**Capstone – Project synopsis**

**Problem Statement:**

To analyse the impact of COVID-19 on Air Quality in terms of eight air pollutants concentrations (PM2.5 ,PM10, NO, NO2, NOx, NH3,CO and SO3) in India from the data in years 2018 to 2020 and associate the relationship between these air pollutants based on data. Also to identify the influence of climate factors such as temperature, atmospheric pressure, humidity and wind speed on air pollutant levels and build a machine learning model to predict levels of PM 2.5, PM 10, NO2, CO and SO2 based on metrological factors.

**Literature Survey:**

To look at the impact of lock down on air quality in India Ramesh P. Singh et al [4] conducted a study on PM2.5 and NO2 concentrations across five cities and found that PM2.5 concentration has decreased by 34.52%, 27.57%, 19.25%, 5.40% and 3.99% in Kolkata, Delhi, Mumbai, Chennai and Hyderabad during lockdown. In March 2020 NO2 trend showed declination while March 2019 showed either flat or increasing trend. Sonal Kumari et al [5] have focused on amounts of pollutants NO2, CO, O3, PM10 and PM2.5 during 24th march to 31st may 2020 and compared them with their concentrations in same time period in year 2019, and found that CO , NO2, PM10 and PM2.5 reduced by 28%, 42%, 44% and 38% in Ghaziabad and Patiala. Mengyuan et al [6] have used CMAQ (Community Multi scale Air Quality) to estimate changes in air pollutants and found that levels of PM2.5, MDA8 O3, NO2 and SO2 decreased by 26%, 11%, 50% and 14% in pre lockdown and lockdown periods.

Coming to use of machine learning techniques to predict air pollutants and air quality, Khalid M.O. Nahar et al [1] have used air polluntant concentrations to predict if the area is considered polluted or not polluted, they have used various classifiers and concluded that SVM, Decision tree, random forest gave high classification accuracy around 99%, while Petr Hajek et al [2] have tried using support vector machine (SVM), TSFISs and Radial basis function neural networks to predict different AQIs based on O3, NO2, SO2, PM10 and found that SVM gave the highest accuracy which is greater than 60%. Mohit Bansal et al [3] have used metrological parameters such as temperature relative humidity, solar radiation and wind speed to predict the concentrations of pollutants like CO, NO, NO2, Ozone, PM2.5, SO2. They found that nueral network with LSTM gave the least RMSE less than 25 while predicting these pollutant concentration. Atakan Kurt et al [7] have developed an online air pollution forecasting system for greater instanbul area using nueral networks. They have used metrological factors such as wind direction, pressure, Day temperature, night temperature, relative humidity and wind speed to predict SO2, PM10 and CO using a deep nueral network. SO2 , PM10 and CO are predicted with error percentage of (15%-20%), (5%-10%) and (5%-14%) across experiments. According to survey conducted by Reshma J [8], ANN ( Artificial Neural Networks) are found to be appropriate method to forecast concentrations of SO2, NO2, O3, CO and PM2.5 by using metrological factors.

**Sample Data:**

Air polluntants data from 2015 to 2020 is taken from kaggle dataset on Air Quality in India (https://www.kaggle.com/rohanrao/air-quality-data-in-india)

Climate data from 2015 to 2020 will be taken from climate website <https://en.tutiempo.net/climate/> . This dataset has the below features recorded on daily basis.

T: Average Temperature (°C)

TM: Maximum temperature (°C)

Tm: Minimum temperature (°C)

SLP: Atmospheric pressure at sea level (hPa)

H: Average relative humidity (%)

VV: Average visibility (Km)

V: Average wind speed (Km/h)

VM: Maximum sustained wind speed (Km/h)

Method used to collect the data is web scrapping.

**Tentative List of Algorithms:**

Linear regression, ridge and lasso regression, KNN regressor, Decision tree, Random forest regressor, Xgboost regressor, Artificial nueral network, RNN and LSTM.

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