

AIR QUALITY ANALYSIS AND PREDICTION IN TAMILNADU

PROBLEM STATEMENT :

The problem is to analyze and predict air quality in Tamilnadu, with a focus on understanding the current state of air pollution and forecasting future pollution levels. This involves collecting and analyzing data from various sources to assess the air quality in different regions of Tamilnadu, identifying key factors contributing to pollution, and developing models to predict air quality trends. The goal is to provide accurate information and early warnings to help residents and authorities take preventive measures to mitigate the impact of poor air quality on health and the environment.

PHASE 1 :

PROBLEM DEFINITIONS :

1.Data Collection : Gather the air quality data from various monitoring stations in Tamil Nadu, ensuring it's reliable and up-to-date.

2.Data Preprocessing : Clean and prepare the data for analysis. This involves handling missing values, outliers, and ensuring data consistency.

3.Exploratory Data Analysis (EDA) : Perform EDA to gain initial insights into the data. Create visualizations like time series plots, heatmaps, or geographical maps to identify pollution trends and hotspots.

4.Identify High Pollution Areas : Use your EDA findings to pinpoint areas with consistently high pollution levels. This can help focus mitigation efforts.

5.Feature Engineering : Create relevant features for your predictive model. You mentioned predicting RSPM/PM10 levels based on SO2 and NO2, so feature engineering would include creating appropriate variables for this prediction.

6.Model Building : Choose a suitable machine learning or statistical model for your prediction task. Common choices include linear regression, decision trees, or neural networks.

7.Model Evaluation : Assess the model's performance using appropriate metrics (e.g., RMSE, MAE, R-squared). You may need to fine-tune the model or try different algorithms.

8.Visualization : Create visualizations to communicate your findings effectively. This could include predictive maps, pollution trend graphs, or model performance charts.

9.Report and Insights : Summarize your findings, including pollution trends, high-risk areas, and the predictive model's results. Clearly communicate your insights for stakeholders and policymakers.

10.Recommendations : Based on your analysis, propose recommendations for improving air quality in areas with high pollution levels.

DESIGN THINKING :

Project Objectives : Define objectives such as analyzing air quality trends, identifying pollution hotspots, and building a predictive model for RSPM/PM10

levels.

Analysis Approach: Plan the steps to load, preprocess, analyze, and visualize the air quality data.

Visualization Selection : Determine visualization techniques (e.g., line charts, heatmaps) to effectively represent air quality trends and pollution levels.

1. Empathize : Begin by understanding the specific air quality challenges in Tamilnadu, considering factors like geography, industrial activity, and population density.

- Conduct interviews, surveys, and gather data to empathize with the concerns and needs of local communities, environmental experts, and policymakers.

2. Define : Clearly define the problem by identifying the key issues related to air quality, such as sources of pollution, seasonal variations, and health impacts.

- Develop a user-centered problem statement, e.g., "How might we predict and mitigate air quality issues to improve the health and well-being of Tamilnadu residents?"

3. Ideate : Brainstorm potential solutions with a multidisciplinary team, including environmental scientists, data analysts, and community representatives.

- Generate innovative ideas, such as using IoT sensors, satellite data, machine learning models, or policy interventions, to address air quality concerns.

4. Prototype : Create prototypes or proof-of-concept models of the proposed solutions. For example:

- Build a prototype air quality monitoring system using IoT devices.

- Develop a machine learning model to predict air quality based on historical data.

- Design policy recommendations for reducing pollution from key sources.

- Test these prototypes in a controlled environment to evaluate their effectiveness.

5. Test and Implement : Deploy the prototypes in real-world settings across Tamilnadu to collect data and assess their performance.

- Gather feedback from users and stakeholders to refine and iterate on the solutions.

- Once the solutions are proven effective, implement them on a larger scale, integrating them into the existing infrastructures.