Air Quality index prediction

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Problem Statement

- Problem statement-

  Air pollution is a severe challenge in urban areas, impacting public health and the environment. Accurately predicting air quality levels can help city officials take timely actions to reduce emissions or warn the public. Traditional methods of monitoring air quality are limited by the number of sensors and real-time reporting. AI models can fill these gaps by using available sensor data combined with weather and traffic information.

- Problem addressed by case study-

  The case study discusses the problem of air pollution in cities, where it has a major influence on the environment and public health. The lack of real-time data reporting and restricted sensor coverage are limitations of traditional air quality monitoring techniques. The case study investigates how artificial intelligence (AI) models can improve air quality predictions by utilizing current sensor data along with meteorological and traffic data, allowing local officials to promptly reduce emissions and alert the public.

- Key Objectives:

1. Boost air quality forecasting
2. Surmount the constraints of conventional monitoring
3. Facilitate prompt action
4. Optimize resource allocation

Source : www.freepik.com/

Dataset Overview(Optional)

- Dataset Description:

1. **Context-** Air is what keeps humans alive. Monitoring it and understanding its quality is of immense importance to our well-being.
2. **Content-** The dataset contains air quality data and AQI (Air Quality Index) at hourly and daily level of various stations across multiple cities in India.
3. **AQI-** A tutorial of how AQI is calculated is available here: https://www.kaggle.com/rohanrao/calculating-aqi-air-quality-index
4. **Cities-** Ahmedabad, Aizawl, Amaravati, Amritsar, Bengaluru, Bhopal, Brajrajnagar, Chandigarh, Chennai, Coimbatore, Delhi, Ernakulam, Gurugram, Guwahati, Hyderabad, Jaipur, Jorapokhar, Kochi, Kolkata, Lucknow, Mumbai, Patna, Shillong, Talcher, Thiruvananthapuram, Visakhapatnam.
5. **Sources-** https://cpcb.nic.in/
6. **Collection Methodology-** The data has been compiled from the Central Pollution Control Board (CPCB) website: https://cpcb.nic.in/ which is the official body of Government of India.
7. **Dataset Source-** https://www.kaggle.com/datasets/rohanrao/air-quality-data-in-india

Source : www.freepik.com/

Methodology

- Approach:

1. Collection of dataset from Kaggle.
2. Loading and learning the dataset.
3. Visualizing dataset-(scatter plot ,heat maps).
4. Preprocessing dataset-(null values, std scaler ,outliers, exchanging with mean values, data description).
5. Selecting target and prediction variables.
6. Creating and training model.
7. Testing model with test data.
8. Plotting test vs predicted variables.
9. Calculating Accuracy of testing and training.

- Algorithms Used:

10. Linear regression-After preprocessing all values where continuous and numerical so we went for trying linear regression.
11. Decision tree- There are various categories or variables used to predict overall AQI like NO2,CO,SO2

Source : www.freepik.com/

Conclusion

- Summary:

  The case study focuses on tackling the serious problem of urban air pollution, which has an adverse effect on the environment and public health. The poor deployment of sensors and the delays in reporting real-time data are the limitations of traditional air quality monitoring systems.

1. The Decision tree model used in project will detect the overall AQI based on following fields- PM2.5, PM10, NO, NO2, CO,SO2,O3
2. It will give prediction of AQI index value
3. This can be used in various weather based apps and real time monitoring situtations

- Future Work:

  Training model based on real time data from IOT sensors and giving real time output and also including model deployment.

Source : www.freepik.com/

References

- Dataset- https://www.kaggle.com/datasets/rohanrao/air-quality-data-in-india
- Notebooks and dataset uses-

1. https://www.kaggle.com/code/zeynepsyavuz970/air-quality-prediction
2. https://www.kaggle.com/code/tarachanrana/air-quality-prediction-rtarachan02
3. https://www.kaggle.com/code/umerirshad282/air-quality-prediction

Thank You