



Department Of Electronics and Computer Science
PILLAI COLLEGE OF ENGINEERING

IOT-BASED AUTONOMOUS AIR QUALITY ANALYZER AND PURIFIER

GROUP A15

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PROJECT GUIDE:
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INTRODUCTION



- Traditional air quality monitoring systems are often stationary and limited in coverage.
- Users lack real-time awareness of the air quality index (AQI) in different rooms.
- Poor air quality awareness may allow harmful bacteria to persist.



INTRODUCTION

- Inspired by automated cleaning devices, we propose a self-moving air purifier that autonomously navigates to areas with low air quality.
- Enhances indoor air quality by targeting specific problem areas in real-time.
- Uses IoT and AI-based monitoring to detect and respond to AQI variations.



Process Flow:

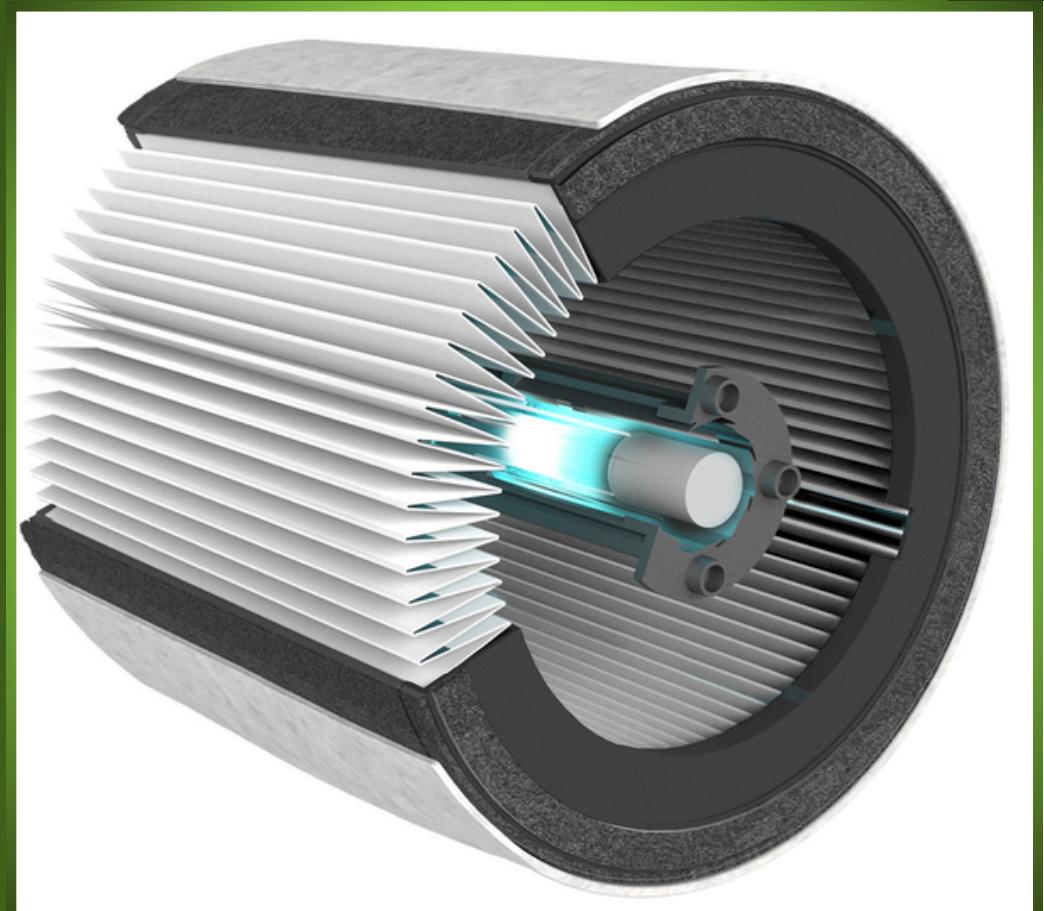
The model is divided into 3 main parts



Mobility



