Title:

Real Time Air Quality Prediction and Classification Using Deep Learning

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1. Project Idea

We propose developing a **Real-Time Air Quality Prediction and Classification System** to tackle the rising challenges of air pollution. This system will use deep learning models to predict air quality levels accurately and provide actionable recommendations. By integrating generative AI tools like LangChain or OpenAI API, we aim to offer personalized advice to users, support policymakers in formulating health and environmental strategies, and empower individuals with real-time data to make informed decisions.

2. Relevance to Sustainable Development Goals (SDGs)

- **SDG 3 (Good Health and Well-being):** It promotes healthier lifestyles by informing individuals about air quality and helping them avoid hazardous exposure.
- **SDG 13 (Climate Action):** By providing insights into pollution patterns, the project can help governments and organizations design effective climate strategies, contributing to environmental sustainability.

3. Literature Examples

- **Example 1:** A study on *Air Quality Prediction Using Machine Learning Approaches* highlights the use of machine learning and deep learning methods for forecasting air quality, demonstrating the effectiveness of advanced algorithms in tackling pollution problems. *Link:* MDPI: Air Quality Prediction Using Machine Learning
- **Example 2:** This research discusses *Deep Learning Models for Environmental Pollution Forecasting*, focusing on how time-series data and LSTM networks can predict environmental conditions, particularly air quality levels. *Link:* ScienceDirect: Deep Learning for Pollution Forecasting

4. Describe Your Data

We plan to use real-time air quality data from trusted APIs like **OpenAQ** and **OpenWeather**. These sources provide data in formats like JSON and CSV, with measurements such as PM2.5, PM10, and CO2 levels. Preprocessing tasks will include handling missing data, removing anomalies, scaling features, and deriving indices like the Air Quality Index (AQI). The data will be stored in a relational database (e.g., SQLite) with efficient indexing for real-time access.

5. Approach (Machine Learning or Deep Learning)

We will use **deep learning**, specifically LSTM models, due to the time-series nature of air quality data. LSTMs are well-suited for capturing temporal dependencies and complex patterns, enabling highly accurate predictions. Generative AI will also assist in creating personalized recommendations based on the model's output, enhancing the system's usability and impact.