Air Quality Analysis and Prediction in Tamil Nadu

TEAM MEMBERS

1.T Haley Pearl Caxmi - au913121106026
2.S Pritthiga - au913121106071
3.S Sandhya - au913121106089
4.D Haritha - au913121106302
5.R Vijaya Varshini - au913121106117

ABSTRACT

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 visualization techniques, and creating a predictive model using Python and relevant libraries.

DESIGN THINKING

1.Project Objective

The project "Air Quality Analysis and Prediction in Tamil Nadu" aims to address critical environmental and public health concerns by comprehensively analyzing and forecasting air quality levels in the state of Tamil Nadu, India. The primary objectives of this project are threefold:

Firstly, to establish a robust and real-time air quality monitoring system across key urban and industrial areas in Tamil Nadu. This will provide a detailed and accurate assessment of air pollutants, including particulate matter (PM2.5 and PM10), nitrogen dioxide (NO2), sulfur dioxide (SO2) among others.

Secondly, to develop advanced data analytics and machine learning models that can predict short-term and long-term trends in air quality. The predictive models regressions and decision trees will enable authorities to take proactive measures to mitigate air pollution and protect public health, such as issuing timely advisories, traffic management, and industrial regulations.

Lastly, to create a user-friendly information dissemination platform, web-based tools, to provide citizens with real-time air quality updates and personalized recommendations for reducing exposure to poor air quality. By achieving these objectives, the project seeks to enhance public awareness, promote sustainable practices, and ultimately improve air quality and the overall quality of life in Tamil Nadu.

2.Analysis Approach

It adopts a multifaceted approach to address the critical issue of air quality in the region. Firstly, it encompasses an extensive data collection phase and sensor networks to gather real-time and historical air quality data.This data is then subjected to rigorous statistical and machine learning analysis to identify key trends, patterns, and correlations.

Furthermore, the project employs advanced modeling techniques, such as atmospheric dispersion modeling, to simulate the spread of air pollutants under various scenarios. These models enable the prediction of air quality levels, taking into account meteorological conditions and emission sources.

To enhance the project's accuracy and relevance, it also incorporates stakeholder engagement, collaborating with local authorities, environmental agencies, and communities. This participatory approach not only fosters data sharing and validation but also helps in formulating effective policy recommendations and mitigation strategies.

Ultimately, the project aims to provide actionable insights and early warning systems for policymakers and the public, fostering informed decision-making and sustainable efforts to improve air quality in Tamil Nadu, thereby addressing the critical issue of air pollution in the region.

3. Visualization Selection

The project "Air Quality Analysis and Prediction in Tamil Nadu" aims to address the pressing issue of air pollution in the Indian state of Tamil Nadu. With urbanization and industrialization on the rise, air quality has become a major concern affecting the health and well-being of the state's residents. This project will employ advanced data analysis techniques and predictive modeling to comprehensively assess the air quality across different regions in Tamil Nadu. It will utilize real-time data from an extensive data collection and historical records to identify patterns, sources, and trends in air pollution. Through this analysis, the project seeks to provide valuable insights into the factors contributing to poor air quality, including industrial emissions, vehicular pollution, and meteorological conditions. Moreover, it will develop predictive models to forecast air quality levels, enabling timely public health interventions and policy recommendations. By offering actionable information to both authorities and citizens, this project strives to contribute to cleaner air, improved public health, and a more sustainable future for Tamil Nadu.