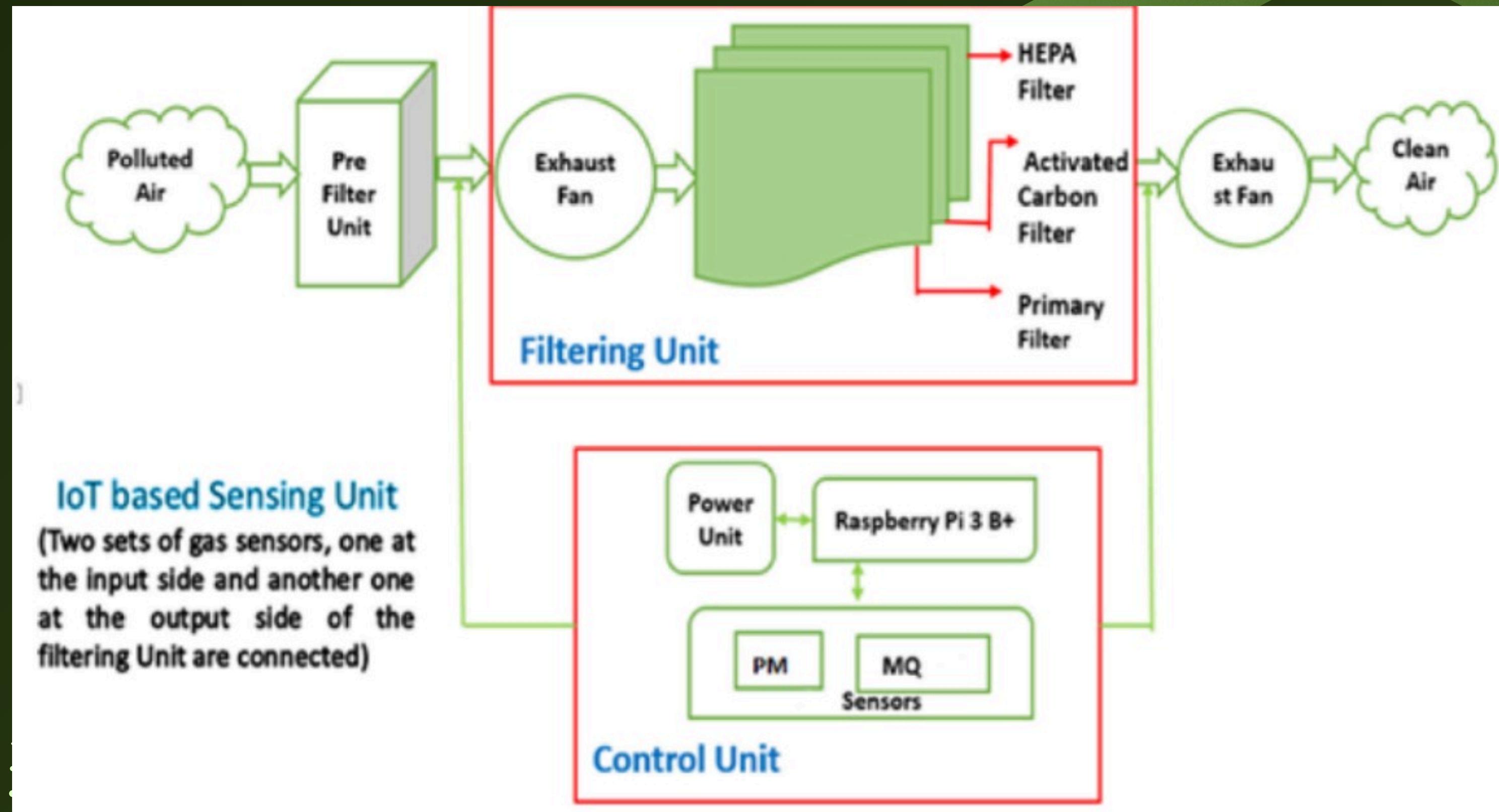
**Processing and Analysis
system**



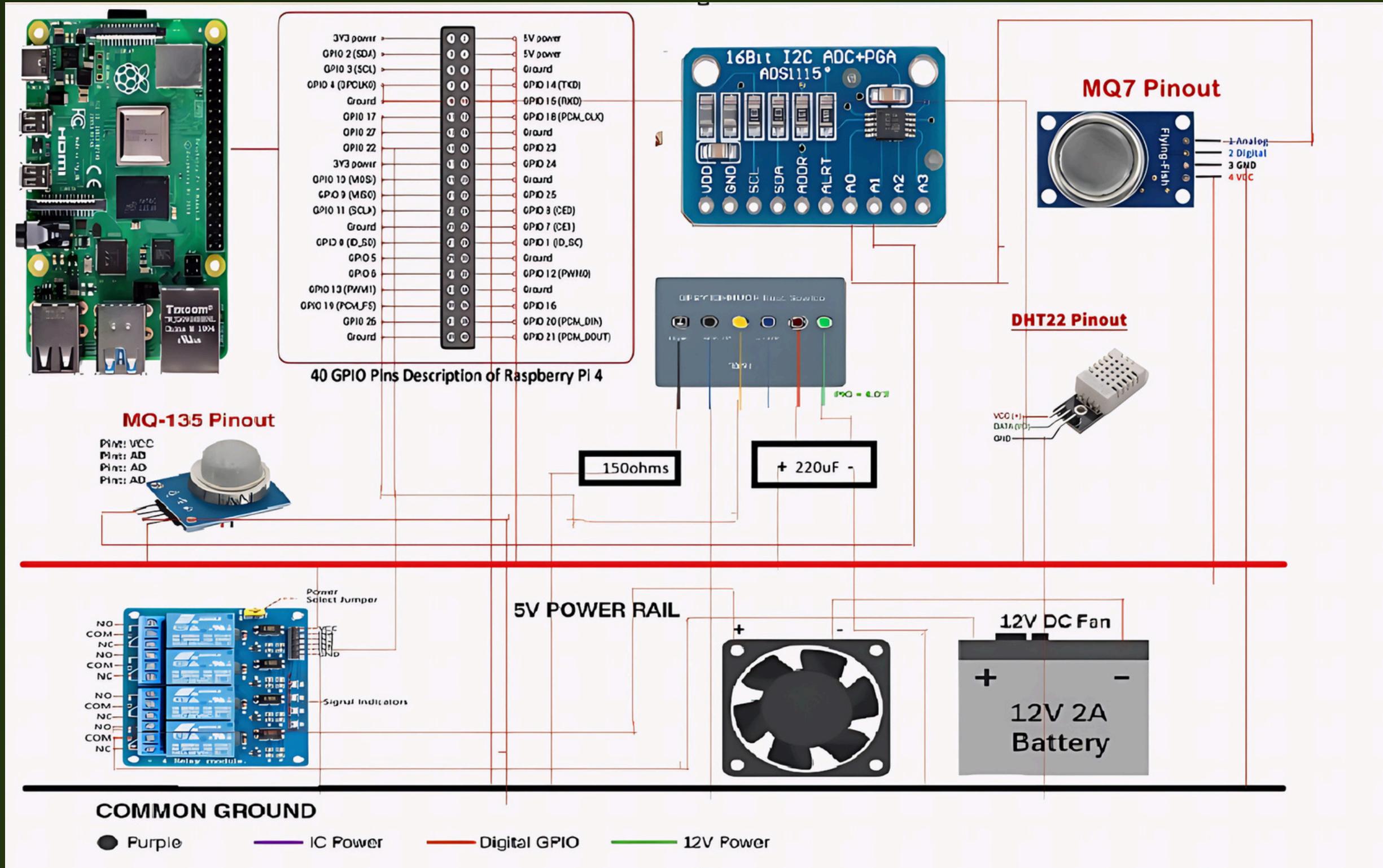
Filtration



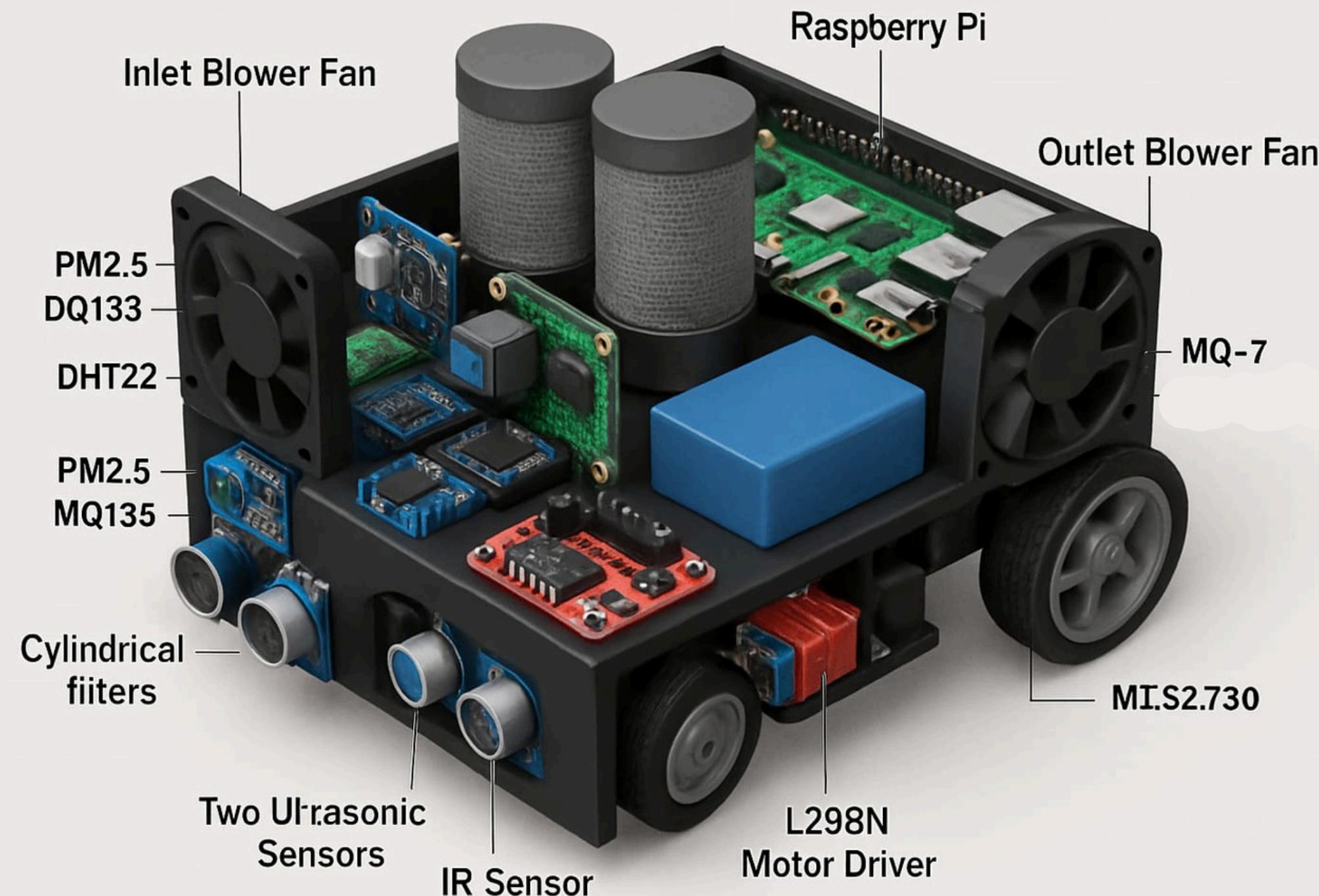
Project Architecture:



Analysis Circuit System Architecture:



Visualised Prototype



Working & Parameters:

Global standard AQI values:

