SYMCA Research Project Report Logbook 2025-26 TERM I

Project Registration	SR. NO	TASK	DATE	COMPLETION DATE	SIGN WITH REMARK
	1	Student Group allocation	01 Aug 2025		
	2	Project Allocation			
	3	Project Abstract Upload			
STAGE-1	SR. NO	Progress Report I	DATE		
	1	Aim, Objective and Scope of Project	09/ Aug 2025		
	2	H/W S/W Requirement, Tools, Human Efforts in Hours			
	3	System Overview, Proposed System and Expected outcome, Architecture & initial phase of design,			
	4	Title of Research Paper, Literature Review, Research Gap			
	5	Objective of Research Paper, Abstract of Research Paper			
STAGE-2	SR. NO	Progress Report 2	DATE		
	1	ERD , UML & ER Diagram (As Per Problem statement)	23 Aug 2025		
	2	Database Design with proper key definition			
	3	Data Dictionary, Flow chart			
	4	Project Plam			
		Synopsis of Research Project and Paper			
REVIEW -1		REVIEW - I	30 Aug 2025		
STAGE-3	SR. NO	Progress Report III	DATE		

	SR. NO		DATE		
	1	Requirement Analysis / Models			
	2	Screen Design with proper validations, Reports-Analytical & graphical	13 Sep 2025		
	3	3-4 Working Models, Publish Research Paper			
	4	30 – 40% Coding documentation			
STAGE-4	**SR. NO**	**Progress Report IV**	**DATE**		
	1	Test Data (screenshot)			
	2	User Manual			
	3	Bibliography, References	27 Oct 2025		
	4	Published copy of Research Paper & Certificate			
	5	Spiral Copy Submission & Project Execution			
REVIEW -2		**REVIEW - II**	**11 Oct 2025**		
REVIEW -3		**PANEL DEMO PRESENTATION**	**1 Nov. 2025**		
		Final OR	**1st Week of Nov 2025**		

Coordinator
Dr. Rama Bansode

HOD MCA (I/C)
Dr. Prakash Kene

RESEARCH PROJECT   (MCA-II) Abstract (2025-26) TERM I

Name Of Student	Gurjas Singh Gandhi
Roll No. Div	52120/B
Project Title	Air Quality Monitoring and Visualizer App
Technology used	**Flutter,Node.Js,TensorflowLite,Google Maps API ,Supabase,CPCB AQI Data,ISRO Vedas Satellite Based AQI Data.**
Group No.	3
Group Members with Roll No.	Nikita Bachute 52102 Pranav Gadewar 52119 Ritwik Rahut 52152
Keywords	Air Quality Index (AQI), real-time monitoring, forecasting, satellite data, ground sensors, hyperlocal pollution, health alerts, predictive analytics, environmental data visualization
Name of Guide/Mentor	Dr. Prakash Kene
Student Email ID	gurjas_gandhi_mca@moderncoe.edu.in
Student Contact Number	9922233168

Vayu Drishti- An Air Quality Monitoring and Visualization App

Keywords:

Air Quality Index (AQI), real-time monitoring, forecasting, satellite data, ground sensors, hyperlocal pollution, health alerts, predictive analytics, environmental data visualization

Technology Used:

Flutter (mobile/web UI), Node.js + Express (backend API), Python (web scraping), TensorFlow Lite (forecasting models), Supabase (PostgreSQL database), Firebase Cloud Messaging (push notifications), Google Maps API (mapping/visualization)

Modules:

- Data Ingestion & Scraper (Python)

- Backend API & Data Processing (Node.js)

- Forecasting Engine (TensorFlow Lite)

- Frontend UI & Visualization (Flutter)

- Notification & Alert System (Firebase)

- Database (Supabase PostgreSQL)

Introduction:

Air pollution is a growing concern worldwide due to its impact on health and the environment. We recognize the need to provide accurate, real-time air quality information to all communities, including small towns and rural areas where monitoring is limited. We will develop an app that visualizes air quality data and provides forecasts to help users stay informed and safe.

We will collect data from multiple sources like government sensors, satellite observations, and public platforms to offer a complete, hyperlocal view of pollution. Our system will display pollutant levels such as PM2.5, NO2, and O3 in easy-to-understand maps and charts. This transparency helps users understand air quality changes over time.

To predict future conditions, we will apply machine learning models that forecast air quality up to 72 hours ahead using weather and historical data. These forecasts will enable early warnings for communities, assisting in health protection and planning. The app will also send push notifications with personalized health advice.

Our platform uses modern technology like Flutter for mobile/web, Node.js for backend services, and Python for data scraping to ensure reliability and scalability. This system is designed for easy integration and expansion, allowing developers and policymakers to use the data effectively.

In summary, we will build a powerful, accessible air quality monitoring system combining multiple data streams and AI forecasts. This will empower individuals and authorities with actionable insights into a healthier environment and better quality of life.

