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BHARATIYA ANTARIKSH HACKATHON 2025

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Team Name: Sirius

Team Leader Name: Ananya Jain

Problem Statement:

Developing an Algorithm for Air Quality Visualizer and Forecast App to Generate Granular, Real-time, and Predictive Air Quality Information

Team Members

Team Leader

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Team Member-1

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Team Member-2

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Brief about the Idea:

AirAware is a hyperlocal air quality visualization and forecasting app designed to bridge the information gap in small towns and rural areas. Unlike traditional AQI apps that focus on metropolitan centers, AirAware integrates ground station data, satellite imagery, and weather inputs to deliver real-time, predictive, and personalized pollution insights anywhere.

Key Highlights:

- Provides real-time AQI using CPCB and satellite data.
- Offers AQI forecasting for the next 24–72 hours.
- Visualizes historical trends and pollution patterns.
- Delivers health-based recommendations and push alerts.
- Designed for inclusivity, covering areas with little to no AQI infrastructure.

This solution empowers citizens, health workers, and local governments with actionable, timely, and transparent air quality intelligence.

How is it different from existing solutions?

01 **Covers underserved areas:** Most AQI apps focus on big cities-our idea: **AirAware serves small towns and rural belts.**

02 **Predictive + Real-time:** Combines **forecasting** (via AI/ML) with **live AQI** from ground & satellite sources.

03 **Health-first design:** Most apps show just numbers—**we aim to deliver alerts, advice, and local actionability.**

💡 *Unique Selling Proposition (USP)*

01. 🌍 **Hyperlocal AQI intelligence** for even the most remote places.
02. 🔗 **Combines health, weather, and pollution data** for better decision-making.
03. 📡 **Scalable, modular backend** for API integration and institutional use.

How does it solve the problem?

01 **Bridges data gaps** using multi-sourc inputs (CPCB, Satellite, CSV datasets

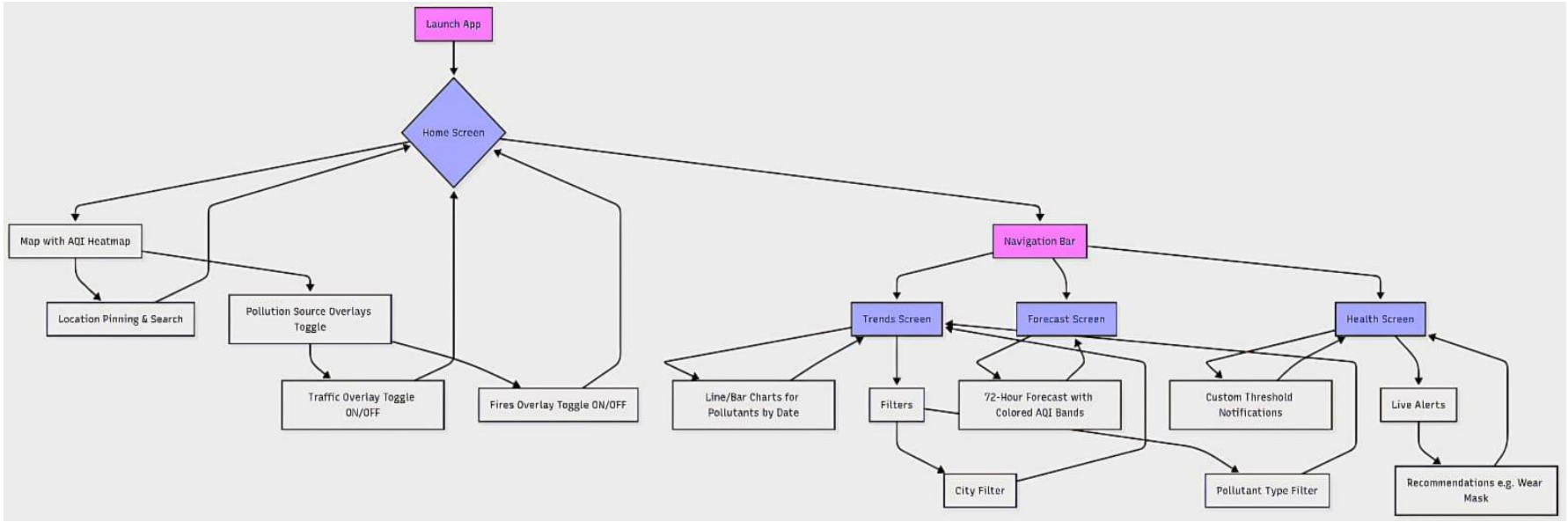
02 **Empowers users** with push notifications, personalized advisories, historical context.

