FORM 2

THE PATENTS ACT, 1970

(39 of 1970)

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THE PATENTS RULES,

2003COMPLETE

SPECIFICATION

1. TITLE OF THE INVENTION

Air Pollution Forecasting in NCR

APPLICANT(S)

Name in Full	Nationality	Country of Residence	Address of the Applicant
Ankita Kushwaha (ankita.2024cs1150@kiet.edu)	Indian	India	KIET Group of Institutions Delhi-NCR, Meerut Road (NH-58) Ghaziabad - 201206
Avika Tyagi (avika.2024cs1011@kiet.edu)	Indian	India	KIET Group of Institutions Delhi-NCR, Meerut Road (NH-58) Ghaziabad - 201206
Avi Chaudhary (avi.2024cs1201@kiet.edu)	Indian	India	KIET Group of Institutions Delhi-NCR, Meerut Road (NH-58) Ghaziabad - 201206

2. PREAMBLE TO DESCRIPTION

COMPLETE SPECIFICATION -

The following specification particularly describes the invention and the way it is to be performed.

Title:

Pollution Forecasting in NCR

Field of the Invention

[0001] This invention relates to the field of environmental science and data analytics, specifically addressing the forecasting of air pollution levels in the National Capital Region (NCR). The invention employs machine learning algorithms and data analysis techniques to predict air quality indices, contributing to proactive environmental management.

Background

[0002] Rapid urbanization, industrialization, and vehicular emissions have led to escalating concerns regarding air pollution, posing severe health and environmental risks. The National Capital Region (NCR) faces substantial challenges in managing air quality due to diverse pollution sources. Traditional monitoring methods provide retrospective data, necessitating a predictive approach for effective pollution control measures.

[0003] The objective of this invention is to develop a robust forecasting system that anticipates air pollution levels based on historical data, meteorological factors, and other relevant parameters. By leveraging advanced machine learning algorithms, the system aims to provide timely and accurate predictions, enabling authorities and the public to take proactive measures for mitigating the impact of poor air quality.

