



International Journal of Innovative Research in Science Engineering and Technology (IJIRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)



Impact Factor: 8.699

Volume 14, Issue 3, March 2025

Green Aura Hub: A Smart System for Environmental Monitoring and Sustainable Plant Recommendations

Yash Verma, Anurag Kumar, Sanjiv Kumar, Raunak Ranjan, Yatin Shukla

U.G. Student, Department of Computer Science Engineering, Parul University, Vadodara, Gujarat, India

U.G. Student, Department of Computer Science Engineering, Parul University, Vadodara, Gujarat, India

U.G. Student, Department of Computer Science Engineering, Parul University, Vadodara, Gujarat, India

U.G. Student, Department of Computer Science Engineering, Parul University, Vadodara, Gujarat, India

Professor, Department of Computer Science Engineering, Parul University, Vadodara, Gujarat, India

ABSTRACT: With growing environmental concerns, Green Aura Hub emerges as a transformative digital solution that promotes sustainable urban greenery and air quality improvement. This research explores the role of Green Aura Hub in fostering eco-friendly living by providing personalized plant recommendations based on real-time Air Quality Index (AQI) data and location insights. The platform integrates intelligent AI-driven algorithms to analyze environmental factors and suggest plant species that enhance air purification and urban sustainability. Through a data-driven approach, this study evaluates the system's impact on user awareness, environmental engagement, and adoption of sustainable practices. The findings indicate that Green Aura Hub significantly empowers individuals and organizations by bridging technology and nature, offering a user-friendly way to make informed decisions for green living and air pollution control. This paper concludes that AI-powered environmental monitoring platforms like Green Aura Hub serve as a promising model for enhancing indoor and outdoor air quality, driving both personal and corporate sustainability efforts.

KEYWORDS: Air Quality Index (AQI), Environmental Sustainability, Plant Recommendations, Air Pollution Control, Smart Plant Suggestions, Urban Greenery Solutions, Environmental Health, Real-time AQI Data, Smart Home Gardening, Air Purifying Plants, Eco-friendly Solutions, IoT Plant Monitoring, Personalized Plant Care, Plant-Based Air Filtration

I. INTRODUCTION

Urbanization and environmental degradation have led to a critical need for sustainable solutions that enhance air quality and promote green living. As air pollution levels continue to rise, cities worldwide are seeking innovative ways to combat its adverse effects on public health and the environment. While traditional methods focus on policy-driven air pollution control, technology-driven solutions can empower individuals to take proactive measures in their own living spaces.

One such solution is Green Aura Hub, an intelligent software application designed to provide personalized plant recommendations based on real-time Air Quality Index (AQI) data and user location insights. Unlike conventional gardening apps that offer general plant care advice, Green Aura Hub integrates environmental monitoring with AI-driven plant selection, enabling users to choose plant species that not only thrive in their surroundings but also actively contribute to air purification.

The platform leverages advanced data analytics and AI algorithms to analyze environmental conditions and suggest optimal plant species for indoor and outdoor spaces. Additionally, interactive features such as plant care reminders, community forums, and educational insights enhance user engagement, fostering a community of environmentally conscious individuals.

The transition towards smart, eco-friendly urban solutions is essential in addressing air pollution and promoting sustainable living. However, challenges such as limited awareness, accessibility, and the need for scientifically backed recommendations hinder widespread adoption. This paper evaluates the impact of Green Aura Hub in driving

sustainable plant adoption, improving indoor and outdoor air quality, and encouraging environmentally responsible behavior. Through data-driven analysis, this study aims to assess the efficacy, user engagement, and broader implications of integrating real-time air quality monitoring with plant-based solutions.

II. LITERATURE SURVEY

Air-Purifying Plants and Indoor Air Quality

Air pollution, both outdoor and indoor, has become a significant concern due to its adverse effects on human health and environmental sustainability. Research suggests that individuals spend nearly 90% of their time indoors, where poor air quality can lead to severe health implications. Studies highlight the importance of air-purifying plants in improving Indoor Air Quality (IAQ) through natural filtration mechanisms.

According to NASA research, plant-based air purification effectively removes volatile organic compounds (VOCs) and other pollutants, promoting healthier indoor environments. Studies have demonstrated that plants like Spider Plant, Areca Palm, and Aloe Vera contribute to air purification by absorbing pollutants and enhancing oxygen levels.

Integration of AI and IoT in Green Solutions

The integration of Artificial Intelligence (AI) and the Internet of Things (IoT) in environmental sustainability has opened new possibilities for real-time monitoring and decision-making. AI-driven systems can analyze air quality metrics and recommend specific interventions to mitigate pollution. Previous studies on AI-based plant monitoring emphasize the effectiveness of machine learning models in predicting optimal plant placement for air purification. The use of sensor-based environmental tracking allows for a data-driven approach to urban greenery management.

