

# TEAM SKY

This document explains about the project in detail, about dataset, methodology and working of our project.

## DATASET

### AQI

The dataset was compiled from various dataset available at Telangana Open Data portal. For Predicting AQI, we need at least three pollutants. Out of the major pollutants, for all the district for which we need to provide predictions, only SO<sub>2</sub>, NO<sub>x</sub> and PM<sub>10</sub> data was available in Monthly average frequency (2016-2022).

### Heatwave

The dataset was sourced from <https://power.larc.nasa.gov/data-access-viewer/>, earlier we tried to train our models with data accessed from Telangana Open Data portal, but the accuracy of data were not found satisfactory so then we used data of 1991-2022 period (daily frequency) which had maximum temp of the day and rainfall observed on the day.

The temperature is highly dependent on AQI, but the data for AQI was available only in Monthly frequency, So we assumed that AQI does not affect the temperature.

## Methodology:

### AQI

To calculate the AQI we need at least 3 pollutants, out of these three pollutants at least one should be either PM<sub>2.5</sub> or PM<sub>10</sub>.

So to predict AQI we will predict each pollutants separately. This methodology is called Univariate time series forecasting. For this we tried various methods/algorithms like ARIMA, SARIMAX, Prophet and Holt Winter's Triple Exponential Smoothing (HWTES). Out of all algorithms, the best results were achieved by HWTES by a very significant difference of RMSE and MAPE (difference >5-10%).

While training the model, we need to remember that during lockdowns the concentration of PM<sub>10</sub> and NO<sub>x</sub> were reduced by as much as 45% from 2019,

[reference:

<https://tspcb.cgg.gov.in/Environment/Report%20on%20Ambient%20Air%20Quality%20of%20TS%20during%20Lockdown.pdf>].

### Heatwave

To calculate the heatwave we need to predict maximum temperature, and then find the departure from normal.

The Indian Meteorological Department (IMD) has given the following criteria for Heat Waves :

- Heat Wave need not be considered till maximum temperature of a station reaches atleast 40°C for Plains and atleast 30°C for Hilly regions
- When normal maximum temperature of a station is less than or equal to 40°C Heat Wave Departure from normal is 5°C to 6°C Severe Heat Wave Departure from normal is 7°C or more
- When normal maximum temperature of a station is more than 40°C Heat Wave Departure from normal is 4°C to 5°C Severe Heat Wave Departure from normal is 6°C or more
- When actual maximum temperature remains 45°C or more irrespective of normal maximum temperature, heat waves should be declared.

The Heatwave model is based on LSTM model, we provide input of previous 365 days maximum temperature and rainfall data, to predict next 365 days temperature.

After getting temperature prediction, we find the departure from normal and determine the occurrence of heatwave.

GUI:

First open XAMPP Apache server in any browser and write : localhost/frontend

For ADMIN end :

The user has to launch app.py using the command “python app.py” . This will open the file app.py and start the flask server and then the user can use the flask website