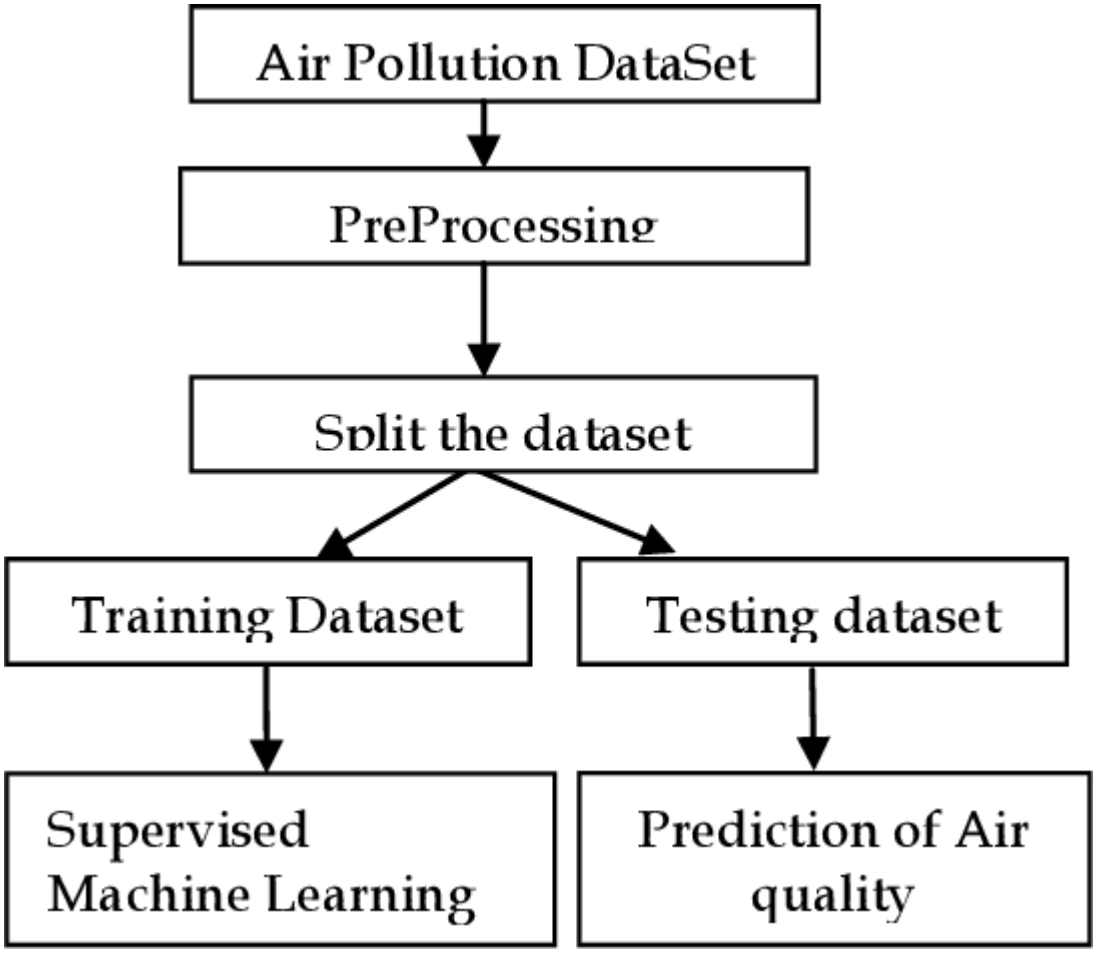
Objects of the Invention

[0004] The primary object of this invention is to create a predictive model for forecasting air pollution levels in the NCR, facilitating timely interventions and public awareness.

[0005] Another object is to integrate historical pollution data, meteorological variables, and real-time monitoring to enhance the accuracy and reliability of the forecasting system.

[0006] The invention further aims to contribute to environmental sustainability by enabling data-driven decision-making for pollution control and prevention.

Drawings



Brief Description of the Drawing

[0007] Figure showcases the overall architecture of the air pollution forecasting system, highlighting the steps of using databases to the machine learning model.

Detailed Description

[0008] The air pollution forecasting system is a multifaceted solution designed to address the complex dynamics of air quality in the National Capital Region (NCR). The following sub-sections provide an in-depth

exploration of each component and process involved in the development and operation of this innovative system:

1. Data Collection

[0009] Comprehensive data collection is fundamental to the accuracy of air pollution forecasting. Historical pollution data, obtained from strategically positioned monitoring stations across the NCR, includes information on air quality indices, concentrations of pollutants such as particulate matter (PM2.5, PM10), nitrogen dioxide (NO2), sulfur dioxide (SO2), ozone (O3), and carbon monoxide (CO). Simultaneously, real-time meteorological data is sourced, encompassing variables like temperature, humidity, wind speed, and atmospheric pressure. This extensive dataset forms the basis for training the machine learning model.

2. Data Preprocessing

[0010] Raw data undergoes meticulous preprocessing to ensure its quality and reliability. This involves handling missing values, identifying and addressing outliers, and rectifying any inconsistencies within the dataset. Normalization and scaling techniques are applied to standardize the data, facilitating uniform representation across diverse parameters.

3. Feature Selection

[0011] An essential step in optimizing the machine learning model is the selection of relevant features. Correlation analysis, statistical measures, and feature importance techniques are employed to identify the variables with the most significant impact on air quality. This process refines the

input variables, enhancing the model's ability to discern patterns and relationships.

4. Machine Learning Model Training

[0012] The heart of the forecasting system lies in the machine learning model. Leveraging both linear regression for baseline predictions and a multi-layer perceptron for capturing intricate patterns, the model is trained on the pre-processed dataset. Through iterative learning, the model discerns the intricate relationships between meteorological variables and air quality indices.

5. Real-time Prediction

[0013] Once the model is trained, it is deployed for real-time predictions. Current meteorological conditions, obtained through ongoing monitoring, serve as input to the model. The system generates forecasts for specified time intervals, providing a dynamic and responsive approach to air quality monitoring.

6. User Interface

[0014] The user interface acts as the gateway to the system's predictions. Accessible to relevant authorities, policymakers, and the general public, the interface provides intuitive visualizations of air quality forecasts. Users can explore historical trends, view real-time predictions, and make informed decisions based on the presented data.

7. Continuous Model Refinement

[0015] The forecasting system is designed for adaptability and continuous improvement. As new data becomes available, the model undergoes periodic updates to ensure its relevance and accuracy. This iterative refinement process involves retraining the model with the latest data, incorporating advancements in machine learning, and enhancing the overall predictive capabilities of the system.

8. Integration with Environmental Management

[0016] The forecasts generated by the system serve as a proactive tool for environmental management. Relevant authorities can implement targeted interventions based on anticipated pollution levels. Public awareness initiatives can also be informed by these predictions, fostering a community-driven approach to pollution control.

9. Scalability and Extensibility

[0017] The architecture of the air pollution forecasting system is designed to be scalable and extensible. It can accommodate additional monitoring stations, incorporate new pollutants, and adapt to evolving environmental dynamics. This ensures the long-term sustainability and relevance of the system in the face of changing urban landscapes.

Claims

1. A system for air pollution forecasting, comprising a data processing unit, a machine learning model, and a user interface.

2. The method of claim 1, wherein historical pollution data is integrated with real-time meteorological variables for improved prediction accuracy.

3. The method of claim 1, wherein feature selection techniques are employed to optimize input variables for machine learning.

Abstract

The present invention discloses a comprehensive air pollution forecasting system for the National Capital Region (NCR). Utilizing historical pollution data, meteorological variables, and advanced machine learning algorithms, the system offers timely and accurate predictions of air quality indices. The integration of real-time monitoring enhances forecasting accuracy, contributing to proactive pollution control measures.