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Guidelines

- Kindly use the given template for submitting your project (Make a copy of the template)
- The ideal size of the presentation should not be more than 11 slides.
- You are welcome to add as many POCs and design concepts to support your project.
- The project should be feasible and the team members should be capable enough, to come up with the prototype of the same idea, if required.
- Projects using Google developer technologies like Gemini APIs & building projects on IDX platform will earn additional points.
- In case of queries, kindly reach out to us at hackoclock.gdgiilm@gmail.com

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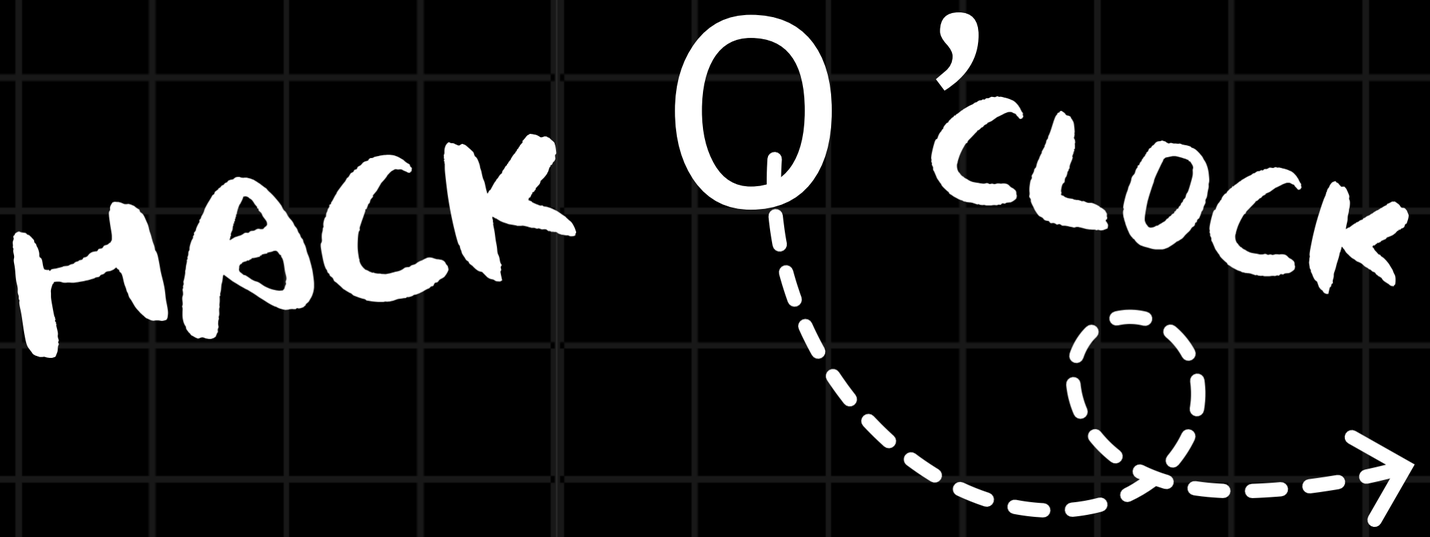

Team Details

- Team name: VectorCTRL
- Team leader name: Priyansh Neel
- Problem Statement: Urban farming's potential is hindered by space constraints, inefficiencies, and expertise gaps, threatening food security and sustainability.

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Brief about your Problem Statement:

Urban areas face escalating challenges in food security, environmental sustainability, and climate resilience due to rapid urbanization, pollution, and inefficient resource management. Key statistics include:-

- 928 million people globally suffered severe food insecurity as of 2020, disproportionately affecting urban populations.
- Cities contribute over 70% of global CO_2 emissions, accelerating climate change and air pollution.
- Urban areas lack green spaces and sustainable food systems, exacerbating environmental degradation and resource scarcity.

