Team Name : RocketRyzens

Team Leader Name : Suraj Yadav

Problem Statement :

Ineffective Real-Time Air Pollution Monitoring in India. Inability to Predict and Prevent pollution Spikes via(AEROVEDA)

Team Members

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Brief about the Idea : AEROVEDA is a visionary AI-driven system that reimagines how India tackles air pollution – not just by monitoring it , but by prescribing solutions. Unlike traditional air quality tools that passively report AQI levels AEROVEDA operates like a " space doctor" for the atmosphere , combining satellite data , AI modelling , and health forecasting to actively engineer clean Air zones in real time .

At its core , AEROVEDA is a prescriptive intelligence platform powered by remote sensing from ISRO's BHUVAN , Sentinel -5P and SCATSAT , along with meteorological and fire data . It detects not just pollution levels (PM2.5 , NO2 ,SO2,CO), but also classifies pollution sources – like stubble burning , traffic congestion ,or industrial emissions – and predicts their spread using wind and weather patterns.

Unlike traditional air quality systems that simply monitor and report pollution, AEROVEDA is India's first prescriptive Space-AI platform that combines satellite data, AI modeling, and real-world intervention simulations to actively fight air pollution.

with the help of AEROVEDA ,we not just about knowing the air is polluted –its about to knowing what to do , when and where to clean it .Most existing platforms .like SAFAR ,AQI India , or CPCB dashboards-are passive pollution monitors. They only display air quality data with minimal predictive insights and no real-world action mapping . It integrates with public health, not just environment — predicting asthma/hospital load and preparing hospitals before pollution spikes.

It fuses space data with ground intelligence (citizen reports, fire alerts, traffic data) to provide a 360° view of pollution events. India struggles with **late, generic pollution warnings** and **lack of actionable insights** at the local level. By combining **high-resolution satellite data**, **AI modeling**, and **decision intelligence**, AEROVEDA provides, Hyperlocal, real-time AQI detection at the ward/district level , AEROVEDA merges top-down data (from satellites) with bottom-up input (citizen reports via app) to create a **unified, real-time "Breathing Map" dashboard**, driving smart governance and public participation. It rewards users for reporting pollution or planting trees, building a **gamified ecosystem** that encourages environmental action and accountability. Unlike traditional air quality systems that simply **monitor and report pollution**, **AEROVEDA will be India's first prescriptive Space-AI platform** that combines **satellite data**, **AI modeling**, and **real-world intervention simulations** to actively fight air pollution.

Air pollution in India is not just a monitoring issue — it's a **response problem**. Existing systems provide delayed or generic AQI data, but no **localized, actionable solutions** to reduce pollution in real time. This results in ineffective intervention, poor health preparedness, and lack of citizen participation.

Using AI, it recommends **zone-wise solutions** like fogging, traffic diversion, and clean pod deployment — ranked by predicted AQI improvement.
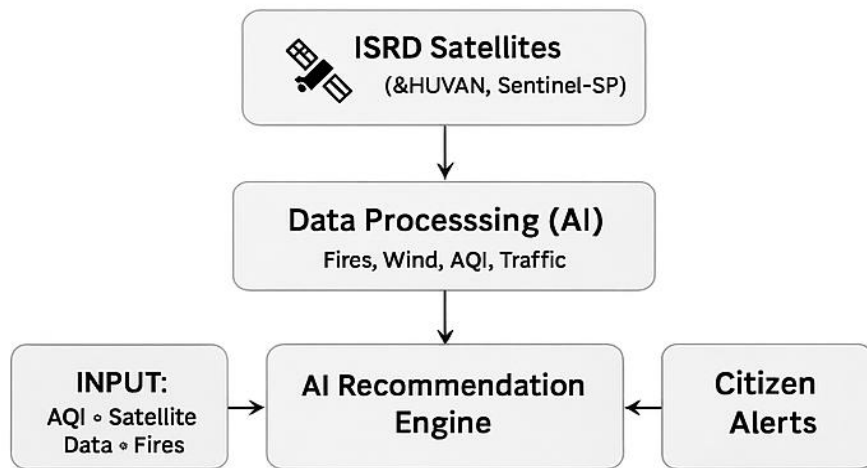
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List of features offered by the solution:

- Satellite-Powered Real-Time Pollution Detection

- AI-Based Pollution Hotspot Analysis

- Intervention Recommendation Engine

- Clean Breathing Zones Simulation

- AQI Forecasting

- Health Risk Alerts for Citizens

- Hospital Load Forecast
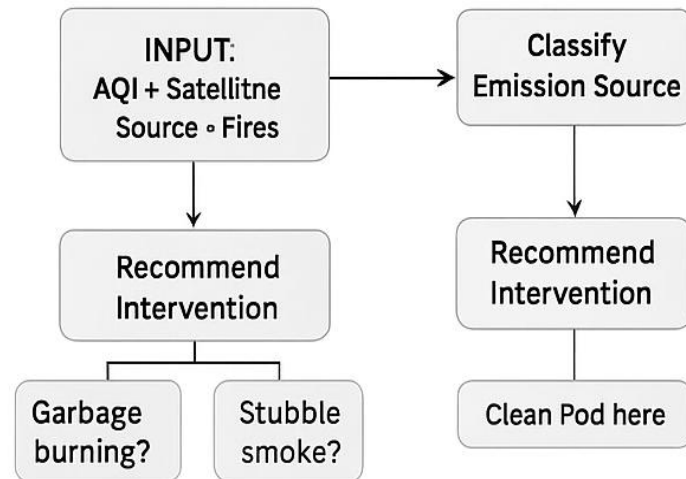
- Citizen-Driven Pollution Reporting
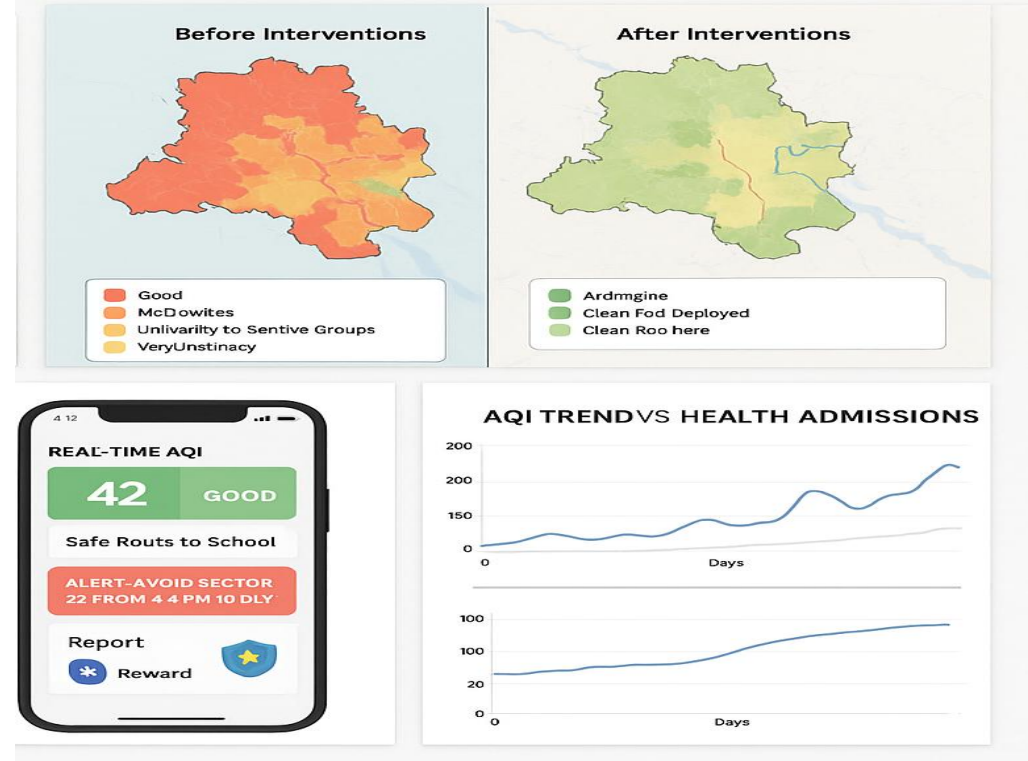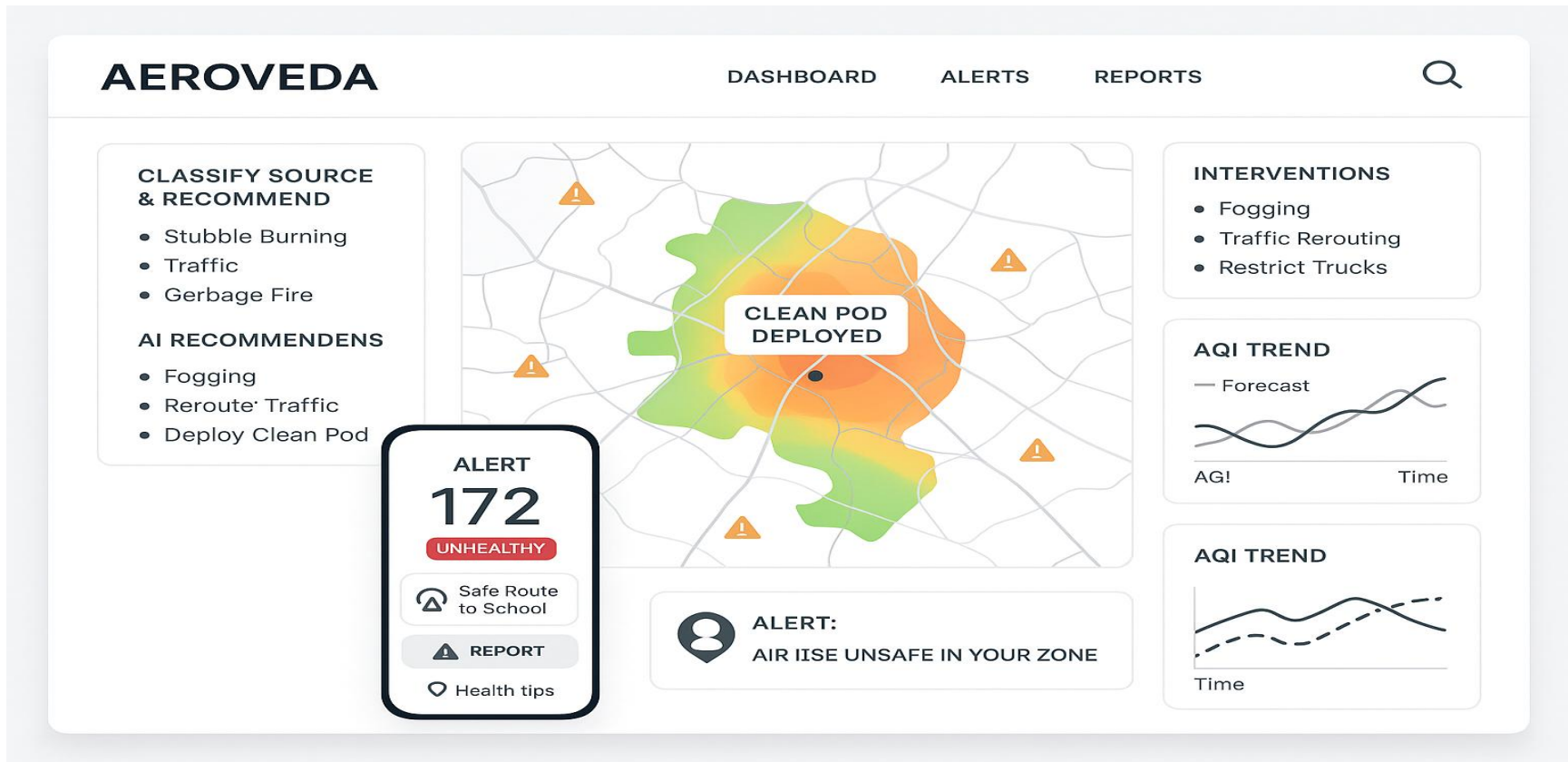
Process flow diagram or Use-case diagram