03 **Supports preparedness** via pollution forecasting—critical for sensitive grou and institutions.

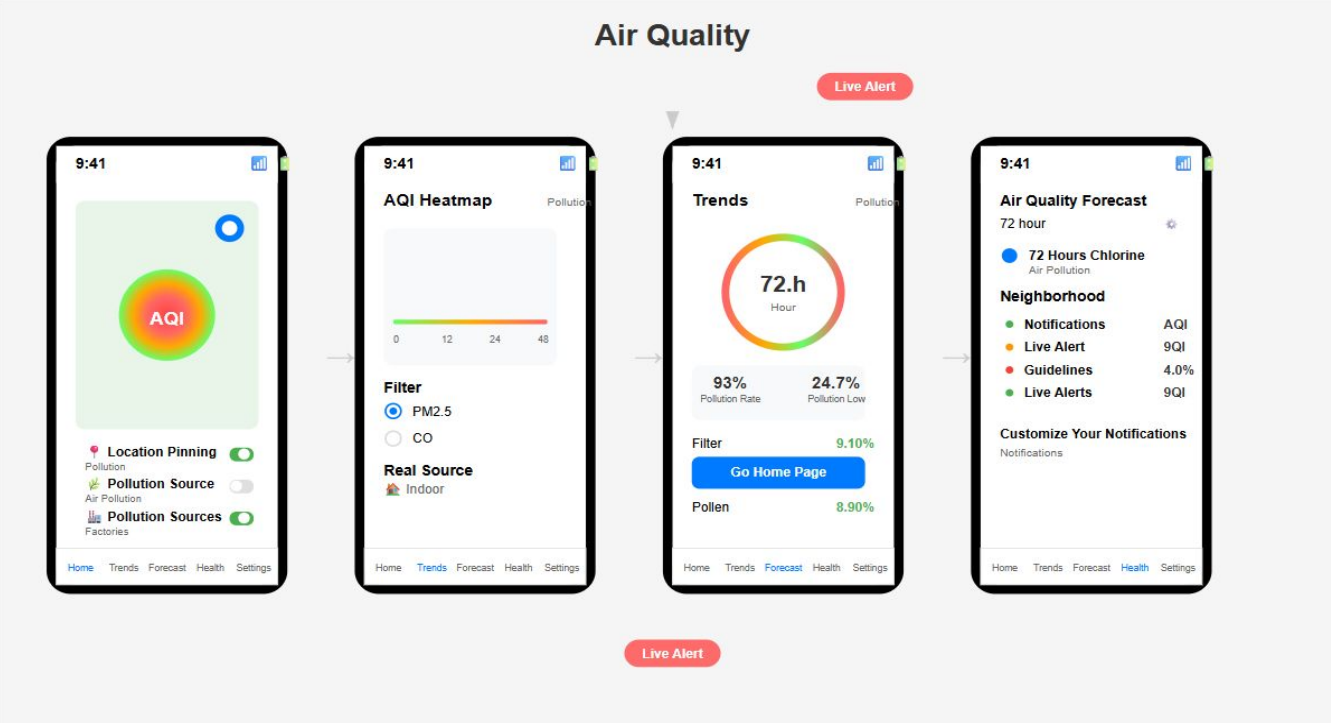
Features offered by the solution:

- Real-time AQI from CPCB/Satellite sources.
- Forecasts using weather and historical AQI
- Pollution Source Mapping(traffic intersections, factories, stubble-burning zones)
- Heatmaps, historical trends, and visualization of pollution sources.
- Health dashboard + push alerts via Firebase.
- Developer & Institutional APIs