PROGRESS REPORT NO. 1

1. **Name of the Student:** Gurjas Singh Gandhi

2. **Class and Div:** SY MCA / B

3. **Date of Submission:** 09/09/2025

4. **Name of the Subject:** Research Project

5. **Name of the Guide:** Dr. Prakash Kene

6. **Team Members: Roll no., Student Name**:

Student Name	Roll no.
Nikita Bachute	52102
Pranav Gadewar	52119
Ritwik Rahut	52152

7. **Title of the Research work :** " Air Quality Monitoring and Visualization"

8. **Details of the work done:** Attach Separate Sheet |(On Page No.2)

9. **Date of Progress report submission**: 09/09/2025

Details of the Work Done:

1. Aim, Objective and Scope

Aim:
To Develop an accessible, real-time air quality visualization and forecasting system for underserved regions in India.

Objectives:

- Aggregate and display real-time/historical AQI data from ground and satellite sources.

- Visualize air quality trends, provide 24–72-hour forecasts, and deliver health advisories/alerts.

- Enable users to access hyperlocal air pollution insights via mobile/web app.

Scope:
It covers data integration, visualization, and automated health notifications for air quality—focusing on small towns and rural areas within India, using open data and modular technology.

2. Requirements, Tools, Human Effort

Requirements

- Real-time & historical AQI data collection: Integrating sources like CPCB, ISRO VEDAS, or AQICN APIs or scrapers.

- Mobile/web user interface: Visualizing AQI data, trends, heatmaps, and forecasts.

- Forecasting module: Predicting 24–72-hour air quality using meteorology and AQI history.

- Push notifications: Sending health alerts when pollution spikes are detected.

- Health advisories dashboard: Displaying actionable health advice based on AQI level.

- Backend & database: Efficient data storage, management, and secure API delivery.

Tools & Technologies

- Frontend: Flutter (mobile/web), React (alternative web UI)

- Backend: Node.js + Express, Supabase (PostgreSQL DB), Firebase Cloud Messaging

- Scraper: Python (requests, BeautifulSoup, Pandas for scraper and data processor)

- Visualization: Google Maps API, Leaflet, or Flutter map plugins

- Forecasting: TensorFlowLite, Hugging Face API for ML models

- Testing/Analytics: Jest, Firebase/Google Analytics

Human Effort (approx):

- 4 students, each 15–20 hours
- Total ~70 hours (design, coding, testing, docs)

3. System Overview & Outcome

System Overview

The system collects real-time air quality data from multiple sources (CPCB, ISRO VEDAS, AQICN) via APIs and scrapers, stores and processes the data in a backend, and delivers it to a mobile/web app. It visualizes current and historical AQI, forecasts pollution levels, and sends health alerts.

Proposed System

- Data Collection: Automated web scraping and API integration to ingest air pollution data.

- Backend: Node.js server with database for real-time data management, forecasting ML model integration, and push notification service.

- Frontend: Flutter app providing interactive maps, trend graphs, and health advisory dashboards.

- Forecasting: ML models (TensorFlowLite or Hugging Face) predict 24–72-hour AQI trends using weather and historical data.

Outcome

- Real-time, hyperlocal air quality visualization across urban and rural regions.

- Predictive pollution forecasts enabling proactive health protection.

- Personalized health recommendations and push alerts for pollution spikes.

- Open, extendable platform supporting integration with external systems and policymaking.

4. Research Paper Details

Title:

An Integrated Real-Time Air Quality Visualization and Forecasting System for Rural and Urban Areas in India

Literature Review:

We find that air quality monitoring systems often use IoT sensors, cloud platforms, and machine learning for data collection and forecasting. Studies highlight integrating gas sensors, wireless modules, and satellite data for broader coverage. Real-time visualization and remote alert systems are common, but most focus on urban areas without full integration or personalized health advisories.

Research Gap:

We observe a gap in coverage for rural and small-town regions. Existing systems rarely combine ground sensors, satellite data, and public sources into a unified real-time platform. We will address this by creating an open, scalable system with AI-driven forecasting and health alerts accessible to underserved communities.

5. Research Paper Objective & Abstract

Objective:
We aim to develop a real-time air quality monitoring and forecasting system that integrates data from ground sensors, satellite platforms, and public sources. We will provide hyperlocal pollution visualization, short-term forecasts, and personalized health alerts to empower communities and policymakers, especially in underserved areas.

Abstract:
Air pollution poses significant health risks, particularly in regions with limited monitoring infrastructure. We will build an integrated system combining data from government sensors, ISRO VEDAS satellites, and public platforms to offer real-time air quality visualization and forecasting. Using machine learning, we will predict pollution levels for the next 24–72 hours and send personalized health advisories via a mobile/web app. This system addresses current limitations by providing comprehensive, timely, and accessible air quality information, promoting healthier environments and informed decision-making.

Signature of the Student   **Signature of the Guide**

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