

AIR QUALITY ASSESSMENT-TAMIL NADU

TEAM MEMBER

962221106074 : Mohamed Shameem S

Phase-1 Document Submission

Project: AIR QUALITY ASSESSMENT



OBJECTIVE : The project aims to analyze and visualize air quality data from monitoring stations in Tamil Nadu. The Objective is to gain insights into air pollution trends, identify areas with high pollution levels, and develop a predictive model to estimate RSPM/PM10 levels based on SO2 and NO2 levels. This project involves Defining objectives, designing the analysis approach, selecting visualized techniques, and creating a Predictive model using Python and relevant libraries. Air Quality Analysis Objectives.

PHASE -1 : Problem definition and Design thinking

Dataset Link : <https://tn.data.gov.in/resource/location-wise-daily-ambient-air-quality-tamil-nadu-year-2014>

1. **Air Quality Trends:** This objective involves studying historical data on air quality parameters, such as pollutant levels, meteorological conditions, and emission sources, to understand how air quality has changed over time. This analysis helps identify long-term trends, seasonal variations, and potential contributing factors.
2. **Identifying Pollution Hotspots:** This objective focuses on pinpointing specific geographic areas or locations where air pollution levels consistently exceed acceptable limits. By identifying pollution hotspots, authorities can prioritize targeted interventions and regulatory measures to reduce pollution in these areas.
3. **Building a Predictive Model for RSPM/PM10 Levels:** This objective involves developing a statistical or machine learning model that can forecast levels of Respirable Suspended Particulate Matter (RSPM) or Particulate Matter with a diameter of 10 micrometers or less (PM10). This model typically uses historical data, meteorological information, and other relevant variables to make predictions, aiding in proactive pollution management and public health planning.

These objectives collectively contribute to better air quality management and the protection of public environment.

ANALYSIS APPROACH:

Steps to load, preprocess, analyze, and visualize the air quality data:

Certainly! Here are the steps to load, preprocess, analyze, and visualize air quality data:

1. Load Data:

✓Obtain the air quality data from reliable sources, which may include government agencies, environmental organizations, or research institutions.

✓The data may be available in various formats like CSV, Excel, or specialized formats like JSON or XML.

2. Preprocess Data:

✓Data Cleaning :

Handle missing values: Replace or interpolate missing data points if possible, or consider removing incomplete records. Check for outliers and anomalies: Identify and address any data points that deviate significantly from the rest of the dataset.

✓Data Transformation:

Convert data types: Ensure that variables are in the correct data type (e.g., numerical, categorical, date). Normalize or standardize data if necessary to bring it to a consistent scale.

✓Feature Engineering:

Create new features that might be useful for analysis (e.g., derived variables, aggregates). Encode categorical variables using techniques like one-hot encoding.

3.Data Analysis:

✓Descriptive Statistics:

Calculate basic statistics like mean, median, standard deviation, and percentiles to understand the distribution of the data.

✓Time Series Analysis (if applicable):

Explore temporal patterns, trends, and seasonality using techniques like moving averages, decomposition, or autocorrelation.

✓Correlation Analysis:

Identify relationships between different variables, especially pollutants, meteorological conditions, and geographical features.

✓Spatial Analysis (if applicable):

Use GIS tools or libraries to analyze spatial patterns and relationships.

4.Build Predictive Models (Optional):

✓If you plan to build predictive models, split the data into training and testing sets.

✓Select an appropriate modeling technique (e.g., regression, time series forecasting, machine learning algorithms) and train the model.

Air Quality Monitoring :

With the increased industrial and commercial activities in the vicinity of major cities, the quality of the ambient air is being affected by

emissions from the industries and from the ever increasing vehicular population. As per the provision of Air (Prevention and Control of Pollution) Act, 1981, the entire state of Tamil Nadu has been declared as an air pollution control area.

Area	Annual average concentrations of pollutants in $\mu\text{g}/\text{m}^3$		
	SO ₂	NO ₂	RSPM
Industrial Residential, Rural & other areas	50	40	60

VIRTUALIZATION ANALYSIS:

✓Time Series Plots:

Plot air quality parameters over time to visualize trends, seasonal variations, and anomalies. ✓Histograms and Box Plots:

Display the distribution of pollutant levels and other relevant variables.

✓Scatter Plots (for correlation analysis):

Visualize relationships between different variables.

