# An Approach to Multi Model Analysis for Air Quality Predictor using Iot and Machine Learning

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**Abstract:- The enormous growth with the pollution and the pollution in the environment which leads to the modification or updating with many times. This effects to reduce the growth of the individual with their health and nature facts directly. Using the structural, hierarchical and fuzzy algorithms we can analyze the air quality automatically with the satisfactory of excellence and average with the large amount and large area occupation systems which are not perfect for the large scale installation. On finding the embedded system in the view of security for environment this logic brings a real-time monitoring the air pollution system. From this system we can reduce the cost upto half a head.it can used for large mesh network. Along with the role of renewable monitoring system, it can improve a purpose of trend in case of the system for the analysis of the output obtained by the embedded model. Afterwards ,logs of data is fetch from cloud platform is used to varoius ML algorithm for accurate output of the sensing values.**

*Keywords:- Monitoring Air Pollution, Embedded System, IOT , Machine Learning.*

## I. INTRODUCTION

This When poisonous or large amounts of components, which includes the gas, particulate and bio molecules are injected into the Earth's atmosphere, air pollution results. It may harm other living things also humans by causing infections, skin allergies, and sometimes death.

Animals and crops used for food are examples of species that can harm the built environment. Both environmental and Artificial like man made activities can cause air pollution.

The 2008, Blacksmith Institute World's greatest Polluted Places study lists indoor air pollution and poor urban indoor air quality as two of the greatest hazardous pollution issues in the world. According to a 2014 World Health Organization report, air pollution caused over 7 million deaths globally in 2012, an estimate that is largely corroborated by one from the International Energy Agency.

Pollutants are substances present in the air that have the potential to endanger both humans and the environment. The substance might take the form of vapour, liquid droplets, or solidified particles. A pollutant made by either nature or by humans.

There are major and secondary categories for pollutants. Processes like the burning of volcanic ash are commonly responsible for the production of primary pollutants. Other examples are carbon monoxide gas released by automotive exhausts or Sulphur dioxide released by factories. Secondary pollutants are indirectly released. Instead, they are present in the air because of fundamental pollutants interacting with each other.

➢ *Major Air Pollutants:-*

- *Carbondioxide ($CO_2$)*
- *Sulfuroxides (SOx)*
- *Nitrogenoxides (NOx)*
- *Carbonmonoxide (Mox)*
- *Volatile Organic Compounds (VOC)*

➢ *Scope of Work:-*
To create trustworthy applications with the help of machine learning algorithms and various techniques on large datasets to determine the best way to improve air quality for people. These software programmers are then utilized for predicting.

➢ *Problem Statement:-*
Because the appropriate information has a few distinctive characteristics, there are a number of barriers for urban air computing.

First, it is costly to get tagged samples to be trained while coping with fine-gained air quality because there are limited air-quality monitoring stations in a city because of the substantial costs of installing and operating such a station.

## II. RELATED WORK

A study of the literature is a study of pure sources on a each subject. It gives us a perceptive of the view of grasp.

To establish whether the sources are appropriate for understanding the subject at hand, read and analyses them. Discuss, analyse, and evaluate the results and conclusions from the sources which we choose.

➢ *Air Pollution Prediction Using Ml:-*
Authoars: -Mushtak Sayyed; Adesh Salunkhe; Akshay Sarode and Swaraj Desai

Mother Nature is under increased stress due to widespread industrialization and technological progress. Included in this is air pollution, which serves as a kind of alert for mankind.

There have been countless unsuccessful attempts to reduce pollution. Considering this ongoing issue, there must be a system to forecast and levels can be used for air pollution.

➤ *Air quality prediction of data log by machine learning:-*
Authors:- Venkat Rao Pasupaleti; Uhasri; Pavan Kalyan; Srikanth and Hari Kiran Reddy.

The monitoring system collects data of all the air pollution gases from different sources to guarantee optimum quality of air. Once an urgent matter at hand currently. The air is corruption due to the release of harmfull components to the environment in the industrial sources, car emissions, etc.