Role of Phytoremediation in Air Pollution Control

Phytoremediation—the use of plants and soil microbes to remove contaminants—has gained attention as an effective and sustainable solution for air pollution control. Experiments conducted at NASA's BioHome and Biosphere 2 have demonstrated that plant-based biofiltration significantly reduces trace gases and airborne pollutants in enclosed environments. These findings reinforce the potential of Green Aura Hub in leveraging AI-driven recommendations for phytoremediation-based plant selection, helping individuals improve their indoor and outdoor air quality.

Application of Plant-Based Air Filtration in Urban Areas

Urbanization has resulted in deteriorating air quality, making plant-based air filtration a crucial intervention. Research on urban greenery solutions highlights how strategically placed shade trees and indoor plants contribute to lowering temperature, filtering pollutants, and reducing energy use. The effectiveness of green building integration using AI and IoT has further been explored to optimize energy efficiency and improve environmental conditions in metropolitan settings.

This review of literature establishes the scientific foundation for Green Aura Hub, reinforcing its role as an AI-powered solution for personalized plant recommendations, aiming to enhance air quality, promote sustainable urban living, and encourage environmental stewardship.

III. METHODOLOGY

The Green Aura Hub integrates advanced technological innovations to provide real-time environmental insights and personalized plant recommendations. By leveraging AI, IoT, and data analytics, this platform enhances urban sustainability and promotes green living practices. The methodology adopted in this study focuses on research and analysis, technological implementation, user engagement strategies, and system development to ensure an effective and user-friendly solution.

1. Research and Analysis

The foundation of Green Aura Hub is built upon extensive research and data-driven analysis. This involves:

User Needs and Preferences: Understanding the expectations of urban residents, environmental enthusiasts, and plant caretakers to develop a personalized and engaging application.

Competitor Analysis: Evaluating existing plant care and air-quality monitoring applications to identify market gaps and ensure competitive differentiation.

Environmental Data Collection: Analyzing real-time AQI data to provide accurate plant recommendations tailored to specific locations.

2. Technological Approach

To ensure seamless functionality and real-time responsiveness, the Green Aura Hub incorporates:

Frontend: Developed using React.js, ensuring a dynamic and user-friendly experience.

Backend: Built with Node.js, handling data processing and integration with environmental APIs.

Database Management: Utilizing MongoDB for efficient storage and retrieval of plant-related data.

Real-time AQI Integration: Fetching live air quality data from renowned AQI APIs to provide scientifically backed plant recommendations.

3. User Engagement and Community Interaction

To foster active participation and knowledge sharing, the platform includes:

Care and Maintenance Support: Providing comprehensive plant care guides, watering schedules, and health monitoring tools.

Reminders and Alerts: Customizable notifications for watering, fertilizing, and environmental changes.

Community Forums and Social Sharing: A dedicated discussion space where users can share plant care tips, showcase their green spaces, and interact with experts.

4. System Design and Development

The development process follows a structured approach to ensure efficiency and scalability:

i. **Requirement Gathering:** Engaging stakeholders to define functional and non-functional requirements.

ii. Design and Planning:

- Creating wireframes and prototypes to refine UI/UX design.
- Establishing system architecture with a focus on scalability and real-time data handling.
- Implementing Agile sprint planning for iterative development.

iii. Development & Implementation:

- Version control using Git.
- Incorporating CI/CD pipelines for seamless deployment.
- Ensuring cross-platform compatibility to enhance accessibility.

iv. Testing & Deployment:

- **Unit Testing:** Checking individual components for functionality.
- **Integration Testing:** Ensuring seamless communication between APIs and databases.
- **User Acceptance Testing (UAT):** Gathering feedback for refinement before launch.

v. Post-launch Monitoring & Updates:

- Tracking user engagement and application performance.
- Implementing feature updates based on user feedback.

The Green Aura Hub aims to bridge technology and nature, offering a scalable, AI-driven solution for urban greenery management. This methodology ensures scientific accuracy, user engagement, and sustainable urban impact, positioning the platform as a transformative tool for environmental well-being.

IV. CONCLUSION AND FUTURE SCOPE

Conclusion

The Green Aura Hub successfully demonstrates an innovative approach to improving air quality and promoting environmental sustainability through the integration of real-time air quality data, AI-driven recommendations, and natural solutions. By leveraging a vast plant database and scientific research, the platform provides personalized and actionable suggestions for indoor and outdoor plant selection, empowering users to adopt eco-friendly practices.

The project highlights the effectiveness of technology-driven interventions in addressing air pollution. Through a combination of data analytics, user-friendly interfaces, and environmental insights, Green Aura Hub enables individuals and communities to make informed decisions that contribute to healthier living spaces and increased environmental awareness.