✓Geospatial Visualization (if applicable):

Create maps to show spatial distribution of air quality data and pollution hotspots

ANALYSIS APPROACH :

	A	B	C	D	E	F	G	H	I	J
1	Stn Code	Sampling	State	City/Town	Location	Agency	Type of Loc	SO2	NO2	RSPM/PM
2	38	1/2/2014	Tamil Nad	Chennai	Kathivakk	Tamilnadu	Industrial	11	17	55
3	38	1/7/2014	Tamil Nad	Chennai	Kathivakk	Tamilnadu	Industrial	13	17	45
4	38	21-01-14	Tamil Nad	Chennai	Kathivakk	Tamilnadu	Industrial	12	18	50
5	38	23-01-14	Tamil Nad	Chennai	Kathivakk	Tamilnadu	Industrial	15	16	46
6	38	28-01-14	Tamil Nad	Chennai	Kathivakk	Tamilnadu	Industrial	13	14	42
7	38	30-01-14	Tamil Nad	Chennai	Kathivakk	Tamilnadu	Industrial	14	18	43
8	38	2/4/2014	Tamil Nad	Chennai	Kathivakk	Tamilnadu	Industrial	12	17	51
9	38	2/6/2014	Tamil Nad	Chennai	Kathivakk	Tamilnadu	Industrial	13	16	46
10	38	#####	Tamil Nad	Chennai	Kathivakk	Tamilnadu	Industrial	10	19	50
11	38	13-02-14	Tamil Nad	Chennai	Kathivakk	Tamilnadu	Industrial	15	14	48
12	38	18-02-14	Tamil Nad	Chennai	Kathivakk	Tamilnadu	Industrial	14	16	32
13	38	20-02-14	Tamil Nad	Chennai	Kathivakk	Tamilnadu	Industrial	14	14	29
14	38	25-02-14	Tamil Nad	Chennai	Kathivakk	Tamilnadu	Industrial	13	17	17
15	38	27-02-14	Tamil Nad	Chennai	Kathivakk	Tamilnadu	Industrial	15	16	44
16	38	3/4/2014	Tamil Nad	Chennai	Kathivakk	Tamilnadu	Industrial	12	17	25
17	38	3/6/2014	Tamil Nad	Chennai	Kathivakk	Tamilnadu	Industrial	13	16	29
18	38	#####	Tamil Nad	Chennai	Kathivakk	Tamilnadu	Industrial	11	18	29
19	38	13-03-14	Tamil Nad	Chennai	Kathivakk	Tamilnadu	Industrial	15	16	41
20	38	18-03-14	Tamil Nad	Chennai	Kathivakk	Tamilnadu	Industrial	14	17	43
21	38	20-03-14	Tamil Nad	Chennai	Kathivakk	Tamilnadu	Industrial	14	14	42
22	38	25-03-14	Tamil Nad	Chennai	Kathivakk	Tamilnadu	Industrial	14	17	54
23	38	27-03-14	Tamil Nad	Chennai	Kathivakk	Tamilnadu	Industrial	15	19	62

```
<?xml
version="1.0"?>
<DATASET>
```

```
<ROW1>
```

```
<STN_CODE>38
```

```
</STN_CODE>
```

```
<SAMPLING_DATE>010214
```

```
</SAMPLING_DATE>
```

```
<STATE>Tamil Nadu
```

```
</STATE>
```

```
<CITYTOWNVILLAGEAREA>Chennai
```

```
</CITYTOWNVILLAGEAREA>
```

```
<LOCATION_OF_MONITORING_STATION>Kathivakkam Municipal Kalyana
Mandapam Chennai
```

</LOCATION_OF_MONITORING_STATION>

<AGENCY>Tamilnadu State Pollution Control Board

</AGENCY>

<TYPE_OF_LOCATION>Industrial Area

</TYPE_OF_LOCATION>

<SO2>11

</SO2>

<NO2>17

</NO2>

<RSPMPM10>55

</RSPMPM10>

<PM_2.5>NA

</PM_2.5>

</ROW1>

<ROW2>

<STN_CODE>38

</STN_CODE>

<SAMPLING_DATE>010714

</SAMPLING_DATE>

<STATE>Tamil Nadu

</STATE>

<CITYTOWNVILLAGEAREA>Chennai

</CITYTOWNVILLAGEAREA>

<LOCATION_OF_MONITORING_STATION>Kathivakkam Municipal Kalyana
Mandapam Chenna

i</LOCATION_OF_MONITORING_STATION>

<AGENCY>Tamilnadu State Pollution Control Board

</AGENCY>

<TYPE_OF_LOCATION>Industrial Area

</TYPE_OF_LOCATION>

<SO2>13

</SO2>

<NO2>17

</NO2>

<RSPMPM10>45

</RSPMPM10>

<PM_2.5>NA

</PM_2.5>

</ROW2>

CONCLUSION :

In phase 1,we have established a understanding of our goal to predict the air quality of tamilnadu with the analysis approaches and visualizations.