Today, the level of air pollution in large cities has exceeded the government-set AQI value and has reached dangerous levels. It significantly affects people's health. Machine learning has developed to the point that it can currently predict pollutants based on past data.

➤ *Prediction of air quality index by external learning:-*
Author: - Burhan BARAN

In this work, the Extreme Learning Machines (ELM) method will be used to analyzed with the index of the data . With the help of the six variables which can be the raised for the AQI for the reason.

These majority includes the temperature, humidity, pressure, and sulphur dioxide. First, connection status of these six factors and AQI and analysis using the "Forecast Sheet" application that was displayed in the Excel nature for the connection survey .

### III. PROPOSED SYSTEM

➤ *Methodology:-*
The project's microcontroller is an ESP32. It keeps analysis of the air quality using a variety of sensors, includes Sound, Humidity and Temperature Sensor, MQ5 and MQ135 gas sensors are employed.

While MQ135 helps to monitor the harmful gases, MQ5 sensor detects smoke. While the DHT sensor offers data on temperature and humidity, the sound sensor utilized here measures sound intensity.
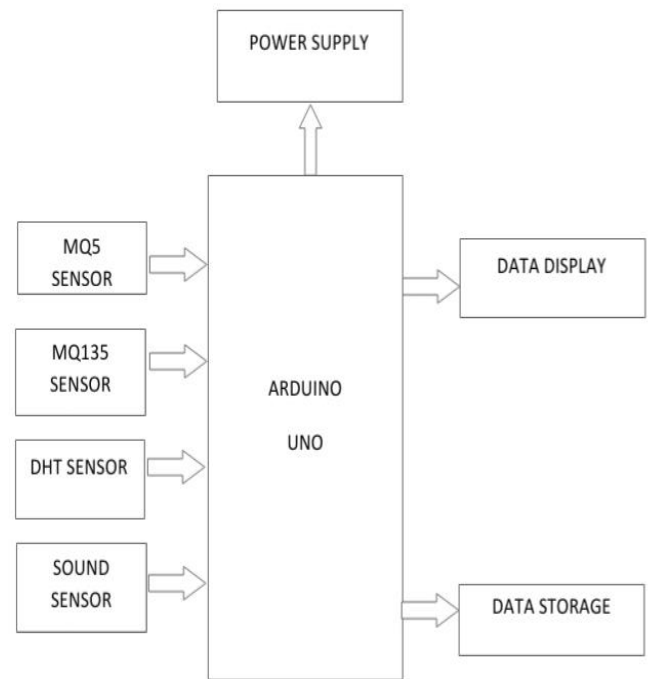


Fig 1 Block Diagram of the Proposed System

The values of the individual sensor will be logged to the Thingspeak platform. The data from the Thingspeak platform is then transformed into a the command separate file. The dataset for machine learning is taken from the file.

This system uses machine learning methods for analysis and prediction, such as Random Forest and Logistic Regression.

Using the layered structure of OSI for the link to the internet is the basic functionality of IOT. For verification of the concentration of pollutants gases is the task at hand, so suggestion on a cluster of the air monitoring gas sensors MQ135 and MQ5.

The structures of this Gas Sensors MQ135 and MQ5 is a little , embedded stage with additional equipment. We use the available open source board called arduino, featuring ESP8266-12E chips, that have been mostly used. To monitor gas concentrations, MQ135 and MQ5 gas sensors are employed.

