Title:

Air quality analysis and prediction in Tamil Nadu

Problem statement:

The real-time air quality in Tamil Nadu is 41 (MODERATE) AQI now. Rapid industrialization, vehicular emissions, and natural factors contribute to deteriorating air quality, affecting the well-being of residents. We aim to develop a comprehensive air quality analysis and prediction system for Tamil Nadu, leveraging machine learning and environmental data.

Problem Definition:

Prediction is one of the applications of artificial neural networks. The main objective of this research was to develop a model to predict PM2.5 in Alandur location based on data from monitoring stations.

create an integrated air quality analysis and prediction system for Tamil Nadu, India, aimed at monitoring and forecasting air pollutant levels, including particulate matter (PM2.5 and PM10), nitrogen dioxide (NO2), sulfur dioxide (SO2), ozone (O3), and carbon monoxide (CO), across key regions and cities. This system should leverage historical data, meteorological parameters, industrial emissions, vehicular traffic, and geographical characteristics to provide actionable insights and early warnings to residents, government agencies, and industries.

Air quality monitoring data are used to check the concentration with the ambient air quality standards provided by the government. The purpose of prediction is to develop effective emission control strategies and help to find the contribution of each source causing pollution. There are two types of prediction methods, deterministic and stochastic. In this work, a deterministic method is used for the prediction. This method works based on physical and chemical transportation processes of pollutants with the influences of meteorological variables, by mathematical models. Artificial neural networks help to forecast the pollutants in complicated non-linear

functions. The accuracy of prediction by artificial neural networks is higher than other methods.

key aspects:

- Data Collection and Integration
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- Real-time Monitoring
- Policy Recommendations
- Public Awareness
- Success Criteria

Design thinking:

Empathize: Understand the diverse stakeholders: Engage with residents, environmental agencies, healthcare professionals, industries, and government authorities to empathize with their concerns and needs related to air quality.

Gather data: Collect historical air quality data, meteorological data, pollution source information, and public feedback to gain insights into the problem.

Clearly define the problem: Identify specific air pollutants of concern, geographic regions, and the urgency of the issue, considering public health implications and environmental impact.

Develop user personas: Create profiles representing different user groups with their unique requirements and expectations.

Ideate: Brainstorm solutions: Generate innovative ideas for monitoring and predicting air quality. Consider IoT sensors, satellite data, machine learning algorithms, and data visualization techniques.

Prototype: Create a minimal viable product (MVP): Build a prototype of the air quality analysis and prediction system, incorporating selected sensors, data sources, and algorithms.

Test with real data: Validate the prototype using historical air quality and meteorological data to ensure it provides accurate insights.

Test: Pilot in select regions: Implement the system in a limited area within Tamil Nadu to gather feedback from users and assess its performance in a real-world setting.

Iterate and refine: Based on feedback and test results, make necessary adjustments and improvements to the system.

Scale up: Expand the system's coverage to cover multiple cities and regions across Tamil Nadu, ensuring it can handle a large volume of data and users.

Collaborate with stakeholders: Work closely with government agencies, industries, and community groups to ensure widespread adoption and support.

Continuous data collection: Regularly update the system with real-time data to keep predictions accurate and up to date.

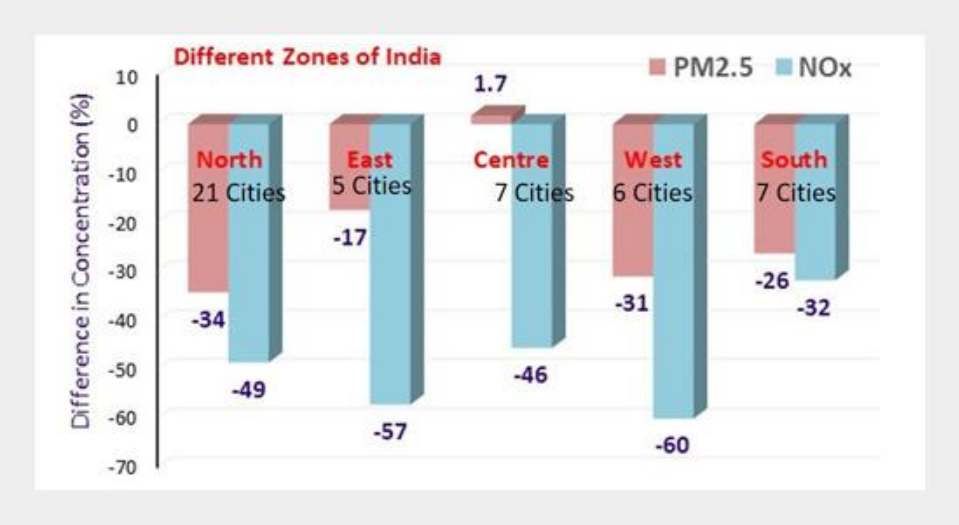
User support: Provide ongoing support and training to users, addressing any issues or concerns promptly.

Evaluate: Assess impact: Continuously evaluate the system's impact on air quality improvement, public health, and informed decision-making.

Incorporate feedback: Use feedback from users and stakeholders to make continuous improvements and adaptations.

Project Timeline:

A detailed project timeline will be created to outline milestones, tasks, and deadlines. This will ensure the project stays on track and is completed within the specified timeframe



TEAM:

Project Manager: Kanishka v

Data Analyst:Dhrasika.R

Data Engineer: Kanishka m

Data Scientist: Krishnaveni

Visualization specialist: Harini

Conclusion:

This project design document outlines our approach to performing. the development of an air quality analysis and prediction system for Tamil Nadu represents a critical step towards addressing the pressing issue of air pollution in the region.