Global Standard AQI Values					
AQI Range	Category	Health Implications	Cautionary Statement	Actions	Notes
0-50	Good	Air quality is satisfactory	Air quality is considered safe	None	
51-100	Moderate	Acceptable; may be moderate concern for very sensitive people	Active children and adults, and people with respiratory disease should limit prolonged outdoor exertion	Limit outdoor exertion	
101-150	Unhealthy for Sensitive Groups	Members of sensitive groups may experience health effects	Active children and adults, and people with respiratory disease should limit outdoor exertion	Limit outdoor exertion	
151-200	Unhealthy	Everyone may begin to experience health effects	Everyone should limit prolonged outdoor exertion	Limit outdoor exertion	
201-300	Very Unhealthy	Health alert: everyone may experience serious effects	Everyone should avoid all outdoor exertion	Avoid outdoor exertion	
301-500	Hazardous	Health warnings of emergency conditions	Everyone should remain indoors and keep activity levels low	Avoid outdoor exertion	

Working & Parameters:

Pollutants in air:

Major Air Pollutants Overview

Particulate Matter (PM)

- PM10: $\leq 10\mu\text{m}$ diameter
- PM2.5: $\leq 2.5\mu\text{m}$ diameter
- PM0.1: $\leq 0.1\mu\text{m}$ (ultrafine)

Gaseous Pollutants

CO (Carbon Monoxide):
Colorless, odorless - binds to hemoglobin

NO₂ (Nitrogen Dioxide):
Reddish-brown gas - respiratory irritant

SO₂ (Sulfur Dioxide):
Acid rain precursor - respiratory effects

O₃ (Ozone):
Ground-level - lung irritant

Volatile Organic Compounds (VOCs)

- Benzene (C₆H₆) - Carcinogenic
- Toluene (C₇H₈) - Neurological effects
- Formaldehyde (CH₂O) - Eye/respiratory irritant
- Xylene (C₈H₁₀) - Central nervous system effects
- Ethylbenzene (C₈H₁₀) - Hearing/vision damage
- Styrene (C₈H₈) - Respiratory/neurological

Sources: Paint, solvents, cleaning products, adhesives, furniture, building materials

Heavy Metals in Air

- Lead (Pb) - Neurological damage, affects children
- Mercury (Hg) - Nervous system toxin
- Cadmium (Cd) - Kidney damage, carcinogen
- Arsenic (As) - Carcinogenic, skin lesions
- Chromium (Cr) - Lung cancer, allergies

Sources: Industrial emissions, vehicle exhaust, coal burning

Biological Pollutants

- Pollen - Allergic reactions, asthma
- Mold Spores - Respiratory infections, allergies
- Bacteria - Infections, disease transmission
- Viruses - Airborne disease spread (COVID-19, flu)
- Dust Mites - Allergies, asthma triggers

Other Common Pollutants

- Ammonia (NH₃) - Irritant, fertilizer emissions
- Hydrogen Sulfide (H₂S) - "Rotten egg" smell, toxic
- Radon (Rn) - Radioactive gas, lung cancer risk
- Asbestos Fibers - Lung disease, mesothelioma
- Dioxins - Highly toxic, persistent pollutants