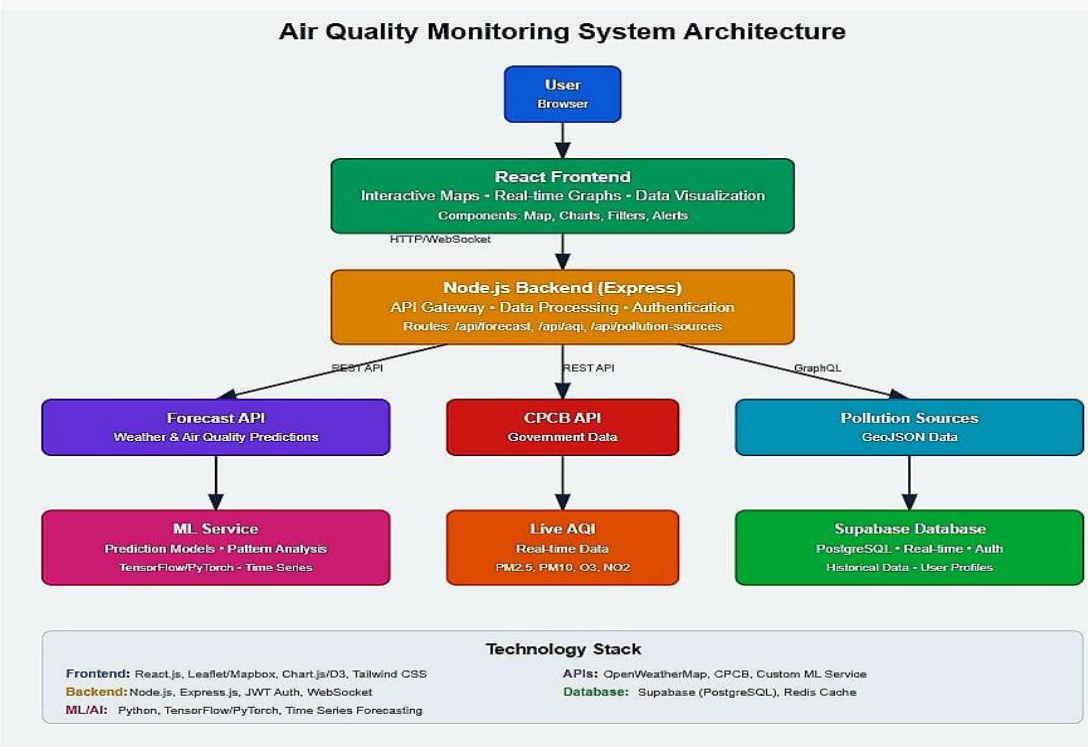
Process flow diagram



Wireframes


Air Quality
Live Alert
9:41
AQI
Location Pinning
Pollution
Pollution Source
Air Pollution
Pollution Sources
Factories
Home Trends Forecast Health Settings
9:41
AQI Heatmap
Pollution
0 12 24 48
Filter
PM2.5
CO
Real Source
Indoor
Home Trends Forecast Health Settings
9:41
Trends
Pollution
72.h
Hour
93%
Pollution Rate
24.7%
Pollution Low
Filter
9.10%
Go Home Page
Pollen
8.90%
Home Trends Forecast Health Settings
9:41
Air Quality Forecast
72 hour
72 Hours Chlorine
Air Pollution
Neighborhood
Notifications AQI
Live Alert 9QI
Guidelines 4.0%
Live Alerts 9QI
Customize Your Notifications
Notifications
Home Trends Forecast Health Settings
Live Alert

Architecture diagram of the proposed solution



Dataset & Key Findings:

=>Dataset used: Kaggle Air Quality Data + CPCB/ISRO APIs

- Tracks PM2.5, NO_2, CO, O_3 AQI values across 30+ Indian cities
- Insight #1: PM2.5 dominates both urban & rural air pollution
- Insight #2: Crop burning spikes AQI in Nov-Dec (North India)
- Dataset supports both:

  📊 Visualization + trend analysis

  🤖 ML-based AQI forecasting

Component	Technology / Data Source	Role in System
Frontend	React.js, TypeScript, TailwindCSS, React-Leaflet	Interactive UI, AQI maps, overlays, real-time data display
Backend	Node.js, Express.js, Supabase (PostgreSQL)	API layer, auth, user data, real-time data aggregation
ML/Forecasting	Python, FastAPI, scikit-learn, XGBoost / Random Forest	72-hour AQI prediction service, called via REST endpoint
Data Sources	CPCB Real-time API,Bhuvan	Live AQI, fire events, wind/temp/humidity, traffic & industry maps
Notifications	Firebase Cloud Messaging	Real-time alerts based on AQI threshold
Deployment	Vercel (Frontend), Railway (Backend), Supabase (DB)	Cloud-based scalable hosting for frontend, backend, and database

Impacts and Outcomes:

✅ Enables rural inclusion in air quality monitoring

✅ Encourages behavior change through alerts & insights

✅ Equips authorities with pollution source awareness

✅ Helps reduce long-term public health risks

✅ Adds visibility to government & community initiatives

Future Scope:

- 🌐 Expand to PAN-India via Bhuvan satellite layers
- 🧠 Source attribution via AI (e.g., 60% of spike from traffic)
- 📱 Community reporting of local incidents (burning, smoke, etc.)
- 💬 Multi-language support for accessibility
- 🚨 School/Hospital alert system for AQI emergencies

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THANK YOU