The values of the sensor could be documented and transferred to the Arduino with IOT data assets.
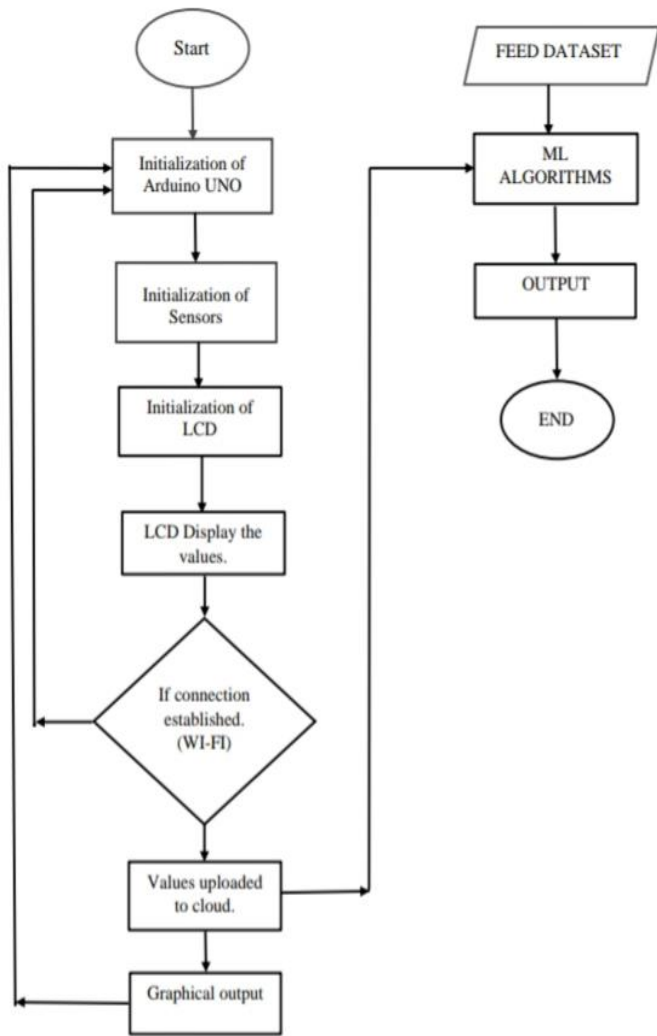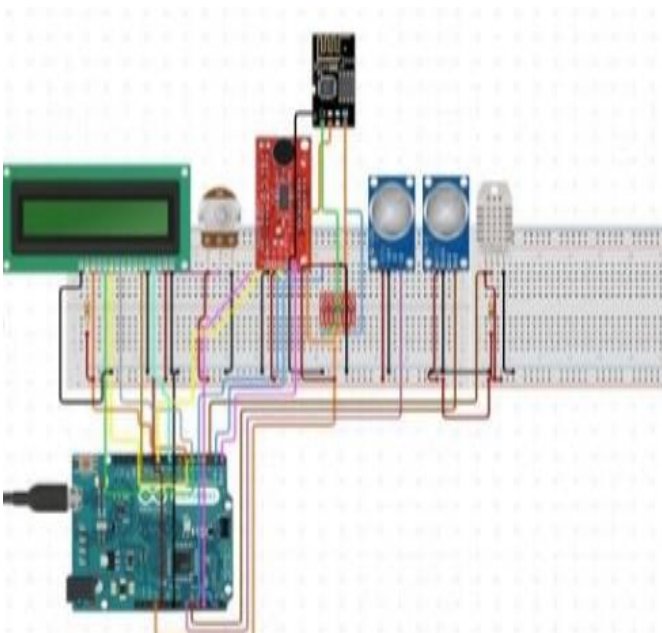
Fig 2 Flow Chart
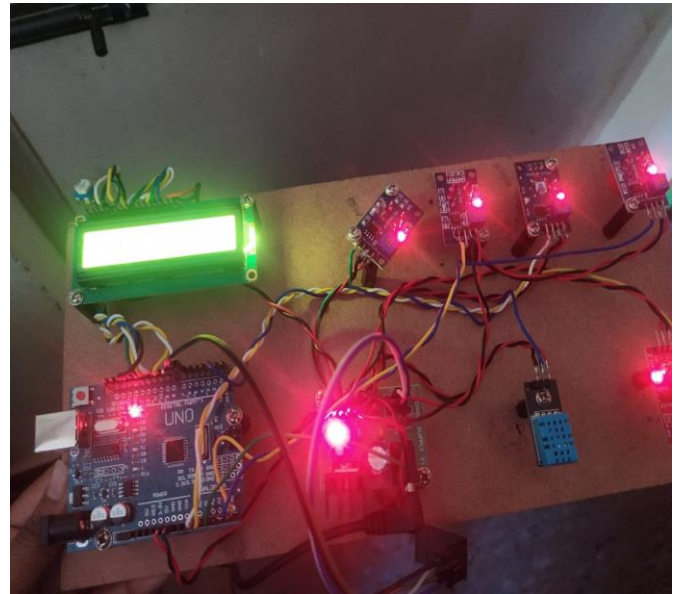
> *Block Diagram*