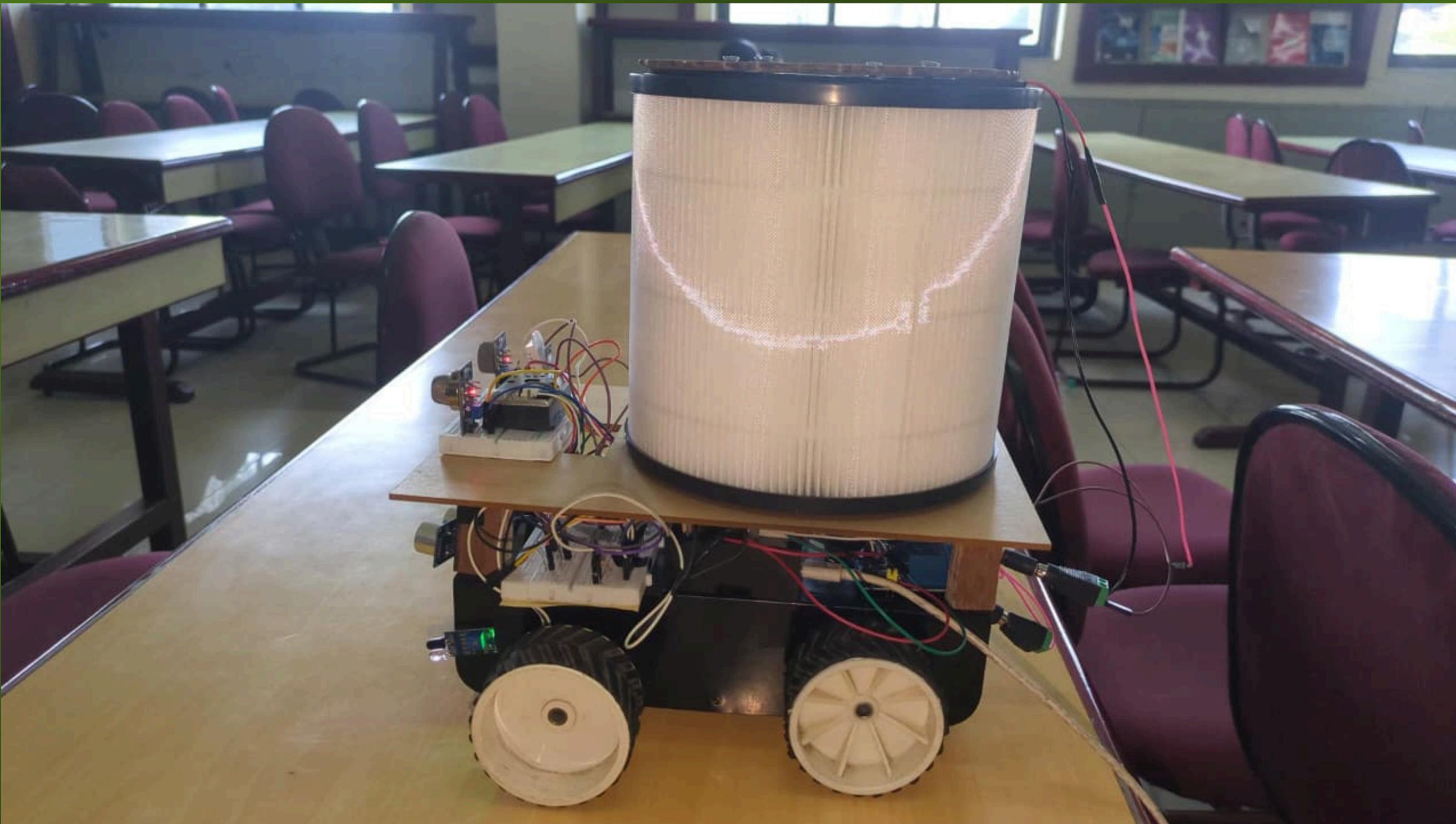
Detection Capability of Your Sensors

✓ PM2.5 Sensor: Particulate Matter ✓ MQ-7: Carbon Monoxide (CO) ✓ MQ-135: VOCs, NH₃, CO₂, NO_x, Smoke X Heavy Metals: Not detectable