To address these issues, innovative urban farming solutions are urgently needed, integrating smart technology, optimizing resource use, and promoting self-sufficiency for sustainable and resilient cities

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Brief about your solution:

Our **AI-Powered Terrace Farming System** revolutionizes urban farming, transforming urban spaces into self-sustaining organic food production hubs, reducing reliance on external food supply chains and promoting climate-adaptive agriculture. Key Features:

1. Smart Sensor Integration: Real-time monitoring of temperature, humidity, soil moisture, CO_2 levels, and water quality ensures optimal plant care.
2. Predictive Water and Disinfection Management: AI-driven irrigation optimization conserves water, while UV-C technology improves water quality.
3. Plant Health Monitoring: AI-powered mobile camera detects diseases and nutrient deficiencies, enabling timely interventions.
4. Adaptive Solar Energy System: Sun-tracing solar setup adjusts to weather forecasts, maximizing energy capture and ensuring uninterrupted operation.
5. Benefits:- Utilizes empty urban spaces for organic food production ,reduces carbon emissions and promotes urban greenery ,no specialized personnel required for maintenance and enhances food security and sustainability in urban areas.

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Technologies to be used in the solution:

SOFTWARE

- React
- TailwinCSS
- Google FireBase
- CNN
- LSTM
- Llama 3.2 90b
- OpenWeatherAPI
- OpenCV
- FastAPI

HARDWARE

- MG-811 CO2 Sensor
- Raspberry Pi
- Servo Motors
- ESP8266 Microcontroller
- Soil Moisture Sensor
- Temperature Sensor
- DH-22
- UV-LED's
- Turbidity Sensor
- PH Sensor
- Solar Panel

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Describe Your Use cases here:

Most residents lack the knowledge, time, and space to grow their own food, while conventional indoor farming relies on costly UV lights and robotics, making it expensive and unnatural. To address this, here are some use cases to creates a huge impact by reducing CO_2 emissions and transforming urban spaces into greener, healthier environments.

- **Smart Urban Farming for Households:** Homeowners and apartment residents with unused terrace space and people looking for cost-effective organic food without depending on markets.
- **Smart Farming for Restaurants & Organic Food Businesses:** Restaurants, cafes, and organic food suppliers needing a steady source of fresh, pesticide-free produce.
- **Community Farming & Urban Sustainability Projects:** Apartment communities wanting a shared farming system. Schools & colleges promoting urban agriculture as a sustainability initiative. Government smart city projects integrating AI-driven terrace farms into urban landscapes.

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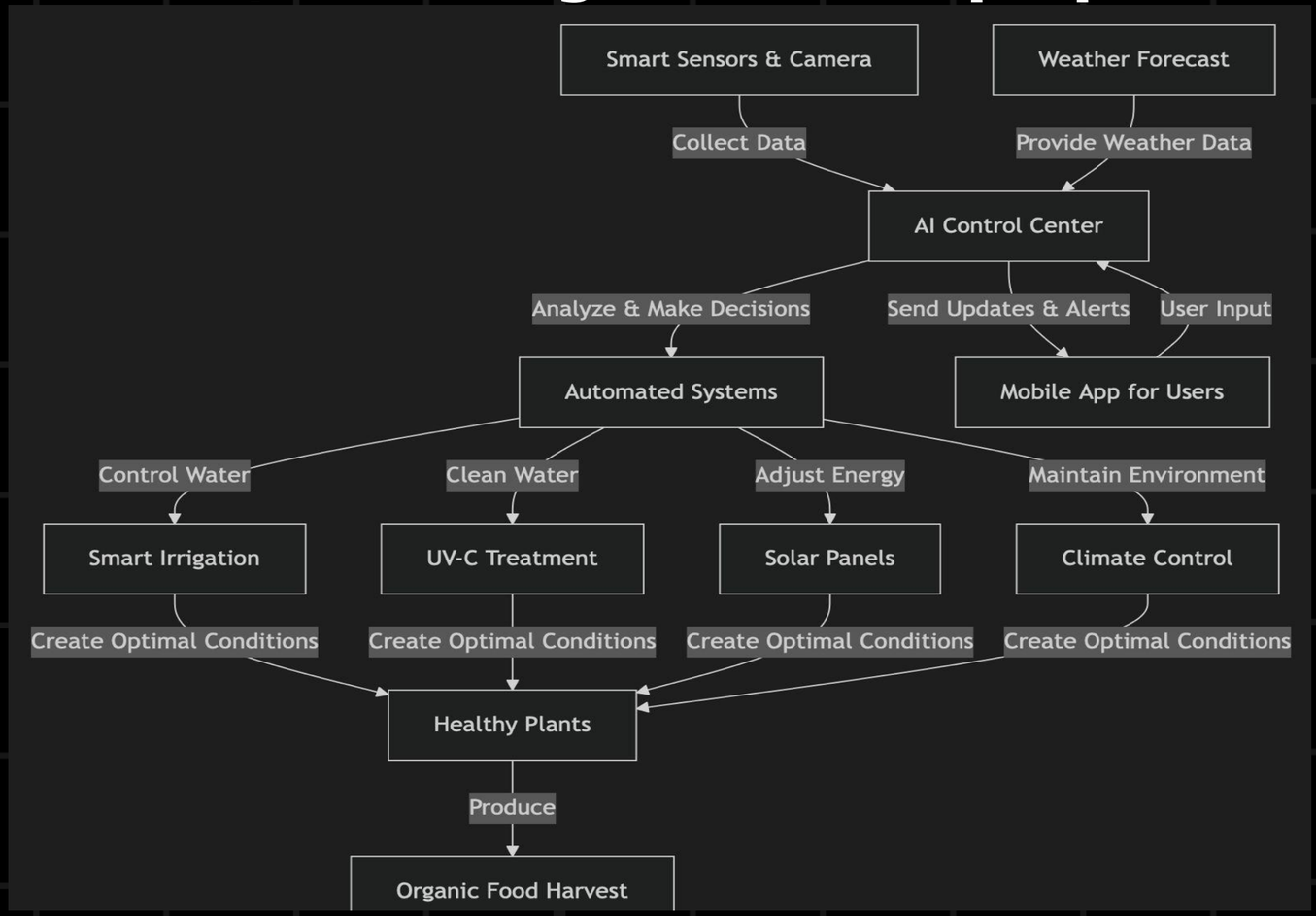
Wireframes/Mock diagrams of the proposed solution:



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Opportunities

Our AI-Powered Terrace Farming System addresses urban food production challenges with a unique blend of innovation and sustainability.

Key differentiators from any other existing ideas:-

- **AI-driven automation for optimal resource utilization.**
- **Integration of adaptive solar energy and UV-C water disinfection.**
- **Real-time monitoring and control for minimized manual intervention.**
- **Existing solutions like AgriPilot.ai, AGEYE Technologies, and INNOFarms.AI focus on indoor farming, relying on UV lights as artificial light sources and robots for automation, making them expensive and less natural. In contrast, our solution leverages natural sunlight, utilizes free terrace space, and is designed to be cost-effective, making sustainable urban farming more accessible and affordable. Our idea is highly feasible and can be implemented in households across India, where ample unused terrace space is available. It provides a cost-effective alternative for those seeking organic food, offering up to 30% faster production cycles and reducing costs.**
- **Educating users on creating organic fertilizers from everyday household waste like banana peels, eggshells, and dead leaves to enhance soil fertility and healthier plant growth at no extra cost.**

How will it be able to solve the problem?

- **Tackling Urban Food Insecurity** - Converts unused terrace spaces into high-yield urban farms, reducing dependence on expensive market produce.
- **Making Farming Easy & Labor-Free** - Uses AI-powered automation, reducing the need for manual labor.
- **Optimizing Water Usage & Preventing Waste** - Predictive irrigation system monitors soil moisture, weather forecasts, and water quality to optimize watering.
- **Promoting Organic Farming & Waste Recycling** - Educates users on composting household organic waste
- **Ensuring Energy Efficiency & Sustainability** - Sun-tracing solar system predicts cloudy/rainy days and adjusts solar panels to maximize energy storage.

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Most Viable Product (MVP)

- AI-powered sensor integration and AI Chatbot for Farming Guidance
- Predictive water and Plant Health Detection Using Mobile Camera AI
- Adaptive solar energy system for energy optimization
- User-friendly interface dashboard
- Seamless integration with existing urban infrastructure

USP(Unique Selling Proposition) of the proposed solution

- **Uses Free Terrace Space & Natural Sunlight** – Unlike expensive indoor farms relying on UV lights.
- **Cost-Effective & Scalable** – Designed for households, making organic urban farming accessible to all.
- **AI-Driven Automation** – Requires minimal human effort with smart irrigation, plant health monitoring, and chatbot assistance.

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