Fig 3 Block Diagram



Fig 4 Model

## IV. RESULT

Technology for monitoring indoor and outdoor air quality has grown quickly in recent years, particularly monitoring and communication technology. Considering this, the Internet of Things into these cutting-edge emerging technologies offers a great opportunity for the establish of air quality systems, which call for new networking paradigms, strategies, and methods to address a variety of restrictions.

The decision-making process benefits from an understanding of the current air quality systems and research into them to connect data flow management with the appropriate intelligent, adaptive, and reasoning technologies The results of the analysis can then be used to determine the cause of the pollution and the AQI values. The survey portion is depicted below.



Fig 5 Survey at Mariyappanapalya

Fig 6 Values at LCD .



Fig 7 Graphical Representation in Thingspeak.



Fig 8 ML Output with AQI and Reason for cause.

# V. ADVANTAGES

- *Sensors are Easily Available* :-
  The most common use of sensors is Mq5 and Mq135 sensors which can be easily obtained at low cost.

- *Detecting a Wide Range of Gases* :-
  These gas sensors can be able to detect many gases like NH3,NOx,Acholol, benzene, CO2, Co smoke Sulphur methane etc. So, at low cost in our model, we can detect the large number of gases.

- *Sample , Compact & Easy to Handle, Simple ,Compact Easy to Handle* :-
  As conventional algorithms have a drawback as prediction part we need a real time application , IOT and ML concepts as have this application so it able to understand easily.

- *Sample Drive Circuit* :-
  As using the Iot and embedded part of the model work as the driver while once output display on it make ML analysis as started.

- *System is Real Time* :-
  As we are using the Iot and embedded concepts for the hardware implementation the output is real time application and using ml it will provide the accurate value of the output.

- *Sensors have a Long Lifetime, Less Cost* :-
  As it is commonly used senors for detecting the gases ,ot as long life and it is available at low cost.

# VI. CONCLUSION

In our project IoT based on measurement and display of Air Quality Index (AQI), Humidity and Temperature of the atmosphere have been performed. And the data obtained from  the project, it is possible to calculate Air Quality in PPM. The disadvantage of the MQ135, MQ5, sensors os not give the specific data on the Carbon monoxide or Carbondioxide values in the environment, but the  main advantage of using MQ135, MQ5, is that it is able to detect smoke, CO, CO2, sulphur ,methane  etc. And other harmful gases. After performing several experiments, it can be easily concluded that the setup is able to measure the air quality in ppm, the temperature in Celsius and humidity in percentage with considerable accuracy.