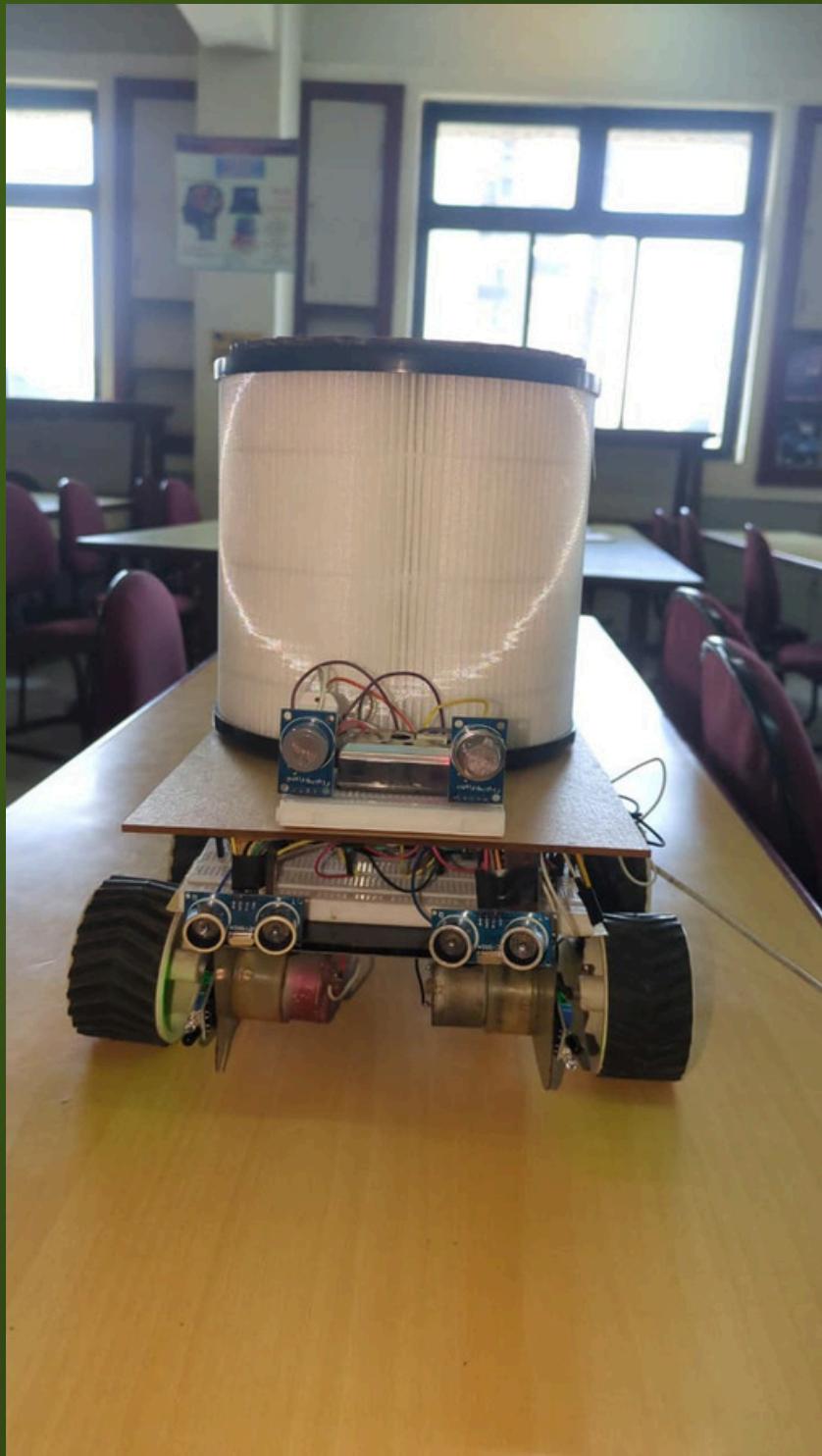
Existing Model's Progress:



Existing Model's Progress:



Existing Model's Progress:



APPLICATIONS

- **Homes & Offices** – Ensures clean indoor air, reducing allergies & respiratory issues.
- **Hospitals & Clinics** – Maintains sterile air quality for patient safety.
- **Schools & Daycares** – Provides a healthy environment for children.
- **Small Businesses & Cafés** – Enhances customer comfort & experience.
- **Gyms & Fitness Centers** – Removes airborne pollutants for better air circulation.



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- [4] Y. Zhang and K. Lee, "Smart Ventilation Control for Indoor Air Quality Enhancement," **IEEE Access**, vol. 10, pp. 78945-78958, 2023.
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- [5] W.-Y. Wu and Y.-C. Liu, "Hybrid AI-Based Approach for Air Quality Management," **2018 IEEE/ASME International Conference on Advanced Intelligent Mechatronics (AIM)**, pp. 188-193, 2018.



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THANK YOU!

BREATH FRESH, BREATH HEALTHY