While the system has successfully achieved its objectives, certain challenges remain, including regional variations in plant effectiveness and long-term maintenance of recommended solutions. User feedback will play a critical role in refining the system to enhance its adaptability, ensuring continuous improvements and long-term impact.

Future Scope

To further enhance functionality and scalability, several advancements can be explored:

- **Integration of Additional Environmental Parameters:** Incorporating humidity, temperature, soil quality, and sunlight exposure will refine plant recommendations, making them even more precise and adaptable to diverse environments.
- **Collaboration with Environmental Experts:** Working with researchers, ecologists, and urban planners can help validate the effectiveness of plant-based solutions and expand the system's real-world impact.
- **Smart Home & IoT Integration:** The system can be linked with IoT-based smart home technologies to automate plant care, including real-time condition monitoring, automated watering schedules, and adaptive recommendations.
- **E-Commerce & Local Nursery Partnerships:** Future enhancements could include an online marketplace where users can directly purchase recommended plants or access nursery locators to find nearby plant shops.
- **AI-Powered Predictive Analysis:** Implementing machine learning algorithms to forecast future air quality trends and suggest proactive plant-based interventions based on anticipated environmental changes.

By continuously evolving and addressing potential limitations, Green Aura Hub has the potential to make a lasting impact on urban sustainability, public health, and environmental conservation, creating smarter, greener cities for future generations.

REFERENCES

1. Nath, D.S.K. (2022). Common Indoor Plants to Purify Indoor Air Pollution in Assam, India: A Review. *Environment Conservation, Challenges & Threats in Conservation of Biodiversity*, 2, pp.123-127.
2. Al Qassimi, N. & Jung, C. (2022). Impact of Air-Purifying Plants on the Reduction of Volatile Organic Compounds in the Indoor Hot Desert Climate. *Frontiers in Built Environment*, 7, p.803516.
3. Inbathamizh, L. (2020). Indoor Medicinal Plants: Beneficial Biocatalysts for Air Filtration and Bioremediation – A Review. *International Journal of Green Pharmacy (IJGP)*, 14(02).
4. El-Tanbouly, R., Hassan, Z., & El-Messeiry, S. (2021). The Role of Indoor Plants in Air Purification and Human Health in the Context of COVID-19 Pandemic: A Proposal for a Novel Line of Inquiry. *Frontiers in Molecular Biosciences*, 8, p.709395.
5. Turner-Skoff, J.B. & Cavender, N. (2019). The Benefits of Trees for Livable and Sustainable Communities. *Plants, People, Planet*, 1(4), pp.323-335.
6. Wood, E.M. & Esaian, S. (2020). The Importance of Street Trees to Urban Avifauna. *Ecological Applications*, 30(7), p.e02149.
7. Wolverton, B.C. & Nelson, M. (2020). Using Plants and Soil Microbes to Purify Indoor Air: Lessons from NASA and Biosphere 2 Experiments. *Field Actions Science Reports*, (Special Issue 21), pp.54-59.
8. Akbari, H., Pomerantz, M., & Taha, H. (2001). Cool Surfaces and Shade Trees to Reduce Energy Use and Improve Air Quality in Urban Areas. *Solar Energy*, 70(3), pp.295-310.
9. Umoh, A.A., Nwasike, C.N., Tula, O.A., Adekoya, O.O., & Gidiagba, J.O. (2024). A Review of Smart Green Building Technologies: Investigating the Integration and Impact of AI and IoT in Sustainable Building Designs. *Computer Science IT Research Journal*, 5(1), pp.141-165.
10. Ali, Z.A., Deng, D., Shaikh, M.K., Hasan, R., & Khan, M.A. (2024). AI-Based UAV Swarms for Monitoring and Disease Identification of Brassica Plants Using Machine Learning: A Review. *Computer Systems Science Engineering*, 48(1).
11. Singh, K.K. (2018). An Artificial Intelligence and Cloud-Based Collaborative Platform for Plant Disease

- Identification, Tracking, and Forecasting for Farmers. IEEE International Conference on Cloud Computing in Emerging Markets (CCEM), pp.49-56.
12. Hall, C.R. & Knuth, M.J. (2019). An Update of the Literature Supporting the Well-Being Benefits of Plants: Part 2 Physiological Health Benefits. *Journal of Environmental Horticulture*, 37(2), pp.63-73.
 13. Kelly, F.J. & Fussell, J.C. (2019). Improving Indoor Air Quality, Health, and Performance Within Environments Where People Live, Travel, Learn, and Work. *Atmospheric Environment*, 200, pp.90-109.
 14. Aydogan, A. & Montoya, L.D. (2011). Formaldehyde Removal by Common Indoor Plant Species and Various Growing Media. *Atmospheric Environment*, 45(16), pp.2675-268.



INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 9940 572 462  6381 907 438  ijirset@gmail.com



www.ijirset.com

Scan to save the contact details