be rectified by choosing right kernel with the support that our machine .

*Supporter machine depends on the radial basis function that acts as a activation function for the algorithm. Smaller the data set then the chances of higher accuracy. The simple kernels users linear and polynomial data exchange is encouraged here.*

### 1.3.12 Naïve Bayes Classifier Algorithm

*Naive Bayes Classifier Algorithm*

*Maybe algorithm is a kind of supervised learning algorithm in which the basic process is depend upon the base theorem for solving multiple classification issues. It is mainly used in text related classification process where it includes high dimensional training data set. Is considered as one of the robust classifier for text analysis and helpful for handling the nonlinear data set. It is a probably stick classifier where the outcome depends upon the probability of occurrence between the input data and the training data. Some popular algorithms utilised maybe as a supporting classify your to determine spam filtration sentimental analysis Mall were detection and classification*

### *1.3.13 Decision tree*

Decision tree acts as a group of various levels of smaller decisions all located together to make high level of classification and regression result. It probably depends upon the pattern of the input data in which the tree structured classified classifies the internal nodes based on the leaf node under tree note. In decision tree classify your decision node and the leaf node are completely used to make decisions the final outcome of the decision tree algorithm is nothing but the accumulation of smaller decisions all together associated with the branches. The decision tree

algorithm performance is measured based on the graphical approach and the accuracy of the system sensitivity level and decision making capability.

*1.3.14* Random Forest Algorithm

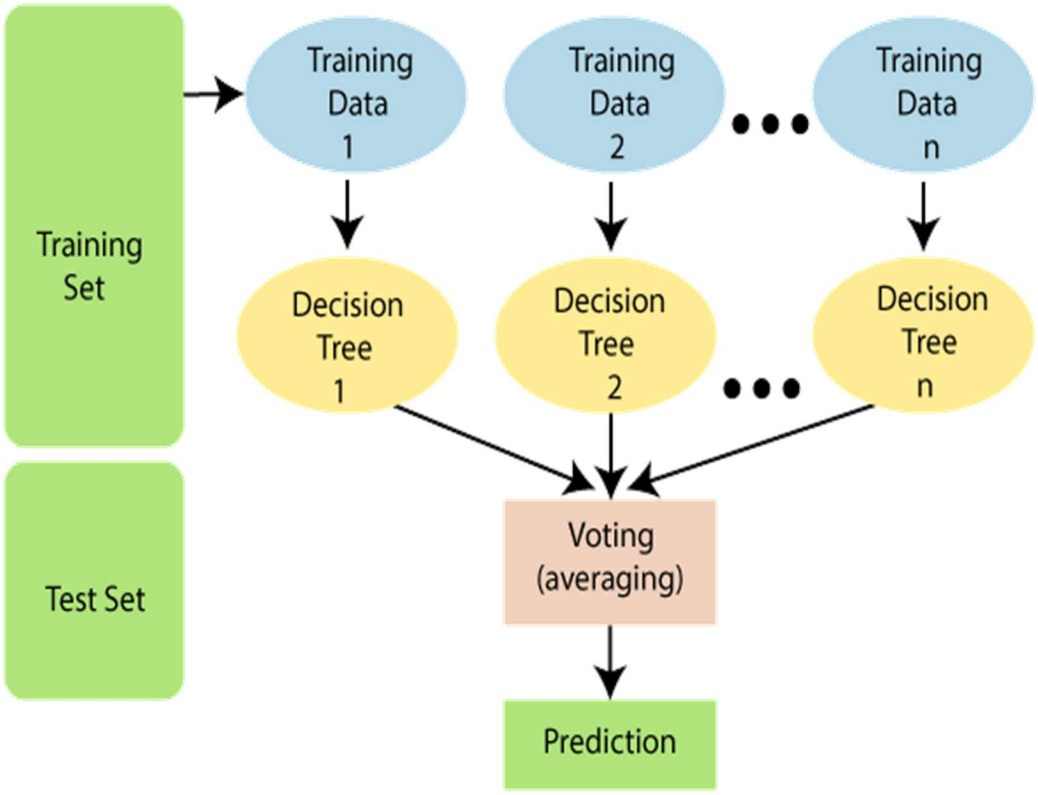



Figure 1.6 Evaluating a Classification model:

**Cross-Entropy Loss:**

Cross entropylos it is used to available the performance of the classifier which is being used for the presented analysis. Most of the machine learning algorithm depend on the statistical analysis part where sums out of a statistical measure need to be validate to consider the predicted results. The cross entropy loss is determined to check the outcome and the expected result for the higher accuracy of the model for binary classification cross entropy need to be used.

