A thorough Survey on prediction of Airpollution

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Abstract – Due to large scale industrialization and advances in technology there has been increased pressure on mother nature. This includes air pollution that is somewhat like a bad omen for humanity. There have been a lot of steps taken to reduce pollution but it has been of no avail. To provide a solution to this ongoing crisis, there needs to be some kind of air pollution level prediction technique that can be utilized. To get a successful prediction Machine Learning is the best option. The prediction through Machine Learning is one of the most accurate and the cost effective technique, but eventually this technique needs high end algorithms and technique to estimate the same. So this review paper basically concentrates on understanding of the all the novel methods existed in the prediction of air pollution and try to find the gaps in them to provide a better solution in the research domain.

Keywords— Air pollution, machine Learning, Pollution Prediction.

I. INTRODUCTION

Health is one of the cornerstones of living a happy and fulfilling life. As the human body can work with maximum efficiency when it is in good health and fit. The human body is a complex organic lifeform that requires a set of conditions to thrive. We need food and water for the purpose of energy for doing various work and oxygen for the various processes in the body. Breathing an oxygen-rich air is one of the most critical components for a human being. Due to the fact that in the absence of oxygen for a few minutes the human body will shut down and will have permanent damage to the brain.

Therefore, it can be concluded that an oxygen-rich atmosphere is vital for the survival of the species. Not only humans but most of the fauna existing on this planet requires an oxygen-rich atmosphere to survive. Since the early ages, man has enjoyed the benefits of clean and fresh air. But that has changed since the rapid industrialization and the invention of automobiles. Most of the activities are done using an internal combustion engine or heavy machinery in the factories by burning fossil fuels. Various industries also produce airborne Particulate Matter (PM) as a byproduct of the industrial process which cause Air pollution.

There has also been a widespread practice in India and a few other nations where the farmers have been utilizing the slash and burn techniques. The farmer would burn the stalks of the left-over plant after harvesting. This process can efficiently clear the land for the next sowing and also the fire would consume the pests and other insects that would have the potential to destroy a large section of crops in the future. But this practice also creates a lot of smoke and Suspended Particulate Matter (SPM) in the air that creates a lot of pollution and can also lead to reduced visibility in the cities.

Air Pollution is one of the most debilitating conditions that have been plaguing our planet. Increased emissions from various factories and the increased affordability and the buying power of the masses has also enabled a large number of people investing in private transport that increases the number of pollution-causing vehicles on the streets which degrades the quality of the air further and can lead to reduced quality of life for the residents and also can increase the likelihood of respiratory problems and even some types of cancer.

Therefore, it is imperative to take a definitive action to reduce emissions and improve the quality of air in our cities. The air pollution has been on the rise lately and it is a rising concern for everyone. The major step in combating pollution is to first be able to monitor it effectively and understanding the various different causes that have led to the degradation of the quality of air in the city. This can be achieved significantly by the application of a machine learning paradigm for the prediction of Air Quality in the most accurate manner.

Machine learning is a very innovative concept that can infer a lot of information from a set of information by the application of various algorithms and techniques. Therefore, Machine Learning can be used to predict the air quality of a particular area through the past data about that particular area. This is useful because it can help avoid potential contamination and also prevent the resident of those areas to come out of the house less to prevent the damage done. It also prevents the younger children from the health hazards that can be highly damaging to their bodies.

Air Quality Index prediction is one of the most important concepts that can help increase the quality of life for the residents of the city. It can help reduce the health hazards posed by Air pollution. Machine learning is highly useful in this application due to its nature of accurate predictions through considerable amount of past data. These predictions would help mitigate the harmful effects of this industrialization by preventing any further damage being done. The prediction

would help people avoid getting outside and exposing themselves to harmful pollution.

This paper dedicates section 2 for analysis of past work as literature survey and section 3 concludes the paper with feasible statement of the literature study.

II. LITERATURE SURVEY

This section of the literature survey eventually reveals some facts based on thoughtful analysis of many authors work as follows.

K. Aanandha Saravanan introduces the critical situation about the environment issue which focused on Nitrogen dioxide, Carbon dioxide. There is been a rapid growth in industries and also because of vehicular transport development across the universe. [1] It's observed that it has been a problem controlling air and monitoring. Air pollution is one of the major costs of lung disease and heart disease. This paper system, it also provides calculates the level of health risk for specific areas.

Sarun Duangsuwan estimates the air pollution has to upgrade desperately under the approach of the smart city of 2024. In the proposed paper they have used various sensors that consist of sensors of particulate matter (PM10) or dust sensor, carbon monoxide (CO), carbon dioxide (CO2), noise level (dB), And ozone (O3). [2] This sensor is used only for specific small area; it is not for the wide-area network. Thus, protect air quality from air pollution we require smart sensors to predict air pollution.