HOW AEROVEDA WORKS FROM SPACE TO STREET

- ISRD Satellites (&HUVAN, Sentinel-SP)
- Data Processsing (AI) — Fires, Wind, AQI, Traffic
- INPUT: AQI ∘ Satellite Data ∘ Fires
- AI Recommendation Engine
- Citizen Alerts

AI Prescriptive Flow Chart

- INPUT: AQI + Satellitne Source ∘ Fires
- Classify Emission Source
- Recommend Intervention
- Recommend Intervention
- Garbage burning?
- Stubble smoke?
- Clean Pod here

Wireframes/Mock diagrams of the proposed solution (optional):

Architecture diagram of the proposed solution

```
+------------------------+
|   ISRO Satellites  |        ← (BHUVAN, Sentinel-5P)
+---------+----------+
          |
          v
+-----------+--------------------+
|   Data Processing (AI)     |    ← Fires, Wind, AQI, Traffic
+-----------+--------------------+
          |
+--------------+-----------------------+
|                           |
v                           v
```

AI Recommendation Engine   Citizen Alerts + Health Risk
| |
v   v
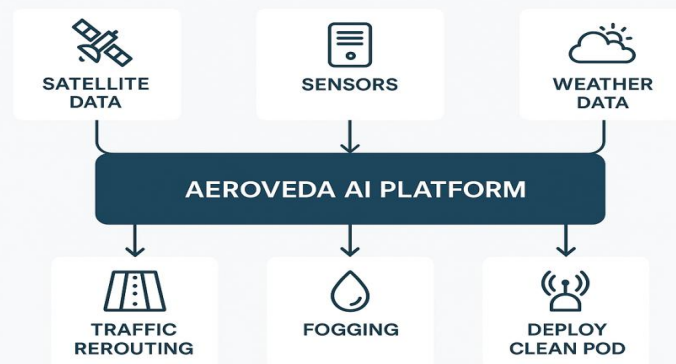Dashboard + Map   Clean Pods Deployment Sim
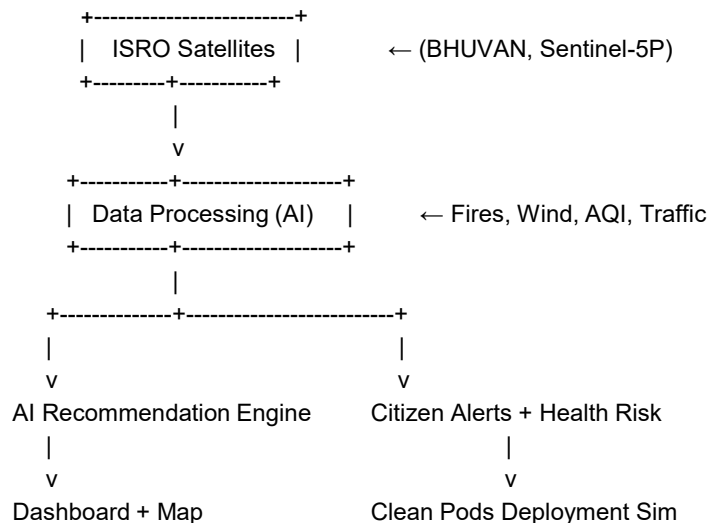
INPUT: AQI + Satellite + Fire Data
  ↓
Classify Source → Predict Spread → Recommend Action
  ↓
Garbage burning?   Clean pod here
Stubble smoke?   Restrict trucks

ARCHITECTURE OF AEROVEDA

SATELLITE DATA · SENSORS · WEATHER DATA

AEROVEDA AI PLATFORM

TRAFFIC REROUTING · FOGGING · DEPLOY CLEAN POD

Technologies used:

Frontend
- React.js
- Tailwind CSS
- Leaflet.js *(for maps using OpenStreetMap)*
- Chart.js / Recharts *(for visual graphs)*

Backend
- Node.js *or* (Python)
- MongoDB Atlas *(cloud NoSQL database)*
- Express.js *(if using Node)*
- REST APIs