The results obtained from our model are analyzed using the excel data . Moreover, these   indicators help us to calculate the air quality values of sensors  around the setup. However, the project experiences a drawback that is it cannot measure the ppm values of the pollutant components separately. This has been improved by adding gas sensors for different pollutants. But eventually, it would increase the coslt of the setup and not be a necessary provision to monitor the air quality. Since it's an IOT-based project, it will require a stable internet connection for uploading the available  data to the ThingSpeak cloud. Therefore, it is able  to conclude that the designed prototype can be utilized for air quality,
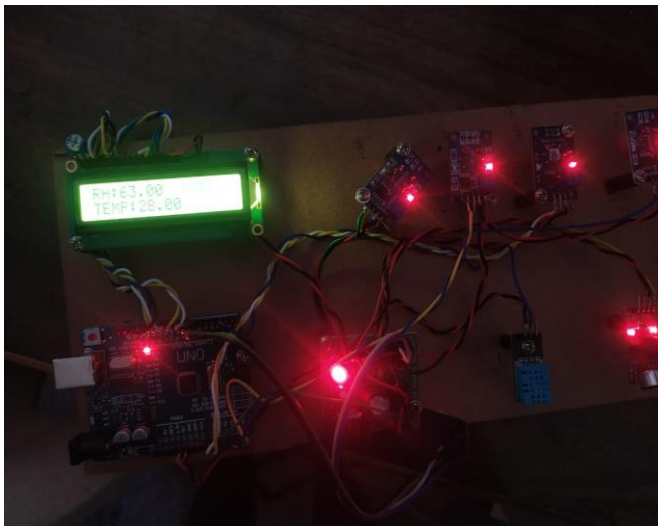
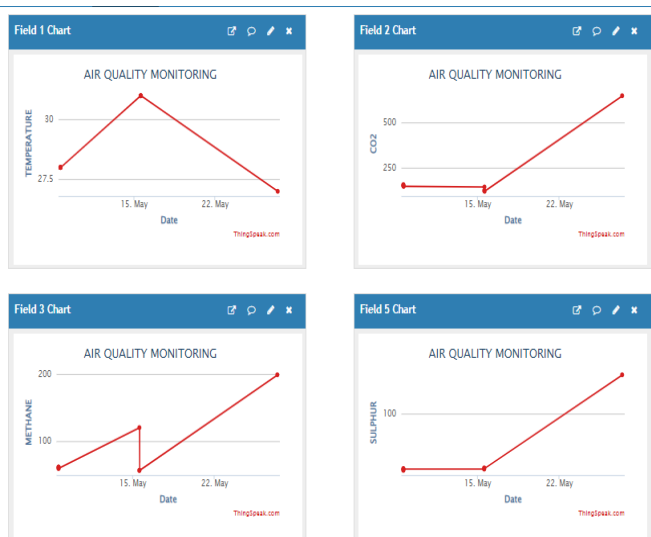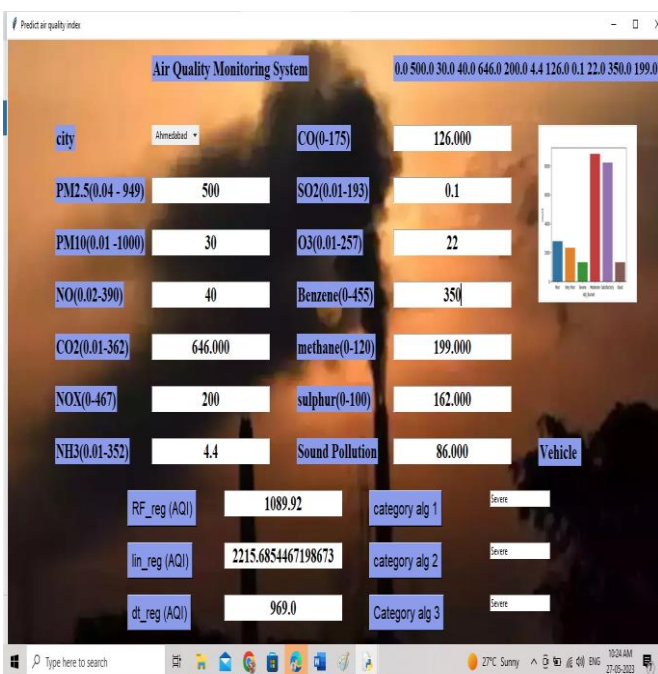humidity, and temperature of the surrounding atmosphere successfull.

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