Ji-hong Zhou in his research shows possible terms of a theory that detects the undetermined information with gray mathematics and this result is dependable. In this paper problem of air pollution is increasing rapidly the pollutants are spreading in the atmosphere of one city. [3] They have used a new conception called an air-ground pollution belt it gives two-dimensional finite difference equation of the air pollution. During heating time and non-heating time, it creates an equation by using the gray theory of one city and it simulates SO2 and PM10.

S. Soussilane explains air quality is one of the growing concerns throughout the world as WHO (World Health Organization) considers indoor and outdoor air pollution largest risk for health such as for the lung, heart disease and also for the many other health conditions. [4]Monitoring the air quality is one of integral parts of HVAC system to maintain the air quality in a very smart way and it also specifies that where and when to be action taken regarding the air pollution. Thus, this paper specifies how they can take small steps for controlling air pollution for betterment of people.

Xin Li describes indoor air pollution is one of the main reason for pollution in city indoor air pollution has caused great concern, colleges are public places where are inhabited by a group of college students who spent their most of day indoors every day, so the environment of indoor air has a direct relationship to the students' learning and health. Ordinary civil construction is one of the pollutants of indoor air pollution. [5]It is very important to take proper and major steps to control indoor air pollutions.

Changmin Li introduces a rating charge on the air pollution for controlling the air pollution of China. The leader of china aims to control the total population and to control the pollutants cost there are 31 provinces whereas each province as he owns duty to reduce the pollution in their own provinces. Just by doing this there is reduction in SO$_2$ in Beijing. Tianjin and Hebei province from 2003 to 2009. [6] This result shows RCTT model is one of the best methods to control the air pollution of the whole region and also promotes cooperation of each administrative region to control the transboundary air pollution.

G. Andria elaborates ground-level ozone is an air pollutant that causes human health problems, and damages crops and other vegetation. It is a key ingredient of urban smog. It is important to ensure effective protection against harmful effects on human health from exposure to ground-level ozone in ambient air. [7] The Monitoring of air pollution is done by using UV method. the metrological characteristic of commercial analyzers, calibration samples and sampling equipment used in the regional environmental agencies to ensure the good quality of data.

Yunping Chen states that in order to quantify the pollution of each factory in the study areas, three pollution indices, pollution gross (PG), pollution intensity, and area-normalized pollution (ANP), were proposed.[8] The polluted factory list is extracted to keep the track of the pollution and was key monitoring factory by the local authority were accurately extracted. Air pollution generally identified by the factories. Thus, proposed paper provides useful results for air quality management and the result would be useful also in economic issues.

Nitin Sadashiv Desai explains the World Health Organization [WHO] air pollution is infectivity of the indoor or outdoor environment by any chemical and biological agent which changes characteristics of the environment. Household combustion devices, vehicles, and forest fires are the common origin of air pollution and noise pollution. [9] Smartphones have brought huge changes in human life it also measures air pollution by using sensors. The proposed system is implemented and useful to monitor and reduce pollution in a smart city by avoiding pollution causes.

Norsuzila Ya'acob describes haze mapping when successfully visualized using GIS-based on API data retrieved from DOE. Haze has to become a yearly occurrence in Malaysia. There are three dimensions to the public ignorance on the quality of air, impact of air pollution on health, and difficulty in obtaining information related to air pollution. The aim and objectives of the study have been accomplished in this research, study area is narrowed to five major cities in Selangor, Malaysia.[10]

B. Ravi Subrahmanyam introduces one of the main aims is to decrease the pollution in the in almost all-natural thing. Everything which to planet such as air, water and land are in danger now. One of the most challenges is to control air pollution. In this paper, pollution is controlled by using the distilled water only water without using the chemical. Pollution is one of the important factors which makes our surrounding inferior [11]. There some technology which is used to purify

water but for the air we have raise the technologies to control air pollution.

N. Zhuang states that in recent years there is rapid growth in the economy in harbors development and it also costs serious pollution. Environmental protection becomes one of factor to be saved these days. So when there is planning going of constructing the port the environmental protection problem must be taken. Proper measures to be taken to stop pollution at port [12]. To stop pollution is to control the emergence and spread of pollution and protect the pollution index under the danger value. Environment protection is important in port development.

Sudjit Karuchit explained that the medium-sized factory is producing sing a lot of pollution in Thailand this pollution has adverse effect on health of people's health due to objectionable odor and dirty environment due to dust deposition. The principle of clean technology helps managers come up with options for reducing pollution from the raw materials and the production processes sides instead of the emission side. AERMOD model coupled with clean technology principles is used for the evaluation of air pollution reduction by Thai starch factory [13].

III CONCLUSION

This paper mainly deals with the fact of different methodologies that deals with the Air pollution prediction technique. The most of the studied proposed methods are having one or the other flaw in them as it is very difficult to predict the feature parameters of the pollution as it depends on the many different parameters like the season, number of vehicles, number of industries and many more. So this paper after studying all these facts putforwadrs an idea of using Fuzzy C means clustering on Air pollution index data along with the Fuzzy Artificial neural network to improve the prediction rate, the details of the technique will be reflected in the coming edition of our research paper.

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