Satellite Data Sources (via APIs)
- ISRO BHUVAN APIs
- Sentinel-5P (via Copernicus Open Access Hub)
- NASA FIRMS API *(for fire points / stubble burning)*
- MERRA-2 *(for weather + pollution reanalysis)*
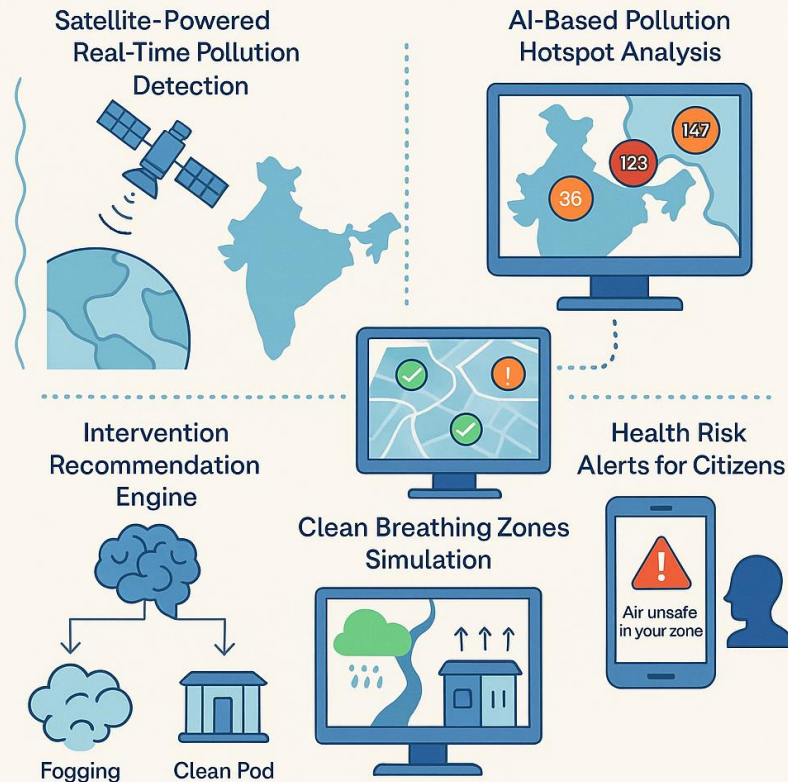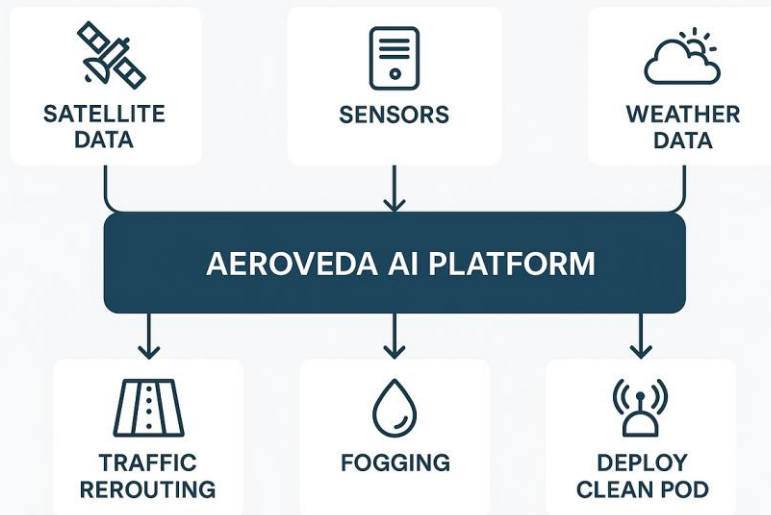- OpenWeatherMap API (free tier) *(for temperature, wind)*

Data Collection
- Satellite APIs (ISRO-BHUVIN, Sentinel-5P)
- Air-Quality Sensors ($PM2.5$, NO_3, SO_2, CO)
- Weather APIs, (wind, humidity, temperature)

AI + ML Processing
- Python
- Pandas / NumPy
- Sckitt-learn / GXBoost
- TensorFlow / PyTorch
- GeoPandas / Folium
- QGIS / Google Earth Engine