For Binary classification, cross-entropy can be calculated as:

?(ylog(p)+(1?y)log(1?p))

Where y= Actual output, p= predicted output.

**Confusion Matrix:**

Analysis model in machine learning and deep learning algorithm is based on the expected result versus The predicted result. The performance of the system need to be unless to the any kind of statistical measures such as error rate true positive rate false posturate to negative rate false negative rate etc. The number of correctly classified parameters need to be com part with the incorrect parameters.

1.3.15 Challenges of Machine Learning

One of the prime challenges in machine learning algorithm are it is a subfield of artificial intelligence hence the number of features used in machine learning algorithm need to be improved to apply the machine learning models into artificial intelligence frameworks. The features election is highly sensitive hence improved version of features selection process is recommended. That wants but admachine learning Technology as improved various effective results towards Technology such that few of them are not related to the results of single machine learning algorithms are recommended.

Machine learning algorithms are recent trend in which the scientific computing need to be done. Artificial intelligent frameworks are highly depend upon the machine learning algorithm and deep learning algorithm. In spite of super intelligence model and strong artificial intelligence model the capability of machine learning algorithm and hybriding the machine learning algorithm together to form high accuracy is recommended. Various medical analysis data analysis singularity formulation are implemented with the help of autonomous validation of data using artificial intelligence. The impact of Artificial Intelligence and its growth is enabled to apply the patient monitoring systems with recent innovations. Medical data are highly sensitive information collect the directly from the patience. This information are process effectively in order to identify the required amount of clarity in the form of data pattern values etc. The impact of artificial intelligence enabled various applications get involved with machine learning algorithms. The presented research work is focused on studying the various benefits along with machine learning algorithm and deep learning algorithm for the innovative idea of deep learning process with lightweight architecture is created.

Artificial intelligence algorithm are applied in various areas of automotive industry where the human intervention need to be reduced. It doesn't mean that human intervention is completely ignored by the evaluation of artificial intelligence on the other hand the enormous growth of artificial intelligence in medical industry provide capable solutions in automated way where manual interventions are reduced. Manual errors are highly reduced and hence the evaluation of recent technology in patient monitoring systems are highly recommended. Medical emergency are very sensitive that need to be treated in a fast and precise way. Automatic detection prevention and predictive analysis models are helpful to analyse the patient data and for the detect the abnormalities in the yearly stages. The sensitive cases are handled by the technological growth hence these kind of systems are highly recommended.

Hardware parts like microcontroller and sensors were provided. Microcontrollers like Arduino uno and different kinds of sensor like gas monitoring sensor , light detection sensor , humidity

sensor ,human detection sensor, moisture content detector sensor were interfaced with led and lcd .

The Sensor along with Arduino were interfaced with lcd and led to visualize the output gathered. Arduino software were used to code the hardware component.

The programmed device after generating the output , it was pushed into cloud via thingspeak - online cloud website.

IoT applications bring a lot of value in our lives. A traffic camera is an intelligent device. The camera monitors traffic congestion, accidents and weather conditions and can access it to a common entrance. This gateway receives data from such cameras and transmits information to the city's traffic monitoring system.

**Test cases**

The purpose of a test case is to describe how you intend to empirically verify that the software being developed conforms to the specifications. In other words, you need to be able to show that it can correctly carry out its intended functions. The test case should be written with enough clarity and detail that it could be given to an independent tester and have the tests properly carried out.

## CONCLUSION

IoT is a platform where embedded devices are connected to the Internet to collect and exchange data. It enables machines to interact, collaborate and learn from experiences like humans. IoT applications equipped billions of objects with connectivity and intelligence.

- The training covered the basic knowledge required for understanding artificial intelligence frameworks.
- The detailed knowledge on inducing the Arduino open source hardware for Cloud configurations.
- The detailed knowledge on IoT Thing Speak cloud is studied.